THK

General Catalog

Linear Motion Systems

A Technical Descriptions of the Products

PRODUCTS INFORMATION

THK develops and provides a large number of linear motion systems products, including LM Guides, Ball Screws and Actuators. All of these are used in various types of industrial equipment such as machine tools, semiconductor manufacturing machines and industrial robots.

To respond to diversifying requirements, THK has been enhancing its high-performance and high-quality products that can be used in widely varying operating environments.

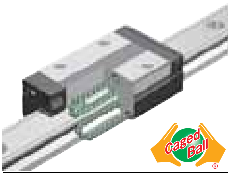
Select the most suitable product from our broad array of product lineups that respond to various applications.

Caged Ball LM Guide

Global standard size
SHS **A-136**

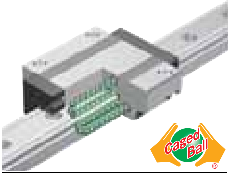
Model No.: SHS15 to 65

Radial Type
SSR **A-142**



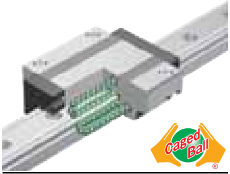
Model No.: SSR15 to 35

Ultra-heavy Load
SNR **A-148**



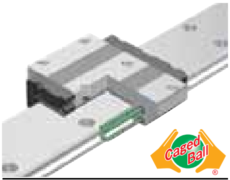
Model No.: SNR25 to 85

Ultra-heavy Load
SNS **A-148**



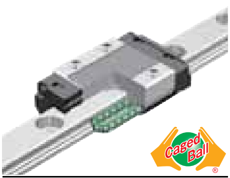
Model No.: SNS25 to 85

Wide Rail
SHW **A-156**



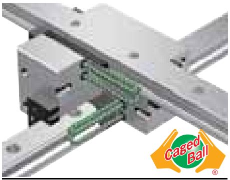
Model No.: SHW12 to 50

Miniature
SRS **A-160**



Model No.: SRS7 to 25

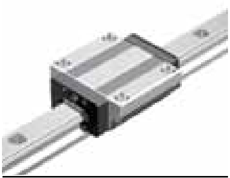
Cross LM Guide
SCR **A-166**



Model No.: SCR15 to 65

LM Guide

Global standard size
HSR **A-170**



Model No.:HSR8 to 150

Radial Type
SR **A-178**

Model No.: SR15 to 150

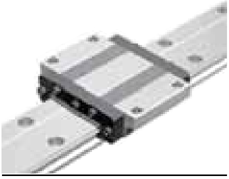
Ultra-heavy Load Type
NR **A-186**

Model No.: NR25 to 100

Ultra-heavy Load Type
NRS **A-186**

Model No.: NRS25 to 100

Wide Rail
HRW **A-194**



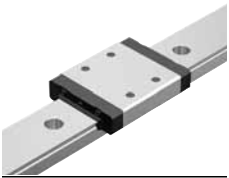
Model No.: HRW12 to 60

LM Guide

Miniature
RSR **A-200**

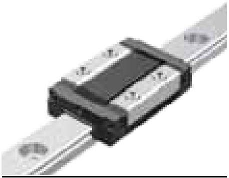
Model No.: RSR3 to 20

Miniature
RSR-W **A-200**



Model No.: RSR-W3 to 20

Miniature (Low Cost Type)
RSR-Z **A-208**



Model No.: RSR-Z7 to 15

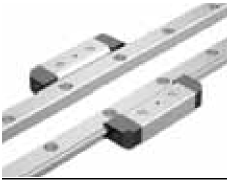
Miniature (Attached with Retainer)
RSH **A-214**

Model No.: RSH7 to 12

Miniature (Attached with Retainer)
RSH-Z **A-218**

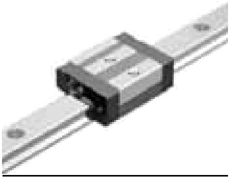
Model No.: RSH-Z 7 to 15

Separate Type
HR **A-224**



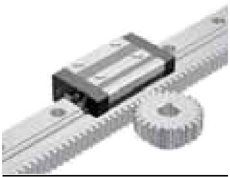
Model No.: HR918 to 60125

Separate Type
GSR **A-230**



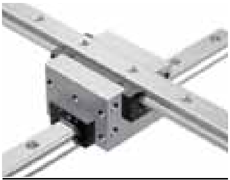
Model No.: GSR15 to 35

Separate Type
GSR-R **A-236**



Model No.: GSR-R25 to 35

Cross LM Guide
CSR **A-244**



Model No.: CSR15 to 45

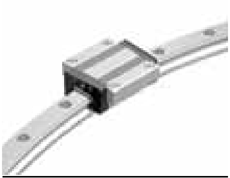
Miniature Cross Guide
MX **A-248**

Model No.: MX5 to 7

Structural Member Rail
JR **A-252**

Model No.: JR25 to 55

R Guide
HCR **A-258**



Model No.: HCR12 to 65

Straight-Curved Guide
HMG **A-262**

Model No.: HMG15 to 65

Self-aligning
NSR-TBC **A-268**

Model No.: NSR-TBC20 to 70

High Temperature
HSR-M1 **A-272**

Model No.: HSR-M1 15 to 35

High Temperature
SR-M1 **A-280**

Model No.: SR-M1 15 to 35

LM Guide

High Temperature
RSR-M1 A-286

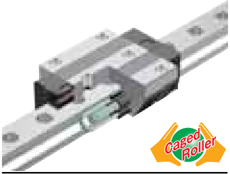
Model No.: RSR-M1 9 to 20

High Corrosion Resistance
HSR-M2 A-292

Model No.: HSR-M2 15 to 25

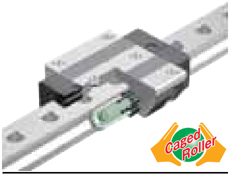
Caged Roller LM Guide

Ultra-high Rigidity
SRG A-300



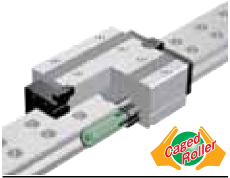
Model No.: SRG15 to 65

Ultra-high Rigidity (Low Center of Gravity)
SRN A-306



Model No.: SRN35 to 65

Ultra-high Rigidity (Wide)
SRW A-312



Model No.: SRW70 to 100

LM Guide Actuator

KR A-386

Model No.: KR15 to 65
Lead: 1 to 25

Caged Ball LM Guide Actuator

SKR A-416

Model No.: SKR33 to 46
Lead: 6 to 20

LM Actuator

Ball Screw Drive Type
GL A-438

Model No.: GL15/20
Lead: 5 to 40

Belt Drive Type
GL A-438

Model No.: GL15/20

High Torque Type Ball Spline

LBS A-484

Shaft diameter: ϕ6 to 100

LBST A-484

Shaft diameter: ϕ20 to 150

LBF A-484

Shaft diameter: ϕ15 to 100

LBR A-484

Shaft diameter: ϕ15 to 100

LBH A-484

Shaft diameter: ϕ15 to 50

Medium Torque Type Ball Spline

LT A-490

Shaft diameter: ϕ4 to 100

LF A-490

Shaft diameter: ϕ6 to 50

Rotary Ball Spline

LBG A-496

Shaft diameter: ϕ20 to 85

LBGT A-496

Shaft diameter: ϕ20 to 85

LTR A-500

Shaft diameter: ϕ16 to 60

LTR-A A-500

Shaft diameter: ϕ8 to 40

Spline Nut

DPM A-514

Model No.: DPM1220 to 5080

DP A-514

Model No.: DP12 to 50

Linear Bushing

LM A-524

Shaft diameter: ϕ3 to 60

LM-GA A-524

Shaft diameter: ϕ6 to 120

LM-MG A-524

Shaft diameter: ϕ3 to 40

LM-L A-524

Shaft diameter: ϕ3 to 60

LME A-524

Shaft diameter: ϕ5 to 80

LMF A-524

Shaft diameter: ϕ6 to 60

LMF-M A-524

Shaft diameter: ϕ6 to 30

LMF-L A-524

Shaft diameter: ϕ6 to 60

LMF-ML A-524

Shaft diameter: ϕ6 to 30

LMK A-524

Shaft diameter: ϕ6 to 60

Linear Bushing

LMK-M
A-524

Shaft diameter: ϕ6 to 30

LMK-L
A-524

Shaft diameter: ϕ6 to 60

LMK-ML
A-524

Shaft diameter: ϕ6 to 30

LMH
A-524

Shaft diameter: ϕ6 to 30

Linear Bushing

LMH-L
A-524

Shaft diameter: ϕ6 to 30

SC
A-524

Shaft diameter: ϕ6 to 50

SL
A-524

Shaft diameter: ϕ6 to 30

SH
A-524

Shaft diameter: ϕ3 to 20

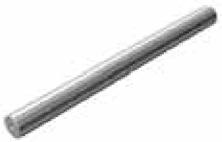
SH-L
A-524

Shaft diameter: ϕ3 to 20

LM Shaft End Support
SK
A-524

Shaft diameter: ϕ10 to 40

Standard LM Shafts
SF
A-524



Shaft diameter: ϕ3 to 100

LM Stroke

ST
A-554

Shaft diameter: ϕ6 to 100

ST-B
A-554

Shaft diameter: ϕ8 to 100

STI
A-554

Shaft diameter: ϕ6 to 100

Miniature Stroke

MST
A-560

Shaft diameter: ϕ3 to 6

Die-setting Ball Cage

KS
A-562

Shaft diameter: ϕ19 to 38

Die-setting Ball Cage

BS A-562

Shaft diameter: ϕ19 to 38

Precision Linear Pack

ER A-566

Model No.: ER513 to 1025

Cross Roller Guide

VR A-572

Model No.: VR1 to 18

Ball Guide

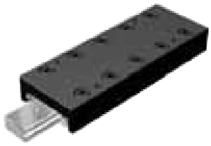
With Ball Cage

VB A-572

Model No.: VB1 to 15

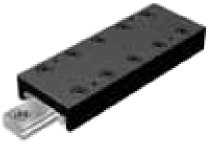
Cross Roller Table

VRT A-586



Model No.: VRT1025 to 3205

VRT-A A-586



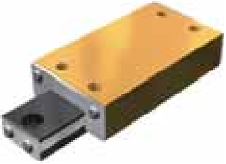
Model No.: VRT1025A to 3205A

VRU A-586

Model No.: VRU1025 to 91010

Linear Ball Slide

LSP A-594



Model No.: LSP1340 to 25150

LS A-594

Model No.: LS827 to 1077

LSC A-594

Model No.: LSC1015 to 1550

Unit Base

LSC A-594

Model No.: LSC1515B to 1550B

LM Roller

LR A-604

Model No.: LR4095 to 50130

LR-Z A-604

Model No.: LR1547Z to 3275Z

LRA A-604

Model No.: LRA4095 to 50130

LRA-Z A-604

Model No.: LRA1547Z to 3275Z

LRB A-604

Model No.: LRB4095 to 50130

LM Roller

LRB-Z A-604

Model No.: LRB1547Z to 3275Z

LRU A-604

Model No.: LRU22.2 to 76.2

LM Roller (Options)

Fixture Model SM A-618

Model No.: SM15 to 50

Fixture Model SMB A-618

Model No.: SMB15 to 50

Fixture Model SE A-618

Model No.: SE15 to 50

Fixture Model SEB A-618

Model No.: SEB15 to 50

Spring Pad PA A-617

Model No.: PA15 to 50

Flat Roller

FT A-622

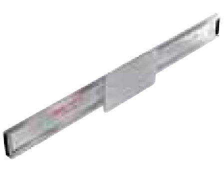
Width: 10 to 60
Length: 32 to 500

FTW A-622

Width: 30 to 70
Length: 150 to 500

Slide Pack

FBW A-636



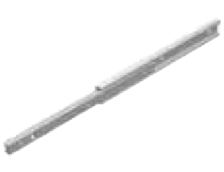
Rail length: 160 to 1800

Slide Rail

FBL A-646

Rail length: 200 to 2160

E15/20 A-646



Rail length: 50 to 300

D20 A-646

Rail length: 80 to 300

Precision, Caged Ball Screw

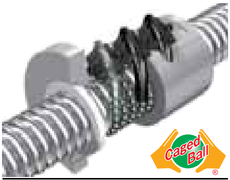
High Speed Ball Screw SBN A-748

Shaft diameter: ϕ32 to 50
Lead: 10 to 20

High Speed Ball Screw SBK A-748

Shaft diameter: ϕ36 to 55
Lead: 20 to 36

High Load Ball Screw HBN A-748



Shaft diameter: ϕ32 to 63
Lead: 10 to 20

Standard-Stock Precision Ball Screw

BIF A-754

Shaft diameter: ϕ16 to 50
Lead: 5 to 12

BNFN A-754

Shaft diameter: ϕ16 to 50
Lead: 5 to 12

MDK A-754

Shaft diameter: ϕ4 to 14
Lead: 1 to 5

MBF A-754

Shaft diameter: ϕ4 to 14
Lead: 1 to 4

BNF A-754

Shaft diameter: ϕ16 to 50
Lead: 5 to 12

Precision Ball Screw

Standard Ball Screw assembly

BNK A-760

Shaft diameter: ϕ4 to 25
Lead: 1 to 20

BIF A-764

Shaft diameter: ϕ16 to 50
Lead: 5 to 12

DIK A-764

Shaft diameter: ϕ14 to 63
Lead: 4 to 16

BNFN A-764

Shaft diameter: ϕ16 to 100
Lead: 4 to 20

DKN A-764

Shaft diameter: ϕ40 to 63
Lead: 20

BLW A-764

Shaft diameter: ϕ15 to 50
Lead: 10 to 50

BNF A-764

Shaft diameter: ϕ16 to 100
Lead: 4 to 20

DK A-764

Shaft diameter: ϕ14 to 63
Lead: 4 to 20

MDK A-764

Shaft diameter: ϕ4 to 14
Lead: 1 to 5

BLK A-764

Shaft diameter: ϕ15 to 50
Lead: 10 to 50

WGF A-764

Shaft diameter: ϕ8 to 50
Lead: 12 to 100

Precision Ball Screw

BNT A-764

Shaft diameter: ϕ14 to 45
Lead: 4 to 12

Precision Rotary Ball Screw

DIR A-772

Shaft diameter: ϕ16 to 40
Lead: 5 to 12

BLR A-772

Shaft diameter: ϕ16 to 50
Lead: 16 to 50

Precision Ball Screw/Spline

BNS-A A-780

Shaft diameter: ϕ8 to 40
Lead: 12 to 40

BNS A-780

Shaft diameter: ϕ16 to 50
Lead: 16 to 50

NS-A A-780

Shaft diameter: ϕ8 to 40
Lead: 12 to 40

NS A-780

Shaft diameter: ϕ16 to 50
Lead: 16 to 50

Rolled Ball Screw

Constant Pressure Preload

JPF A-790

Shaft diameter: ϕ14 to 40
Lead: 4 to 10

BTK A-790

Shaft diameter: ϕ10 to 50
Lead: 4 to 16

MTF A-790

Shaft diameter: ϕ6 to 12
Lead: 1 to 2

BLK A-790

Shaft diameter: ϕ15 to 50
Lead: 10 to 50

WTF A-790

Shaft diameter: ϕ15 to 50
Lead: 20 to 100

CNF A-790

Shaft diameter: ϕ15 to 30
Lead: 30 to 60

BNT A-790

Shaft diameter: ϕ14 to 45
Lead: 4 to 12

Rolled Rotary Ball Screw

BLR A-796

Shaft diameter: ϕ16 to 50
Lead: 16 to 50

Lead Screw Nut

DCM A-830

Shaft diameter: ϕ12 to 50

Lead Screw Nut

DC A-830

Shaft diameter: φ12 to 50

Change Nut

DCMA A-842

Model No.: DCMA15T to 50

DCMB A-842

Model No.: DCMB8T to 50

Cross-Roller Ring

Integrated Inner/Outer Ring Type

RU A-854

Inner diameter: φ20 to 350

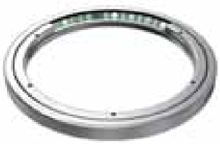
Separable Outer Ring Type

RB A-854

Inner diameter: φ20 to 1250

Two-piece Inner Ring

RE A-854

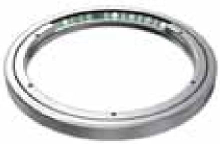


Inner diameter: φ20 to 600

RB-USP A-854

Inner diameter: φ100 to 600

RE-USP A-854



Inner diameter: φ100 to 600

Separable Outer Ring Type

RA A-854

Inner diameter: φ50 to 200

Separable Outer Ring Type

RA-C A-854

Inner diameter: φ50 to 200

Cam Follower

Popular Type

CF A-880

Stud diameter: φ5 to 30

With a Hexagon Socket

CF-A A-880

Stud diameter: φ3 to 30

Containing Thrust Balls

CFN-R-A A-880

Stud diameter: φ5 to 12

Eccentric Cam Follower with Hexagon Socket

CFH-A A-880

Stud diameter: φ6 to 30

With a Tapped Hole for Greasing

CFT A-880

Stud diameter: φ6 to 30

Roller Follower

Separable Type

NAST A-896

Inner diameter: φ6 to 50

Roller Follower

Separable Type
RNAST A-896

Inner diameter: ϕ7 to 60

Non-separable Type
NART A-896

Inner diameter: ϕ5 to 50

Spherical Plain Bearing

Double-split Outer Ring
SB A-910

Inner diameter: ϕ12 to 65

Single-split Outer Ring
SA1 A-910

Inner diameter: ϕ12 to 70

Link Ball

AL A-922

Shank thread diameter:
M4 to M10

BL A-922

Shank thread diameter:
M6 to M16

RBL A-922

Shank thread diameter:
M5 to M22

RBI A-922

Shank thread diameter:
M5 to M22

TBS A-922

Shank thread diameter:
M6 to M12

Rod End

Female Threading Type
PHS A-942

Spherical inner ring: ϕ5 to 30

Die Cast, Low Price Type
RBH A-942

Spherical inner ring: ϕ5 to 22

No Lubrication Type
NHS-T A-942

Spherical inner ring: ϕ3 to 22

Male Threading Type
POS A-942

Spherical inner ring: ϕ5 to 30

No Lubrication, Male Threading Type
NOS-T A-942

Spherical inner ring: ϕ3 to 22

Standard Type
PB A-942

Spherical inner ring: ϕ5 to 30

Die Cast Type
PBA A-942

Spherical inner ring: ϕ5 to 22

Rod End

No Lubrication Type
NB-T A-942

Spherical inner ring: ϕ14 to 22

No Lubrication Type
HB A-942

Spherical inner ring: ϕ5 to 12

Lubrication-free, Corrosion-resistant Type
HS A-942

Spherical inner ring: ϕ5 to 12

Accessories for Lubrication

Grease Gun Unit
MG70 A-970

For a 70-g bellows cartridge

Accessories for Lubrication
Special Plumbing Fixtures A-970

Available in various types

Accessories for Lubrication
Grease Nipple A-970

Available in various types

Original Grease
AFA A-959

Base oil: High-grade synthetic oil
Consistency enhancer: Urea-based

Original Grease
AFB-LF A-960

Base oil: Refined mineral oil
Consistency enhancer: Lithium-based

Original Grease
AFC A-961

Base oil: High-grade synthetic oil
Consistency enhancer: Urea-based

Original Grease
AFE-CA A-963

Base oil: High-grade synthetic oil
Consistency enhancer: Urea-based

Original Grease
AFF A-965

Base oil: High-grade synthetic oil
Consistency enhancer: Lithium-based

Original Grease
AFG A-968

Base oil: High-grade synthetic oil
Consistency enhancer: Urea-based

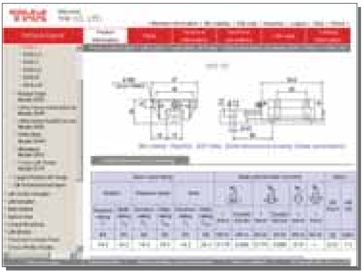
THK Technical Support Site

The THK Technical Support Site lets you access product information and technical support online. You will also find a search feature for locating desired products and a calculation feature for calculating service life. 2D CAD and 3D CAD data are also downloadable.

http://www.thk.com/ **Enter here.**

Product Information

View information on our products.
Search by model number, description, or any other criteria.

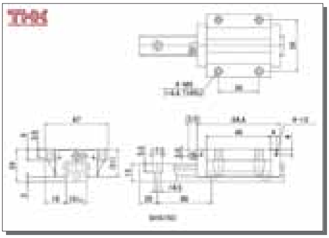


Detailed Dimensional Drawings

Check detailed product dimensions according to model number.

Detailed Specifications

Check detailed product specifications according to model number.



Available in 3 languages: Japanese,English,and German

Technical Information

View technical information, from application examples to research papers.

FAQ

View inquiries relating to products.
You can search by an entire inquiry or answer.

Technical Calculation

Rated life (service life time) can be calculated simply by entering model number, application criteria, etc.

2D CAD Data Downloads

Approximately 4,000 downloadables of 2D CAD data (DXF files) are available.

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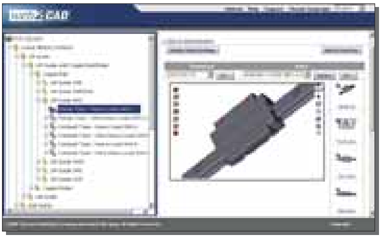

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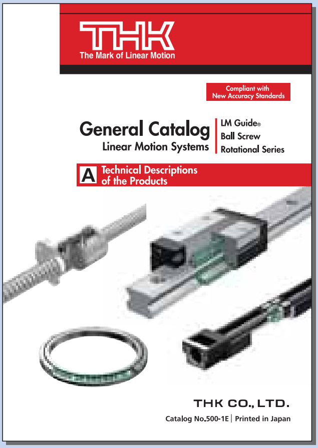
Guide to the General Catalog

The THK General Catalog is in two volumes, A Technical Descriptions of the Products, and B Product Specifications.



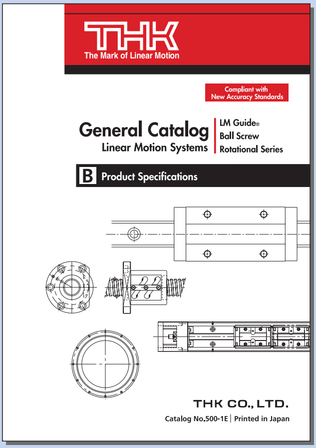
THK
The Mark of Linear Motion
Compliant with New Accuracy Standards
General Catalog
Linear Motion Systems
LM Guide®
Ball Screw
Rotational Series
A Technical Descriptions of the Products
THK CO., LTD.
Catalog No.500-1E | Printed in Japan

A Product Technical Descriptions

A Technical Descriptions of the Products mainly contains product

- Features and Structure
- Point of Selection
- Point of Design
- Mounting Procedure and Maintenance
- Options
- Precautions on Use

■Point of Selection include test data and service life calculation formulas for use when considering technical features in detail. Further, information relating generally to lubrication and grease-type products in special environments can be found conveniently together in Accessories for Lubrication



THK
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B Product Specifications

B Product Specifications contains dimensional drawings and tables according to product and model number.

All information containing product dimensional elements is given.

With two volumes, you can compare a page of product technical information with the product's dimensional drawings and tables to aid when considering specifications.

We at THK are sure you will be pleased in finding products among our abundant selection in the General Catalog that fit your needs.

General Table of Contents

THK General Catalog

General Table of Contents

Dimensions of Each Model with an Option Attached

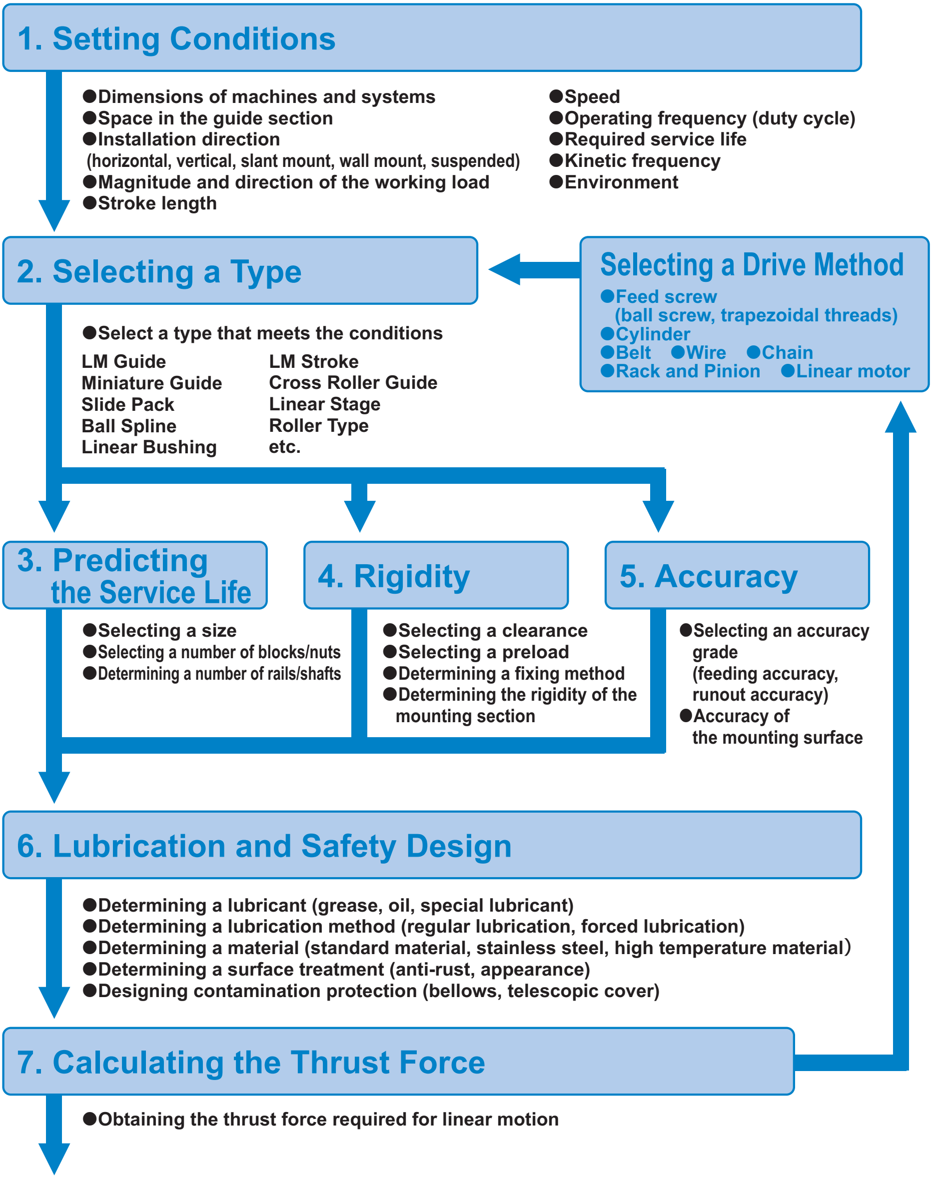
Model GL

General Description

THK General Catalog

A Technical Descriptions of the Products

Selection Flow Chart



1. Setting Conditions

- ●Dimensions of machines and systems
- ●Space in the guide section
- ●Installation direction (horizontal, vertical, slant mount, wall mount, suspended)
- ●Magnitude and direction of the working load
- ●Stroke length
- ●Speed
- ●Operating frequency (duty cycle)
- ●Required service life
- ●Kinetic frequency
- ●Environment

2. Selecting a Type

- ●Select a type that meets the conditions

LM Guide
Miniature Guide
Slide Pack
Ball Spline
Linear Bushing
LM Stroke
Cross Roller Guide
Linear Stage
Roller Type
etc.

Selecting a Drive Method

- ●Feed screw (ball screw, trapezoidal threads)
- ●Cylinder
- ●Belt
- ●Wire
- ●Chain
- ●Rack and Pinion
- ●Linear motor

3. Predicting the Service Life

- ●Selecting a size
- ●Selecting a number of blocks/nuts
- ●Determining a number of rails/shafts

4. Rigidity

- ●Selecting a clearance
- ●Selecting a preload
- ●Determining a fixing method
- ●Determining the rigidity of the mounting section

5. Accuracy

- ●Selecting an accuracy grade (feeding accuracy, runout accuracy)
- ●Accuracy of the mounting surface

6. Lubrication and Safety Design

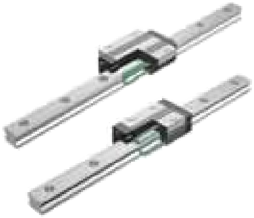
- ●Determining a lubricant (grease, oil, special lubricant)
- ●Determining a lubrication method (regular lubrication, forced lubrication)
- ●Determining a material (standard material, stainless steel, high temperature material)
- ●Determining a surface treatment (anti-rust, appearance)
- ●Designing contamination protection (bellows, telescopic cover)

7. Calculating the Thrust Force

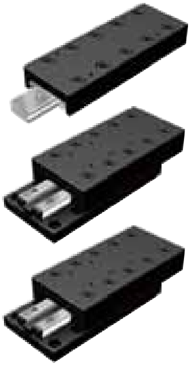
- ●Obtaining the thrust force required for linear motion

Selection Completed

Types and Features of LM Systems

Type	LM Guide	Ball Spline	Linear Bushing
Appearance			
Features	• Ideal Four Raceway, Circular-Arc Groove, Two-Point Contact Structure • Superb error-absorbing capability with the DF design • Accuracy Averaging Effect by Absorbing Mounting Surface Error • Large Permissible Load and High Rigidity • Low Friction Coefficient	• Large torque load capacity • Optimal for torque-transmitting mechanisms and locations where torque and radial load are simultaneously applied • No angular backlash • Ball Retaining Type	• Interchangeable type • LM system capable of performing infinite linear motion at low price
Stroke	Infinite stroke	Infinite stroke	Infinite stroke
Major Applications	• Surface grinder • Electric discharge machine • High-speed transfer equipment • NC lathe • Injection molding machine • Woodworking machine • Semiconductor manufacturing equipment • Inspection equipment • Food-related machine • Medical equipment	• Z axis of assembly robot • Automatic loader • Transfer machine • Automatic conveyance system • Wire winder • Spindle drive shaft of grinding machine • Steering of construction vehicle • Blood test equipment • ATC • Golf training machine	• Measuring instruments • Digital 3D measuring instrument • Printing machine • OA equipment • Automatic vending machine • Medical equipment • Food packaging machine
Page introducing the product	A-25 onward	A-447 onward	A-523 onward

Type	LM Stroke	Precision Linear Pack	Cross Roller Guide
Appearance			
Features	• Capable of performing rotary motion, straight motion and complex motion • Capable of performing rolling motion with an extremely small friction coefficient • Low cost	• Ultra-thin lightweight type • Reduced design and assembly costs	• Long service life, high rigidity • Easy clearance adjustment type
Stroke	Finite stroke	Infinite stroke	Finite stroke
Major Applications	• Press die setting • Ink roll unit of printing machine • Optical measuring instrument • Spindle • Solenoid valve guide • Press post guide • Load cell • Photocopiers • Inspection machines	• Magnetic disc device • Electronic equipment • Semiconductor manufacturing equipment • Medical equipment • Measuring equipment • Plotting machine • Photocopier	• Measuring instruments • Insertion machine • Printed circuit board drilling machine • Inspection equipment • Small stage • Handling mechanism • Automatic lathe • Tool grinder • Internal grinding machine • Small surface grinding machine
Page introducing the product	A-553 onward	A-565 onward	A-571 onward

Type	Cross Roller Table	Linear Ball Slide	LM Roller
Appearance			
Features	• Easily installable unit type • Allows selection of diverse uses	• Easily installable unit type • Lightweight and Compact • Capable of performing rolling motion with an extremely small friction coefficient • Capable of operating without lubrication • Low cost	• Compact, large load capacity type • Self skewing-adjusting type
Stroke	Finite stroke	Finite stroke	Infinite stroke
Major Applications	• Measuring equipment stage • Optical stage • Tool grinder • Printed circuit board drilling machine • Medical equipment • Automatic lathe • Tool grinder • Internal grinding machine • Small surface grinding machine	• Small electronic part assembly machine • Handler • Automatic recorder • Measuring equipment stage • Optical stage • Medical equipment	• Precision press ram guide • Press metal mold exchanger • Heavy load conveyor systems • Vendor machine
Page introducing the product	A-585 onward	A-593 onward	A-603 onward

Type	Flat Roller	Slide Pack	Slide Rail
Appearance			
Features	• Large Load Capacity • Combined accuracy of 90° V-shape surface and flat surface available as standard	• Interchangeable type • Low-cost, simple type	• Thin, compact design • Low-cost, simple type • High strength, high durability
Stroke	Finite stroke	Infinite stroke	Finite stroke
Major Applications	• Planer • Horizontal milling machine • Roll grinding machine • Surface grinder • Cylindrical grinder • Optical measuring instrument	• Amusement machine • High-grade furniture • Light and heavy doors • Tool cabinet • Kitchen fitments • Automatic feeder • Computer peripherals • Photocopier • Medical equipment • Office equipment	• Amusement machine • High-grade furniture • Light and heavy doors • Office equipment • Store fixture • Stocker
Page introducing the product	A-621 onward	A-635 onward	A-645 onward

Load Rating

Service Life of an LM System

When an LM system rolls under a load, its raceway and rolling elements (balls or rollers) constantly receive repetitive stress. If a limit is reached, the raceway fractures from fatigue and part of the surface exfoliates like scales. This phenomenon is called flaking.
The service life of an LM system refers to the total travel distance until the first event of flaking occurs due to rolling fatigue of the material on the raceway or the rolling element.

Nominal Life

The service life of an LM system is subject to slight variations even under the same operating conditions. Therefore, it is necessary to use the nominal life defined below as a reference value for obtaining the service life of the LM system.
The nominal life means the total travel distance that 90% of a group of identical LM system units can achieve without flaking.

Basic Load Rating

An LM system has two types of basic load ratings: basic dynamic load rating (C), which is used to calculate the service life, and basic static load rating (C_0), which defines the static permissible limit.

Basic Dynamic Load Rating C

The basic dynamic load rating (C) indicates the load with constant direction and magnitude, under which the rated life (L) is L = 50 km for an LM system using balls, or L = 100 km for an LM system using rollers, when a group of identical LM system units independently operate under the same conditions.
The basic dynamic load rating (C) is used to calculate the service life when an LM system operates under a load.

Specific values of each LM system model are indicated in the specification table for the corresponding model number.

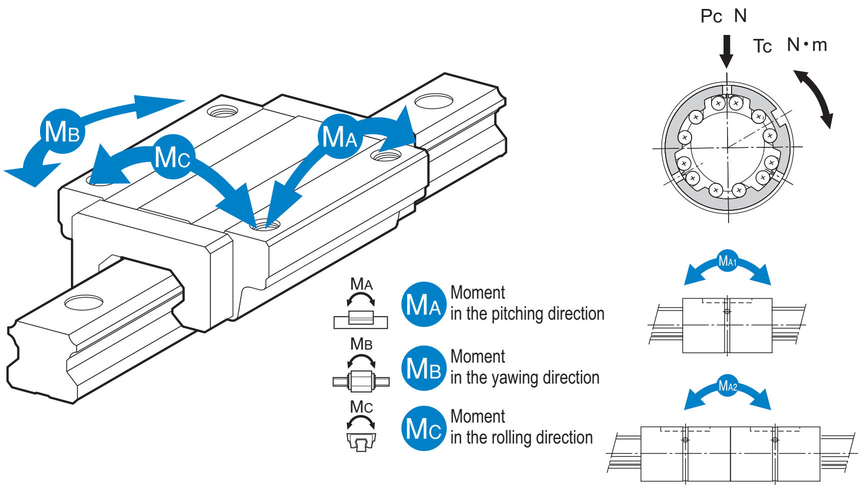
Basic Static Load Rating C_0

If an LM system receives an excessively large load or a large impact when it is stationary or operative, permanent deformation occurs between the raceway and the rolling element. If the permanent deformation exceeds a certain limit, it will prevent the LM system from performing smooth motion.
The basic static load rating is a static load with a constant direction and magnitude whereby the sum of the permanent deformation of the rolling element and that of the raceway on the contact area under the maximum stress is 0.0001 times the rolling element diameter. With an LM system, the basic static load rating is defined for the radial load.
Therefore, the basic static load rating is considered the limit of the static permissible load.

Specific values of each LM system model are indicated in the specification table for the corresponding model number.

Static Permissible Moment M_0

When an LM system receives a moment, the rolling elements on both ends receive the maximum stress due to uneven distribution of the stress on the rolling elements within the LM system.
The permissible static moment (M_0) means the moment with constant direction and magnitude, under which the sum of the permanent deformation of the rolling element and the permanent deformation of the raceway accounts for 0.0001 times of the rolling element's diameter in the contact area where the maximum stress is applied.
With an LM system, the static permissible moment is defined in three directions: M_A, M_B and M_C.
Thus, the static permissible moment is considered the limit of the static moment applied.



P_C : Radial load
T_C : Moment in the torque direction
M_{A1} : Moment in the pitching direction
M_{A2} : Moment in the pitching direction

The specific static permissible moment value of each LM system model is provided in the section on the permissible moments of each model.

Static Safety Factor f_S

The Linear Motion system may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

[Static Safety Factor f_S]

The static safety factor (f_S) is determined by the ratio of the load capacity (basic static load rating C_0) of an LM system to the load applied on the LM system.

$$f_S = \frac{f_C \cdot C_0}{P} \quad \text{or} \quad f_S = \frac{f_C \cdot M_0}{M} \quad \cdots\cdots\cdots \ (1)$$

f_S : Static safety factor
f_C : Contact factor (see Table2 on A-11)
C_0 : Basic static load rating
M_0 : Static permissible moment (M_A, M_B and M_C)
P : Calculated load
M : Calculated moment

[Measure of Static Safety Factor]

Refer to the static safety factor in Table1 as a measure of the lower limit under the service conditions.

Table1 Measure of Static Safety Factor

Kinetic conditions	Load conditions	Lower limit of f_S
Constantly stationary	Impact is small, and deflection of the shaft is also small	1.0 to 1.3
	Impact is present, and a twisting load is applied	2.0 to 3.0
Normal motion	A normal load is applied, and the deflection of the shaft is small	1.0 to 1.5
	Impact is present, and a twisting load is applied	2.5 to 7.0

Life Calculation Formula

The nominal life (L) of an LM system is obtained from the following equation using the basic dynamic load rating (C) and the applied load (P).

[LM System Using Balls]

$$L = \left(\frac{C}{P}\right)^{3} \times 50 \quad \cdots\cdots\cdots \ (2)$$

[LM System Using Rollers]

$$L = \left(\frac{C}{P}\right)^{\frac{10}{3}} \times 100 \quad \cdots\cdots\cdots \ (3)$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P : Applied load (N)

In most cases, it is difficult to calculate a load applied on an LM system.
In actual use, most LM systems receive vibrations and impact during operation, and fluctuation of the loads applied on them is assumed. In addition, the hardness of the raceway and the temperature of the LM system unit greatly affect the service life.
With these conditions considered, the practical service life calculation formulas (2) and (3) should be as follows.

[LM System Using Balls]

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \times \frac{C}{P}\right)^{3} \times 50 \quad \cdots\cdots\cdots \ (4)$$

[LM System Using Rollers]

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \times \frac{C}{P}\right)^{\frac{10}{3}} \times 100 \quad \cdots\cdots\cdots \ (5)$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P : Applied load (N)
f_H : Hardness factor (see Fig.1 on A-11)
f_T : Temperature factor (see Fig.2 on A-11)
f_C : Contact factor (see Table2 on A-11)
f_W : Load factor (see Table3 on A-12)

● f_H: Hardness Factor

To maximize the load capacity of the LM system, the hardness of the raceways needs to be between 58 and 64 HRC.

If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).

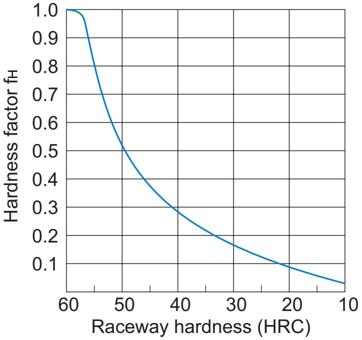


Fig.1 Hardness Factor (f_H)

● f_T:Temperature Factor

If the temperature of the environment surrounding the operating LM System exceeds 100 ℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.2.

In addition, the LM system must be of high temperature type.

Note) If the temperature of the service environment exceeds 80 ℃, it is necessary to change the materials of the seal and end plate to high-temperature materials.

Note) If the temperature of the environment exceeds 120℃, it is necessary to provide dimensional stabilization.

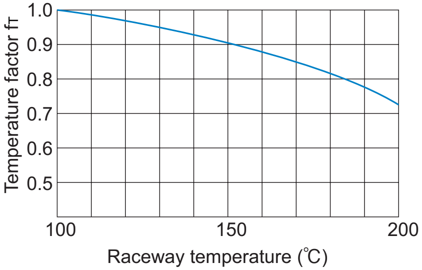


Fig.2 Temperature Factor (f_T)

● f_C: Contact Factor

If multiple LM Guide blocks are closely arranged with each other, it is difficult to achieve uniform load distribution due to a moment load and the accuracy of the mounting surface. In such applications, multiply basic load ratings “C” and “C_0” by the corresponding contact factors in Table2.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in Table2.

Table2 Contact Factor (f_C)

Number of blocks used in close contact	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
6 or greater	0.6
Normal use	1

● f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, where the effects of speed and vibration are estimated to be significant, divide the basic dynamic load rating (C) by a load factor selected from Table3, which contains empirically obtained data.

Table3 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

Rigidity

When using an LM system, it is necessary to select a type and a clearance (preload) that meet the service conditions in order to achieve the required rigidity of the machine/equipment.

Selecting a Clearance/Preload for an LM System

Since clearances and preloads of LM systems are standardized for different models, you can select a clearance and a preload according to the service conditions.

For separate-type models, THK cannot adjust their clearances at shipment. Therefore, the user must adjust the clearance when installing the product.

Determine a clearance/preload while referring to the following section.

Clearance and Preload

[Clearance (internal clearance)]

Clearance of an LM system is a play between the block (nut), the rail (shaft) and the ball (or roller). The sum of vertical clearances is called radial clearance, and the sum of circumferential clearances is called angular backlash (clearance in the rotational direction).

(1) Radial clearance

With the LM Guide, a radial clearance refers to the value of a movement of the block center when the LM block is gently moved vertically with constant force applied in the center of the fixed LM rail in the longitudinal direction.

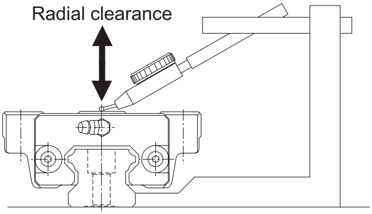


Fig.3 Radial clearance of the LM Guide

(2) Angular backlash (clearance in the rotational direction)

With the Ball Spline, angular backlash (clearance in the rotational direction) refers to the value of a rotational motion of the nut when the nut is gently rotated forward and backward with constant force with the spline shaft fixed.

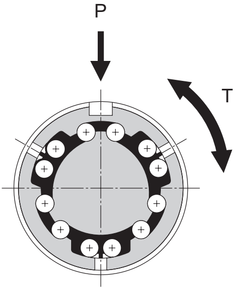


Fig.4 Angular backlash of the Ball Spline

[Preload]
Preload is a load that is preliminarily applied to the rolling elements in order to eliminate a clearance of an LM system and increase its rigidity.
A negative clearance indication (negative value) of an LM system means that a preload is provided.

Table4 Examples of Radial Clearances for LM Guide Model HSR

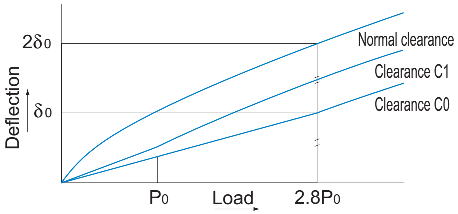
Unit: μm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
HSR 15	−4 to +2	−12 to −4	—
HSR 20	−5 to +2	−14 to −5	−23 to −14
HSR 25	−6 to +3	−16 to −6	−26 to −16
HSR 30	−7 to +4	−19 to −7	−31 to −19
HSR 35	−8 to +4	−22 to −8	−35 to −22

For specific clearances and preloads, see the section concerning the corresponding model.

Preload and Rigidity

Providing a preload to an LM system will increase the rigidity according to the amount of the preload. Fig.5 shows deflection of clearances (normal clearance, clearance C1 and clearance C0) (with LM Guide model HSR).



P0: Applied preload

Fig.5 Rigidity Data

Thus, a preload has an effect of up to approximately 2.8 times greater than the applied preload itself. The deflection with a preload under a given load is smaller, and the rigidity is much greater, than that without a preload.

Fig.6 shows how the radial deflection of an LM Guide changes with a preload. As indicated in Fig.6, when an LM Guide block receives a radial load of 2.45 kN, the radial deflection is 9μm if the radial clearance is zero (normal clearance) or 2μm if it the radial clearance is -30μm (clearance C0), thus increasing the rigidity by 4.5 times.

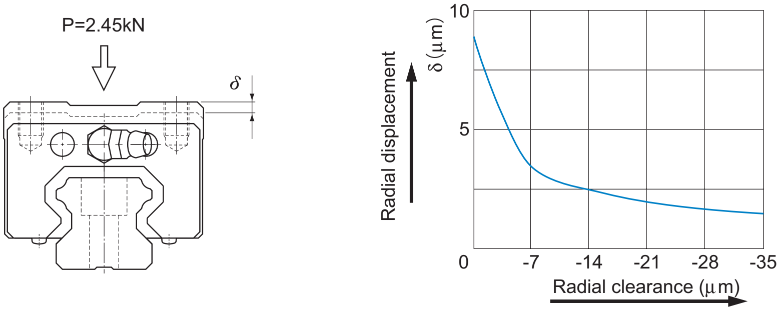


Fig.6 Radial Clearance and Deflection

For selecting a specific clearance, see the section concerning selection of a radial clearance for the corresponding LM system model.

Friction coefficient

Since an LM system makes rolling motion via its rolling elements such as balls and rollers between the raceways, its frictional resistance is 1/20 to 1/40 smaller than a sliding guide. Its static friction is especially small and almost the same as dynamic friction, preventing the system from experiencing “stick-slip.” Therefore, the system is capable of being fed by the submicron distance.

The frictional resistance of an LM system varies according to the type of the LM system, preload, viscosity resistance of the lubricant and the load applied on the LM system.

In particular, when a moment is given or a preload is applied to increase rigidity, the frictional resistance increases.

Normal friction coefficient by LM systems are indicated in Table5.

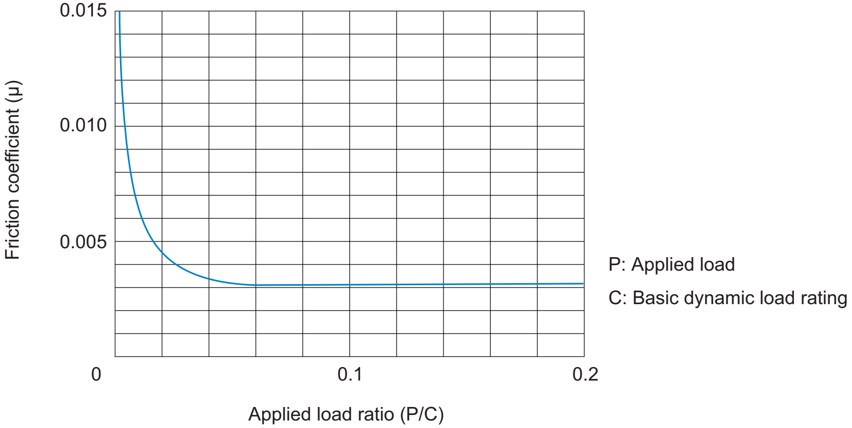


Fig.7 Relationship between Applied Load Ratio and Frictional Resistance

Table5 Frictional Resistances (μ) of LM Systems

Types of LM systems	Representative types	Frictional resistance (μ)
LM Guide	SSR, SHS, SNR/SNS, SRS, RSR, HSR, NR/NRS	0.002 to 0.003
	SRG, SRN	0.001 to 0.002
Ball Spline	LBS, LBF, LT, LF	0.002 to 0.003
Linear Bushing	LM, LMK, LMF, SC	0.001 to 0.003
LM Stroke	MST, ST	0.0006 to 0.0012
LM Roller	LR, LRA	0.005 to 0.01
Flat Roller	FT, FTW	0.001 to 0.0025
Cross-roller Guide/Cross-roller Table	VR, VRU, VRT	0.001 to 0.0025
Linear Ball Slide	LS	0.0006 to 0.0012
Cam Follower/Roller Follower	CF, NAST	0.0015 to 0.0025

Accuracy

The motion accuracy of an LM system is defined in running accuracy for models that are fixed on the flat surface and in runout accuracy for models whose shafts are supported, and accuracy grades are established for each of them.

For details, see the page concerning the corresponding model.

Lubrication

When using an LM system, it is necessary to provide effective lubrication. Using the product without lubrication may increase wear of the rolling elements or shorten the service life.

A lubricant has the following effects.

1. Minimizes friction in moving elements to prevent seizure and reduce wear.
2. Forms an oil film on the raceway to decrease stress acting on the surface and extend rolling fatigue life.
3. Covers the metal surface to prevent rust formation.

To fully bring out an LM system's functions, it is necessary to provide lubrication according to the conditions.

Even with an LM system with seals, the internal lubricant gradually seeps out during operation. Therefore, the system needs to be lubricated at an appropriate interval according to the conditions.

[Types of Lubricants]

LM systems mainly use grease or sliding surface oil for their lubricants.

The requirements that lubricants need to satisfy generally consist of the following.

(1) High oil film strength
(2) Low friction
(3) High wear resistance
(4) High thermal stability
(5) Non-corrosive
(6) Highly anti-corrosive
(7) Minimal dust/water content
(8) Consistency of grease must not be altered to a significant extent even after it is repeatedly stirred.

Lubricants that meet these requirements include the following products.

Table6 Lubricants for General Use

Lubricant	Type	Brand name
Oil	Sliding surface oil or turbine oil ISOVG32 to 68	Super Multi 32 to 68 (Idemitsu) Vactra No.2S (ExxonMobile) DT Oil (ExxonMobile) Tonner Oil (Showa Shell Sekiyu) or equivalent

Table7 Lubricants Used under Special Environments

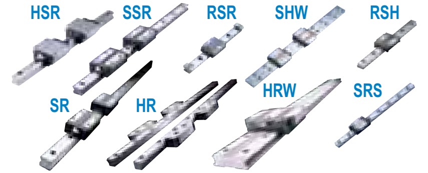
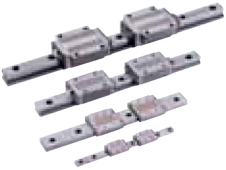
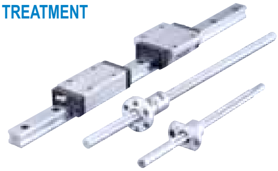
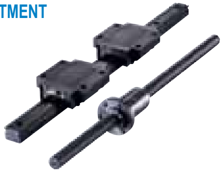
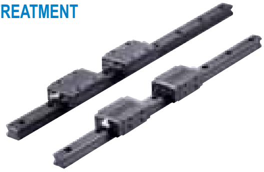
Service environment	Lubricant characteristics	Brand name
High-speed moving parts	Grease with low torque and low heat generation	AFG Grease(THK) see A-968 AFA Grease(THK) see A-959 NBU15(NOK Kluba) Multemp (Kyodo Yushi) or equivalent
Vacuum	Fluorine based vacuum grease or oil (vapor pressure varies by brand) Note 1	Fomblin Grease (Solvay Solexis) Fomblin Oil (Solvay Solexis) Barrierta IEL/V (NOK Kluba) Isoflex(NOK Kluba) Krytox (Dupont)
Clean room	Grease with very low dust generation	AFE-CA Grease(THK) see A-963 (The above vacuum grease products also applicable) AFF Grease(THK) see A-965
Environments subject to microvibrations or microstrokes, which may cause fretting corrosion	Grease that easily forms an oil film and has high fretting resistance	AFC Grease(THK) see A-961
Environments subject to a spattering coolant such as machine tools	Highly anti-corrosive, refined mineral oil or synthetic oil that forms a strong oil film and is not easily emulsified or washed away by coolant Water-resistant grease Note 2	Super Multi 68 (Idemitsu) Vactra No.2S (ExxonMobile) or equivalent

Note1) When using a vacuum grease, be sure that some brands have starting resistances several times greater than ordinary lithium-based greases.
Note2) In an environment subject to a spattering water-soluble coolant, some brands of intermediate viscosity significantly decrease their lubricity or do not properly form an oil film. Check the compatibility between the lubricant and the coolant.
Note3) Do not mix greases with different physical properties.
Note4) For THK original grease products, see A-958.

Safety Design

LM systems are used in various environments. If using an LM system in a special environment such as vacuum, anti corrosion, high temperature and low temperature, it is necessary to select a material and surface treatment that suit the service environment.

To support use in various special environments, THK offers the following materials and surface treatments for LM systems.

	Description	Model No.	Features/Capabilities
Material	Martensite stainless steel		Anti-rust property ★★★★★
	Martensite stainless steel	**SR-M1** **HSR-M1** **RSR-M1** 	High temperature support ★★★★★ * up to 150℃
	Austenite stainless steel	**HSR-M2** 	Anti-rust property ★★★★★
Surface Treatment	AP-HC	**THK AP-HC TREATMENT** 	Low dust generation ★★★★★ Anti-rust property ★★★ Surface hardness ★★★★★
	AP-C	**THK AP-C TREATMENT** 	Anti-rust property ★★★★
	AP-CF	**THK AP-CF TREATMENT** 	Anti-rust property ★★★★★

* If you desire a surface treatment other than the above, contact THK.

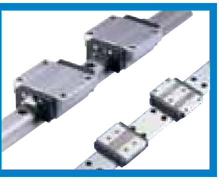
Determining a Material

In normal service conditions, LM systems use a type of steel that suits LM systems. If using an LM system in a special environment, it is necessary to select a material that suits the service environment.
For locations that require high corrosion resistance, a stainless steel material is used.

Material Specifications

Stainless Steel LM Systems

●Material···martensite stainless steel/austenite stainless steel



For use in environments where corrosion resistance is required, some LM system models can use martensite stainless steel.
If the model number of an LM system contains symbol M, it means that the model is made of stainless steel. See the section concerning the corresponding model.

Model number coding

HSR25 A 2 QZ UU C0 M +1200L P M -Ⅱ

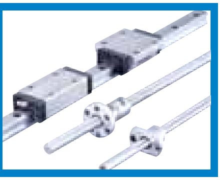
HSR25	Model number
A	Type of LM block
2	No. of LM blocks used on the same rail
QZ	With QZ Lubricator
UU	Dust prevention accessory symbol
C0	Radial clearance symbol
M	Stainless steel LM block
+1200L	LM rail length (in mm)
P	Accuracy symbol
M	Stainless steel LM rail
-Ⅱ	Symbol for No. of rails used on the same plane

Surface Treatment

The surfaces of the rails and shafts of LM systems can be treated for anti-corrosive or aesthetic purposes.
THK offers THK-AP treatment, which is the optimum surface treatment for LM systems.
The THK-AP treatment consists of the following 3 types.

AP-HC

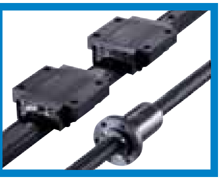
- ●Surface treatment···industrial-use hard chrome plating
- ●Film hardness···750 Hv or higher



Equivalent to industrial-use hard chrome plating, AP-HC achieves almost the same level of corrosion resistance as martensite stainless steel. In addition, it is highly wear resistant since the film hardness is extremely high, 750 Hv or higher.

AP-C

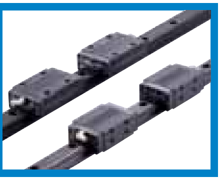
- ●Surface treatment···industrial-use black chrome coating



A type of industrial-use black chrome coating designed to increase corrosion resistance. It achieves lower cost and higher corrosion resistance than martensite stainless steel.

AP-CF

- ●Surface treatment···industrial-use black chrome coating
/special fluorocarbon resin coating



A compound surface treatment that combines black chrome coating and special fluorine resin coating and is suitable for applications requiring high corrosion resistance.
In addition to the above treatments, other surface treatments are sometimes performed on areas other than the raceways, such as alkaline coloring treatment (black oxidizing) and color anodize treatment. However, some of them are not suitable for LM systems. For details, contact THK.
If using an LM system whose raceways are surface treated, set a higher safety factor.

Model number coding

SR15 V 2 F + 640L F

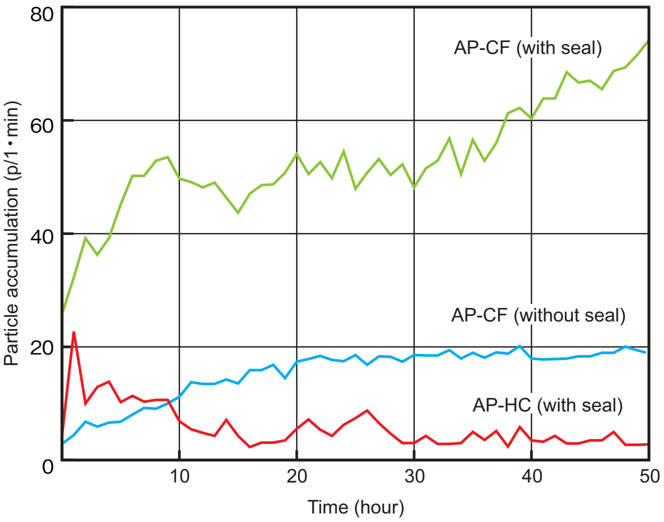
SR15: Model number
V: Type of LM block
2: No. of LM blocks used on the same rail
F: With surface treatment on the LM block
640L: LM rail length (in mm)
F: With surface treatment on the LM block

Note) Note that the inside of the mounting hole is not provided with surface treatment.

[Data on Comparison of Dust Generation with AP Treatment]

[Test conditions]

Item	Description
LM Guide model number	SSR20WF+280LF (AP-CF, without seal) SSR20UUF+280LF (AP-CF, with seal) SSR20WUUF+280LF (AP-HC, with seal)
Grease used	THK AFE-CA Grease
Grease quantity	1cc (per LM block)
Speed	30m/min(MAX)
Stroke	200mm
Flow rate during measurement	1ℓ/min
Clean room volume	1.7 liter (acrylic casing)
Measuring instrument	Dust counter
Measured particle diameter	0.3µm or more



THK AP-HC treatment provides high surface hardness and has high wear resistance. The high level of wear in the early stage in the graph above is considered to be due to the initial wear of the end seal.

Note) THK AP-HC treatment (equivalent to hard chrome plating)
THK AP-CF treatment (equivalent to black chrome plating + fluorine resin coating)

[Data on Comparison of Rust Prevention]

<Salt-water spray resistance cycle test>

Item	Description
Spray liquid	1% NaCl solution
cycles	Spraying for 6 hours, drying for 6 hours
Temperature conditions	35℃ during spraying
	60℃ during drying

Specimen material Time		Austenite stainless steel	Martensite stainless steel	THK AP-HC	THK AP-C	THK AP-CF
Before test						
6 hours						
24 hours						
96 hours						
Test Result	Anti-rust property	◎	○	○	◎	◎
	Wear Resistance	○	◎	◎	△	○
	Surface hardness	△	◎	◎	△	△
	Adherence	—	—	◎	△	○
	Appearance	Metallic luster	Metallic luster	Metallic luster	Black luster	Black luster

Contamination Protection

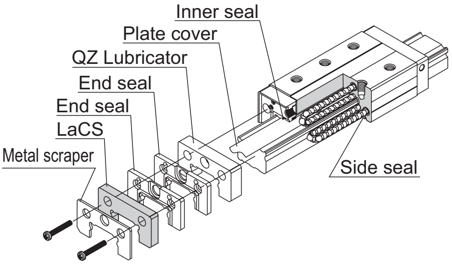
Contamination protection is the most important factor in using an LM system. Entrance of dust or other foreign material into the LM system will cause abnormal wear or shorten the service life.
Therefore, when entrance of dust or other foreign material is predicted, it is necessary to select a sealing device or contamination protection device that meets the service environment conditions.

(1) Dedicated seals for LM systems

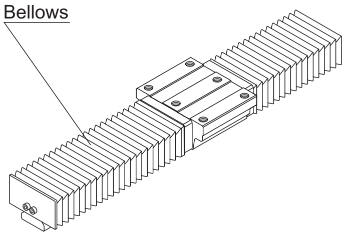
For LM systems, seals made of special synthetic rubber with high wear resistance (e.g., Laminated Contact Scraper LaCS) and a wiper ring are available as contamination protection seals.
For locations with adverse service environments, dedicated bellows and dedicated covers are available for some models.
For details and symbols of these seals, see the section concerning options (contamination protection) for the corresponding model.
To provide contamination protection also for Ball Screws in service environments subject to cutting chips and cutting fluids, it is advisable to use a telescopic cover that covers the whole system and a large-size bellows.

(2) Dedicated bellows

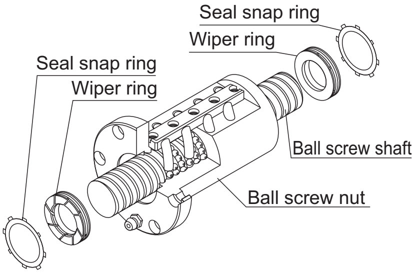
For LM Guides, standardized bellows are available.
THK manufactures dedicated bellows also for other LM systems such as Ball Screws and Ball Splines. Contact THK for details.



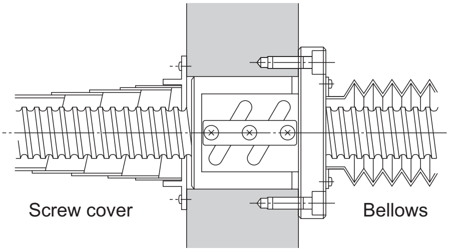
Contamination Protection Seal for the LM Guide



Dedicated Bellows for the LM Guide



Wiper Ring for the Ball Screw



Contamination Protection Cover for the Ball Screw

LM Guide®

THK General Catalog

LM Guide

THK General Catalog

A Technical Descriptions of the Products

Dimensions of Each Model with an Option Attached

B Product Specifications (Separate)

Dimensional Drawing, Dimensional Table
Caged Ball LM Guide

LM Guide

Caged Roller LM Guide

*** Please see the separate "B Product Specifications".**

Features of the LM Guide

Functions Required for Linear Guide Surface

- Large permissible load
- Highly rigid in all directions
- High positioning repeatability
- Running accuracy can be obtained easily
- High accuracy can be maintained over a long period
- Smooth motion with no clearance
- Superbly high speed
- Easy maintenance
- Can be used in various environments

Features of the LM Guide

- Large permissible load and high rigidity
- Accuracy averaging effect by absorbing mounting surface error
- Ideal four raceway, circular-arc groove, two point contact structure
- Superb error-absorbing capability with the DF design
- Low friction coefficient
- Wide array of options (QZ lubricator, Laminated contact scraper LaCS, etc.)

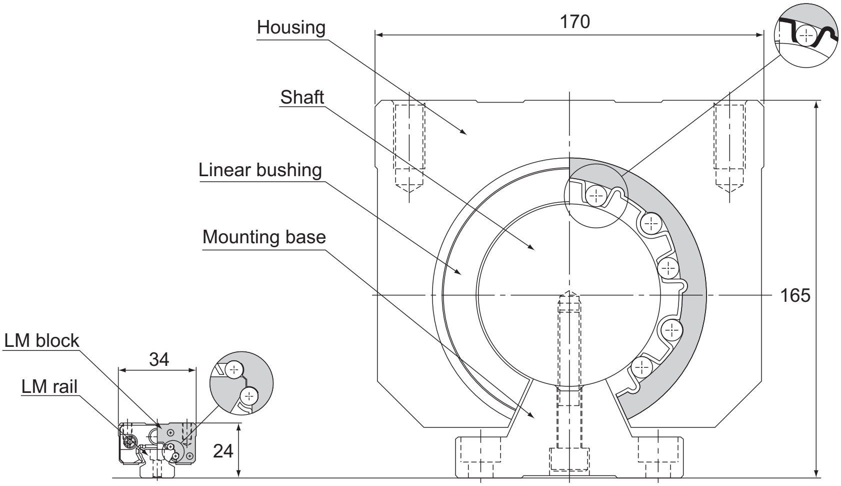
As a result, the following features are achieved.

Easy maintenance
Improved productivity of the machine
Substantial energy savings
Low total cost
Higher accuracy of the machine
Higher efficiency in machine design

Large Permissible Load and High Rigidity

[Large Permissible Load]

The LM Guide has raceway grooves with a radius almost equal to the ball radius, which is significantly different from the linear bushing. As shown in Fig.1, which compares size between the LM Guide and the linear bushing with similar basic dynamic load ratings, the LM Guide is much smaller than the linear bushing, indicating that the LM Guide allows a significantly compact design.
The reason for this space saving is the greater difference in permissible load between the R-groove contact structure and the surface contact structure. The R-groove contact structure (radius: 52% of the ball radius) can bear a load per ball 13 times greater than the surface contact structure. Since service life is proportional to the cube of the permissible load, this increased ball-bearing load translates into a service life that is approximately 2,200 longer than the linear bushing.



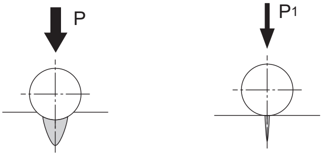
LM Guide model SSR15XW
Basic dynamic load rating: 14.7 kN

Linear Bushing model LM80 OP
Basic dynamic load rating: 7.35 kN

Fig.1 Comparison between the LM Guide and the Linear Bushing

Table1 Load Capacity per Ball (P and P_1)
Permissible contact surface pressure: 4,200 MPa

	R-groove (P)	Flat surface (P_1)	P/P_1
ϕ 3.175 (1/8´´)	0.90 kN	0.07 kN	13
ϕ 4.763 (3/16´´)	2.03 kN	0.16 kN	13
ϕ 6.350 (1/4´´)	3.61 kN	0.28 kN	13
ϕ 7.938 (5/16´´)	5.64 kN	0.44 kN	13
ϕ 11.906 (15/32´´)	12.68 kN	0.98 kN	13



R-groove **Flat surface**

Fig.2 Load Capacity per Ball

[High Rigidity]

The LM Guide is capable of bearing vertical and horizontal loads. Additionally, due to the circular-arc groove design, it is capable of carrying a preload as necessary to increase its rigidity.
When compared with a feed screw shaft system and a spindle in rigidity, the guide surface using an LM Guide has higher rigidity.

- **Example of comparing static rigidity between the LM Guide, a feed screw shaft system and a spindle**

(vertical machining center with the main shaft motor of 7.5 kW)

[Components]

LM Guide: SNR45LC/C0
(C0 clearance: preload = 8.05kN)
Ball Screw: BNFN4010-5/G0
(G0 clearance: preload = 2.64kN)
Spindle: general-purpose cutting spindle

Table2 Comparison of Static Rigidity

Unit: N/µm

Components	X-axis direction	Y-axis direction	Z-axis direction
LM Guide	—	2110	8700 (radial) 6730 (reverse radial)
Ball screw	330	—	—
Spindle	250	250	280

Note) The rigidity of the feed screw shaft system includes rigidity of the shaft end support bearing.

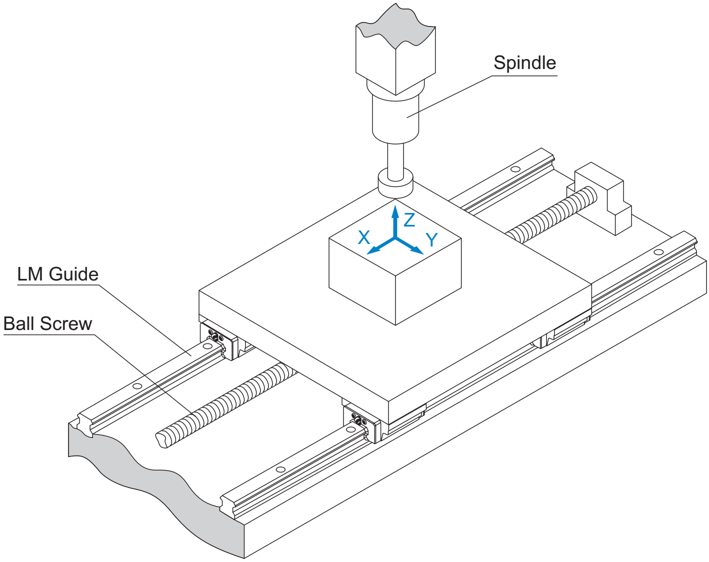
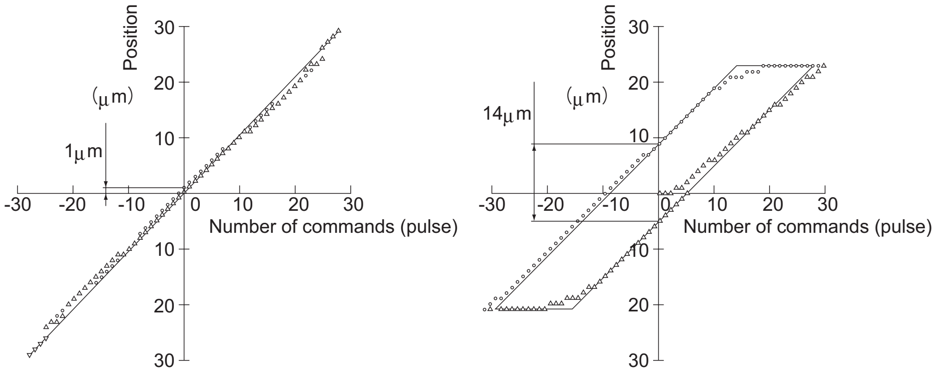


Fig.3

High Precision of Motion

[Small lost motion]

The LM Guide is provided with an ideal rolling mechanism. Therefore, the difference between dynamic and static friction is minimal and lost motion hardly occurs.



LM Guide model HSR45

Square slide + Turcite

(Measurements are taken with the single-axis table loaded with a 500-kg weight)

Fig.4 Comparison of Lost Motion between the LM Guide and a Slide Guide

Table3 Lost Motion Comparison

Unit: μm

Type	Clearance	Test method			
		As per JIS B 6330			Based on minimum unit feeding
		10mm/min	500mm/min	4000mm/min	
LM Guide (HSR45)	C1 clearance (see table below)	2.3	5.3	3.9	0
	C0 clearance (see table below)	3.6	4.4	3.1	1
Square slide + turcite	0.02mm	10.7	15	14.1	14
	0.005mm	8.7	13.1	12.1	13

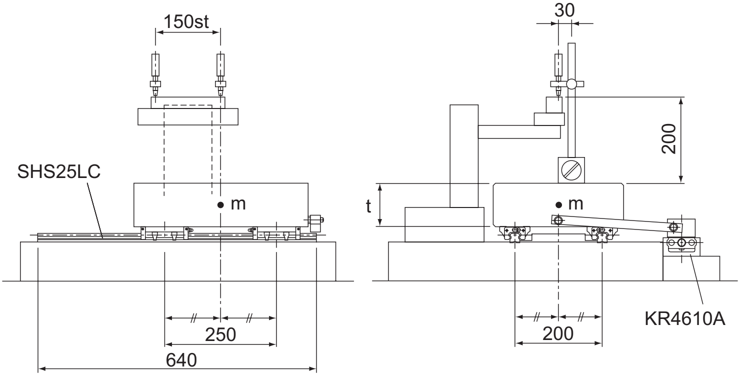
Radial clearance of the LM Guide

Unit: μm

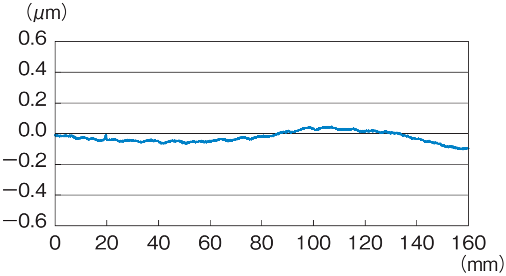
Symbol	C1	C0
Radial clearance	−25 to −10	−40 to −25

[High running accuracy]
Use of the LM Guide allows you to achieve high running accuracy.

[Measurement method]



Pitching accuracy



Yawing accuracy

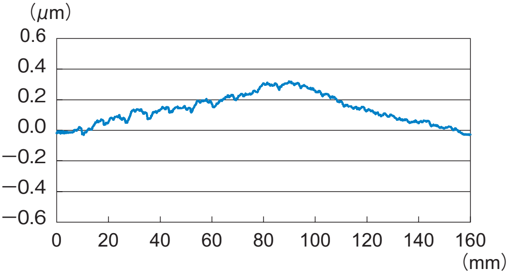


Fig.5 Dynamic Accuracy of a Single-axis Table

[High accuracy maintained over a long period]

As the LM Guide employs an ideal rolling mechanism, wear is negligible and high precision is maintained for long periods of time. As shown in Fig.6, when the LM Guide operates under both a preload and a normal load, more than 90% of the preload remains even after running 2,000 km.

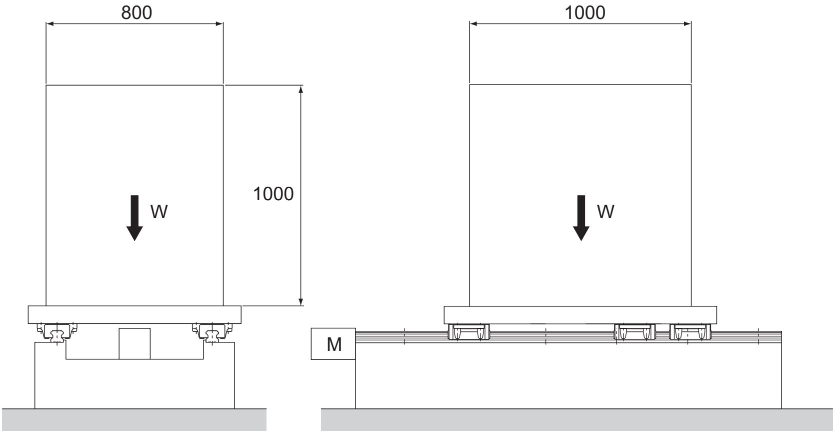


Fig.6 Condition

[Conditions]
Model No. : HSR65LA3SSC0 + 2565LP-Ⅱ
Radial clearance
: C0 (preload: 15.7 kN)
Stroke : 1,050mm
Speed : 15 m/min (stops 5 sec at both ends)
Acceleration/decelelation time in rapid motion
: 300 ms (acceleration: α = 0.833 m/s^2)
Mass : 6000kg
Drive : Ball Screws
Lubrication : Lithium soap-based grease No. 2
(greased every 100 km)

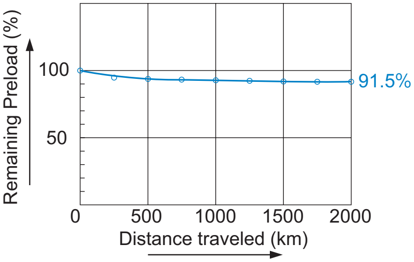


Fig.7 Distance Traveled and Remaining Preload

Accuracy Averaging Effect by Absorbing Mounting Surface Error

The LM Guide contains highly spherical balls and has a constrained structure with no clearance. In addition, it uses LM rails in parallel on multiple axes to form a guide system with multiple-axis configuration. Thus, the LM Guide is capable of absorbing misalignment in straightness, flatness or parallelism that would occur in the machining of the base to which the LM Guide is to be mounted or in the installation of the LM Guide by averaging these errors.

The magnitude of the averaging effect varies according to the length or size of the misalignment, the preload applied on the LM Guide and the number of axes in the multiple-axis configuration. When misalignment is given to one of the LM rails of the table as shown in Fig.8, the magnitude of misalignment and the actual dynamic accuracy of the table (straightness in the horizontal direction) are as shown in Fig.9.

By applying such characteristics obtained with the averaging effect, you can easily establish a guide system with high precision of motion.

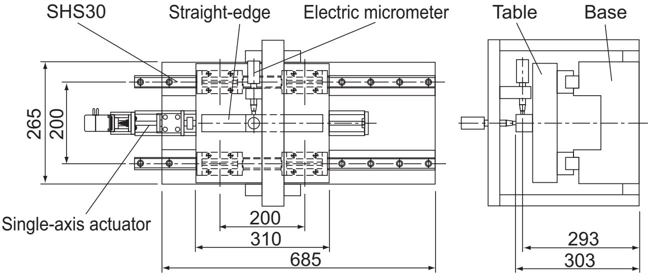
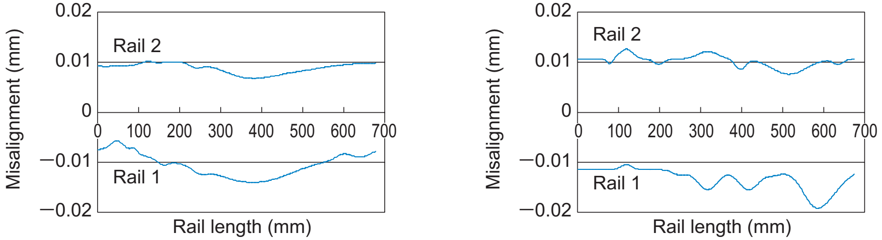
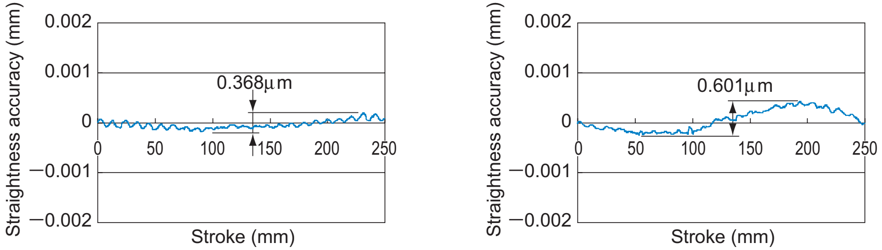


Fig.8



Misalignment curve (vertical)

Misalignment curve (horizontal)



Displacement of the table (vertical)

Displacement of the table (horizontal)

Fig.9

Even on a roughly milled mounting surface, the LM Guide drastically increases running accuracy of the top face of the table.

[Example of Installation]

When comparing the mounting surface accuracy (a) and the table running accuracy (b), the results are :

Vertical	92.5µm	→	15µm	=	1/6
Horizontal	28µm	→	4µm	=	1/7

Table4 Actual Measurement of Mounting-Surface Accuracy

Unit: µm

Direction	Mounting surface		Straightness	Average (a)
Vertical	Horizontal	A	80	92.5
		B	105	
Bottom surface	Side surface	C	40	28
		D	16	

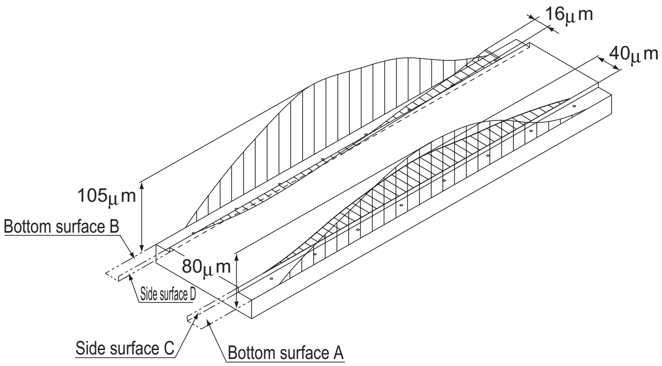


Fig.10 Surface Accuracy of the LM Guide Mounting Base (Milled Surface Only)

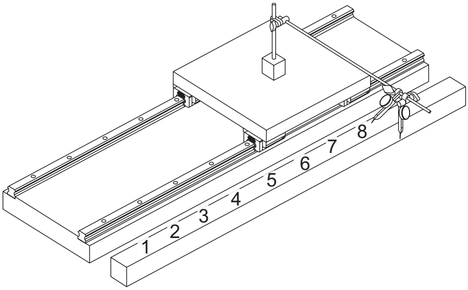


Fig.11 Running Accuracy After the LM Guide Is Mounted

Table5 Actual Measurement of Running Accuracy on the Table (Based on Measurement in Fig.10 and Fig.11)

Unit: µm

Direction	Measurement point								
	1	2	3	4	5	6	7	8	Straightness (b)
Vertical	0	+2	+8	+13	+15	+9	+5	0	15
Horizontal	0	+1	+2	+3	+2	+2	–1	0	4

Easy Maintenance

Unlike with sliding guides, the LM Guide does not incur abnormal wear. As a result, sliding surfaces do not need to be reconditioned, and precision needs not be altered. Regarding lubrication, sliding guides require forced circulation of a large amount of lubricant so as to maintain an oil film on the sliding surfaces, whereas the LM Guide only needs periodical replenishing of a small amount of grease or lubricant. Maintenance is that simple. This also helps keep the work environment clean.

Improved Productivity of the Machine

Since the LM Guide is superb in high speed, productivity of the machine is improved.

Table6 Examples of Using the LM Guide in High-speed Applications

Machine using the LM Guide	Place where the LM Guide is used	Speed (m/s)	Model No.
Durability test machine	X axis	5.0	SSR25XW
Pick-up robot	X axis	2.0	SSR25XW
	Z axis	3.0	SSR15XW
Injection molding machine	Automatic unloading unit	2.2	HSR30LR
Glass cutter	Cutter sliding unit	3.7	HSR25B
Inspection equipment	Work transfer unit	5.0	HRW27CA
Conveyance robot	Work transport unit	4.2	HSR25R
XY table	X-Y axis	2.3	RSR15WV

Substantial Energy Savings

As shown in Table7, the LM Guide has a substantial energy saving effect.

Table7 Comparative Data on Sliding and Rolling Characteristics

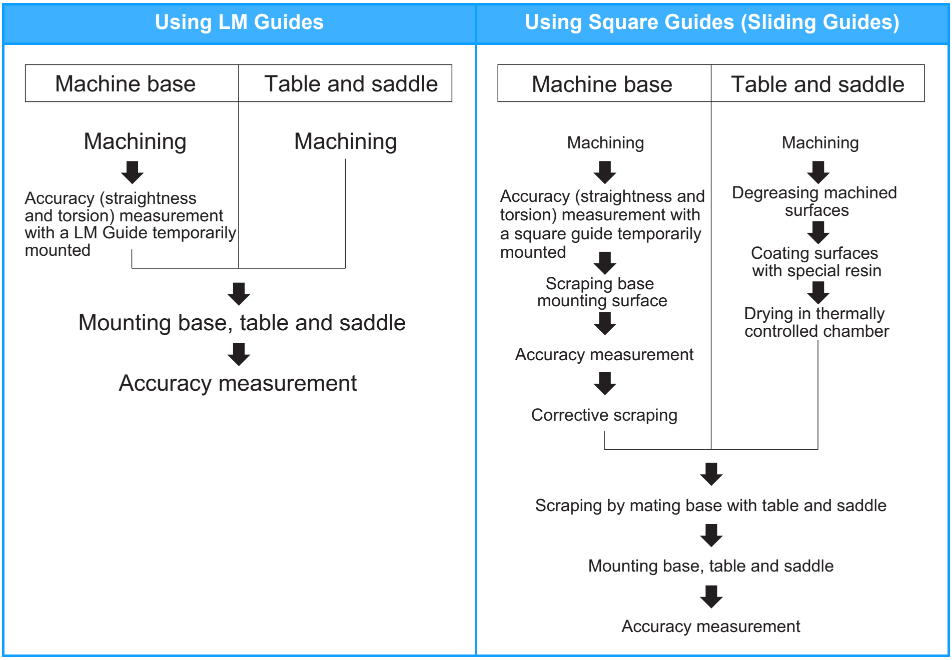
Machine Specifications		
Type of machine	Single-axis surface grinding machine (sliding guide)	Three-axis surface grinding machine (rolling guide)
Overall length × overall width	13m×3.2m	12.6m×2.6m
Total mass	17000kg	16000kg
Table mass	5000kg	5000kg
Grinding area	0.7m×5m	0.7m×5m
Table guide	Rolling through V-V guide	Rolling through LM Guide installation
No. of grinding stone axes	Single axis (5.5 kW)	Three axes (5.5 kW + 3.7 kW x 2) Grinding capacity: 3 times greater

Table Drive Specifications			Ratio
Motor used	38.05kW	3.7kW	10.3
Drive hydraulic pressure	Bore diameterϕ160×1.2MPa	Bore diameter ϕ 65×0.7MPa	—
Thrust	23600N	2270N	10.4
Electric Power consumption	38kWH	3.7kWH	10.3
Drive hydraulic pressure oil consumption	400ℓ/year	250ℓ/year	1.6
Lubricant consumption	60 ℓ/year (oil)	3.6 ℓ/year (grease)	16.7

Low Total Cost

Compared with a sliding guide, the LM Guide is easier to assemble and does not require highly skilled technicians to perform the adjustment work. Thus, the assembly man-hours for the LM Guide are reduced, and machines and systems incorporating the LM Guide can be produced at lower cost. The figure below shows an example of difference in the procedure of assembling a machining center between using siding guides and using LM Guides.
Normally, with a sliding guide, the surface on which the guide is installed must be given a very smooth finish by grinding. However, the LM Guide can offer high precision even if the surface is milled or planed. Using the LM Guide thus cuts down on machining man-hours and lowers machining costs as a whole.

[Assembly Procedure for a Machining Center]



When extremely high precision is not required (e.g., running accuracy), the LM Guide can be attached to the steel plate even if the black scale on it is not removed.

Ideal Four Raceway, Circular-Arc Groove, Two-Point Contact Structure

The LM Guide has a self-adjusting capability that competitors' products do not have.
This feature is achieved with an ideal four raceway, circular-arc groove, two-point contact structure.

[Comparison of Characteristics between the LM Guide and Similar Products]

LM Guide: Four Raceway, Circular-arc Groove, Two-point Contact Structure

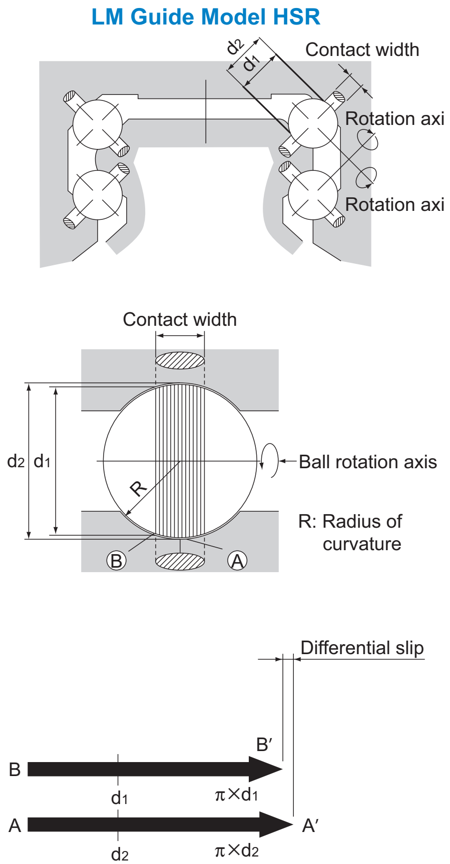


Fig.12

Other Product: Two-row, Gothic-arch Groove Four Point Contact Structure

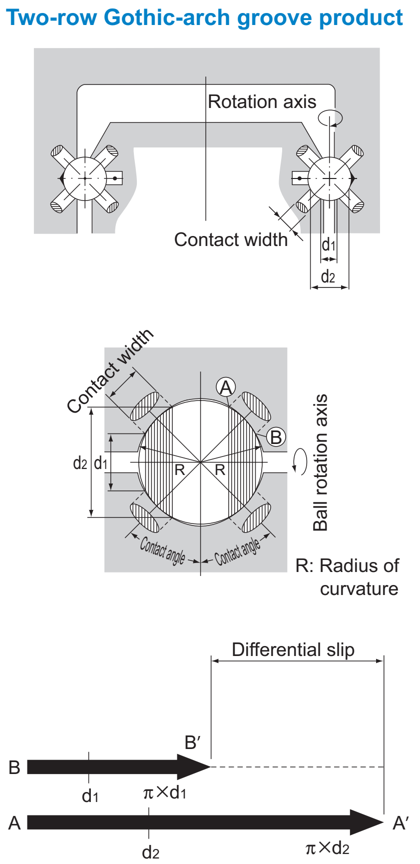


Fig.13

As indicated in Fig.12 and Fig.13, when the ball rotates one revolution, the ball slips by the difference between the circumference of the diameter of inner surface (πd_1) and that of the outer contact diameter (πd_2). (This slip is called differential slip.) If the difference is large, the ball rotates while slipping, the friction coefficient increases more than 10 times and the friction resistance steeply increases.

Four Raceway, Circular-Arc Groove, Two-Point Contact Structure	Two-Row, Gothic-Arch Groove, Four Point Contact Structure
Smooth Motion	
Since the ball contacts the groove at two points in the load direction as shown in Fig.12 and Fig.13 on A-39 even under a preload or a normal load, the difference between d_1 and d_2 is small and the differential slip is minimized to allow smooth rolling motion.	The difference between d_1 and d_2 in the contact area is large as shown in Fig.12 and Fig.13 on A-39. Therefore, if any of the following occurs, the ball will generate differential slip, causing friction almost as large as sliding resistance and shortening the service as a result of abnormal friction. (1) A preload is applied. (2) A lateral load is applied. (3) The mounting parallelism between the two axes is poor.
Accuracy and Rigidity of the Mounting Surface	
In the ideal two-point contact structure, four rows of circular arc grooves are given appropriate contact angles. With this structure, a light distortion of the mounting surface would be absorbed within the LM block due to elastic deformation of the balls and moving of the contact points to allow unforced, smooth motion. This eliminates the need for a robust mounting base with high rigidity and accuracy for machinery such as a conveyance system.	With the Gothic-arch groove product, each ball contacts the groove at four points, preventing itself from being elastically deformed and the contact points from moving (i.e., no self-adjusting capability). Therefore, even a slight distortion of the mounting surface or an accuracy error of the rail bed cannot be absorbed and smooth motion cannot be achieved. Accordingly, it is necessary to machine a highly rigid mounting base with high precision and mount a high precision rail.
Rigidity	
With the two-point contact, even if a relatively large preload is applied, the rolling resistance does not abnormally increase and high rigidity is obtained.	Since differential slip occurs due to the four-point contact, a sufficient preload cannot be applied and high rigidity cannot be obtained.
Load Rating	
Since the curvature radius of the ball raceway is 51 to 52% of the ball diameter, a large rated load can be obtained.	Since the curvature radius of the gothic arch groove has to be 55 to 60% of the ball diameter, the rated load is reduced to approx. 50% of that of the circular arc groove.

Difference in Rigidity

As shown in Fig.14, the rigidity widely varies according to the difference in curvature radius or difference in preload.

Curvature radius and rigidity

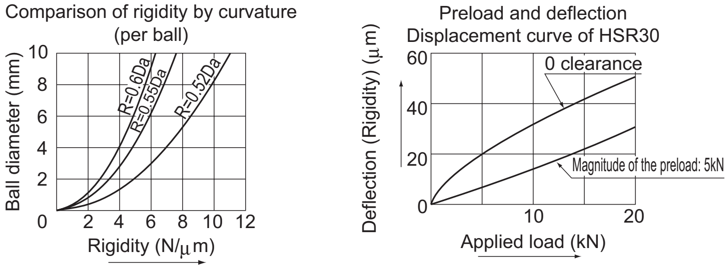


Fig.14

Difference in Service Life

Since the load rating of the gothic arch groove is reduced to approx. 50% of that of the circular arc groove, the service life also decreases to 87.5%.

[Accuracy Error of the Mounting Surface and Test Data on Rolling Resistance]

The difference between the contact structures translates into a rolling resistance.
In the gothic arch groove contact structure, each ball contacts at four points and differential slip or spinning occurs if a preload is applied to increase rigidity or an error in the mounting precision is large. This sharply increases the rolling resistance and causes abnormal wear in an early stage.
The following are test data obtained by comparing an LM Guide having the four raceway, circular-arc groove two-point contact structure and a product having the two-row, Gothic-arch, four-point contact structure.

[Sample]

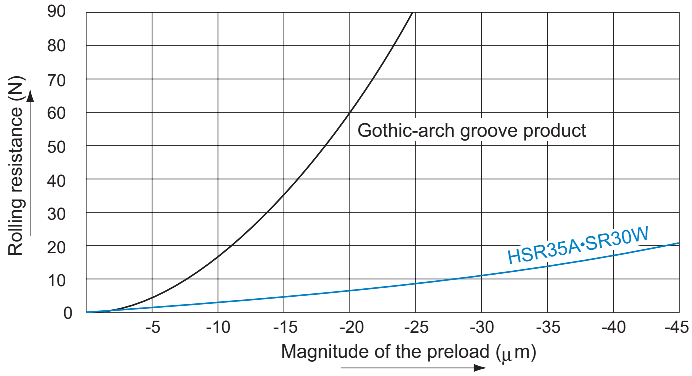
(1) LM Guide
SR30W (self-adjusting type) 2 sets
HSR35A (four-way equal-load type) 2 sets
(2) Two-row Gothic-arch groove product
Type with dimensions similar to HSR30 2 sets

[Conditions]

Radial clearance: ±0μm
Without seal
Without lubrication
Load: table mass of 30 kg

Data 1: Preload and rolling resistance

When a preload is applied, the rolling resistance of the Gothic-arch groove product steeply increases and differential slip occurs. Even under a preload, the rolling resistance of the LM Guide does not increase.



Data 2: Error in parallelism between two axes and rolling resistance

As shown in the Fig.15, part of the rails mounted in parallel is parallelly displaced and the rolling resistance at that point is measured.
With the Gothic-arch groove product, the rolling resistance is 34 N when the parallelistic error is 0.03 mm and 62 N when the error is 0.04 mm. These resistances are equivalent to the slip friction coefficients, indicating that the balls are in sliding contact with the groove.

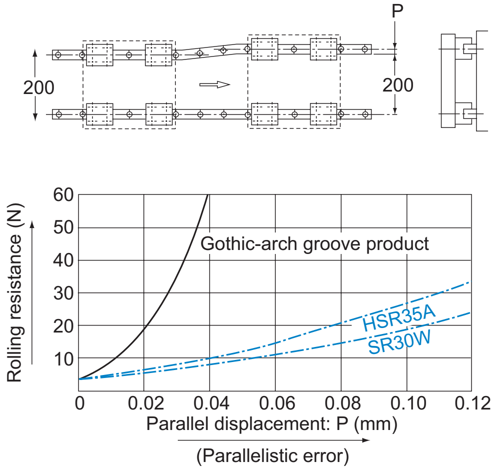
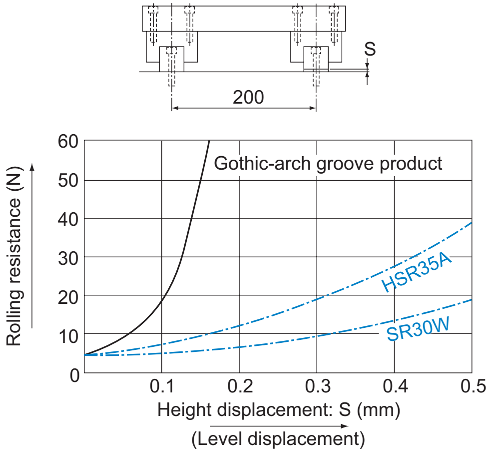


Fig.15

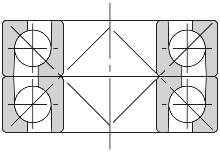
Data 3: Difference between the levels of the right and left rails and rolling resistance

The bottom of either rail is displaced by distance S so that there is a level difference between the two axes, and then rolling resistance is measured. If there is a level difference between the right and left rails, a moment acts on the LM block, and in the case of the Gothic-arch groove, spinning occurs. Even if the level difference between the two rails is as great as 0.3/200 mm, the LM Guide absorbs the error. This indicates that the LM Guide can operate normally even when such errors are present.

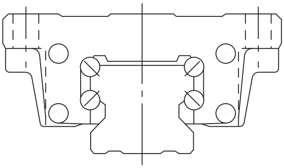


Superb Error-Absorbing Capability with the DF Design

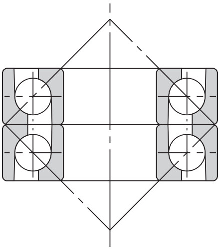
Since the LM Guide has a contact structure similar to the front-to-front mount of angular ball bearings, it has superb self-adjusting capability.



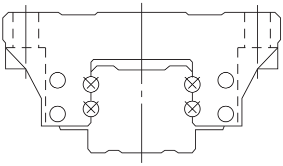
Angular Ball Bearings Mounted Front-to-front (DF type)



DF Type Four-row Angular Contact (LM Guide)

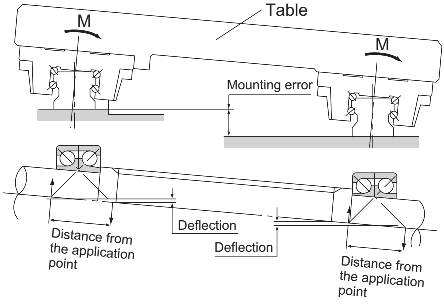
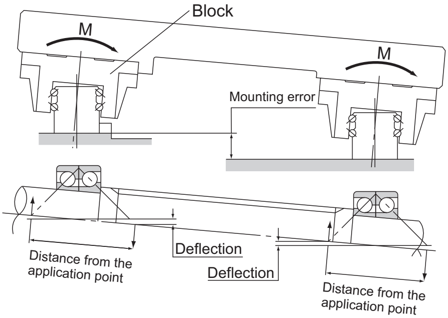


Angular Ball Bearings Mounted Back-to-back (DB type)

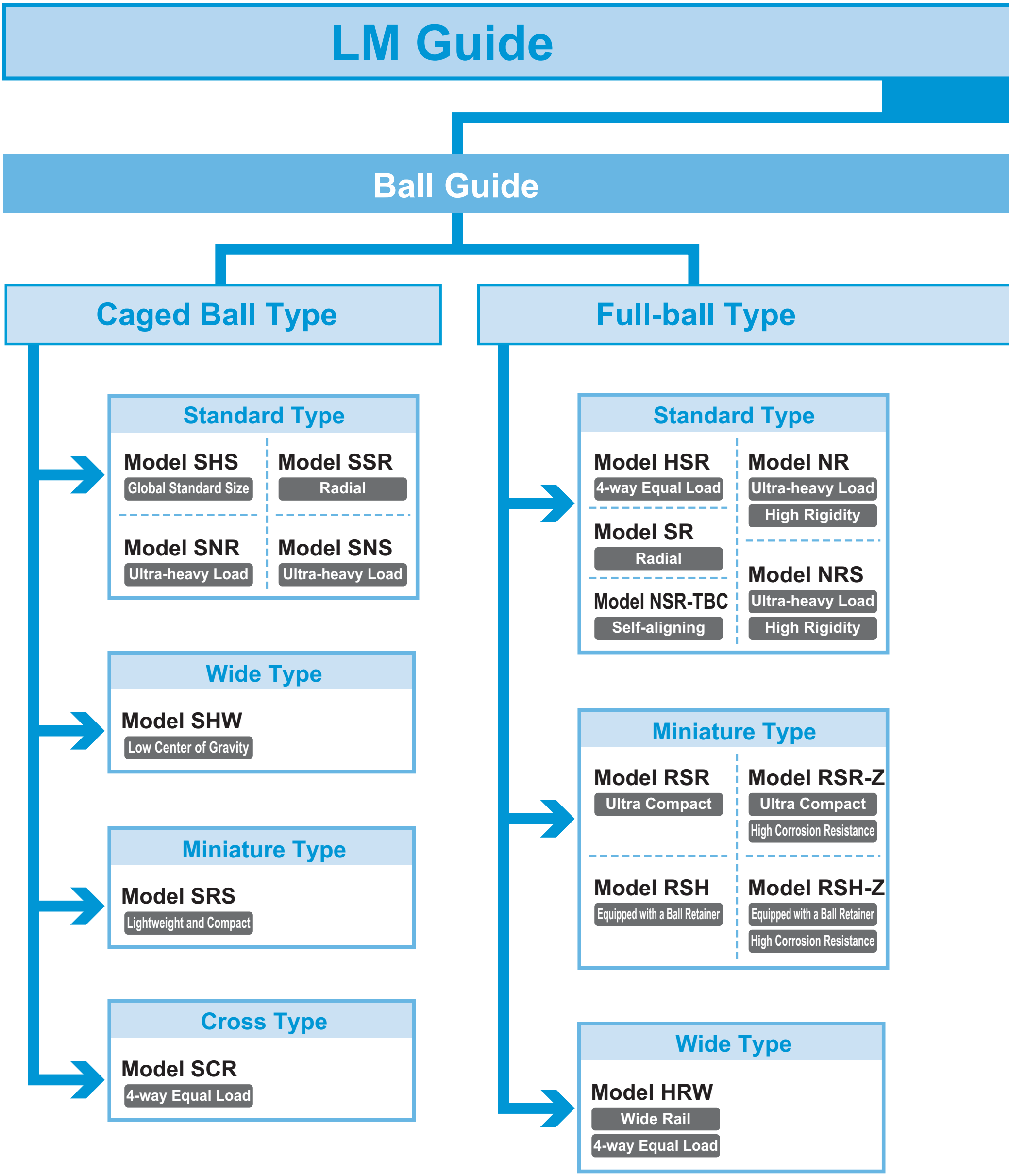


Four-row Gothic-arch Contact

An LM ball guide mounted on a plane receives a moment (M) due to an error in flatness or in level or a deflection of the table. Therefore, it is essential for the guide to have self-adjusting capability.

LM Guide Model HSR	Similar Product of a Competitor
	
Since the distance from the application point of the bearing is small, the internal load generated from a mounting error is small and the self-adjusting capability is large.	Since the distance from the application point of the bearing is large, the internal load generated from a mounting error is large and the self-adjusting capability is small. With an LM ball guide having angular ball bearings mounted back-to-back, if there is an error in flatness or a deflection in the table, the internal load applied to the block is approx. 6 times greater than that of the front-to-front mount structure and the service life is much shorter. In addition, the fluctuation in sliding resistance is greater.

Classification Table of the LM Guides



LM Guide

Ball Guide

Caged Ball Type

- **Standard Type**
  - **Model SHS** Global Standard Size
  - **Model SSR** Radial
  - **Model SNR** Ultra-heavy Load
  - **Model SNS** Ultra-heavy Load
- **Wide Type**
  - **Model SHW** Low Center of Gravity
- **Miniature Type**
  - **Model SRS** Lightweight and Compact
- **Cross Type**
  - **Model SCR** 4-way Equal Load

Full-ball Type

- **Standard Type**
  - **Model HSR** 4-way Equal Load
  - **Model SR** Radial
  - **Model NSR-TBC** Self-aligning
  - **Model NR** Ultra-heavy Load, High Rigidity
  - **Model NRS** Ultra-heavy Load, High Rigidity
- **Miniature Type**
  - **Model RSR** Ultra Compact
  - **Model RSR-Z** Ultra Compact, High Corrosion Resistance
  - **Model RSH** Equipped with a Ball Retainer
  - **Model RSH-Z** Equipped with a Ball Retainer, High Corrosion Resistance
- **Wide Type**
  - **Model HRW** Wide Rail, 4-way Equal Load

Cross Type

- **Model CSR**: 4-way Equal Load
- **Model MX**: Miniature Cross

Special Environment Types

- **Model HSR-M1**: High Temperature, 4-way Equal Load
- **Model SR-M1**: High Temperature, Radial
- **Model HSR-M2**: High Corrosion Resistance, 4-way Equal Load
- **Model RSR-M1**: High Temperature

R Guide Type

- **Model HCR**

Straight-Curved Type

- **Model HMG**

Separate Type

- **Model HR**: Heavy Load
- **Model GSR**: Interchangeable, Self-aligning
- **Model GSR-R**: Interchangeable, Self-aligning, With Rack

Model JR Type

- **Model JR**: Structural Member Rail, 4-way Equal Load

Roller Guide

With a Caged Roller

Standard Type

- **Model SRG**: Ultra-high Rigidity
- **Model SRN**: Ultra-high Rigidity, Low Center of Gravity

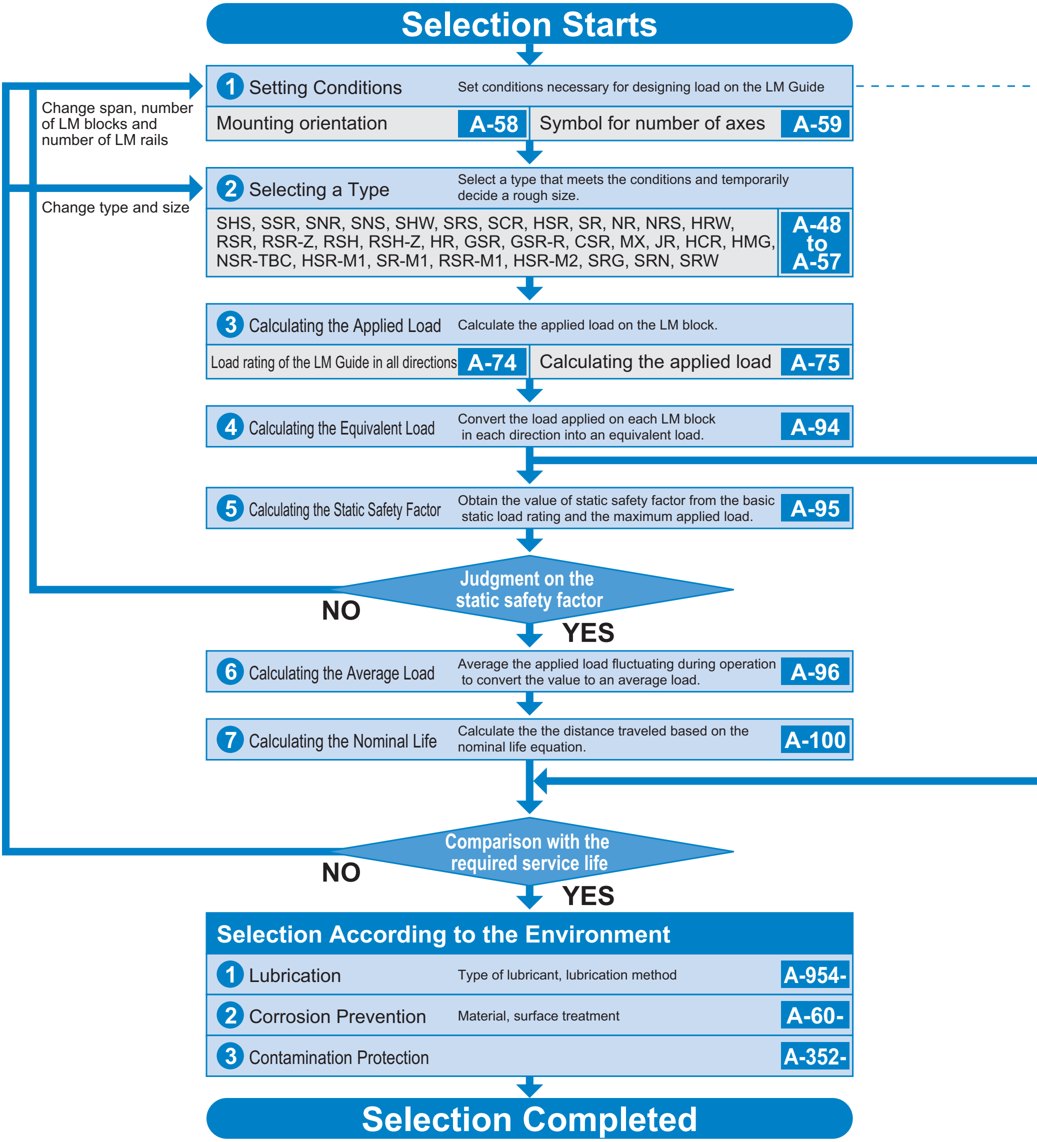
Wide Type

- **Model SRW**: Ultra-high Rigidity

Flowchart for Selecting an LM Guide

[Steps for Selecting an LM Guide]

The following is a flowchart as a measuring stick for selecting an LM Guide.



Selection Starts

① Setting Conditions — Set conditions necessary for designing load on the LM Guide

Mounting orientation	A-58	Symbol for number of axes	A-59

② Selecting a Type — Select a type that meets the conditions and temporarily decide a rough size.

SHS, SSR, SNR, SNS, SHW, SRS, SCR, HSR, SR, NR, NRS, HRW, RSR, RSR-Z, RSH, RSH-Z, HR, GSR, GSR-R, CSR, MX, JR, HCR, HMG, NSR-TBC, HSR-M1, SR-M1, RSR-M1, HSR-M2, SRG, SRN, SRW	A-48 to A-57

③ Calculating the Applied Load — Calculate the applied load on the LM block.

Load rating of the LM Guide in all directions	A-74	Calculating the applied load	A-75

④ Calculating the Equivalent Load — Convert the load applied on each LM block in each direction into an equivalent load. A-94

⑤ Calculating the Static Safety Factor — Obtain the value of static safety factor from the basic static load rating and the maximum applied load. A-95

Judgment on the static safety factor — NO: Change type and size (back to ②) / YES

⑥ Calculating the Average Load — Average the applied load fluctuating during operation to convert the value to an average load. A-96

⑦ Calculating the Nominal Life — Calculate the the distance traveled based on the nominal life equation. A-100

Comparison with the required service life — NO: Change span, number of LM blocks and number of LM rails (back to ①) / YES

Selection According to the Environment

① Lubrication	Type of lubricant, lubrication method	A-954-
② Corrosion Prevention	Material, surface treatment	A-60-
③ Contamination Protection		A-352-

Selection Completed

- Space in the guide section
- Dimensions (span, number of LM blocks, number of LM rails, thrust)
- Installation direction (horizontal, vertical, slant mount, wall mount, suspended)
- Magnitude, direction and position of the working load
- Operating frequency (duty cycle)
- Speed (acceleration)
- Stroke length
- Required service life
- Precision of motion
- Environment
- In a special environment (vacuum, clean room, high temperature, environment exposed to contaminated environment, etc.), it is necessary to take into account material, surface treatment, lubrication and contamination protection.

Prediction the Rigidity

1	Selecting a Radial Clearance (Preload)	A-111
2	Service Life with a Preload Considered	A-112
3	Rigidity	A-112
4	Radial Clearance Standard for Each Model	A-113-
5	Designing the Guide System	A-318-

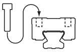
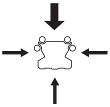
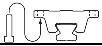
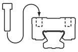
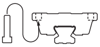
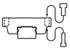
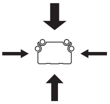
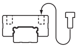
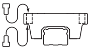
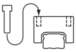
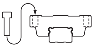
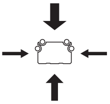
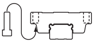
Determining the Accuracy

1	Accuracy Standards	A-116
2	Guidelines for Accuracy Grades by Machine Type	A-117
3	Accuracy Standard for Each Model	A-118-

Selecting a Type

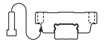
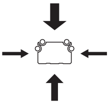
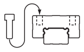
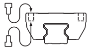
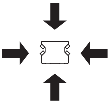
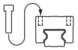
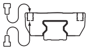
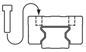
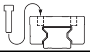
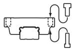
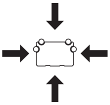
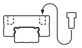
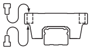
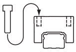
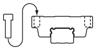
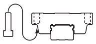
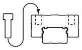
Types of LM Guides

THK offers a wide array of types and dimensions with LM Guides as standard so that you can select the optimal product for any application. With the unit structure of each model, you can easily obtain high running accuracy with no clearance simply by mounting the product on a plane surface with bolts. We have a proven track record and know-how in extensive applications with LM Guides.

Classification		Type		Specification Table*	Load capacity diagram	Basic load rating (kN)	
						Basic dynamic load rating	Basic static load rating
Radial type	Caged Ball LM Guide		SSR-XW	▶B-16		14.7 to 64.6	16.5 to 71.6
			SSR-XV	▶B-18		9.1 to 21.7	9.7 to 22.5
			SSR-XTB	▶B-20		14.7 to 31.5	16.5 to 36.4
	Full-ball LM Guides		Model SR-W	▶B-86		9.51 to 411	19.3 to 537
			SR-M1W	▶B-192		9.51 to 41.7	19.3 to 77.2
			SR-V	▶B-86		5.39 to 23.8	11.1 to 44.1
			SR-M1V	▶B-192		5.39 to 23.8	11.1 to 44.1
			SR-TB	▶B-88		9.51 to 89.1	19.3 to 157
			SR-M1TB	▶B-194		9.51 to 41.7	19.3 to 77.2
			SR-SB	▶B-88		5.39 to 23.8	11.1 to 44.1
			SR- M1SB	▶B-194		5.39 to 23.8	11.1 to 44.1
	Caged Ball LM Guide - ultra-heavy load, high rigidity types		SNR-C	▶B-30		48 to 260	79 to 409
			SNR-LC	▶B-30		57 to 550	101 to 887
			SNR-R	▶B-26		48 to 260	79 to 409
			SNR-LR	▶B-26		57 to 550	101 to 887
			SNR-CH	▶B-38		90 to 177	144 to 292
			SNR-LCH	▶B-38		108 to 214	188 to 383
			SNR-RH	▶B-34		90 to 177	144 to 292
			SNR-LRH	▶B-34		108 to 214	188 to 383
	Full-ball LM Guide - ultra-heavy load, high rigidity types		NR-A	▶B-98		33 to 479	84.6 to 1040
			NR-LA	▶B-98		44 to 599	113 to 1300
			NR-B	▶B-102		33 to 479	84.6 to 1040

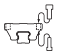
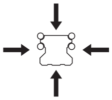
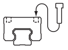
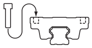
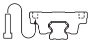
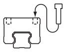
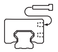
∗For specification tables for each model, please see the separate "B Product Specifications".

External dimensions (mm)		Features	Major application
Height	Width		
24 to 48	34 to 70	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Thin, compact design, large radial load capacity ● Superb in planar running accuracy ● Superb capability of absorbing mounting error ● Stainless steel type also available as standard	● Surface grinder table ● Tool grinder table ● Electric discharge machine ● Printed circuit board drilling machine ● Chip mounter ● High-speed transfer equipment ● Traveling unit of robots ● Machining center ● NC lathe ● Five axis milling machine ● Conveyance system ● Mold guide of pressing machines ● Inspection equipment ● Testing machine ● Food-related machine ● Medical equipment ● 3D measuring instrument ● Packaging machine ● Injection molding machine ● Woodworking machine ● Ultra precision table ● Semiconductor/liquid crystal manufacturing equipment
24 to 33	34 to 48		
24 to 33	52 to 73		
24 to 135	34 to 250	● Thin, compact design, large radial load capacity ● Superb in planar running accuracy ● Superb capability of absorbing mounting error ● Stainless steel type also available as standard ● Type M1, achieving max service temperature of 150℃, also available	
24 to 48	34 to 70		
24 to 48	34 to 70		
24 to 48	34 to 70		
24 to 68	52 to 140		
24 to 48	52 to 100		
24 to 48	52 to 100		
24 to 48	52 to 100		
31 to 75	72 to 170	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Ultra-heavy load capacity optimal for machine tools ● Thin, compact design, large radial load capacity ● High vibration resistance and impact resistance due to improved damping characteristics ● Superb in planar running accuracy	● Machining center ● NC lathe ● Grinding machine ● Five axis milling machine ● Jig borer ● Drilling machine ● NC milling machine ● Horizontal milling machine ● Mold processing machine ● Graphite working machine ● Electric discharge machine ● Wire-cut electric discharge machine
31 to 90	72 to 215		
31 to 75	50 to 126		
31 to 90	50 to 156		
48 to 70	100 to 140	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Ultra-heavy load capacity optimal for machine tools ● Large radial load capacity ● High vibration resistance and impact resistance due to improved damping characteristics ● Superb in planar running accuracy ● Has dimensions almost the same as that of the full-ball type LM Guide model HSR, which is practically a global standard size	
48 to 70	100 to 140		
55 to 80	70 to 100		
55 to 80	70 to 100		
31 to 105	72 to 260	● Ultra-heavy load capacity optimal for machine tools ● High vibration resistance and impact resistance due to improved damping characteristics ● Thin, compact design, large radial load capacity ● Superb in planar running accuracy	
31 to 105	72 to 260		
31 to 105	72 to 260		

Classification		Type		Specification Table*	Load capacity diagram	Basic load rating (kN)	
						Basic dynamic load rating	Basic static load rating
Radial type	Full-ball LM Guide - ultra-heavy load, high rigidity types		NR-LB	▶**B-102**		44 to 599	113 to 1300
			NR-R	▶**B-94**		33 to 479	84.6 to 1040
			NR-LR	▶**B-94**		44 to 599	113 to 1300
4-way equal load type	Caged Roller LM Guide - super ultra-heavy-load, high rigidity types		SRG-A, C	▶**B-208**		11.3 to 131	25.8 to 266
			SRG-LA, LC	▶**B-208**		26.7 to 278	63.8 to 599
			SRG-R, V	▶**B-210**		11.3 to 131	25.8 to 266
			SRG-LR, LV	▶**B-210**		26.7 to 278	63.8 to 599
			SRN-C	▶**B-214**		59.1 to 131	119 to 266
			SRN-LC	▶**B-214**		76 to 278	165 to 599
			SRN-R	▶**B-216**		59.1 to 131	119 to 266
			SRN-LR	▶**B-216**		76 to 278	165 to 599
			SRW-LR	▶**B-220**		115 to 278	256 to 599
	Caged Ball LM Guide - ultra-heavy load, high rigidity types		SNS-C	▶**B-32**		37 to 199	61 to 315
			SNS-LC	▶**B-32**		44 to 422	78 to 679
			SNS-R	▶**B-28**		37 to 199	61 to 315
			SNS-LR	▶**B-28**		44 to 422	78 to 679
			SNS-CH	▶**B-40**		69 to 136	110 to 225
			SNS-LCH	▶**B-40**		83 to 164	144 to 295
			SNS-RH	▶**B-36**		69 to 136	110 to 225
			SNS-LRH	▶**B-36**		83 to 164	144 to 295
	Full-ball LM Guide - ultra-heavy load, high rigidity types		NRS-A	▶**B-100**		25.9 to 376	59.8 to 737
			NRS-LA	▶**B-100**		34.5 to 470	79.7 to 920
			NRS-B	▶**B-104**		25.9 to 376	59.8 to 737
			NRS-LB	▶**B-104**		34.5 to 470	79.7 to 920
			NRS-R	▶**B-96**		25.9 to 376	59.8 to 737
			NRS-LR	▶**B-96**		34.5 to 470	79.7 to 920

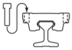
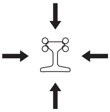
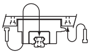
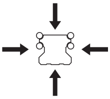
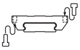
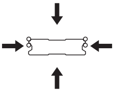
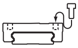
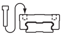
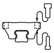
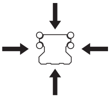
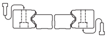
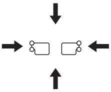
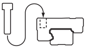
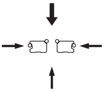
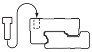
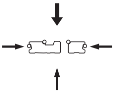
∗For specification tables for each model, please see the separate "B Product Specifications".

External dimensions (mm)		Features	Major application
Height	Width		
31 to 105	72 to 260	● Ultra-heavy load capacity optimal for machine tools ● High vibration resistance and impact resistance due to improved damping characteristics ● Thin, compact design, large radial load capacity ● Superb in planar running accuracy	● Machining center ● NC lathe ● Grinding machine ● Five axis milling machine ● Jig borer ● Drilling machine ● NC milling machine ● Horizontal milling machine ● Mold processing machine ● Graphite working machine ● Electric discharge machine ● Wire-cut electric discharge machine
31 to 105	50 to 200		
31 to 105	50 to 200		
24 to 70	47 to 140	● Long service life, long-term maintenance-free operation ● Low noise, acceptable running sound ● Superbly high speed ● Smooth motion due to prevention of rollers from skewing ● Ultra-heavy load capacity optimal for machine tools	
30 to 90	63 to 170		
24 to 80	34 to 100		
30 to 90	44 to 126		
44 to 63	100 to 140	● Long service life, long-term maintenance-free operation ● Low noise, acceptable running sound ● Superbly high speed ● Smooth motion due to prevention of rollers from skewing ● Ultra-heavy load capacity optimal for machine tools ● Low center of gravity, ultra-high rigidity	
44 to 75	100 to 170		
44 to 63	70 to 100		
44 to 75	70 to 126		
70 to 100	135 to 200		
31 to 75	72 to 170	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Ultra-heavy load capacity optimal for machine tools ● Thin, compact design, 4-way equal load ● High vibration resistance and impact resistance due to improved damping characteristics	
31 to 90	72 to 215		
31 to 75	50 to 126		
31 to 90	50 to 156		
48 to 70	100 to 140	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Ultra-heavy load capacity optimal for machine tools ● 4-way equal load type ● High vibration resistance and impact resistance due to improved damping characteristics ● Has dimensions almost the same as that of the full-ball type LM Guide model HSR, which is practically a global standard size	
48 to 70	100 to 140		
55 to 80	70 to 100		
55 to 80	70 to 100		
31 to 105	72 to 260	● Ultra-heavy load capacity optimal for machine tools ● High vibration resistance and impact resistance due to improved damping characteristics ● Thin, compact design, 4-way equal load	
31 to 105	72 to 260		
31 to 105	72 to 260		
31 to 105	72 to 260		
31 to 105	50 to 200		
31 to 105	50 to 200		

Classification		Type		Specification Table*	Load capacity diagram	Basic load rating (kN)	
						Basic dynamic load rating	Basic static load rating
4-way equal load type	Caged Ball LM Guide - heavy-load, high rigidity types		SHS-C	▶B-6		14.2 to 205	24.2 to 320
			SHS-LC	▶B-6		17.2 to 253	31.9 to 408
			SHS-V	▶B-8		14.2 to 205	24.2 to 320
			SHS-LV	▶B-8		17.2 to 253	31.9 to 408
			SHS-R	▶B-10		14.2 to 128	24.2 to 197
			SHS-LR	▶B-10		36.8 to 161	64.7 to 259
	Full-ball LM Guide - heavy-load, high rigidity types		HSR-A	▶B-62		8.33 to 210	13.5 to 310
			HSR-M1A	▶B-182		8.33 to 37.3	13.5 to 61.1
			HSR-LA	▶B-62		21.3 to 282	31.8 to 412
			HSR-M1LA	▶B-182		21.3 to 50.2	31.8 to 81.5
			HSR-CA	▶B-76		13.8 to 210	23.8 to 310
			HSR-HA	▶B-76		21.3 to 518	31.8 to 728
			HSR-B	▶B-64		8.33 to 210	13.5 to 310
			HSR-M1B	▶B-184		8.33 to 37.3	13.5 to 61.1
			HSR-LB	▶B-64		21.3 to 282	31.8 to 412
			HSR-M1LB	▶B-184		21.3 to 50.2	31.8 to 81.5
			HSR-CB	▶B-78		13.8 to 210	23.8 to 310
			HSR-HB	▶B-78		21.3 to 518	31.8 to 728
			HSR-R	▶B-70		1.08 to 210	2.16 to 310
			HSR-M1R	▶B-186		8.33 to 37.3	13.5 to 61.1
			HSR-LR	▶B-70		21.3 to 282	31.8 to 412
			HSR-M1LR	▶B-186		21.3 to 50.2	31.8 to 81.5
			HSR-HR	▶B-80		351 to 518	506 to 728
	Full-ball LM Guide - side mount types		HSR-YR	▶B-74		8.33 to 141	13.5 to 215
			HSR-M1YR	▶B-188		8.33 to 37.3	13.5 to 61.1

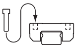
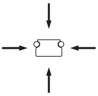
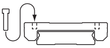
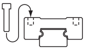
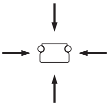
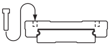
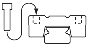
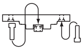
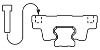
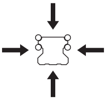
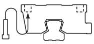
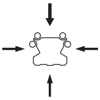
*For specification tables for each model, please see the separate "B Product Specifications".

External dimensions (mm)		Features	Major application
Height	Width		
24 to 90	47 to 170	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Heavy load, high rigidity ● Has dimensions almost the same as that of the full-ball type LM Guide model HSR, which is practically a global standard size ● Superb capability of absorbing mounting error	● Machining center ● NC lathe ● XYZ axes of heavy cutting machine tools ● Grinding head feeding axis of grinding machines ● Components requiring a heavy moment and high accuracy ● NC milling machine ● Horizontal milling machine ● Gantry five axis milling machine ● Z axis of electric discharge machines ● Wire-cut electric discharge machine ● Car elevator ● Food-related machine ● Testing machine ● Vehicle doors ● Printed circuit board drilling machine ● ATC ● Construction equipment ● Shield machine ● Semiconductor/liquid crystal manufacturing equipment
24 to 90	47 to 170		
24 to 90	34 to 126		
24 to 90	34 to 126		
28 to 80	34 to 100		
28 to 80	34 to 100		
24 to 110	47 to 215	● Heavy load, high rigidity ● Practically a global standard size ● Superb capability of absorbing mounting error ● Stainless steel type also available as standard ● Type M1, achieving max service temperature of 150℃, also available ● Type M2, with high corrosion resistance, also available (Basic dynamic load rating: 2.33 to 5.57 kN) (Basic static load rating: 2.03 to 5.16 kN)	
24 to 48	47 to 100		
30 to 110	63 to 215		
30 to 48	63 to 100		
30 to 110	63 to 215		
30 to 145	63 to 350		
24 to 110	47 to 215		
24 to 48	47 to 100		
30 to 110	63 to 215		
30 to 48	63 to 100		
30 to 110	63 to 215		
30 to 145	63 to 350		
11 to 110	16 to 156		
28 to 55	34 to 70		
30 to 110	44 to 156		
30 to 55	44 to 70		
120 to 145	250 to 266		
28 to 90	33.5 to 124.5	● Easy mounting and reduced mounting height when using 2 units opposed to each other since the side faces of the LM block have mounting holes ● Heavy load, high rigidity ● Superb capability of absorbing mounting error ● Stainless steel type also available as standard ● Type M1, achieving max service temperature of 150℃, also available	● Cross rails of gantry machine tools ● Z axis of woodworking machines ● Z axis of measuring instruments ● Components opposed to each other
28 to 55	33.5 to 69.5		

Classification		Type		Specification Table*	Load capacity diagram	Basic load rating (kN)	
						Basic dynamic load rating	Basic static load rating
4-way equal load type	Full-ball LM Guides - special LM rail types		JR-A	**▶B-164**		19.9 to 88.5	34.4 to 137
			JR-B	**▶B-164**		19.9 to 88.5	34.4 to 137
			JR-R	**▶B-164**		19.9 to 88.5	34.4 to 137
	Caged Ball Cross LM Guide		SCR	**▶B-56**		36.8 to 253	64.7 to 408
	Full-ball LM Guide - orthogonal type		CSR	**▶B-154**		8.33 to 80.4	13.5 to 127.5
	Caged Ball LM Guide - wide, low center of gravity types		SHW-CA	**▶B-44**		4.31 to 70.2	5.66 to 91.4
			SHW-CR, HR	**▶B-46**		4.31 to 70.2	5.66 to 91.4
	Full-ball LM Guide - wide, low center of gravity types		HRW-CA	**▶B-108**		4.31 to 63.8	81.4 to 102
			HRW-CR, LR	**▶B-110**		3.29 to 50.2	7.16 to 81.5
	Full-ball Straight - Curved Guide		HMG	**▶B-172**		2.56 to 66.2	Straight section 4.23 to 66.7 Curved section 0.44 to 36.2
	Full-ball LM Guide - separate types		HR, HR-T	**▶B-138**		1.57 to 141	3.04 to 206
Interchangeable designs			GSR-T	**▶B-146**		5.69 to 25.1	8.43 to 33.8
			GSR-V	**▶B-146**		4.31 to 10.29	5.59 to 12.65
	Full-ball LM Guides - LM rail-rack intergrated type		GSR-R	**▶B-150**		10.29 to 25.1	12.65 to 33.8

∗For specification tables for each model, please see the separate "B Product Specifications".

External dimensions (mm)		Features	Major application
Height	Width		
61 to 114	70 to 140	● Since the central part of the LM rail is thinly structured, the LM Guide is capable of absorbing an error and achieving smooth motion if the parallelism between the two axes is poor ● Since the LM rail has a highly rigid sectional shape, it can be used as a structural member	● Automated warehouse ● Garage ● Gantry robot ● FMS traveling rail ● Lift ● Conveyance system ● Welding machine ● Lifter ● Crane ● Forklift ● Coating machine ● Shield machine ● Stage setting
61 to 114	70 to 140		
65 to 124	48 to 100		
70 to 180	88 to 226	● A compact XY structure is allowed due to an XY orthogonal, single-piece LM block ● Since a saddle-less structure is allowed, the machine can be lightweighted and compactly designed ● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed	● Low center of gravity, precision XY table ● NC lathe ● Optical measuring instrument ● Automatic lathe ● Inspection equipment ● Cartesian coordinate robot ● Bonding machine ● Wire-cut electric discharge machine ● Hollow table ● Printed circuit board assembler ● Machine tool table ● Electric discharge machine ● XY axes of horizontal machining center
47 to 118	38.8 to 129.8	● A compact XY structure is allowed due to an XY orthogonal, single-piece LM block ● Since a saddle-less structure is allowed, the machine can be lightweighted and compactly designed	
12 to 50	40 to 162	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Wide, low center of gravity, space saving structure ● Stainless steel type also available as standard	● Z axis of IC printed circuit board drilling machine ● Z axis of small electric discharge machine ● Loader ● Machining center ● NC lathe ● Robot ● Wire-cut electric discharge machine ● APC ● Semiconductor/liquid crystal manufacturing equipment ● Measuring instrument ● Wafer transfer equipment ● Construction equipment ● Railroad vehicle
12 to 50	30 to 130		
17 to 60	60 to 200	● 4-way equal load, thin and highly rigid ● Wide, low center of gravity, space saving structure ● Stainless steel type also available as standard	
12 to 50	30 to 130		
24 to 90	47 to 170	● Freedom of design ● Cost reduction through simplified structure	● Large swivel base ● Pendulum vehicle for railroad ● Pantagraph ● Control unit ● Optical measuring machine ● Tool grinder ● X-Ray machine ● CT scanner ● Medical equipment ● Stage setting ● Car elevator ● Amusement machine ● Turntable ● Tool changer
8.5 to 60	18 to 125	● Thin, high rigidity, space saving structure ● Interchangeable with Cross-Roller Guide ● Preload can be adjusted ● Stainless steel type also available as standard	● XYZ axes of electric discharge machine ● Precision table ● XZ axes of NC lathe ● Assembly robot ● Conveyance system ● Machining center ● Wire-cut electric discharge machine ● Tool changer ● Woodworking machine
20 to 38	32 to 68	● LM block and LM rail are both interchangeable ● Preload can be adjusted ● Capable of absorbing vertical level error and horizontal tolerance for parallelism	● Industrial robot ● Various conveyance systems ● Automated warehouse ● Palette changer ● ATC ● Door closing device ● Guide using an aluminum mold base ● Welding machine ● Coating machine ● Car washing machine
20 to 30	32 to 50		
30 to 38	59.91 to 80.18	● LM rail-rack integrated design eliminates assembly and adjustment work ● LM rail-rack integrated design enables a space-saving structure to be achieved ● Capable of supporting long strokes	

Classification		Type		Specification Table*	Load capacity diagram	Basic load rating (kN)	
						Basic dynamic load rating	Basic static load rating
Miniature types	Caged Ball LM Guides		SRS	▶B-50		1.51 to 16.5	1.29 to 20.2
			SRS-W	▶B-52		2.01 to 9.12	1.94 to 8.55
	Full-ball LM Guides		RSR, RSR-K, RSR-V	▶B-116		0.18 to 8.82	0.27 to 12.7
			RSR-M1V	▶B-198		1.47 to 8.82	2.25 to 12.7
			RSR-N	▶B-114		0.3 to 14.2	0.44 to 20.6
			RSR-M1N	▶B-198		2.6 to 14.2	3.96 to 20.6
			RSR-Z	▶B-122		0.88 to 4.41	1.37 to 6.57
	Full-ball LM Guide - wide types		RSR-W, WV	▶B-118		0.25 to 6.66	0.47 to 9.8
			RSR-M1WV	▶B-200		2.45 to 6.66	3.92 to 9.8
			RSR-WN	▶B-118		0.39 to 9.91	0.75 to 14.9
			RSR-M1WN	▶B-200		3.52 to 9.91	5.37 to 14.9
			RSR-WZ	▶B-124		1.37 to 6.66	2.16 to 9.8
	Full-ball LM Guide - ball-retaining plate types		RSH, RSH-K, RSH-V	▶B-128		0.88 to 2.65	1.37 to 4.02
			RSH-Z	▶B-132		0.88 to 4.41	1.37 to 6.57
	Full-ball LM Guide - orthogonal type		MX	▶B-160		0.59 to 2.04	1.1 to 3.21
Circular arc types	Full-ball LM Guides		HCR	▶B-168		4.7 to 141	8.53 to 215
Self-aligning types	Full-ball LM Guides		NSR-TBC	▶B-178		9.41 to 90.8	18.6 to 152

＊For specification tables for each model, please see the separate "B Product Specifications".

External dimensions (mm)		Features	Major application
Height	Width		
8 to 25	17 to 48	● Long service life, long-term maintenance-free operation ● Low dust generation, low noise, acceptable running sound ● Superbly high speed ● Smooth motion in all mounting orientations ● Stainless steel type also available as standard ● Lightweight and compact	● IC/LSI manufacturing machine ● Hard disc drive ● Slide unit of OA equipment ● Wafer transfer equipment ● Printed circuit board assembly table ● Medical equipment ● Electronic components of electron microscope ● Optical stage ● Stepper ● Plotting machine ● Feed mechanism of IC bonding machine ● Inspection equipment
9 to 16	25 to 60		
4 to 25	8 to 46	● Stainless steel type also available as standard ● Long type with increased load capacity also offered as standard ● Type M1, achieving max service temperature of 150℃, also available	● IC/LSI manufacturing machine ● Hard disc drive ● Slide unit of OA equipment ● Wafer transfer equipment ● Printed circuit board assembly table ● Medical equipment ● Electronic components of electron microscope ● Optical stage ● Stepper ● Plotting machine ● Feed mechanism of IC bonding machine ● Inspection equipment
10 to 25	20 to 46		
4 to 25	8 to 46		
10 to 25	20 to 46		
8 to 16	17 to 32		
4.5 to 16	12 to 60	● Stainless steel type also available as standard ● Long type with increased load capacity also offered as standard ● Type M1, achieving max service temperature of 150℃, also available	
12 to 16	30 to 60		
4.5 to 16	12 to 60		
12 to 16	30 to 60		
9 to 16	25 to 60		
8 to 13	17 to 27	● Equipped with a ball retainer ● Stainless steel type also available as standard	
8 to 16	17 to 32		
10 to 14.5	15.2 to 30.2	● A compact XY structure is allowed due to an XY orthogonal, single-piece LM block ● Stainless steel type also available as standard	● IC/LSI manufacturing machine ● Inspection equipment ● Slide unit of OA equipment ● Wafer transfer equipment ● Feed mechanism of IC bonding machine ● Printed circuit board assembly table ● Medical equipment ● Electronic components of electron microscope ● Optical stage
18 to 90	39 to 170	● Circular motion guide in a 4-way equal load design ● Highly accurate circular motion without play ● Allows an efficient design with the LM block placed in the loading point ● Large circular motion easily achieved	● Large swivel base ● Pendulum vehicle for railroad ● Pantagraph ● Control unit ● Optical measuring machine ● Tool grinder ● X-Ray machine ● CT scanner ● Medical equipment ● Stage setting ● Car elevator ● Amusement machine ● Turntable ● Tool changer
40 to 105	70 to 175	● Can be used in rough mount due to self-aligning on the fit surface of the case ● Preload can be adjusted ● Can be mounted on a black steel sheet	● XY axes of ordinary industrial machinery ● Various conveyance systems ● Automated warehouse ● Palette changer ● Automatic coating machine ● Various welding machines

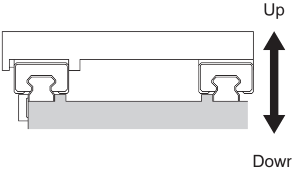
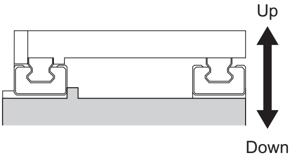
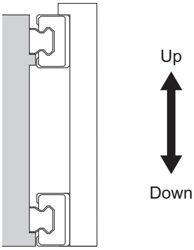
Setting Conditions

Conditions of the LM Guide

[Mounting Orientation]

The LM Guide can be mounted in the following five orientations. If oil is to be used as a lubricant, it is necessary to change the lubrication routing and the related settings. When ordering an LM Guide, please specify the mounting orientation.

[Mounting Orientation]

<table>
<tr><th colspan="2">Horizontal (symbol: H)</th><th colspan="2">Inverted (symbol: R)</th><th colspan="2">Wall mount (symbol: K)</th></tr>
<tr><td colspan="2">
</td><td colspan="2">
</td><td colspan="2">
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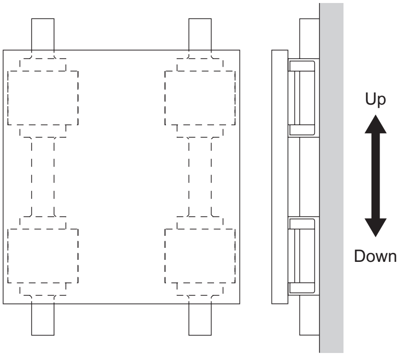
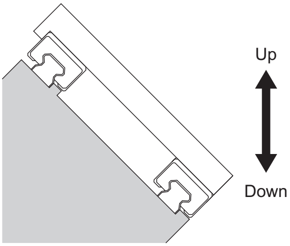
<tr><td colspan="3">
</td><td colspan="3">
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[Symbol for Number of Axes]

With the LM Guide, the normal and high-accuracy grades are interchangeable when two or more units of the LM Guide are used in combination on the same plane. However, when using two or more units of a model of precision or higher grade, or with a radial clearance of C1 or C0, specify the number of LM rails (symbol for number of axes) in advance.
(For accuracy standards and radial clearance standards, see A-118 and A-113, respectively.)

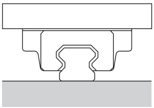
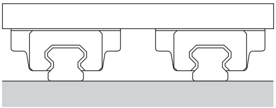
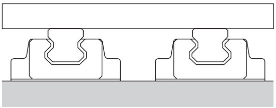
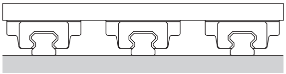
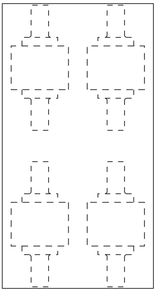
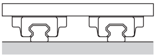
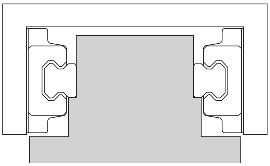
Model number coding

SHS25C2SSCO+1000LP -Ⅱ

Model number (details are given on the corresponding page of the model)

Symbol for number of axes
("II" indicates 2 axes. No symbol for a single axis)

[Symbol for Number of Axes]

Symbol for number of axes: none	Symbol for number of axes: Ⅱ	Symbol for number of axes: Ⅱ
Required number of axes: 1 	**Required number of axes: 2**  Note: When placing an order, specify the number in multiple of 2 axes.	**Required number of axes: 2**  Note: When placing an order, specify the number in multiple of 2 axes.
Symbol for number of axes: Ⅲ	**Symbol for number of axes: Ⅳ**	**Other**
Required number of axes: 3  Note: When placing an order, specify the number in multiple of 3 axes.	**Required number of axes: 4**   Note: When placing an order, specify the number in multiple of 4 axes.	**Required number of axes: 2**  Using 2 axes opposed to each other

[Service environment]

● Lubrication

When using an LM system, it is necessary to provide effective lubrication. Without lubrication, the rolling elements or the raceway may be worn faster and the service life may be shortened.

A lubricant has effects such as the following.

(1) Minimizes friction in moving elements to prevent seizure and reduce wear.

(2) Forms an oil film on the raceway to decrease stress acting on the surface and extend rolling fatigue life.

(3) Covers the metal surface to prevent rust formation.

To fully bring out an LM system's functions, it is necessary to provide lubrication according to the conditions.

Even with an LM system with seals, the internal lubricant gradually seeps out during operation. Therefore, the system needs to be lubricated at an appropriate interval according to the conditions.

● Corrosion Prevention

■Determining a Material

Any LM system requires a material that meets the environments. For use in environments where corrosion resistance is required, some LM system models can use martensite stainless steel.

(Martensite stainless steel can be used for LM Guide models SSR, SHW, SRS, HSR, SR, HRW, RSR, RSR-Z, RSH RSH-Z and HR.)

The HSR series includes HSR-M2, a highly corrosion resistant LM Guide using austenite stainless steel, which has high anti-corrosive effect. For details, see A-292.

■Surface Treatment

The surfaces of the rails and shafts of LM systems can be treated for anti-corrosive or aesthetic purposes.

THK offers THK-AP treatment, which is the optimum surface treatment for LM systems.

There are roughly three types of THK-AP treatment: AP-HC, AP-C, and AP-CF. (See A-20.)

● Contamination Protection

When foreign material enters an LM system, it will cause abnormal wear or shorten the service life, and it is necessary to prevent foreign material from entering the system. When entrance of dust or other foreign material is predicted, it is important to select an effective sealing device or dust-control device that meets the environment conditions.

THK offers contamination protection accessories for LM Guides by model number, such as end seals made of special synthetic rubber with high wear resistance, and side seals and inner seals for further increasing dust-prevention effect.

In addition, for locations with adverse environment, Laminated Contact Scraper LaCS and dedicated bellows are available by model number. Also, THK offers dedicated caps for LM rail mounting holes, designed to prevent cutting chips from entering the LM rail mounting holes.

When it is required to provide contamination protection for a Ball Screw in an environment exposed to cutting chips and moisture, we recommend using a telescopic cover that protects the whole system or a large bellows.

Clean Room

In a clean environment like clean rooms, generation of dust from the LM system has to be reduced and anti-rust oil cannot be used. Therefore, it is necessary to increase the corrosion resistance of the LM system. In addition, depending on the level of cleanliness, a dust collector is required.

Dust Generation from the LM System

■Measure to Prevent Dust Generation Resulting from Flying Grease

THK AFE-CA and AFF Grease

Use environmentally clean grease that produces little dust.

■Measure to Prevent Dust Generation Resulting from Metallic Abrasion Dust

Caged Ball LM Guide

Use the Caged Ball LM Guide, which has no friction between balls and generates little metallic abrasion dust, to allow generation of dust to be minimized.

Corrosion Prevention

■Material-based Measure

Stainless Steel LM Guide

This LM Guide uses martensite stainless steel, which has an anti-corrosion effect.

Highly Corrosion Resistant LM Guide

It uses austenite stainless steel, which has a high anti-corrosion effect, in its LM rail.

■Measure Through Surface Treatment

THK AP-HC, AP-C and AP-CF Treatment

The LM system is surface treated to increase corrosion resistance.

Caged Ball LM Guide

Supported models: SHS SSR SNR/SNS SHW SRS SCR

Caged Roller LM Guide

Supported models: SRG SRN SRW

Stainless Steel LM Guide

Supported models: SSR SHW SRS HSR SR HRW HR RSR RSH

Highly Corrosion Resistant LM Guide

Surface Treatment

Grease

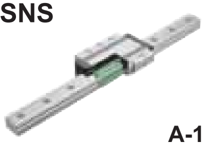
SHS

A-136

SSR

A-142

SNR/SNS



A-148

SHW

A-156

SRS

A-160

SCR

A-166

SRG

A-300

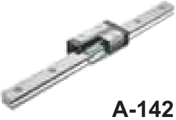
SRN

A-306

SRW

A-312

SSR



A-142

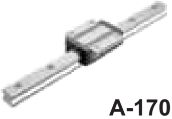
SHW

A-156

SRS

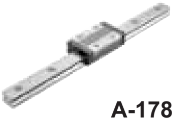
A-160

HSR



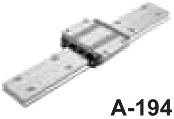
A-170

SR



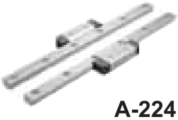
A-178

HRW



A-194

HR



A-224

RSR

A-200

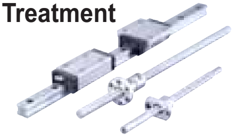
RSH

A-214

HSR-M2

A-292

THK AP-HC Treatment



A-20

THK AFE-CA Grease

A-963

THK AFF Grease

A-965

Vacuum

In a vacuum environment, measures to prevent gas from being emitted from a resin and grease from flying are required and anti-rust oil cannot be used. Therefore, it is necessary to select a product with high corrosion resistance.

■Measure to Prevent Emission of Gas from Resin

Stainless Steel LM Guide

It uses stainless steel in the endplate (ball circulation unit made of resin) of the LM block to reduce emission of gas.

■Measure to Prevent Grease from Evaporating

Vacuum Grease

If a general-purpose grease is used in a vacuum environment, oil contained in the grease evaporates and the grease looses lubricity. Therefore, use a vacuum grease that uses fluorine based oil, whose vapor pressure is low, as the base oil.

■Corrosion Prevention

Stainless Steel LM Guide

In a vacuum environment, use a stainless steel LM Guide, which is highly corrosion resistant.

High Temperature LM Guide

If high temperature is predicted due to baking, use a High Temperature LM Guide, which is highly resistant to heat and corrosion.

■Highly Corrosion Resistant LM Guide

This LM Guide uses austenite stainless steel, which has a high anti-corrosion effect, in the LM rail.

High Temperature LM Guide

Supported models HSR-M1 SR-M1 RSR-M1

Highly Corrosion Resistant LM Guide

Stainless Steel LM Guide

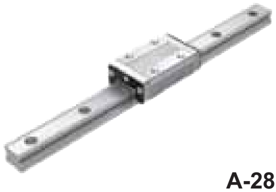
Supported models SSR SHW SRS HSR SR HRW HR RSR RSH

Vacuum Grease

HSR-M1

A-272

SR-M1



A-280

RSR-M1

A-286

HSR-M2

A-292

SSR

A-142

SHW

A-156

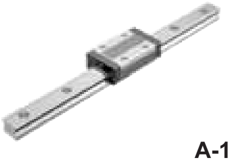
SRS

A-160

HSR

A-170

SR



A-178

HRW

A-194

HR

A-224

RSR

A-200

RSH

A-214

Corrosion Prevention

As with clean room applications, it is necessary to increase corrosion resistance through material selection and surface treatment.

Material-based Measure

Stainless Steel LM Guide
This LM Guide uses martensite stainless steel, which has an anti-corrosion effect.

Highly Corrosion Resistant LM Guide
It uses austenite stainless steel, which has a high anti-corrosion effect, in its LM rail.

Measure Through Surface Treatment

THK AP-HC, AP-C and AP-CF Treatment
The LM system is surface treated to increase corrosion resistance.

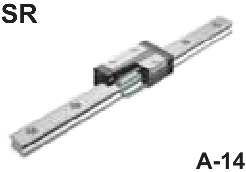
Stainless Steel LM Guide

Supported models: SSR SHW SRS HSR SR HRW HR RSR RSH

Highly Corrosion Resistant LM Guide

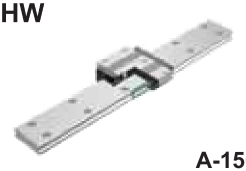
Surface Treatment

SSR



A-142

SHW

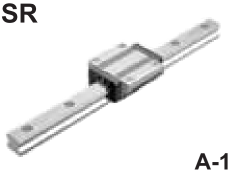


A-156

SRS

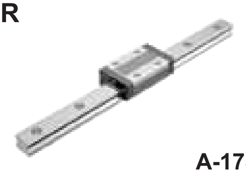
A-160

HSR



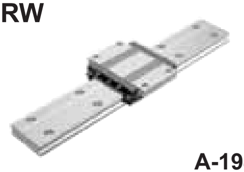
A-170

SR



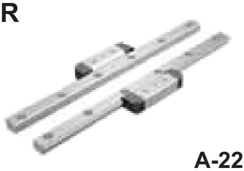
A-178

HRW



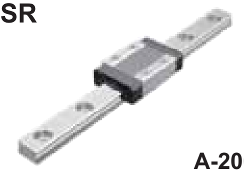
A-194

HR



A-224

RSR



A-200

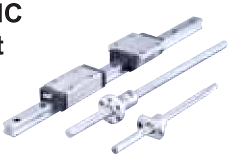
RSH

A-214

HSR-M2

A-292

THK AP-HC Treatment

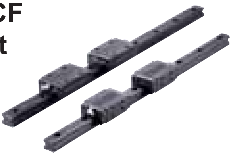


A-20

THK AP-C Treatment

A-20

THK AP-CF Treatment



A-20

High Speed

In a high speed environment, it is necessary to apply an optimum lubrication method that reduces heat generation during high speed operation and increases grease retention.

■Measures to Reduce Heat Generation

Caged Ball LM Guide

Use of a ball cage eliminates friction between balls to reduce heat generation. In addition, grease retention is increased, thus to achieve long service life and high speed operation.

High Speed Ball Screw with Ball Cage

Use of a ball cage and an ideal ball recirculation structure enables fast feeding, which conventional products have not achieved.

THK AFG Grease

It reduces heat generation in high speed operation and has superb lubricity.

■Measure to Improve Lubrication

QZ Lubricator

Since it supplements oil loss, the lubrication and maintenance interval can significantly be extended. It also applies the right amount of oil to the raceway, making itself an eco-friendly lubrication system that does not contaminate the surrounding area.

Caged Ball LM Guide

Supported models SHS SSR SNR/SNS SHW SRS SCR

Caged Roller LM Guide

Supported models SRG SRN SRW

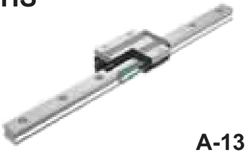
High Speed Ball Screw with Ball Cage

Supported models SBK SBN

QZ Lubricator

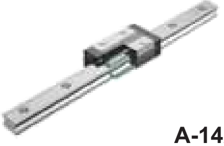
Grease

SHS



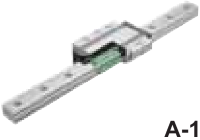
A-136

SSR



A-142

SNR/SNS



A-148

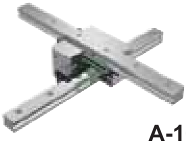
SHW

A-156

SRS

A-160

SCR



A-166

SRG

A-300

SRN

A-306

SRW

A-312

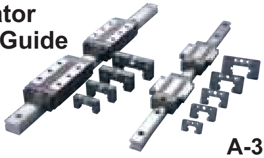
SBK

A-748

SBN

A-748

QZ Lubricator for the LM Guide



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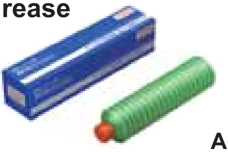
QZ Lubricator for the Ball Screw

A-817

THK AFG Grease



A-968

High Temperature

In a high temperature environment, dimensional alteration caused by heat is problematic. Use a High Temperature LM Guide, which is heat resistant and whose dimensions little change after being heated, and a high temperature grease.

■Heat Resistance

High Temperature LM Guide

It is an LM Guide that is highly resistant to heat and whose dimensions little change after being heated and cooled.

■Grease

High Temperature Grease

Use a high temperature grease with which the rolling resistance of the LM system little fluctuates even temperature changes from a normal to high range.

High Temperature LM Guide

Supported models HSR-M1 SR-M1 RSR-M1

High Temperature Grease

Low Temperature

Use an LM system whose resin component are little affected by low temperature, as a measure to increase corrosion resistance in transition from normal to low temperature, and a grease with a low rolling resistance fluctuation even at low temperature.

■Impact of Low Temperature on Resin Components

Stainless Steel LM Guide

The endplate (ball circulation path normally made of resin) of the LM block is made of stainless steel.

■Corrosion Prevention

Provide surface treatment to the LM system to increase its corrosion resistance.

■Grease

Use THK AFC Grease, with which the rolling resistance of the system little fluctuates even at low temperature.

Stainless Steel LM Guide

Supported models SSR SHW SRS HSR SR HRW HR RSR RSH

Surface Treatment

Grease

Micro Motion

Micro strokes cause oil film break and poor lubrication, resulting in early wear. In such cases, select a grease with which the oil film strength is high and an oil film can easily be formed.

■Grease

THK AFC Grease

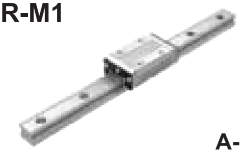
AFC Grease is a urea-based grease that excels in oil film strength and wear resistance.

Grease

HSR-M1

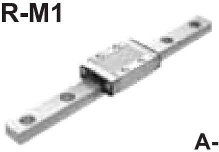
A-272

SR-M1



A-280

RSR-M1



A-286

SSR

A-142

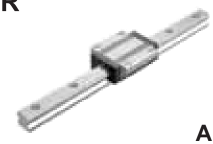
SHW

A-156

SRS

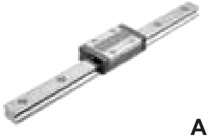
A-160

HSR



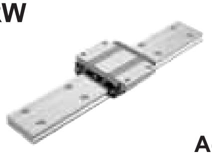
A-170

SR



A-178

HRW



A-194

HR

A-224

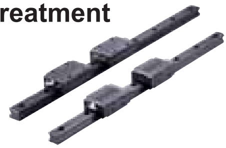
RSR

A-200

RSH

A-214

THK AP-CF Treatment



A-20

THK AFC Grease

A-961

THK AFC Grease

A-961

Foreign Matter

If foreign matter enters the LM system, it will cause abnormal wear and shorten the service life. Therefore, it is necessary to prevent such entrance of foreign matter.
Especially in an environment containing minute foreign matter or a water-soluble coolant that a telescopic cover or a bellows cannot remove, it is necessary to attach a contamination protection accessory capable of efficiently removing foreign matter.

■Metal Scraper

It is used to remove relatively large foreign objects such as cutting chips, spatter and sand or hard foreign matter that adhere to the LM rail.

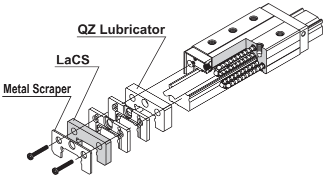
■Laminated Contact Scraper LaCS

Unlike a metal scraper, it removes foreign matter while it is in contact with the LM rail. Therefore, it demonstrates a high contamination protection effect against minute foreign matter, which has been difficult to remove with conventional metal scrapers.

■QZ Lubricator

QZ Lubricator is a lubrication system that feeds the right amount of lubricant by closely contacting its highly oil-impregnated fiber net to the ball raceway.

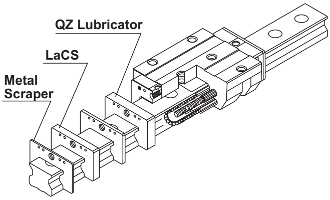
LM Guide
+Metal Scraper
+Laminated Contact Scraper LaCS
+QZ Lubricator



Supported models

Caged Ball LM Guide
SHS SSR SNR/SNS SHW SRS
Full Ball LM Guide
HSR NR/NRS

Caged Roller LM Guide
+Metal Scraper
+Laminated Contact Scraper LaCS
+QZ Lubricator



Supported models

SRG

Caged Ball LM Guide

SHS

A-136

SSR

A-142

SNR/SNS

A-148

SHW

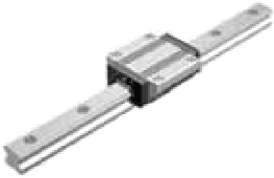
A-156

SRS

A-160

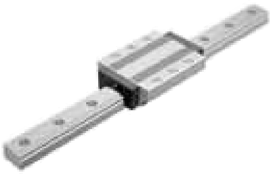
Full ball LM Guide

HSR



A-170

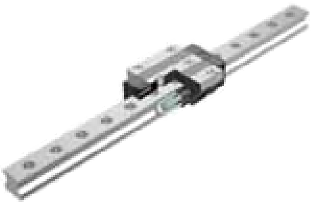
NR/NRS



A-186

Caged Roller LM Guide

SRG



A-300

Calculating the Applied Load

The LM Guide is capable of receiving loads and moments in all directions that are generated due to the mounting orientation, alignment, gravity center position of a traveling object, thrust position and cutting resistance.

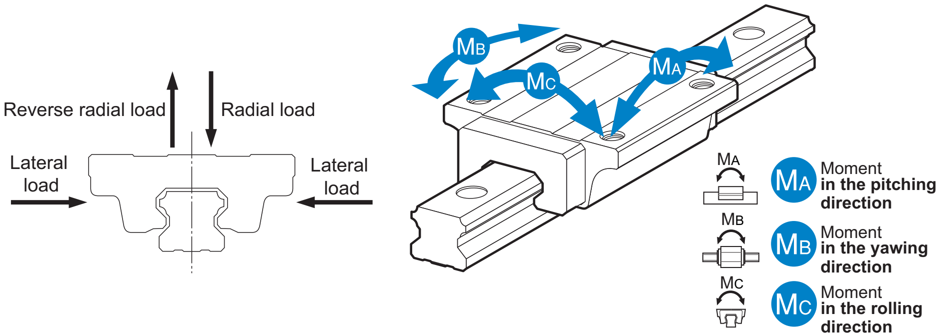
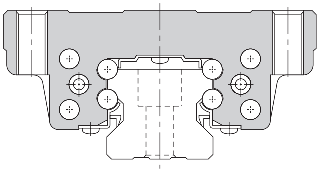
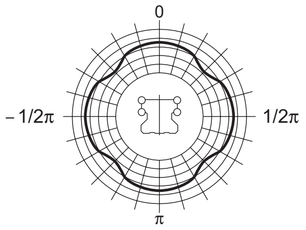
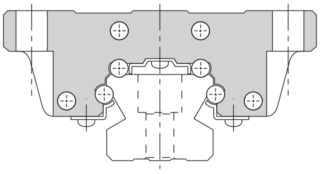
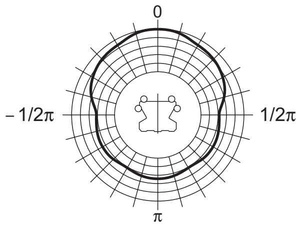


Fig.1 Directions of the Loads Applied on the LM Guide

Rated Load of an LM Guide in Each Direction

The LM Guide is categorized into roughly two types: the 4-way equal load type, which has the same rated load in the radial, reverse radial and lateral directions, and the radial type, which has a large rated load in the radial direction. With the radial type LM Guide, the rated load in the radial direction is different from that in the reverse radial and lateral directions. When such loads are applied, multiply the basic load rating by the corresponding factor. Those factors are specified in the respective sections.

[Rated Loads in All Directions]

Type	Load Distribution Curve
4-way Equal Load Type 	
Radial Type 	

Calculating an Applied Load

[Single-Axis Use]

● Moment Equivalence

When the installation space for the LM Guide is limited, you may have to use only one LM block, or double LM blocks closely contacting with each other. In such a setting, the load distribution is not uniform and, as a result, an excessive load is applied in localized areas (i.e., both ends) as shown in Fig.2. Continued use under such conditions may result in flaking in those areas, consequently shortening the service life. In such a case, calculate the actual load by multiplying the moment value by any one of the equivalent-moment factors specified in Table1 to Table9.

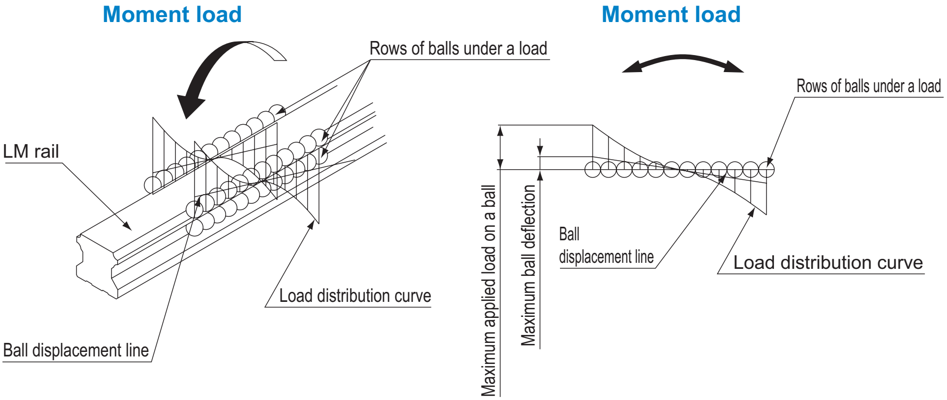


Fig.2 Ball Load when a Moment is Applied

An equivalent-load equation applicable when a moment acts on an LM Guide is shown below.

$$P = K \cdot M$$

P : Equivalent load per LM Guide (N)
K : Equivalent moment factor
M : Applied moment (N-mm)

● Equivalent Factor

Since the rated load is equivalent to the permissible moment, the equivalent factor to be multiplied when equalizing the M_A, M_B and M_C moments to the applied load per block is obtained by dividing the rated loads in the corresponding directions.

With those models other than 4-way equal load types, however, the load ratings in the 4 directions differ from each other. Therefore, the equivalent factor values for the M_A and M_C moments also differ depending on whether the direction is radial or reverse radial.

■Equivalent Factors for the M_A Moment

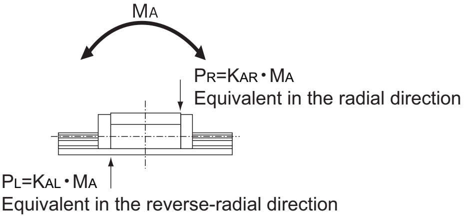


Fig.3 Equivalent Factors for the M_A Moment

Equivalent factors for the M_A Moment

- Equivalent factor in the radial direction $K_{AR}=\frac{C_0}{M_A}$
- Equivalent factor in the reverse radial direction $K_{AL}=\frac{C_{0L}}{M_A}$

$$\frac{C_0}{K_{AR}\cdot M_A}=\frac{C_{0L}}{K_{AL}\cdot M_A}=1$$

■Equivalent Factors for the M_B Moment

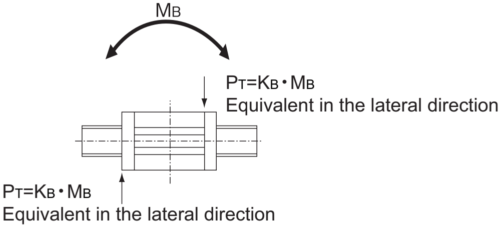


Fig.4 Equivalent Factors for the M_B Moment

Equivalent factors for the M_B Moment

- Equivalent factor in the lateral directions $K_B=\frac{C_{0T}}{M_B}$

$$\frac{C_{0T}}{K_B\cdot M_B}=1$$

■Equivalent Factors for the M_C Moment

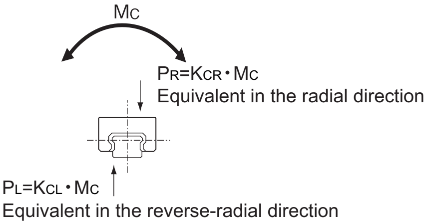


Fig.5 Equivalent Factors for the M_C Moment

Equivalent factors for the M_C Moment

- Equivalent factor in the radial direction $K_{CR}=\frac{C_0}{M_C}$
- Equivalent factor in the reverse radial direction $K_{CL}=\frac{C_{0L}}{M_C}$

$$\frac{C_0}{K_{CR} \cdot M_C}=\frac{C_{0L}}{K_{CL} \cdot M_C}=1$$

C_0 : Basic static load rating (radial direction) (N)
C_{0L} : Basic static load rating (reverse radial direction) (N)
C_{0T} : Basic static load rating (lateral direction) (N)
P_R : Calculated load (radial direction) (N)
P_L : Calculated load (reverse radial direction) (N)
P_T : Calculated load (lateral direction) (N)

Table1 Equivalent Factors (Models SHS, SSR and SNR)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
SHS	15	1.38×10^{-1}		2.69×10^{-2}		1.38×10^{-1}	2.69×10^{-2}	1.50×10^{-1}	
	15L	1.07×10^{-1}		2.22×10^{-2}		1.07×10^{-1}	2.22×10^{-2}	1.50×10^{-1}	
	20	1.15×10^{-1}		2.18×10^{-2}		1.15×10^{-1}	2.18×10^{-2}	1.06×10^{-1}	
	20L	8.85×10^{-2}		1.79×10^{-2}		8.85×10^{-2}	1.79×10^{-2}	1.06×10^{-1}	
	25	9.25×10^{-2}		1.90×10^{-2}		9.25×10^{-2}	1.90×10^{-2}	9.29×10^{-2}	
	25L	7.62×10^{-2}		1.62×10^{-2}		7.62×10^{-2}	1.62×10^{-2}	9.29×10^{-2}	
	30	8.47×10^{-2}		1.63×10^{-2}		8.47×10^{-2}	1.63×10^{-2}	7.69×10^{-2}	
	30L	6.52×10^{-2}		1.34×10^{-2}		6.52×10^{-2}	1.34×10^{-2}	7.69×10^{-2}	
	35	6.95×10^{-2}		1.43×10^{-2}		6.95×10^{-2}	1.43×10^{-2}	6.29×10^{-2}	
	35L	5.43×10^{-2}		1.16×10^{-2}		5.43×10^{-2}	1.16×10^{-2}	6.29×10^{-2}	
	45	6.13×10^{-2}		1.24×10^{-2}		6.13×10^{-2}	1.24×10^{-2}	4.69×10^{-2}	
	45L	4.79×10^{-2}		1.02×10^{-2}		4.79×10^{-2}	1.02×10^{-2}	4.69×10^{-2}	
	55	4.97×10^{-2}		1.02×10^{-2}		4.97×10^{-2}	1.02×10^{-2}	4.02×10^{-2}	
	55L	3.88×10^{-2}		8.30×10^{-3}		3.88×10^{-2}	8.30×10^{-3}	4.02×10^{-2}	
	65	3.87×10^{-2}		7.91×10^{-3}		3.87×10^{-2}	7.91×10^{-3}	3.40×10^{-2}	
	65L	3.06×10^{-2}		6.51×10^{-3}		3.06×10^{-2}	6.51×10^{-3}	3.40×10^{-2}	
SSR	15XW (TB)	2.08×10^{-1}	1.04×10^{-1}	3.75×10^{-2}	1.87×10^{-2}	1.46×10^{-1}	2.59×10^{-2}	1.71×10^{-1}	8.57×10^{-2}
	15XV	3.19×10^{-1}	1.60×10^{-1}	5.03×10^{-2}	2.51×10^{-2}	2.20×10^{-1}	3.41×10^{-2}	1.71×10^{-1}	8.57×10^{-2}
	20XW (TB)	1.69×10^{-1}	8.46×10^{-2}	3.23×10^{-2}	1.62×10^{-2}	1.19×10^{-1}	2.25×10^{-2}	1.29×10^{-1}	6.44×10^{-2}
	20XV	2.75×10^{-1}	1.37×10^{-1}	4.28×10^{-2}	2.14×10^{-2}	1.89×10^{-1}	2.89×10^{-2}	1.29×10^{-1}	6.44×10^{-2}
	25XW (TB)	1.41×10^{-1}	7.05×10^{-2}	2.56×10^{-2}	1.28×10^{-2}	9.86×10^{-2}	1.77×10^{-2}	1.10×10^{-1}	5.51×10^{-2}
	25XV	2.15×10^{-1}	1.08×10^{-1}	3.40×10^{-2}	1.70×10^{-2}	1.48×10^{-1}	2.31×10^{-2}	1.10×10^{-1}	5.51×10^{-2}
	30XW	1.18×10^{-1}	5.91×10^{-2}	2.19×10^{-2}	1.10×10^{-2}	8.26×10^{-2}	1.52×10^{-2}	9.22×10^{-2}	4.61×10^{-2}
	35XW	1.01×10^{-1}	5.03×10^{-2}	1.92×10^{-2}	9.60×10^{-3}	7.04×10^{-2}	1.33×10^{-2}	7.64×10^{-2}	3.82×10^{-2}
SNR	25	1.16×10^{-1}	7.41×10^{-2}	2.18×10^{-2}	1.40×10^{-2}	7.02×10^{-2}	1.33×10^{-2}	9.09×10^{-2}	5.82×10^{-2}
	25L	8.79×10^{-2}	5.62×10^{-2}	1.82×10^{-2}	1.16×10^{-2}	5.41×10^{-2}	1.13×10^{-2}	9.09×10^{-2}	5.82×10^{-2}
	30	1.02×10^{-1}	6.51×10^{-2}	1.86×10^{-2}	1.19×10^{-2}	6.16×10^{-2}	1.13×10^{-2}	8.11×10^{-2}	5.19×10^{-2}
	30L	7.60×10^{-2}	4.87×10^{-2}	1.55×10^{-2}	9.93×10^{-3}	4.68×10^{-2}	9.58×10^{-3}	8.11×10^{-2}	5.19×10^{-2}
	35	8.92×10^{-2}	5.71×10^{-2}	1.67×10^{-2}	1.07×10^{-2}	5.40×10^{-2}	1.01×10^{-2}	6.73×10^{-2}	4.31×10^{-2}
	35L	7.01×10^{-2}	4.48×10^{-2}	1.37×10^{-2}	8.79×10^{-3}	4.27×10^{-2}	8.41×10^{-3}	6.73×10^{-2}	4.31×10^{-2}
	45	6.55×10^{-2}	4.19×10^{-2}	1.35×10^{-2}	8.62×10^{-3}	4.03×10^{-2}	8.32×10^{-3}	5.10×10^{-2}	3.27×10^{-2}
	45L	5.32×10^{-2}	3.41×10^{-2}	1.10×10^{-2}	7.01×10^{-3}	3.26×10^{-2}	6.73×10^{-3}	5.10×10^{-2}	3.27×10^{-2}
	55	5.85×10^{-2}	3.74×10^{-2}	1.13×10^{-2}	7.24×10^{-3}	3.56×10^{-2}	6.92×10^{-3}	4.36×10^{-2}	2.79×10^{-2}
	55L	4.55×10^{-2}	2.91×10^{-2}	9.36×10^{-3}	5.99×10^{-3}	2.79×10^{-2}	5.75×10^{-3}	4.36×10^{-2}	2.79×10^{-2}
	65	5.07×10^{-2}	3.25×10^{-2}	9.92×10^{-3}	6.35×10^{-3}	3.09×10^{-2}	6.06×10^{-3}	3.70×10^{-2}	2.37×10^{-2}
	65L	3.58×10^{-2}	2.29×10^{-2}	7.67×10^{-3}	4.91×10^{-3}	2.21×10^{-2}	4.75×10^{-3}	3.70×10^{-2}	2.37×10^{-2}
	85L	2.92×10^{-2}	1.87×10^{-2}	6.20×10^{-3}	4.00×10^{-3}	1.80×10^{-2}	3.80×10^{-3}	2.78×10^{-2}	1.78×10^{-2}

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used

K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used

K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other

K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other

K_{B1} : M_B Equivalent factor when one LM block is used

K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other

K_{CR} : Equivalent factor in the M_C radial direction

K_{CL} : Equivalent factor in the M_C reverse radial direction

Table2 Equivalent Factors (Models SNS, SHW and SRS)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
SNS	25	1.12×10^{-1}	9.42×10^{-2}	2.11×10^{-2}	1.78×10^{-2}	1.02×10^{-1}	1.91×10^{-2}	9.41×10^{-2}	7.90×10^{-2}
	25L	8.52×10^{-2}	7.16×10^{-2}	1.77×10^{-2}	1.48×10^{-2}	7.73×10^{-2}	1.60×10^{-2}	9.41×10^{-2}	7.90×10^{-2}
	30	9.86×10^{-2}	8.28×10^{-2}	1.80×10^{-2}	1.51×10^{-2}	8.93×10^{-2}	1.63×10^{-2}	8.42×10^{-2}	7.07×10^{-2}
	30L	7.37×10^{-2}	6.19×10^{-2}	1.50×10^{-2}	1.26×10^{-2}	6.68×10^{-2}	1.36×10^{-2}	8.42×10^{-2}	7.07×10^{-2}
	35	8.64×10^{-2}	7.26×10^{-2}	1.61×10^{-2}	1.36×10^{-2}	7.83×10^{-2}	1.46×10^{-2}	7.01×10^{-2}	5.89×10^{-2}
	35L	6.80×10^{-2}	5.71×10^{-2}	1.33×10^{-2}	1.12×10^{-2}	6.17×10^{-2}	1.21×10^{-2}	7.01×10^{-2}	5.89×10^{-2}
	45	6.34×10^{-2}	5.33×10^{-2}	1.30×10^{-2}	1.10×10^{-2}	5.75×10^{-2}	1.18×10^{-2}	5.27×10^{-2}	4.43×10^{-2}
	45L	5.17×10^{-2}	4.34×10^{-2}	1.06×10^{-2}	8.94×10^{-3}	4.69×10^{-2}	9.64×10^{-3}	5.27×10^{-2}	4.43×10^{-2}
	55	5.67×10^{-2}	4.76×10^{-2}	1.10×10^{-2}	9.22×10^{-3}	5.14×10^{-2}	9.94×10^{-3}	4.52×10^{-2}	3.80×10^{-2}
	55L	4.42×10^{-2}	3.72×10^{-2}	9.09×10^{-3}	7.64×10^{-3}	4.01×10^{-2}	8.24×10^{-3}	4.52×10^{-2}	3.80×10^{-2}
	65	4.92×10^{-2}	4.13×10^{-2}	9.62×10^{-3}	8.08×10^{-3}	4.46×10^{-2}	8.71×10^{-3}	3.82×10^{-2}	3.21×10^{-2}
	65L	3.47×10^{-2}	2.92×10^{-2}	7.45×10^{-3}	6.26×10^{-3}	3.15×10^{-2}	6.75×10^{-3}	3.82×10^{-2}	3.21×10^{-2}
	85L	2.83×10^{-2}	2.38×10^{-2}	6.00×10^{-3}	5.10×10^{-3}	2.57×10^{-2}	5.50×10^{-3}	2.86×10^{-2}	2.40×10^{-2}
SHW	12	2.48×10^{-1}		4.69×10^{-2}		2.48×10^{-1}	4.69×10^{-2}	1.40×10^{-1}	
	12HR	1.70×10^{-1}		3.52×10^{-2}		1.70×10^{-1}	3.52×10^{-2}	1.40×10^{-1}	
	14	1.92×10^{-1}		3.80×10^{-2}		1.92×10^{-1}	3.80×10^{-2}	9.93×10^{-2}	
	17	1.72×10^{-1}		3.41×10^{-2}		1.72×10^{-1}	3.41×10^{-2}	6.21×10^{-2}	
	21	1.59×10^{-1}		2.95×10^{-2}		1.59×10^{-1}	2.95×10^{-2}	5.57×10^{-2}	
	27	1.21×10^{-1}		2.39×10^{-2}		1.21×10^{-1}	2.39×10^{-2}	4.99×10^{-2}	
	35	8.15×10^{-2}		1.64×10^{-2}		8.15×10^{-2}	1.64×10^{-2}	3.02×10^{-2}	
	50	6.22×10^{-2}		1.24×10^{-2}		6.22×10^{-2}	1.24×10^{-2}	2.30×10^{-2}	
SRS	7	4.19×10^{-1}		7.46×10^{-2}		4.18×10^{-1}	7.45×10^{-2}	2.58×10^{-1}	
	7W	3.01×10^{-1}		5.67×10^{-2}		3.00×10^{-1}	5.66×10^{-2}	1.36×10^{-1}	
	9	2.95×10^{-1}		5.26×10^{-2}		3.04×10^{-1}	5.40×10^{-2}	2.17×10^{-1}	
	9W	2.37×10^{-1}		4.25×10^{-2}		2.44×10^{-1}	4.37×10^{-2}	1.06×10^{-1}	
	12	2.94×10^{-1}		4.50×10^{-2}		2.94×10^{-1}	4.50×10^{-2}	1.53×10^{-1}	
	12W	2.00×10^{-1}		3.69×10^{-2}		2.00×10^{-1}	3.69×10^{-2}	7.97×10^{-2}	
	15	2.17×10^{-1}		3.69×10^{-2}		2.17×10^{-1}	3.69×10^{-2}	1.41×10^{-1}	
	15W	1.67×10^{-1}		2.94×10^{-2}		1.67×10^{-1}	2.94×10^{-2}	4.83×10^{-2}	
	20	1.80×10^{-1}		3.30×10^{-2}		1.86×10^{-1}	3.41×10^{-2}	9.34×10^{-2}	
	25	1.14×10^{-1}		2.17×10^{-2}		1.14×10^{-1}	2.17×10^{-2}	8.13×10^{-2}	

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used
K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used
K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other
K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other
K_{B1} : M_B Equivalent factor when one LM block is used
K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other
K_{CR} : Equivalent factor in the M_C radial direction
K_{CL} : Equivalent factor in the M_C reverse radial direction

Table3 Equivalent Factors (Models SCR and HSR)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
SCR	25	9.25×10^{-2}		1.90×10^{-2}		9.25×10^{-2}	1.90×10^{-2}	9.29×10^{-2}	
	30	8.47×10^{-2}		1.63×10^{-2}		8.47×10^{-2}	1.63×10^{-2}	7.69×10^{-2}	
	35	6.95×10^{-2}		1.43×10^{-2}		6.95×10^{-2}	1.43×10^{-2}	6.29×10^{-2}	
	45	6.13×10^{-2}		1.24×10^{-2}		6.13×10^{-2}	1.24×10^{-2}	4.69×10^{-2}	
	65	3.87×10^{-2}		7.91×10^{-3}		3.87×10^{-2}	7.91×10^{-3}	3.40×10^{-2}	
HSR	8	4.39×10^{-1}		6.75×10^{-2}		4.39×10^{-1}	6.75×10^{-2}	2.97×10^{-1}	
	10	3.09×10^{-1}		5.33×10^{-2}		3.09×10^{-1}	5.33×10^{-2}	2.35×10^{-1}	
	12	2.08×10^{-1}		3.74×10^{-2}		2.08×10^{-1}	3.74×10^{-2}	1.91×10^{-1}	
	15	1.68×10^{-1}		2.95×10^{-2}		1.68×10^{-1}	2.95×10^{-2}	1.60×10^{-1}	
	20	1.25×10^{-1}		2.28×10^{-2}		1.25×10^{-1}	2.28×10^{-2}	1.18×10^{-1}	
	20L	9.83×10^{-2}		1.91×10^{-2}		9.83×10^{-2}	1.91×10^{-2}	1.18×10^{-1}	
	25	1.12×10^{-1}		2.01×10^{-2}		1.12×10^{-1}	2.01×10^{-2}	1.00×10^{-1}	
	25L	8.66×10^{-2}		1.68×10^{-2}		8.66×10^{-2}	1.68×10^{-2}	1.00×10^{-1}	
	30	8.93×10^{-2}		1.73×10^{-2}		8.93×10^{-2}	1.73×10^{-2}	8.31×10^{-2}	
	30L	7.02×10^{-2}		1.43×10^{-2}		7.02×10^{-2}	1.43×10^{-2}	8.31×10^{-2}	
	35	7.81×10^{-2}		1.55×10^{-2}		7.81×10^{-2}	1.55×10^{-2}	6.74×10^{-2}	
	35L	6.15×10^{-2}		1.28×10^{-2}		6.15×10^{-2}	1.28×10^{-2}	6.74×10^{-2}	
	45	6.71×10^{-2}		1.21×10^{-2}		6.71×10^{-2}	1.21×10^{-2}	5.22×10^{-2}	
	45L	5.20×10^{-2}		1.00×10^{-2}		5.20×10^{-2}	1.00×10^{-2}	5.22×10^{-2}	
	55	5.59×10^{-2}		1.03×10^{-2}		5.59×10^{-2}	1.03×10^{-2}	4.27×10^{-2}	
	55L	4.33×10^{-2}		8.56×10^{-3}		4.33×10^{-2}	8.56×10^{-3}	4.27×10^{-2}	
	65	4.47×10^{-2}		9.13×10^{-3}		4.47×10^{-2}	9.13×10^{-3}	3.69×10^{-2}	
	65L	3.28×10^{-2}		7.06×10^{-3}		3.28×10^{-2}	7.06×10^{-3}	3.69×10^{-2}	
	85	3.73×10^{-2}		6.80×10^{-3}		3.73×10^{-2}	6.80×10^{-3}	2.79×10^{-2}	
	85L	2.89×10^{-2}		5.68×10^{-3}		2.89×10^{-2}	5.68×10^{-3}	2.79×10^{-2}	
	100	2.60×10^{-2}		5.15×10^{-3}		2.60×10^{-2}	5.15×10^{-3}	2.25×10^{-2}	
	120	2.36×10^{-2}		4.72×10^{-3}		2.36×10^{-2}	4.72×10^{-3}	1.97×10^{-2}	
	150	2.17×10^{-2}		4.35×10^{-3}		2.17×10^{-2}	4.35×10^{-3}	1.61×10^{-2}	
	15M2A	1.65×10^{-1}		2.89×10^{-2}		1.65×10^{-1}	2.89×10^{-2}	1.86×10^{-1}	
	20M2A	1.23×10^{-1}		2.23×10^{-2}		1.23×10^{-1}	2.23×10^{-2}	1.34×10^{-1}	
	25M2A	1.10×10^{-1}		1.98×10^{-2}		1.10×10^{-1}	1.98×10^{-2}	1.14×10^{-1}	

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used

K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used

K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other

K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other

K_{B1} : M_B Equivalent factor when one LM block is used

K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other

K_{CR} : Equivalent factor in the M_C radial direction

K_{CL} : Equivalent factor in the M_C reverse radial direction

Table4 Equivalent Factors (Models SR and NR)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
SR	15W (TB)	2.09×10^{-1}	1.04×10^{-1}	3.74×10^{-2}	1.87×10^{-2}	1.46×10^{-1}	2.58×10^{-2}	1.70×10^{-1}	8.48×10^{-2}
	15V (SB)	3.40×10^{-1}	1.70×10^{-1}	4.94×10^{-2}	2.47×10^{-2}	2.35×10^{-1}	3.32×10^{-2}	1.70×10^{-1}	8.48×10^{-2}
	20W (TB)	1.72×10^{-1}	8.61×10^{-2}	3.24×10^{-2}	1.62×10^{-2}	1.21×10^{-1}	2.25×10^{-2}	1.30×10^{-1}	6.49×10^{-2}
	20V (SB)	2.72×10^{-1}	1.36×10^{-1}	4.33×10^{-2}	2.16×10^{-2}	1.88×10^{-1}	2.94×10^{-2}	1.30×10^{-1}	6.49×10^{-2}
	25W (TB)	1.38×10^{-1}	6.89×10^{-2}	2.59×10^{-2}	1.30×10^{-2}	9.67×10^{-2}	1.80×10^{-2}	1.11×10^{-1}	5.55×10^{-2}
	25V (SB)	2.17×10^{-1}	1.09×10^{-1}	3.46×10^{-2}	1.73×10^{-2}	1.51×10^{-1}	2.35×10^{-2}	1.11×10^{-1}	5.55×10^{-2}
	30W (TB)	1.15×10^{-1}	5.74×10^{-2}	2.22×10^{-2}	1.11×10^{-2}	8.06×10^{-2}	1.55×10^{-2}	9.22×10^{-2}	4.61×10^{-2}
	30V (SB)	1.99×10^{-1}	9.93×10^{-2}	2.99×10^{-2}	1.49×10^{-2}	1.37×10^{-1}	2.02×10^{-2}	9.22×10^{-2}	4.61×10^{-2}
	35W (TB)	1.04×10^{-1}	5.21×10^{-2}	1.92×10^{-2}	9.61×10^{-3}	7.31×10^{-2}	1.33×10^{-2}	7.64×10^{-2}	3.82×10^{-2}
	35V (SB)	1.70×10^{-1}	8.51×10^{-2}	2.61×10^{-2}	1.31×10^{-2}	1.17×10^{-1}	1.77×10^{-2}	7.64×10^{-2}	3.82×10^{-2}
	45W (TB)	9.12×10^{-2}	4.56×10^{-2}	1.69×10^{-2}	8.47×10^{-3}	6.39×10^{-2}	1.17×10^{-2}	5.71×10^{-2}	2.85×10^{-2}
	55W (TB)	6.89×10^{-2}	3.44×10^{-2}	1.39×10^{-2}	6.93×10^{-3}	4.84×10^{-2}	9.66×10^{-3}	5.46×10^{-2}	2.73×10^{-2}
NR	25X	1.10×10^{-1}	7.78×10^{-2}	2.19×10^{-2}	1.55×10^{-2}	8.11×10^{-2}	1.63×10^{-2}	9.26×10^{-2}	6.58×10^{-2}
	25XL	8.91×10^{-2}	6.33×10^{-2}	1.79×10^{-2}	1.27×10^{-2}	6.55×10^{-2}	1.33×10^{-2}	9.26×10^{-2}	6.58×10^{-2}
	30	9.66×10^{-2}	6.86×10^{-2}	1.84×10^{-2}	1.31×10^{-2}	7.05×10^{-2}	1.35×10^{-2}	8.28×10^{-2}	5.88×10^{-2}
	30L	7.43×10^{-2}	5.27×10^{-2}	1.52×10^{-2}	1.08×10^{-2}	5.47×10^{-2}	1.13×10^{-2}	8.28×10^{-2}	5.88×10^{-2}
	35	8.82×10^{-2}	6.26×10^{-2}	1.64×10^{-2}	1.16×10^{-2}	6.42×10^{-2}	1.20×10^{-2}	6.92×10^{-2}	4.91×10^{-2}
	35L	6.67×10^{-2}	4.74×10^{-2}	1.35×10^{-2}	9.61×10^{-3}	4.90×10^{-2}	1.00×10^{-2}	6.92×10^{-2}	4.91×10^{-2}
	45	6.84×10^{-2}	4.86×10^{-2}	1.30×10^{-2}	9.23×10^{-3}	5.00×10^{-2}	9.58×10^{-3}	5.19×10^{-2}	3.68×10^{-2}
	45L	5.11×10^{-2}	3.62×10^{-2}	1.08×10^{-2}	7.66×10^{-3}	3.79×10^{-2}	8.07×10^{-3}	5.19×10^{-2}	3.68×10^{-2}
	55	5.75×10^{-2}	4.08×10^{-2}	1.11×10^{-2}	7.90×10^{-3}	4.21×10^{-2}	8.21×10^{-3}	4.44×10^{-2}	3.15×10^{-2}
	55L	4.53×10^{-2}	3.22×10^{-2}	9.16×10^{-3}	6.51×10^{-3}	3.34×10^{-2}	6.79×10^{-3}	4.44×10^{-2}	3.15×10^{-2}
	65	4.97×10^{-2}	3.53×10^{-2}	9.74×10^{-3}	6.91×10^{-3}	3.64×10^{-2}	7.18×10^{-3}	3.75×10^{-2}	2.66×10^{-2}
	65L	3.56×10^{-2}	2.53×10^{-2}	7.51×10^{-3}	5.33×10^{-3}	2.65×10^{-2}	5.61×10^{-3}	3.75×10^{-2}	2.66×10^{-2}
	75	4.21×10^{-2}	2.99×10^{-2}	8.31×10^{-3}	5.90×10^{-3}	3.08×10^{-2}	6.13×10^{-3}	3.16×10^{-2}	2.24×10^{-2}
	75L	3.14×10^{-2}	2.23×10^{-2}	6.74×10^{-3}	4.78×10^{-3}	2.33×10^{-2}	5.04×10^{-3}	3.16×10^{-2}	2.24×10^{-2}
	85	3.70×10^{-2}	2.62×10^{-2}	7.31×10^{-3}	5.19×10^{-3}	2.71×10^{-2}	5.40×10^{-3}	2.80×10^{-2}	1.99×10^{-2}
	85L	2.80×10^{-2}	1.99×10^{-2}	6.07×10^{-3}	4.31×10^{-3}	2.08×10^{-2}	4.55×10^{-3}	2.80×10^{-2}	1.99×10^{-2}
	100	3.05×10^{-2}	2.17×10^{-2}	6.20×10^{-3}	4.41×10^{-3}	2.26×10^{-2}	4.63×10^{-3}	2.38×10^{-2}	1.69×10^{-2}
	100L	2.74×10^{-2}	1.95×10^{-2}	5.46×10^{-3}	3.87×10^{-3}	2.00×10^{-2}	4.00×10^{-3}	2.38×10^{-2}	1.69×10^{-2}

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used
K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used
K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other
K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other
K_{B1} : M_B Equivalent factor when one LM block is used
K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other
K_{CR} : Equivalent factor in the M_C radial direction
K_{CL} : Equivalent factor in the M_C reverse radial direction

Table5 Equivalent Factors (Models NRS and HRW)

<table>
<tr><th colspan="2" rowspan="2">Model No.</th><th colspan="8">Equivalent factor</th></tr>
<tr><th>K_{AR1}</th><th>K_{AL1}</th><th>K_{AR2}</th><th>K_{AL2}</th><th>K_{B1}</th><th>K_{B2}</th><th>K_{CR}</th><th>K_{CL}</th></tr>
<tr><td rowspan="18">NRS</td><td>25X</td><td colspan="2">1.05×10^{-1}</td><td colspan="2">2.11×10^{-2}</td><td>1.05×10^{-1}</td><td>2.11×10^{-2}</td><td colspan="2">9.41×10^{-2}</td></tr>
<tr><td>25XL</td><td colspan="2">8.60×10^{-2}</td><td colspan="2">1.73×10^{-2}</td><td>8.60×10^{-2}</td><td>1.73×10^{-2}</td><td colspan="2">9.41×10^{-2}</td></tr>
<tr><td>30</td><td colspan="2">9.30×10^{-2}</td><td colspan="2">1.77×10^{-2}</td><td>9.30×10^{-2}</td><td>1.77×10^{-2}</td><td colspan="2">8.44×10^{-2}</td></tr>
<tr><td>30L</td><td colspan="2">7.17×10^{-2}</td><td colspan="2">1.47×10^{-2}</td><td>7.17×10^{-2}</td><td>1.47×10^{-2}</td><td colspan="2">8.44×10^{-2}</td></tr>
<tr><td>35</td><td colspan="2">8.47×10^{-2}</td><td colspan="2">1.57×10^{-2}</td><td>8.47×10^{-2}</td><td>1.57×10^{-2}</td><td colspan="2">7.08×10^{-2}</td></tr>
<tr><td>35L</td><td colspan="2">6.44×10^{-2}</td><td colspan="2">1.31×10^{-2}</td><td>6.44×10^{-2}</td><td>1.31×10^{-2}</td><td colspan="2">7.08×10^{-2}</td></tr>
<tr><td>45</td><td colspan="2">6.58×10^{-2}</td><td colspan="2">1.25×10^{-2}</td><td>6.58×10^{-2}</td><td>1.25×10^{-2}</td><td colspan="2">5.26×10^{-2}</td></tr>
<tr><td>45L</td><td colspan="2">4.92×10^{-2}</td><td colspan="2">1.04×10^{-2}</td><td>4.92×10^{-2}</td><td>1.04×10^{-2}</td><td colspan="2">5.26×10^{-2}</td></tr>
<tr><td>55</td><td colspan="2">5.54×10^{-2}</td><td colspan="2">1.07×10^{-2}</td><td>5.54×10^{-2}</td><td>1.07×10^{-2}</td><td colspan="2">4.52×10^{-2}</td></tr>
<tr><td>55L</td><td colspan="2">4.38×10^{-2}</td><td colspan="2">8.85×10^{-3}</td><td>4.38×10^{-2}</td><td>8.85×10^{-3}</td><td colspan="2">4.52×10^{-2}</td></tr>
<tr><td>65</td><td colspan="2">4.79×10^{-2}</td><td colspan="2">9.38×10^{-3}</td><td>4.79×10^{-2}</td><td>9.38×10^{-3}</td><td colspan="2">3.81×10^{-2}</td></tr>
<tr><td>65L</td><td colspan="2">3.43×10^{-2}</td><td colspan="2">7.25×10^{-3}</td><td>3.43×10^{-2}</td><td>7.25×10^{-3}</td><td colspan="2">3.81×10^{-2}</td></tr>
<tr><td>75</td><td colspan="2">4.05×10^{-2}</td><td colspan="2">8.01×10^{-3}</td><td>4.05×10^{-2}</td><td>8.01×10^{-3}</td><td colspan="2">3.20×10^{-2}</td></tr>
<tr><td>75L</td><td colspan="2">3.03×10^{-2}</td><td colspan="2">6.50×10^{-3}</td><td>3.03×10^{-2}</td><td>6.50×10^{-3}</td><td colspan="2">3.20×10^{-2}</td></tr>
<tr><td>85</td><td colspan="2">3.56×10^{-2}</td><td colspan="2">7.05×10^{-3}</td><td>3.56×10^{-2}</td><td>7.05×10^{-3}</td><td colspan="2">2.83×10^{-2}</td></tr>
<tr><td>85L</td><td colspan="2">2.70×10^{-2}</td><td colspan="2">5.87×10^{-3}</td><td>2.70×10^{-2}</td><td>5.87×10^{-3}</td><td colspan="2">2.83×10^{-2}</td></tr>
<tr><td>100</td><td colspan="2">2.93×10^{-2}</td><td colspan="2">5.97×10^{-3}</td><td>2.93×10^{-2}</td><td>5.97×10^{-3}</td><td colspan="2">2.41×10^{-2}</td></tr>
<tr><td>100L</td><td colspan="2">2.65×10^{-2}</td><td colspan="2">5.27×10^{-3}</td><td>2.65×10^{-2}</td><td>5.27×10^{-3}</td><td colspan="2">2.41×10^{-2}</td></tr>
<tr><td rowspan="8">HRW</td><td>12</td><td colspan="2">2.72×10^{-1}</td><td colspan="2">5.16×10^{-2}</td><td>5.47×10^{-1}</td><td>1.04×10^{-1}</td><td colspan="2">1.40×10^{-1}</td></tr>
<tr><td>14</td><td colspan="2">2.28×10^{-1}</td><td colspan="2">4.16×10^{-2}</td><td>4.54×10^{-1}</td><td>8.28×10^{-2}</td><td colspan="2">1.01×10^{-1}</td></tr>
<tr><td>17</td><td colspan="2">1.95×10^{-1}</td><td colspan="2">3.33×10^{-2}</td><td>1.95×10^{-1}</td><td>3.33×10^{-2}</td><td colspan="2">6.32×10^{-2}</td></tr>
<tr><td>21</td><td colspan="2">1.64×10^{-1}</td><td colspan="2">2.89×10^{-2}</td><td>1.64×10^{-1}</td><td>2.89×10^{-2}</td><td colspan="2">5.92×10^{-2}</td></tr>
<tr><td>27</td><td colspan="2">1.30×10^{-1}</td><td colspan="2">2.33×10^{-2}</td><td>1.30×10^{-1}</td><td>2.33×10^{-2}</td><td colspan="2">5.12×10^{-2}</td></tr>
<tr><td>35</td><td colspan="2">8.66×10^{-2}</td><td colspan="2">1.59×10^{-2}</td><td>8.66×10^{-2}</td><td>1.59×10^{-2}</td><td colspan="2">3.06×10^{-2}</td></tr>
<tr><td>50</td><td colspan="2">6.50×10^{-2}</td><td colspan="2">1.21×10^{-2}</td><td>6.50×10^{-2}</td><td>1.21×10^{-2}</td><td colspan="2">2.35×10^{-2}</td></tr>
<tr><td>60</td><td colspan="2">5.77×10^{-2}</td><td colspan="2">8.24×10^{-3}</td><td>5.77×10^{-2}</td><td>8.24×10^{-3}</td><td colspan="2">1.77×10^{-2}</td></tr>
</table>

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used

K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used

K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other

K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other

K_{B1} : M_B Equivalent factor when one LM block is used

K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other

K_{CR} : Equivalent factor in the M_C radial direction

K_{CL} : Equivalent factor in the M_C reverse radial direction

Table6 Equivalent Factors (Model RSR)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
RSR	3M	9.20×10^{-1}		1.27×10^{-1}		9.20×10^{-1}	1.27×10^{-1}	6.06×10^{-1}	
	3N	6.06×10^{-1}		1.01×10^{-1}		6.06×10^{-1}	1.01×10^{-1}	6.06×10^{-1}	
	3W	7.03×10^{-1}		1.06×10^{-1}		7.03×10^{-1}	1.06×10^{-1}	3.17×10^{-1}	
	3WN	4.76×10^{-1}		8.27×10^{-2}		4.76×10^{-1}	8.27×10^{-2}	3.17×10^{-1}	
	5M	6.67×10^{-1}		9.06×10^{-2}		6.67×10^{-1}	9.06×10^{-2}	3.85×10^{-1}	
	5N	5.21×10^{-1}		8.00×10^{-2}		5.21×10^{-1}	8.00×10^{-2}	3.85×10^{-1}	
	5W	4.85×10^{-1}		7.28×10^{-2}		4.85×10^{-1}	7.28×10^{-2}	1.96×10^{-1}	
	5WN	3.44×10^{-1}		5.93×10^{-2}		3.44×10^{-1}	5.93×10^{-2}	1.96×10^{-1}	
	7M	4.66×10^{-1}		6.57×10^{-2}		4.66×10^{-1}	6.57×10^{-2}	2.74×10^{-1}	
	7Z	4.66×10^{-1}		6.60×10^{-2}		4.66×10^{-1}	6.60×10^{-2}	2.74×10^{-1}	
	7N	2.88×10^{-1}		5.01×10^{-2}		2.88×10^{-1}	5.01×10^{-2}	2.74×10^{-1}	
	7W	3.07×10^{-1}		5.30×10^{-2}		3.07×10^{-1}	5.30×10^{-2}	1.40×10^{-1}	
	7WZ	3.30×10^{-1}		5.12×10^{-2}		3.30×10^{-1}	5.12×10^{-2}	1.40×10^{-1}	
	7WN	2.18×10^{-1}		4.13×10^{-2}		2.18×10^{-1}	4.13×10^{-2}	1.40×10^{-1}	
	9K	3.06×10^{-1}		5.19×10^{-2}		3.06×10^{-1}	5.19×10^{-2}	2.15×10^{-1}	
	9Z	3.06×10^{-1}		5.23×10^{-2}		3.06×10^{-1}	5.23×10^{-2}	2.15×10^{-1}	
	9N	2.15×10^{-1}		4.08×10^{-2}		2.15×10^{-1}	4.08×10^{-2}	2.15×10^{-1}	
	9WV	2.44×10^{-1}		4.22×10^{-2}		2.44×10^{-1}	4.22×10^{-2}	1.09×10^{-1}	
	9WZ	2.44×10^{-1}		4.22×10^{-2}		2.44×10^{-1}	4.22×10^{-2}	1.09×10^{-1}	
	9WN	1.73×10^{-1}		3.32×10^{-2}		1.73×10^{-1}	4.22×10^{-2}	1.09×10^{-1}	
	12V	3.52×10^{-1}	2.46×10^{-1}	5.37×10^{-2}	3.76×10^{-2}	2.81×10^{-1}	4.21×10^{-2}	2.09×10^{-1}	1.46×10^{-1}
	12Z	3.52×10^{-1}	2.46×10^{-1}	5.37×10^{-2}	3.76×10^{-2}	2.81×10^{-1}	4.21×10^{-2}	2.09×10^{-1}	1.46×10^{-1}
	12N	2.30×10^{-1}	1.61×10^{-1}	4.08×10^{-2}	2.85×10^{-2}	1.85×10^{-1}	3.25×10^{-2}	2.09×10^{-1}	1.46×10^{-1}
	12WV	2.47×10^{-1}	1.73×10^{-1}	4.38×10^{-2}	3.07×10^{-2}	1.99×10^{-1}	3.49×10^{-2}	1.02×10^{-1}	7.15×10^{-2}
	12WZ	2.47×10^{-1}	1.73×10^{-1}	4.38×10^{-2}	3.07×10^{-2}	1.99×10^{-1}	3.49×10^{-2}	1.02×10^{-1}	7.15×10^{-2}
	12WN	1.71×10^{-1}	1.20×10^{-1}	3.36×10^{-2}	2.35×10^{-2}	1.38×10^{-1}	2.70×10^{-2}	1.02×10^{-1}	7.15×10^{-2}
	14WV	2.10×10^{-1}	1.47×10^{-1}	3.89×10^{-2}	2.73×10^{-2}	1.69×10^{-1}	3.10×10^{-2}	8.22×10^{-2}	5.75×10^{-2}
	15V	2.77×10^{-1}	1.94×10^{-1}	4.38×10^{-2}	3.07×10^{-2}	2.21×10^{-1}	3.45×10^{-2}	1.69×10^{-1}	1.18×10^{-1}
	15Z	2.77×10^{-1}	1.94×10^{-1}	4.38×10^{-2}	3.07×10^{-2}	2.21×10^{-1}	3.45×10^{-2}	1.69×10^{-1}	1.18×10^{-1}
	15N	1.70×10^{-1}	1.19×10^{-1}	3.24×10^{-2}	2.27×10^{-2}	1.37×10^{-1}	2.59×10^{-2}	1.69×10^{-1}	1.18×10^{-1}
	15WV	1.95×10^{-1}	1.36×10^{-1}	3.52×10^{-2}	2.46×10^{-2}	1.56×10^{-1}	2.80×10^{-2}	5.83×10^{-2}	4.08×10^{-2}
	15WZ	1.95×10^{-1}	1.36×10^{-1}	3.52×10^{-2}	2.46×10^{-2}	1.56×10^{-1}	2.80×10^{-2}	5.83×10^{-2}	4.08×10^{-2}
	15WN	1.34×10^{-1}	9.41×10^{-2}	2.68×10^{-2}	1.88×10^{-2}	1.09×10^{-1}	2.16×10^{-2}	5.82×10^{-2}	4.08×10^{-2}
	20V	1.68×10^{-1}	1.18×10^{-1}	2.92×10^{-2}	2.04×10^{-2}	1.35×10^{-1}	2.32×10^{-2}	1.30×10^{-1}	9.13×10^{-2}
	20N	1.20×10^{-1}	8.39×10^{-2}	2.30×10^{-2}	1.61×10^{-2}	9.68×10^{-2}	1.84×10^{-2}	1.30×10^{-1}	9.13×10^{-2}

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used

K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used

K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other

K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other

K_{B1} : M_B Equivalent factor when one LM block is used

K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other

K_{CR} : Equivalent factor in the M_C radial direction

K_{CL} : Equivalent factor in the M_C reverse radial direction

Table7 Equivalent Factors (Models RSH, HR and GSR)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
RSH	7Z	4.66×10^{-1}		6.60×10^{-2}		4.66×10^{-1}	6.60×10^{-2}	2.74×10^{-1}	
	7WZ	3.30×10^{-1}		5.12×10^{-2}		3.30×10^{-1}	5.12×10^{-2}	1.40×10^{-1}	
	9Z	3.06×10^{-1}		5.23×10^{-2}		3.06×10^{-1}	5.23×10^{-2}	2.15×10^{-1}	
	9WZ	2.44×10^{-1}		4.22×10^{-2}		2.44×10^{-1}	4.22×10^{-2}	1.09×10^{-1}	
	12Z	3.52×10^{-1}	2.46×10^{-1}	5.37×10^{-2}	3.76×10^{-2}	2.81×10^{-1}	4.21×10^{-2}	2.09×10^{-1}	1.46×10^{-1}
	12WZ	2.47×10^{-1}	1.73×10^{-1}	4.38×10^{-2}	3.07×10^{-2}	1.99×10^{-1}	3.49×10^{-2}	1.02×10^{-1}	7.15×10^{-2}
	15Z	2.77×10^{-1}	1.94×10^{-1}	4.38×10^{-2}	3.07×10^{-2}	2.21×10^{-1}	3.45×10^{-2}	1.69×10^{-1}	1.18×10^{-1}
	15WZ	1.95×10^{-1}	1.36×10^{-1}	3.52×10^{-2}	2.46×10^{-2}	1.56×10^{-1}	2.80×10^{-2}	5.83×10^{-2}	4.08×10^{-2}
HR	918	2.65×10^{-1}	2.65×10^{-1}	—	—	2.65×10^{-1}	—	—	—
	1123	2.08×10^{-1}	2.08×10^{-1}	—	—	2.08×10^{-1}	—	—	—
	1530	1.56×10^{-1}	1.56×10^{-1}	—	—	1.56×10^{-1}	—	—	—
	2042	1.11×10^{-1}	1.11×10^{-1}	—	—	1.11×10^{-1}	—	—	—
	2042T	8.64×10^{-2}	8.64×10^{-2}	—	—	8.64×10^{-2}	—	—	—
	2555	7.79×10^{-2}	7.79×10^{-2}	—	—	7.79×10^{-2}	—	—	—
	2555T	6.13×10^{-2}	6.13×10^{-2}	—	—	6.13×10^{-2}	—	—	—
	3065	6.92×10^{-2}	6.92×10^{-2}	—	—	6.92×10^{-2}	—	—	—
	3065T	5.45×10^{-2}	5.45×10^{-2}	—	—	5.45×10^{-2}	—	—	—
	3575	6.23×10^{-2}	6.23×10^{-2}	—	—	6.23×10^{-2}	—	—	—
	3575T	4.90×10^{-2}	4.90×10^{-2}	—	—	4.90×10^{-2}	—	—	—
	4085	5.19×10^{-2}	5.19×10^{-2}	—	—	5.19×10^{-2}	—	—	—
	4085T	4.09×10^{-2}	4.09×10^{-2}	—	—	4.09×10^{-2}	—	—	—
	50105	4.15×10^{-2}	4.15×10^{-2}	—	—	4.15×10^{-2}	—	—	—
	50105T	3.27×10^{-2}	3.27×10^{-2}	—	—	3.27×10^{-2}	—	—	—
	60125	2.88×10^{-2}	2.88×10^{-2}	—	—	2.88×10^{-2}	—	—	—
GSR	15T	1.61×10^{-1}	1.44×10^{-1}	2.88×10^{-2}	2.59×10^{-2}	1.68×10^{-1}	3.01×10^{-2}	—	—
	15V	2.21×10^{-1}	1.99×10^{-1}	3.54×10^{-2}	3.18×10^{-2}	2.30×10^{-1}	3.68×10^{-2}	—	—
	20T	1.28×10^{-1}	1.16×10^{-1}	2.34×10^{-2}	2.10×10^{-2}	1.34×10^{-1}	2.44×10^{-2}	—	—
	20V	1.77×10^{-1}	1.59×10^{-1}	2.87×10^{-2}	2.58×10^{-2}	1.84×10^{-1}	2.99×10^{-2}	—	—
	25T	1.07×10^{-1}	9.63×10^{-2}	1.97×10^{-2}	1.77×10^{-2}	1.12×10^{-1}	2.06×10^{-2}	—	—
	25V	1.47×10^{-1}	1.33×10^{-1}	2.42×10^{-2}	2.18×10^{-2}	1.53×10^{-1}	2.52×10^{-2}	—	—
	30T	9.17×10^{-2}	8.26×10^{-2}	1.68×10^{-2}	1.51×10^{-2}	9.59×10^{-2}	1.76×10^{-2}	—	—
	35T	8.03×10^{-2}	7.22×10^{-2}	1.48×10^{-2}	1.33×10^{-2}	8.39×10^{-2}	1.55×10^{-2}	—	—

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used
K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used
K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other
K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other
K_{B1} : M_B Equivalent factor when one LM block is used
K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other
K_{CR} : Equivalent factor in the M_C radial direction
K_{CL} : Equivalent factor in the M_C reverse radial direction

Table8 Equivalent Factors (Model CSR, MX,JR, NSR and SRG)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
CSR	15	1.68×10^{-1}		2.95×10^{-2}		1.68×10^{-1}	2.95×10^{-2}	1.60×10^{-1}	
	20S	1.25×10^{-1}		2.28×10^{-2}		1.25×10^{-1}	2.28×10^{-2}	1.18×10^{-1}	
	20	9.83×10^{-2}		1.91×10^{-2}		9.83×10^{-2}	1.91×10^{-2}	1.18×10^{-1}	
	25S	1.12×10^{-1}		2.01×10^{-2}		1.12×10^{-1}	2.01×10^{-2}	1.00×10^{-1}	
	25	8.66×10^{-2}		1.68×10^{-2}		8.66×10^{-2}	1.68×10^{-2}	1.00×10^{-1}	
	30S	8.93×10^{-2}		1.73×10^{-2}		8.93×10^{-2}	1.73×10^{-2}	8.31×10^{-2}	
	30	7.02×10^{-2}		1.43×10^{-2}		7.02×10^{-2}	1.43×10^{-2}	8.31×10^{-2}	
	35	6.15×10^{-2}		1.28×10^{-2}		6.15×10^{-2}	1.28×10^{-2}	6.74×10^{-2}	
	45	5.20×10^{-2}		1.00×10^{-2}		5.20×10^{-2}	1.00×10^{-2}	5.22×10^{-2}	
MX	5	4.27×10^{-1}		7.01×10^{-2}		4.27×10^{-1}	7.01×10^{-2}	3.85×10^{-2}	
	7W	2.18×10^{-1}		4.13×10^{-1}		2.18×10^{-1}	4.13×10^{-1}	1.40×10^{-1}	
JR	25	1.12×10^{-1}		2.01×10^{-2}		1.12×10^{-1}	2.01×10^{-2}	1.00×10^{-1}	
	35	7.81×10^{-2}		1.55×10^{-2}		7.81×10^{-2}	1.55×10^{-2}	6.74×10^{-2}	
	45	6.71×10^{-2}		1.21×10^{-2}		6.71×10^{-2}	1.21×10^{-2}	5.22×10^{-2}	
	55	5.59×10^{-2}		1.03×10^{-2}		5.59×10^{-2}	1.03×10^{-2}	4.27×10^{-2}	
NSR	20TBC	2.29×10^{-1}		2.68×10^{-2}		2.29×10^{-1}	2.68×10^{-2}	—	—
	25TBC	2.01×10^{-1}		2.27×10^{-2}		2.01×10^{-1}	2.27×10^{-2}	—	—
	30TBC	1.85×10^{-1}		1.93×10^{-2}		1.85×10^{-1}	1.93×10^{-2}	—	—
	40TBC	1.39×10^{-1}		1.60×10^{-2}		1.39×10^{-1}	1.60×10^{-2}	—	—
	50TBC	1.24×10^{-1}		1.42×10^{-2}		1.24×10^{-1}	1.42×10^{-2}	—	—
	70TBC	9.99×10^{-2}		1.15×10^{-2}		9.99×10^{-2}	1.15×10^{-2}	—	—
SRG	15	1.23×10^{-1}		2.07×10^{-2}		1.23×10^{-1}	2.07×10^{-2}	1.04×10^{-1}	
	20	9.60×10^{-2}		1.71×10^{-2}		9.60×10^{-2}	1.71×10^{-2}	8.00×10^{-2}	
	20L	7.21×10^{-2}		1.42×10^{-2}		7.21×10^{-2}	1.42×10^{-2}	8.00×10^{-2}	
	25	8.96×10^{-2}		1.55×10^{-2}		8.96×10^{-2}	1.55×10^{-2}	7.23×10^{-2}	
	25L	6.99×10^{-2}		1.31×10^{-2}		6.99×10^{-2}	1.31×10^{-2}	7.23×10^{-2}	
	30	8.06×10^{-2}		1.33×10^{-2}		8.06×10^{-2}	1.33×10^{-2}	5.61×10^{-2}	
	30L	6.12×10^{-2}		1.11×10^{-2}		6.12×10^{-2}	1.11×10^{-2}	5.61×10^{-2}	
	35	7.14×10^{-2}		1.18×10^{-2}		7.14×10^{-2}	1.18×10^{-2}	4.98×10^{-2}	
	35L	5.26×10^{-2}		9.67×10^{-3}		5.26×10^{-2}	9.67×10^{-3}	4.98×10^{-2}	
	45	5.49×10^{-2}		9.58×10^{-3}		5.49×10^{-2}	9.58×10^{-3}	3.85×10^{-2}	
	45L	4.18×10^{-2}		7.93×10^{-3}		4.18×10^{-2}	7.93×10^{-3}	3.85×10^{-2}	
	55	4.56×10^{-2}		8.04×10^{-3}		4.56×10^{-2}	8.04×10^{-3}	3.25×10^{-2}	
	55L	3.37×10^{-2}		6.42×10^{-3}		3.37×10^{-2}	6.42×10^{-3}	3.25×10^{-2}	
	65L	2.63×10^{-2}		4.97×10^{-3}		2.63×10^{-2}	4.97×10^{-3}	2.70×10^{-2}	

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used
K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used
K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other
K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other
K_{B1} : M_B Equivalent factor when one LM block is used
K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other
K_{CR} : Equivalent factor in the M_C radial direction
K_{CL} : Equivalent factor in the M_C reverse radial direction

Table9 Equivalent Factors (Models SRN and SRW)

Model No.		Equivalent factor							
		K_{AR1}	K_{AL1}	K_{AR2}	K_{AL2}	K_{B1}	K_{B2}	K_{CR}	K_{CL}
SRN	35	7.14×10^{-2}		1.18×10^{-2}		7.14×10^{-2}	1.18×10^{-2}	4.98×10^{-2}	
	35L	5.26×10^{-2}		9.67×10^{-3}		5.26×10^{-2}	9.67×10^{-3}	4.98×10^{-2}	
	45	5.49×10^{-2}		9.58×10^{-3}		5.49×10^{-2}	9.58×10^{-3}	3.85×10^{-2}	
	45L	4.18×10^{-2}		7.93×10^{-3}		4.18×10^{-2}	7.93×10^{-3}	3.85×10^{-2}	
	55	4.56×10^{-2}		8.04×10^{-3}		4.56×10^{-2}	8.04×10^{-3}	3.25×10^{-2}	
	55L	3.37×10^{-2}		6.42×10^{-3}		3.37×10^{-2}	6.42×10^{-3}	3.25×10^{-2}	
	65L	2.63×10^{-2}		4.97×10^{-3}		2.63×10^{-2}	4.97×10^{-3}	2.70×10^{-2}	
SRW	70	4.18×10^{-2}		7.93×10^{-3}		4.18×10^{-2}	7.93×10^{-3}	2.52×10^{-2}	
	85	3.37×10^{-2}		6.42×10^{-3}		3.37×10^{-2}	6.42×10^{-3}	2.09×10^{-2}	
	100	2.63×10^{-2}		4.97×10^{-3}		2.63×10^{-2}	4.97×10^{-3}	1.77×10^{-2}	

K_{AR1} : Equivalent factor in the M_A radial direction when one LM block is used

K_{AL1} : Equivalent factor in the M_A reverse radial direction when one LM block is used

K_{AR2} : Equivalent factor in the M_A radial direction when two LM blocks are used in close contact with each other

K_{AL2} : Equivalent factor in the M_A reverse radial direction when two LM blocks are used in close contact with each other

K_{B1} : M_B Equivalent factor when one LM block is used

K_{B2} : M_B Equivalent factor when two LM blocks are used in close contact with each other

K_{CR} : Equivalent factor in the M_C radial direction

K_{CL} : Equivalent factor in the M_C reverse radial direction

[Example of calculation]

When one LM block is used

Model No.: SSR20XV1

Gravitational acceleration g=9.8 (m/s²)
Mass m=10 (kg)
ℓ_1=200 (mm)
ℓ_2=100 (mm)

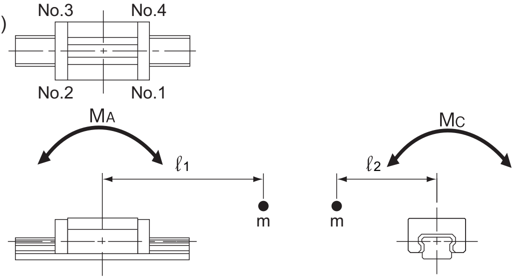


Fig.6 When One LM Block is Used

No.1 $P_1=mg+K_{AR1}\cdot mg\cdot \ell_1+K_{CR}\cdot mg\cdot \ell_2=98+0.275\times98\times200+0.129\times98\times100=6752$ (N)
No.2 $P_2=mg-K_{AL1}\cdot mg\cdot \ell_1+K_{CR}\cdot mg\cdot \ell_2=98-0.137\times98\times200+0.129\times98\times100=-1323$ (N)
No.3 $P_3=mg-K_{AL1}\cdot mg\cdot \ell_1-K_{CL}\cdot mg\cdot \ell_2=98-0.137\times98\times200-0.0644\times98\times100=-3218$ (N)
No.4 $P_4=mg+K_{AR1}\cdot mg\cdot \ell_1-K_{CL}\cdot mg\cdot \ell_2=98+0.275\times98\times200-0.0644\times98\times100=4857$ (N)

When two LM blocks are used in close contact with each other

Model No.: SNS30R2

Gravitational acceleration g=9.8 (m/s²)
Mass m=5 (kg)
ℓ_1=200 (mm)
ℓ_2=150 (mm)

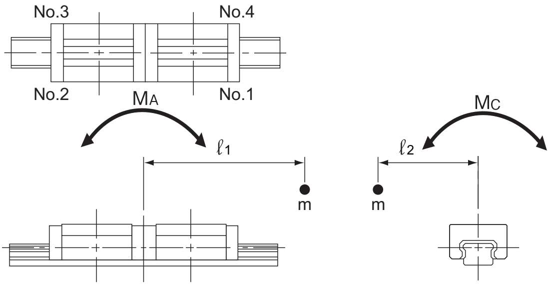


Fig.7 When Two LM Blocks are Used in Close Contact with Each Other

No.1 $P_1=\frac{mg}{2}+K_{AR2}\cdot mg\cdot \ell_1+K_{CR}\cdot\frac{mg\cdot \ell_2}{2}=\frac{49}{2}+0.018\times49\times200+0.0842\times\frac{49\times150}{2}=510.3$ (N)

No.2 $P_2=\frac{mg}{2}-K_{AL2}\cdot mg\cdot \ell_1+K_{CR}\cdot\frac{mg\cdot \ell_2}{2}=\frac{49}{2}-0.0151\times49\times200+0.0842\times\frac{49\times150}{2}=186$ (N)

No.3 $P_3=\frac{mg}{2}-K_{AL2}\cdot mg\cdot \ell_1-K_{CL}\cdot\frac{mg\cdot \ell_2}{2}=\frac{49}{2}-0.0151\times49\times200-0.0707\times\frac{49\times150}{2}=-383.3$ (N)

No.4 $P_4=\frac{mg}{2}+K_{AR2}\cdot mg\cdot \ell_1-K_{CL}\cdot\frac{mg\cdot \ell_2}{2}=\frac{49}{2}+0.018\times49\times200-0.0707\times\frac{49\times150}{2}=-58.9$ (N)

Note1) Since an LM Guide used in vertical installation receives only a moment load, there is no need to apply a load force (mg).
Note2) In some models, load ratings differ depending on the direction of the applied load. With such a model, calculate an equivalent load in the direction of the smallest load rating.

[Double-axis Use]

● Setting Conditions

Set the conditions needed to calculate the LM system's applied load and service life in hours. The conditions consist of the following items.

(1) Mass: m (kg)
(2) Direction of the working load
(3) Position of the working point (e.g., center of gravity): ℓ_2, ℓ_3, h_1(mm)
(4) Thrust position: ℓ_4, h_2(mm)
(5) LM system arrangement: ℓ_0, ℓ_1(mm)
(No. of units and axes)
(6) Velocity diagram
Speed: V (mm/s)
Time constant: t_n (s)
Acceleration: α_n(mm/s^2)

$$\left(\alpha_n = \frac{V}{t_n}\right)$$

(7) Duty cycle
Number of reciprocations per minute: N_1(min^{-1})
(8) Stroke length: ℓ_s(mm)
(9) Average speed: V_m(m/s)
(10) Required service life in hours: L_h(h)

Gravitational acceleration g=9.8 (m/s^2)

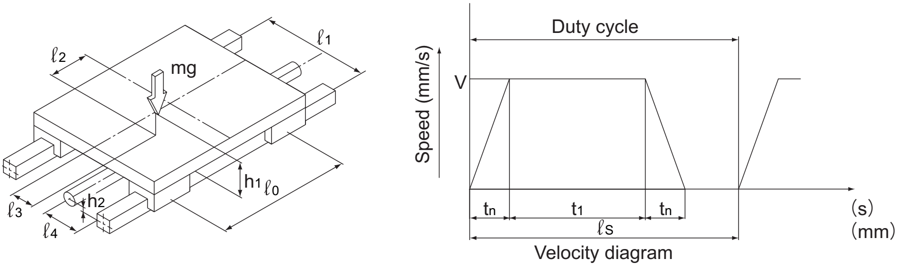


Fig.8 Condition

● Applied Load Equation

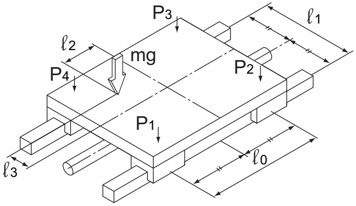
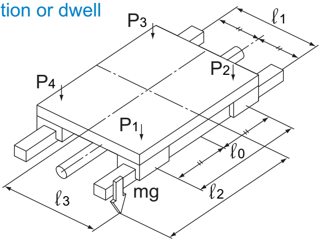
The load applied to the LM Guide varies with the external force, such as the position of the gravity center of an object, thrust position, inertia generated from acceleration/deceleration during start or stop, and cutting force.
In selecting an LM Guide, it is necessary to obtain the value of the applied load while taking into account these conditions.

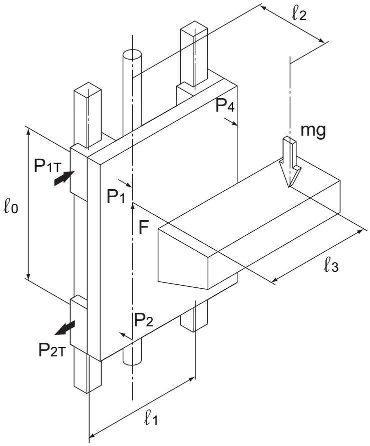
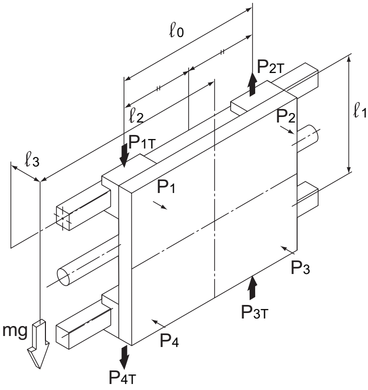
Calculate the load applied to the LM Guide in each of the examples 1 to 10 shown below.

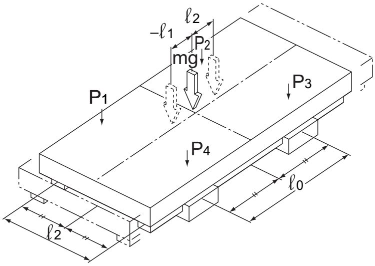
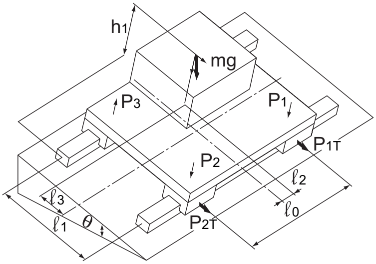
m	: Mass	(kg)
ℓ_n	: Distance	(mm)
F_n	: External force	(N)
P_n	: Applied load (radial/reverse radial direction)	(N)
P_{nT}	: Applied load (lateral directions)	(N)
g	: Gravitational acceleration (g =9.8m/s^2)	(m/s^2)
V	: Speed	(m/s)
t_n	: Time constant	(s)
α_n	: Acceleration	(m/s^2)

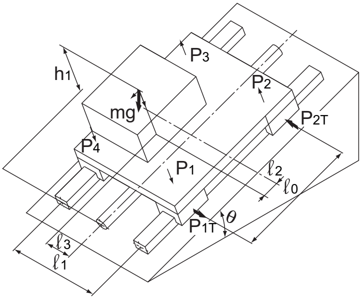
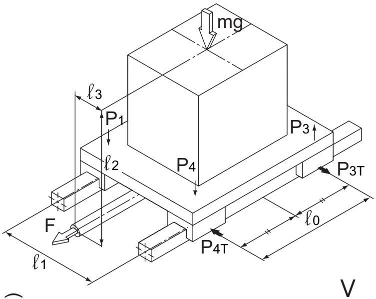
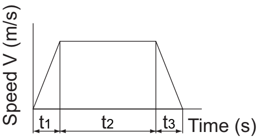
$$\left(\alpha_n = \frac{V}{t_n}\right)$$

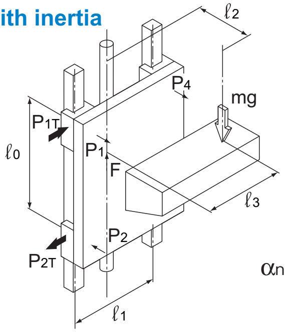
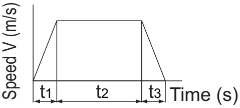
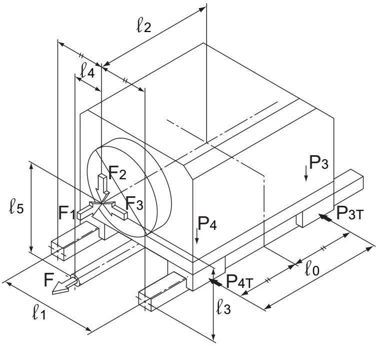
[Example]

	Condition	Applied Load Equation
1	Horizontal mount (with the block traveling) Uniform motion or dwell  	$P_1 = \frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0} - \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$ $P_2 = \frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0} - \frac{mg \cdot \ell_3}{2 \cdot \ell}$ $P_3 = \frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0} + \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$ $P_4 = \frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0} + \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$
2	Horizontal mount, overhung (with the block traveling) Uniform motion or dwell  	$P_1 = \frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0} + \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$ $P_2 = \frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0} + \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$ $P_3 = \frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0} - \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$ $P_4 = \frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0} - \frac{mg \cdot \ell_3}{2 \cdot \ell_1}$

	Condition	Applied Load Equation
3	**Uniform motion or dwell**  E.g.: Vertical axis of industrial robot, automatic coating machine, lifter	$P_1 \text{ to } P_4 = \frac{mg\cdot\ell_2}{2\cdot\ell_0}$ $P_{1T} \text{ to } P_{4T} = \frac{mg\cdot\ell_3}{2\cdot\ell_0}$
4	**Wall mount** **Uniform motion or dwell**  E.g.: Travel axis of cross-rail loader	$P_1 \text{ to } P_4 = \frac{mg\cdot\ell_3}{2\cdot\ell_1}$ $P_{1T} = P_{4T} = \frac{mg}{4} + \frac{mg\cdot\ell_2}{2\cdot\ell_0}$ $P_{2T} = P_{3T} = \frac{mg}{4} - \frac{mg\cdot\ell_2}{2\cdot\ell_0}$

	Condition	Applied Load Equation
5	**With the LM rails movable** **Horizontal mount**  E.g.: XY table sliding fork	$P_1 \text{ to } P_4 (\max) = \frac{mg}{4} + \frac{mg\cdot\ell_1}{2\cdot\ell_0}$ $P_1 \text{ to } P_4 (\min) = \frac{mg}{4} - \frac{mg\cdot\ell_1}{2\cdot\ell_0}$
6	**Laterally tilt mount**  E.g.: NC lathe Carriage	$P_1 = +\frac{mg\cdot\cos\theta}{4} + \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} + \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_1}$ $P_{1T} = \frac{mg\cdot\sin\theta}{4} + \frac{mg\cdot\sin\theta\cdot\ell_2}{2\cdot\ell_0}$ $P_2 = +\frac{mg\cdot\cos\theta}{4} - \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} + \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_1}$ $P_{2T} = \frac{mg\cdot\sin\theta}{4} - \frac{mg\cdot\sin\theta\cdot\ell_2}{2\cdot\ell_0}$ $P_3 = +\frac{mg\cdot\cos\theta}{4} - \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} - \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_1}$ $P_{3T} = \frac{mg\cdot\sin\theta}{4} - \frac{mg\cdot\sin\theta\cdot\ell_2}{2\cdot\ell_0}$ $P_4 = +\frac{mg\cdot\cos\theta}{4} + \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} - \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_1}$ $P_{4T} = \frac{mg\cdot\sin\theta}{4} + \frac{mg\cdot\sin\theta\cdot\ell_2}{2\cdot\ell_0}$

	Condition	Applied Load Equation
7	**Longitudinally tilt mount**  E.g.: NC lathe Tool rest	$P_1 = +\frac{mg\cdot\cos\theta}{4} + \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} + \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$ $P_{1T} = +\frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$ $P_2 = +\frac{mg\cdot\cos\theta}{4} - \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} - \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} - \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$ $P_{2T} = -\frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$ $P_3 = +\frac{mg\cdot\cos\theta}{4} - \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} - \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$ $P_{3T} = -\frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$ $P_4 = +\frac{mg\cdot\cos\theta}{4} + \frac{mg\cdot\cos\theta\cdot\ell_2}{2\cdot\ell_0} + \frac{mg\cdot\cos\theta\cdot\ell_3}{2\cdot\ell_1} + \frac{mg\cdot\sin\theta\cdot h_1}{2\cdot\ell_0}$ $P_{4T} = +\frac{mg\cdot\sin\theta\cdot\ell_3}{2\cdot\ell_0}$
8	**Horizontal mount with inertia**  $\alpha_n = \frac{V}{t_n}$  Velocity diagram E.g.: Conveyance truck	During acceleration $P_1 = P_4 = \frac{mg}{4} - \frac{m\cdot\alpha_1\cdot\ell_2}{2\cdot\ell_0}$ $P_2 = P_3 = \frac{mg}{4} + \frac{m\cdot\alpha_1\cdot\ell_2}{2\cdot\ell_0}$ P_{1T} to $P_{4T} = \frac{m\cdot\alpha_1\cdot\ell_3}{2\cdot\ell_0}$ During uniform motion P_1 to $P_4 = \frac{mg}{4}$ During deceleration $P_1 = P_4 = \frac{mg}{4} + \frac{m\cdot\alpha_3\cdot\ell_2}{2\cdot\ell_0}$ $P_2 = P_3 = \frac{mg}{4} - \frac{m\cdot\alpha_3\cdot\ell_2}{2\cdot\ell_0}$ P_{1T} to $P_{4T} = \frac{m\cdot\alpha_3\cdot\ell_3}{2\cdot\ell_0}$

	Condition	Applied Load Equation
9	**Vertical mount with inertia**  $\alpha_n = \dfrac{V}{t_n}$  Velocity diagram E.g.: Conveyance lift	During acceleration $P_1 \text{ to } P_4 = \dfrac{m \cdot (g+\alpha_1) \cdot \ell_2}{2 \cdot \ell_0}$ $P_{1T} \text{ to } P_{4T} = \dfrac{m \cdot (g+\alpha_1) \cdot \ell_3}{2 \cdot \ell_0}$ During uniform motion $P_1 \text{ to } P_4 = \dfrac{mg \cdot \ell_2}{2 \cdot \ell_0}$ $P_{1T} \text{ to } P_{4T} = \dfrac{mg \cdot \ell_3}{2 \cdot \ell_0}$ During deceleration $P_1 \text{ to } P_4 = \dfrac{m \cdot (g-\alpha_3) \cdot \ell_2}{2 \cdot \ell_0}$ $P_{1T} \text{ to } P_{4T} = \dfrac{m \cdot (g-\alpha_3) \cdot \ell_3}{2 \cdot \ell_0}$
10	Horizontal mount with external force  E.g.: Drill unit, Milling machine, Lathe, Machining center and other cutting machine	Under force F1 $P_1 \text{ to } P_4 = \dfrac{F_1 \cdot \ell_5}{2 \cdot \ell_0}$ $P_{1T} \text{ to } P_{4T} = \dfrac{F_1 \cdot \ell_4}{2 \cdot \ell_0}$ Under force F2 $P_1 = P_4 = \dfrac{F_2}{4} + \dfrac{F_2 \cdot \ell_2}{2 \cdot \ell_0}$ $P_2 = P_3 = \dfrac{F_2}{4} - \dfrac{F_2 \cdot \ell_2}{2 \cdot \ell_0}$ Under force F3 $P_1 \text{ to } P_4 = \dfrac{F_3 \cdot \ell_3}{2 \cdot \ell_1}$ $P_{1T} = P_{4T} = \dfrac{F_3}{4} + \dfrac{F_3 \cdot \ell_2}{2 \cdot \ell_0}$ $P_{2T} = P_{3T} = \dfrac{F_3}{4} - \dfrac{F_3 \cdot \ell_2}{2 \cdot \ell_0}$

Calculating the Equivalent Load

The LM Guide can bear loads and moments in all directions, including a radial load (P_R), reverse radial load (P_L) and lateral loads (P_T), simultaneously.
Applied loads include the following.

P_R: Radial load
P_L: Reverse-radial load
P_T: Lateral load

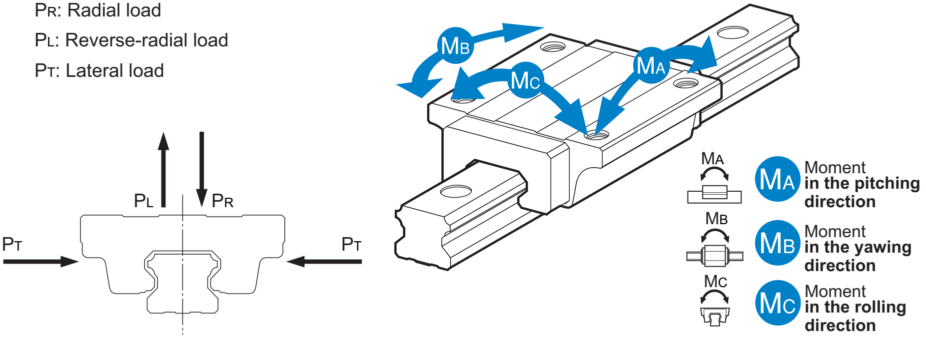


Fig.9 Directions of the Loads Applied on the LM Guide

[Equivalent Load P_E]

When two or more loads (e.g., radial load and lateral load) are simultaneously applied to the LM Guide, the service life and the static safety factor are calculated using equivalent load values obtained by converting all the loads into radial, lateral and other loads.

[Equivalent Load Equation]

The equivalent load equation for the LM Guide differs by model. For details, see the section corresponding to the subject model.

Example of equation for LM Guide model HSR

The equivalent load when a radial load (P_R) and a lateral load (P_T) are applied simultaneously is obtained using the following equation.

$$P_E(\text{equivalent load})=P_R+P_T$$

P_R: Radial load
P_T: Lateral load

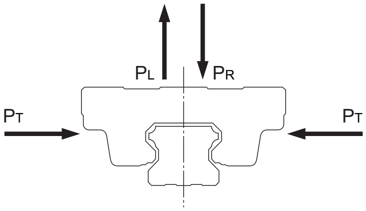


Fig.10 Equivalent of Load of the LM Guide

Calculating the Static Safety Factor

To calculate a load applied to the LM Guide, the average load required for calculating the service life and the maximum load needed for calculating the static safety factor must be obtained first. In a system subject to frequent starts and stops, placed under cutting forces or under a large moment caused by an overhang load, an excessively large load may apply to the LM Guide. When selecting a model number, make sure that the desired model is capable of receiving the required maximum load (whether stationary or in motion). Table10 shows standard values for the static safety factor.

Table10 Reference Value of Static Safety Factors (f_S)

Machine using the LM Guide	Load conditions	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3
Machine tool	Without vibration or impact	1 to 1.5
	With vibration or impact	2.5 to 7

When the radial load is large	$\frac{f_H \cdot f_T \cdot f_C \cdot C_0}{P_R} \geqq f_S$
When the reverse radial load is large	$\frac{f_H \cdot f_T \cdot f_C \cdot C_{0L}}{P_L} \geqq f_S$
When the lateral loads are large	$\frac{f_H \cdot f_T \cdot f_C \cdot C_{0T}}{P_T} \geqq f_S$

f_S : Static safety factor
C_0 : Basic static load rating (radial direction) (N)
C_{0L} : Basic static load rating (reverse-radial direction) (N)
C_{0T} : Basic static load rating (lateral direction) (N)
P_R : Calculated load (radial direction) (N)
P_L : Calculated load (reverse-radial direction) (N)
P_T : Calculated load (lateral direction) (N)
f_H : Hardness factor (see Fig.11 on A-101)
f_T : Temperature factor (see Fig.12 on A-101)
f_C : Contact factor (see Table11 on A-101)

Calculating the Average Load

In cases where the load applied to each LM block fluctuates under different conditions, such as an industrial robot holding a work with its arm as it advances and receding with its arm empty, and a machine tool handling various workpieces, it is necessary to calculate the service life of the LM Block while taking into account such fluctuating loading conditions.

The average load (P_m) is the load under which the service life of the LM Guide is equivalent to that under varying loads applied to the LM blocks.

$$P_m = \sqrt[3]{\frac{1}{L} \cdot \sum_{n=1}^{n} (P_n{}^3 \cdot L_n)}$$

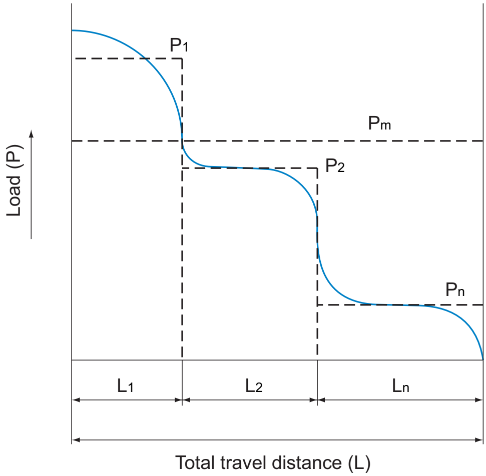
P_m : Average load (N)
P_n : Varying load (N)
L : Total travel distance (mm)
L_n : Distance traveled under load P_n (mm)

Note) The above equation or the equation (1) below applies when the rolling elements are balls.

(1) When the load fluctuates stepwise

$$P_m = \sqrt[3]{\frac{1}{L} (P_1{}^3 \cdot L_1 + P_2{}^3 \cdot L_2 \cdots\cdots + P_n{}^3 \cdot L_n)} \quad \cdots\cdots\cdots\cdots (1)$$

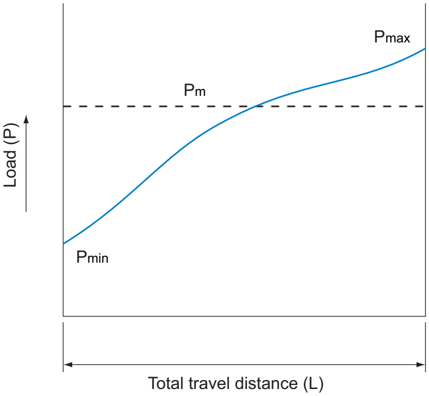
P_m : Average load (N)
P_n : Varying load (N)
L : Total travel distance (mm)
L_n : Distance traveled under P_n (mm)



(2) When the load fluctuates monotonically

$$P_m \fallingdotseq \frac{1}{3}\left(P_{min} + 2\cdot P_{max}\right) \quad \cdots\cdots\cdots\cdots(2)$$

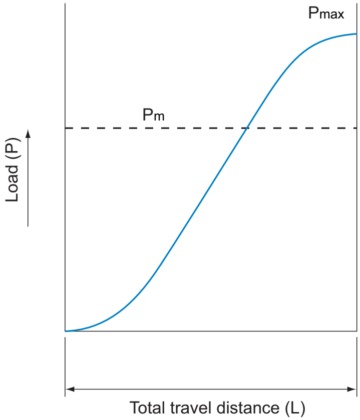
P_{min} : Minimum load (N)
P_{max} : Maximum load (N)

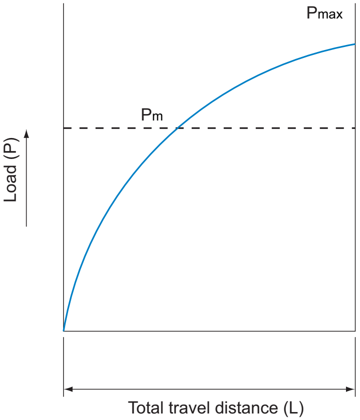


(3) When the load fluctuates sinusoidally

(a) $P_m \fallingdotseq 0.65P_{max} \cdots\cdots\cdots\cdots(3)$

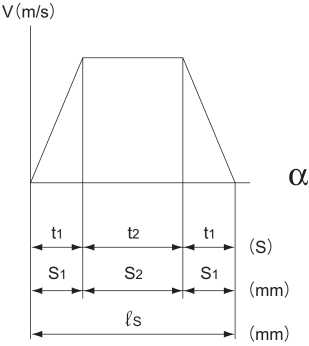
(b) $P_m \fallingdotseq 0.75P_{max} \cdots\cdots\cdots\cdots(4)$



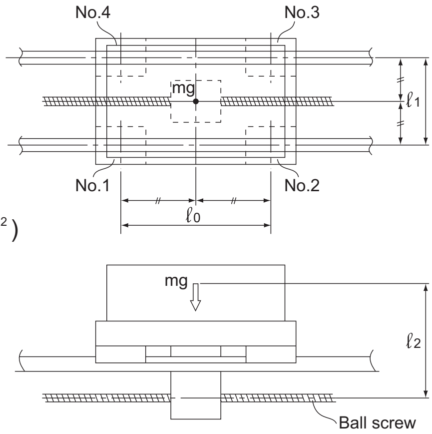


Example of Calculating the Average Load (1) - with Horizontal Mount and Acceleration/Deceleration Considered

[Conditions]



$$\alpha_1 = \frac{V}{t_1} \ (\mathrm{m/s^2})$$



[Load Applied to the LM Block]

●During uniform motion

$$P_1 = +\frac{mg}{4}$$

$$P_2 = +\frac{mg}{4}$$

$$P_3 = +\frac{mg}{4}$$

$$P_4 = +\frac{mg}{4}$$

●During acceleration

$$Pa_1 = P_1 + \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

$$Pa_2 = P_2 - \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

$$Pa_3 = P_3 - \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

$$Pa_4 = P_4 + \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

●During deceleration

$$Pd_1 = P_1 - \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

$$Pd_2 = P_2 + \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

$$Pd_3 = P_3 + \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

$$Pd_4 = P_4 - \frac{m \cdot \alpha_1 \cdot \ell_2}{2 \cdot \ell_0}$$

[Average load]

$$P_{m1} = \sqrt[3]{\frac{1}{\ell_s}\left(Pa_1^{\,3} \cdot s_1 + P_1^{\,3} \cdot s_2 + Pd_1^{\,3} \cdot s_3\right)}$$

$$P_{m2} = \sqrt[3]{\frac{1}{\ell_s}\left(Pa_2^{\,3} \cdot s_1 + P_2^{\,3} \cdot s_2 + Pd_2^{\,3} \cdot s_3\right)}$$

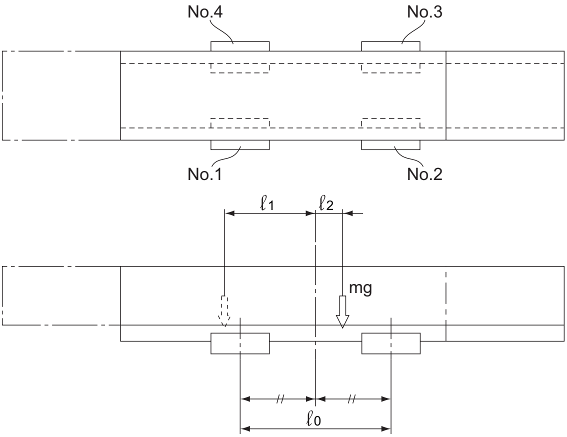
$$P_{m3} = \sqrt[3]{\frac{1}{\ell_s}\left(Pa_3^{\,3} \cdot s_1 + P_3^{\,3} \cdot s_2 + Pd_3^{\,3} \cdot s_3\right)}$$

$$P_{m4} = \sqrt[3]{\frac{1}{\ell_s}\left(Pa_4^{\,3} \cdot s_1 + P_4^{\,3} \cdot s_2 + Pd_4^{\,3} \cdot s_3\right)}$$

Note) Pa_n and Pd_n represent loads applied to each LM block. The suffix "n" indicates the block number in the diagram above.

Example of Calculating the Average Load (2) - When the Rails are Movable

[Conditions]



[Load Applied to the LM Block]

●At the left of the arm

$$P_{\ell 1} = +\frac{mg}{4} + \frac{mg \cdot \ell_1}{2 \cdot \ell_0}$$

$$P_{\ell 2} = +\frac{mg}{4} - \frac{mg \cdot \ell_1}{2 \cdot \ell_0}$$

$$P_{\ell 3} = +\frac{mg}{4} - \frac{mg \cdot \ell_1}{2 \cdot \ell_0}$$

$$P_{\ell 4} = +\frac{mg}{4} + \frac{mg \cdot \ell_1}{2 \cdot \ell_0}$$

●At the right of the arm

$$P_{r1} = +\frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{r2} = +\frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{r3} = +\frac{mg}{4} + \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

$$P_{r4} = +\frac{mg}{4} - \frac{mg \cdot \ell_2}{2 \cdot \ell_0}$$

[Average load]

$$P_{m1} = \frac{1}{3}(2 \cdot |P_{\ell 1}| + |P_{r1}|)$$

$$P_{m2} = \frac{1}{3}(2 \cdot |P_{\ell 2}| + |P_{r2}|)$$

$$P_{m3} = \frac{1}{3}(2 \cdot |P_{\ell 3}| + |P_{r3}|)$$

$$P_{m4} = \frac{1}{3}(2 \cdot |P_{\ell 4}| + |P_{r4}|)$$

Note) $P_{\ell n}$ and P_{rn} represent loads applied to each LM block. The suffix "n" indicates the block number in the diagram above.

Calculating the Nominal Life

The service life of an LM Guide is subject to variations even under the same operational conditions. Therefore, it is necessary to use the nominal life defined below as a reference value for obtaining the service life of the LM Guide. The nominal life means the total travel distance that 90% of a group of units of the same LM Guide model can achieve without flaking (scale-like pieces on the metal surface) after individually running under the same conditions.

Nominal Life Equation for an LM Guide Using Balls

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^3 \times 50$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P_C : Calculated load (N)
f_H : Hardness factor (see Fig.11 on A-101)
f_T : Temperature factor (see Fig.12 on A-101)
f_C : Contact factor (see Table11 on A-101)
f_W : Load factor (see Table12 on A-102)

Rated Life Equation for an LM Guide Using Rollers

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^{\frac{10}{3}} \times 100$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P_C : Calculated load (N)
f_H : Hardness factor (see Fig.11 on A-101)
f_T : Temperature factor (see Fig.12 on A-101)
f_C : Contact factor (see Table11 on A-101)
f_W : Load factor (see Table12 on A-102)

Once the nominal life (L) has been obtained, the service life time can be obtained using the following equation if the stroke length and the number reciprocations are constant.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

[f_H: Hardness Factor]

To ensure the achievement of the optimum load capacity of the LM Guide, the raceway hardness must be between 58 and 64 HRC.
If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).
Since the LM Guide has sufficient hardness, the f_H value for the LM Guide is normally 1.0 unless otherwise specified.

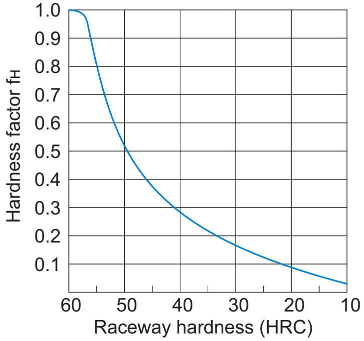


Fig.11 Hardness Factor (f_H)

[f_T:Temperature Factor]

If the temperature of the environment surrounding the operating LM Guide exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.12.
In addition, the selected LM Guide must also be of a high temperature type.

Note) The LM Guide is designed to normally be used at environment temperature of 80℃ or less.

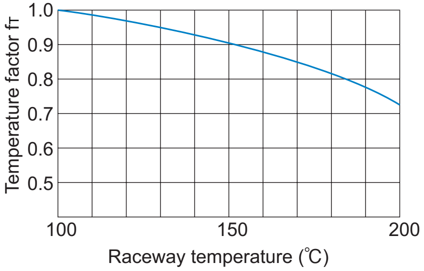


Fig.12 Temperature Factor (f_T)

[f_C: Contact Factor]

When multiple LM blocks are used in close contact with each other, it is difficult to achieve uniform load distribution due to moment loads and mounting-surface accuracy. When using multiple blocks in close contact with each other, multiply the basic load rating (C or C_0) by the corresponding contact factor indicated in Table11.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in Table11.

Table11 Contact Factor (f_C)

Number of blocks used in close contact	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
6 or greater	0.6
Normal use	1

[f_W: Load Factor]

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, where the effects of speed and vibration are estimated to be significant, divide the basic dynamic load rating (C) by a load factor selected from Table12, which contains empirically obtained data.

Table12 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

Example of Calculating the Nominal Life (1) - with Horizontal Mount and High-speed Acceleration

[Conditions]

Model No. : HSR35LA2SS+2500LP-Ⅱ
(basic dynamic load rating: C =50.2 kN)
(basic static load rating: C_0=81.4 kN)

Mass : m_1 =800 kg
m_2 =500 kg

Speed : V =0.5 m/s

Time : t_1 =0.05 s
t_2 =2.8 s
t_3 =0.15 s

Acceleration : α_1 =10 m/s²
α_3 =3.333 m/s²

Stroke : ℓ_s =1450 mm

Distance : ℓ_0=600 mm
ℓ_1=400 mm
ℓ_2=120 mm
ℓ_3=50 mm
ℓ_4=200 mm
ℓ_5=350 mm

Gravitational acceleration g=9.8 (m/s²)

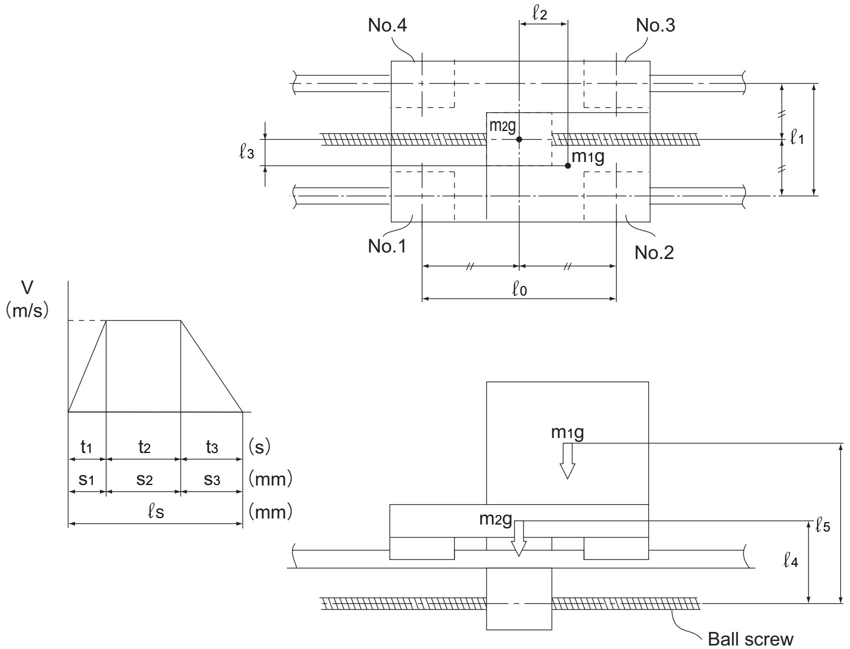


Fig.13 Condition

[Load Applied to the LM Block]

Calculate the load applied to each LM block.

● During uniform motion

■Applied load in the radial direction P_n

$$P_1 = +\frac{m_1 g}{4} - \frac{m_1 g \cdot \ell_2}{2 \cdot \ell_0} + \frac{m_1 g \cdot \ell_3}{2 \cdot \ell_1} + \frac{m_2 g}{4} = +2891\text{N}$$

$$P_2 = +\frac{m_1 g}{4} + \frac{m_1 g \cdot \ell_2}{2 \cdot \ell_0} + \frac{m_1 g \cdot \ell_3}{2 \cdot \ell_1} + \frac{m_2 g}{4} = +4459\text{N}$$

$$P_3 = +\frac{m_1 g}{4} + \frac{m_1 g \cdot \ell_2}{2 \cdot \ell_0} - \frac{m_1 g \cdot \ell_3}{2 \cdot \ell_1} + \frac{m_2 g}{4} = +3479\text{N}$$

$$P_4 = +\frac{m_1 g}{4} - \frac{m_1 g \cdot \ell_2}{2 \cdot \ell_0} - \frac{m_1 g \cdot \ell_3}{2 \cdot \ell_1} + \frac{m_2 g}{4} = +1911\text{N}$$

● During leftward acceleration

■Applied load in the radial direction $P\ell a_n$

$$P\ell a_1 = P_1 - \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = -\ 275.6\text{ N}$$

$$P\ell a_2 = P_2 + \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = +\ 7625.6\text{ N}$$

$$P\ell a_3 = P_3 + \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = +\ 6645.6\text{ N}$$

$$P\ell a_4 = P_4 - \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = -\ 1255.6\text{ N}$$

■Applied load in the lateral direction $Pt\ell a_n$

$$Pt\ell a_1 = -\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = -\ 333.3\text{N}$$

$$Pt\ell a_2 = +\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = +\ 333.3\text{N}$$

$$Pt\ell a_3 = +\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = +\ 333.3\text{N}$$

$$Pt\ell a_4 = -\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = -\ 333.3\text{N}$$

● During leftward deceleration

■Applied load in the radial direction $P\ell d_n$

$$P\ell d_1 = P_1 + \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +\ 3946.6\text{N}$$

$$P\ell d_2 = P_2 - \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +\ 3403.4\text{N}$$

$$P\ell d_3 = P_3 - \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +\ 2423.4\text{N}$$

$$P\ell d_4 = P_4 + \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +\ 2966.6\text{N}$$

■Applied load in the lateral direction $Pt\ell d_n$

$$Pt\ell d_1 = +\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = +111.1\text{N}$$

$$Pt\ell d_2 = -\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = -111.1\text{N}$$

$$Pt\ell d_3 = -\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = -111.1\text{N}$$

$$Pt\ell d_4 = +\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = +111.1\text{N}$$

- **During rightward acceleration**

■Applied load in the radial direction Pra_n

$$Pra_1 = P_1 + \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = +6057.6\text{N}$$

$$Pra_2 = P_2 - \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = +1292.4\text{N}$$

$$Pra_3 = P_3 - \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = +312.4\text{N}$$

$$Pra_4 = P_4 + \frac{m_1 \cdot \alpha_1 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_1 \cdot \ell_4}{2 \cdot \ell_0} = +5077.6\text{N}$$

■Applied load in the lateral direction $Ptra_n$

$$Ptra_1 = +\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = +333.3\text{N}$$

$$Ptra_2 = -\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = -333.3\text{N}$$

$$Ptra_3 = -\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = -333.3\text{N}$$

$$Ptra_4 = +\frac{m_1 \cdot \alpha_1 \cdot \ell_3}{2 \cdot \ell_0} = +333.3\text{N}$$

- **During rightward deceleration**

■Applied load in the radial direction Prd_n

$$Prd_1 = P_1 - \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +1835.4\text{N}$$

$$Prd_2 = P_2 + \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +5514.6\text{N}$$

$$Prd_3 = P_3 + \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} + \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +4534.6\text{N}$$

$$Prd_4 = P_4 - \frac{m_1 \cdot \alpha_3 \cdot \ell_5}{2 \cdot \ell_0} - \frac{m_2 \cdot \alpha_3 \cdot \ell_4}{2 \cdot \ell_0} = +855.4\text{N}$$

■Applied load in the lateral direction $Ptrd_n$

$$Ptrd_1 = -\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = -111.1\,N$$

$$Ptrd_2 = +\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = +111.1\,N$$

$$Ptrd_3 = +\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = +111.1\,N$$

$$Ptrd_4 = +\frac{m_1 \cdot \alpha_3 \cdot \ell_3}{2 \cdot \ell_0} = -111.1\,N$$

[Combined Radial And Thrust Load]

● During uniform motion:

$P_{E1} = P_1 = 2891$ N

$P_{E2} = P_2 = 4459$ N

$P_{E3} = P_3 = 3479$ N

$P_{E4} = P_4 = 1911$ N

● During leftward acceleration

$P_{E\ell a_1} = |P\ell a_1| + |Pt\ell a_1| = 608.9$ N

$P_{E\ell a_2} = |P\ell a_2| + |Pt\ell a_2| = 7958.9$ N

$P_{E\ell a_3} = |P\ell a_3| + |Pt\ell a_3| = 6978.9$ N

$P_{E\ell a_4} = |P\ell a_4| + |Pt\ell a_4| = 1588.9$ N

● During leftward deceleration

$P_{E\ell d_1} = |P\ell d_1| + |Pt\ell d_1| = 4057.7$ N

$P_{E\ell d_2} = |P\ell d_2| + |Pt\ell d_2| = 3514.5$ N

$P_{E\ell d_3} = |P\ell d_3| + |Pt\ell d_3| = 2534.5$ N

$P_{E\ell d_4} = |P\ell d_4| + |Pt\ell d_4| = 3077.7$ N

● During rightward acceleration

$P_{Era_1} = |Pra_1| + |Ptra_1| = 6390.9$ N

$P_{Era_2} = |Pra_2| + |Ptra_2| = 1625.7$ N

$P_{Era_3} = |Pra_3| + |Ptra_3| = 645.7$ N

$P_{Era_4} = |Pra_4| + |Ptra_4| = 5410.9$ N

● During rightward deceleration

$P_{Erd_1} = |Prd_1| + |Ptrd_1| = 1946.5$ N

$P_{Erd_2} = |Prd_2| + |Ptrd_2| = 5625.7$ N

$P_{Erd_3} = |Prd_3| + |Ptrd_3| = 4645.7$ N

$P_{Erd_4} = |Prd_4| + |Ptrd_4| = 966.5$ N

[Static Safety Factor]

As indicated above, the maximum load is applied to the LM Guide during the leftward acceleration of the second LM block. Therefore, the static safety factor (f_s) is obtained in the following equation.

$$f_S = \frac{C_0}{P_{E\ell a_2}} = \frac{81.4 \times 10^3}{7958.9} = 10.2$$

[Average Load P_{mn}]

Obtain the average load applied to each LM block.

$$P_{m1} = \sqrt[3]{\frac{1}{2 \cdot \ell_S}\left(P_{E\ell a1}{}^3 \cdot S_1 + P_{E1}{}^3 \cdot S_2 + P_{E\ell d1}{}^3 \cdot S_3 + P_{Era1}{}^3 \cdot S_1 + P_{E1}{}^3 \cdot S_2 + P_{Erd1}{}^3 \cdot S_3\right)}$$

$$= \sqrt[3]{\frac{1}{2 \times 1450}(608.9^3 \times 12.5 + 2891^3 \times 1400 + 4057.7^3 \times 37.5 + 6390.9^3 \times 12.5 + 2891^3 \times 1400 + 1946.5^3 \times 37.5)}$$

$$= 2940.1\text{N}$$

$$P_{m2} = \sqrt[3]{\frac{1}{2 \cdot \ell_S}\left(P_{E\ell a2}{}^3 \cdot S_1 + P_{E2}{}^3 \cdot S_2 + P_{E\ell d2}{}^3 \cdot S_3 + P_{Era2}{}^3 \cdot S_1 + P_{E2}{}^3 \cdot S_2 + P_{Erd2}{}^3 \cdot S_3\right)}$$

$$= \sqrt[3]{\frac{1}{2 \times 1450}(7958.9^3 \times 12.5 + 4459^3 \times 1400 + 3514.5^3 \times 37.5 + 1625.7^3 \times 12.5 + 4459^3 \times 1400 + 5625.7^3 \times 37.5)}$$

$$= 4492.2\text{N}$$

$$P_{m3} = \sqrt[3]{\frac{1}{2 \cdot \ell_S}\left(P_{E\ell a3}{}^3 \cdot S_1 + P_{E3}{}^3 \cdot S_2 + P_{E\ell d3}{}^3 \cdot S_3 + P_{Era3}{}^3 \cdot S_1 + P_{E3}{}^3 \cdot S_2 + P_{Erd3}{}^3 \cdot S_3\right)}$$

$$= \sqrt[3]{\frac{1}{2 \times 1450}(6978.9^3 \times 12.5 + 3479^3 \times 1400 + 2534.5^3 \times 37.5 + 645.7^3 \times 12.5 + 3479^3 \times 1400 + 4645.7^3 \times 37.5)}$$

$$= 3520.4\text{N}$$

$$P_{m4} = \sqrt[3]{\frac{1}{2 \cdot \ell_S}\left(P_{E\ell a4}{}^3 \cdot S_1 + P_{E4}{}^3 \cdot S_2 + P_{E\ell d4}{}^3 \cdot S_3 + P_{Era4}{}^3 \cdot S_1 + P_{E4}{}^3 \cdot S_2 + P_{Erd4}{}^3 \cdot S_3\right)}$$

$$= \sqrt[3]{\frac{1}{2 \times 1450}(1588.9^3 \times 12.5 + 1911^3 \times 1400 + 3077.7^3 \times 37.5 + 5410.9^3 \times 12.5 + 1911^3 \times 1400 + 966.5^3 \times 37.5)}$$

$$= 1985.5\text{N}$$

[Nominal Life L_n]

The nominal life of the four LM blocks is obtained from the corresponding nominal life equations shown below.

$$L_1 = \left(\frac{C}{f_W \cdot P_{m1}}\right)^3 \times 50 = 73700 \text{ km}$$

$$L_2 = \left(\frac{C}{f_W \cdot P_{m2}}\right)^3 \times 50 = 20600 \text{ km}$$

$$L_3 = \left(\frac{C}{f_W \cdot P_{m3}}\right)^3 \times 50 = 43000 \text{ km}$$

$$L_4 = \left(\frac{C}{f_W \cdot P_{m4}}\right)^3 \times 50 = 239000 \text{ km}$$

(where $f_W = 1.5$)

Therefore, the service life of the LM Guide used in a machine or equipment under the conditions stated above is equivalent to the nominal life of the second LM block, which is 20,600 km.

Example of Calculating the Nominal Life (2) - with Vertical Mount

[Conditions]

Model No. : HSR25CA2SS+1500L-Ⅱ
(basic dynamic load rating: C =19.9 kN)
(basic static load rating: C_0=34.4 kN)

Mass : m_0 =100 kg
m_1 =200 kg
m_2 =100 kg

Stroke : ℓ_S =1000 mm

Distance : ℓ_0=300 mm
ℓ_1=80 mm
ℓ_2=50 mm
ℓ_3=280 mm
ℓ_4=150 mm
ℓ_5=250 mm

The mass (m_0) is loaded only during ascent; it is removed during descent.

Gravitational acceleration g=9.8 (m/s^2)

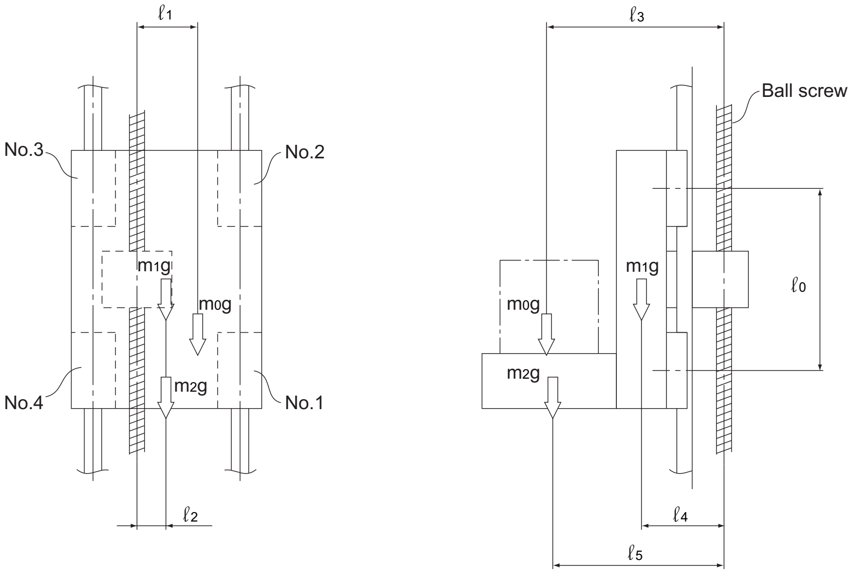


Fig.14 Condition

[Load Applied to the LM Block]

● During Ascent

■Load applied to each LM block in the radial direction Pu_n during ascent

$$Pu_1 = +\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} + \frac{m_0g\cdot\ell_3}{2\cdot\ell_0} = +1355.6\ \text{N}$$

$$Pu_2 = -\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} - \frac{m_0g\cdot\ell_3}{2\cdot\ell_0} = -1355.6\ \text{N}$$

$$Pu_3 = -\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} - \frac{m_0g\cdot\ell_3}{2\cdot\ell_0} = -1355.6\ \text{N}$$

$$Pu_4 = +\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} + \frac{m_0g\cdot\ell_3}{2\cdot\ell_0} = +1355.6\ \text{N}$$

■Load applied to each LM block in the lateral direction Ptu_n during ascent

$$Ptu_1 = +\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} + \frac{m_0g\cdot\ell_1}{2\cdot\ell_0} = +375.7\ \text{N}$$

$$Ptu_2 = -\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} - \frac{m_0g\cdot\ell_1}{2\cdot\ell_0} = -375.7\ \text{N}$$

$$Ptu_3 = -\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} - \frac{m_0g\cdot\ell_1}{2\cdot\ell_0} = -375.7\ \text{N}$$

$$Ptu_4 = +\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} + \frac{m_0g\cdot\ell_1}{2\cdot\ell_0} = +375.7\ \text{N}$$

● During Descent

■Load applied to each LM block in the radial direction Pd_n during descent

$$Pd_1 = +\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} = +898.3\ \text{N}$$

$$Pd_2 = -\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} = -898.3\ \text{N}$$

$$Pd_3 = -\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} = -898.3\ \text{N}$$

$$Pd_4 = +\frac{m_1g\cdot\ell_4}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_5}{2\cdot\ell_0} = +898.3\ \text{N}$$

■Load applied to each LM block in the lateral direction Ptd_n during descent

$$Ptd_1 = +\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} = +245\ \text{N}$$

$$Ptd_2 = -\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} = -245\ \text{N}$$

$$Ptd_3 = -\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} - \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} = -245\ \text{N}$$

$$Ptd_4 = +\frac{m_1g\cdot\ell_2}{2\cdot\ell_0} + \frac{m_2g\cdot\ell_2}{2\cdot\ell_0} = +245\ \text{N}$$

[Combined Radial And Thrust Load]

● During Ascent

$P_{Eu1} = |P_{u1}| + |Pt_{u1}| = 1731.3$ N

$P_{Eu2} = |P_{u2}| + |Pt_{u2}| = 1731.3$ N

$P_{Eu3} = |P_{u3}| + |Pt_{u3}| = 1731.3$ N

$P_{Eu4} = |P_{u4}| + |Pt_{u4}| = 1731.3$ N

● During Descent

$P_{Ed1} = |Pd_1| + |Ptd_1| = 1143.3$ N

$P_{Ed2} = |Pd_2| + |Ptd_2| = 1143.3$ N

$P_{Ed3} = |Pd_3| + |Ptd_3| = 1143.3$ N

$P_{Ed4} = |Pd_4| + |Ptd_4| = 1143.3$ N

[Static Safety Factor]

The static safety factor (f_S) of the LM Guide used in a machine or equipment under the conditions stated above is obtained as follows.

$$f_S = \frac{C_0}{P_{EU2}} = \frac{34.4\times10^3}{1731.3} = 19.9$$

[Average Load P_{mn}]

Obtain the average load applied to each LM block.

$$P_{m1} = \sqrt[3]{\frac{1}{2\cdot\ell_S}\left(P_{EU1}{}^3\cdot\ell_S + P_{Ed1}{}^3\cdot\ell_S\right)} = 1495.1\ \text{N}$$

$$P_{m2} = \sqrt[3]{\frac{1}{2\cdot\ell_S}\left(P_{EU2}{}^3\cdot\ell_S + P_{Ed2}{}^3\cdot\ell_S\right)} = 1495.1\ \text{N}$$

$$P_{m3} = \sqrt[3]{\frac{1}{2\cdot\ell_S}\left(P_{EU3}{}^3\cdot\ell_S + P_{Ed3}{}^3\cdot\ell_S\right)} = 1495.1\ \text{N}$$

$$P_{m4} = \sqrt[3]{\frac{1}{2\cdot\ell_S}\left(P_{EU4}{}^3\cdot\ell_S + P_{Ed4}{}^3\cdot\ell_S\right)} = 1495.1\ \text{N}$$

[Nominal Life L_n]

The nominal life of the four LM blocks is obtained from the corresponding nominal life equations shown below.

$$L_1 = \left(\frac{C}{f_W\cdot P_{m1}}\right)^3\times 50 = 68200\ \text{km}$$

$$L_2 = \left(\frac{C}{f_W\cdot P_{m2}}\right)^3\times 50 = 68200\ \text{km}$$

$$L_3 = \left(\frac{C}{f_W\cdot P_{m3}}\right)^3\times 50 = 68200\ \text{km}$$

$$L_4 = \left(\frac{C}{f_W\cdot P_{m4}}\right)^3\times 50 = 68200\ \text{km}$$

(where $f_W = 1.2$)

Therefore, the service life of the LM Guide used in a machine or equipment under the conditions stated above is 68,200 km.

Predicting the Rigidity

Selecting a Radial Clearance (Preload)

Since the radial clearance of an LM Guide greatly affects the running accuracy, load carrying capacity and rigidity of the LM Guide, it is important to select an appropriate clearance according to the application. In general, selecting a negative clearance (i.e., a preload* is applied) while taking into account possible vibrations and impact generated from reciprocating motion favorably affects the service life and the accuracy.

For specific radial clearances, contact THK. We will help you select the optimal clearance according to the conditions.

The clearances of all LM Guide models (except model HR, GSR and GSR-R, which are separate types) are adjusted as specified before shipment, and therefore they do not need further preload adjustment.

Preload is an internal load applied to the rolling elements (balls, rollers, etc.) of an LM block in advance in order to increase its rigidity.

Table13 Types of Radial Clearance

	Normal Clearance	Clearance C1 (Light Preload)	Clearance C0 (Medium Preload)
Condition	● The loading direction is fixed, impact and vibrations are minimal and 2 rails are installed in parallel. ● Very high precision is not required, and the sliding resistance must be as low as possible.	● An overhang load or moment load is applied. ● LM Guide is used in a single-rail configuration. ● Light load and high accuracy are required.	● High rigidity is required and vibrations and impact are applied. ● Heavy-cutting machine tool
Examples of applications	• Beam-welding machine • Book-binding machin • Automatic packaging machine • XY axes of general industrial machinery • Automatic sash-manufacturing machine • Welding machine • Flame cutting machine • Tool changer • Various kinds of material feeder	• Grinding machine table feed axis • Automatic coating machine • Industrial robot • various kinds of material high speed feeder • NC drilling machine • Vertical axis of general industrial machinery • Printed circuit board drilling machine • Electric discharge machine • Measuring instrument • Precision XY table	• Machining center • NC lathe • Grinding stone feed axis of grinding machine • Milling machine • Vertical/horizontal boring machine • Tool rest guide • Vertical axis of machine tool

Service Life with a Preload Considered

When using an LM Guide under a medium preload (clearance C0), it is necessary to calculate the service life while taking into account the magnitude of the preload.

To identify the appropriate preload for any selected LM Guide model, contact THK.

Rigidity

When the LM Guide receives a load, its rolling element, LM blocks and LM rails are elastically deformed within a permissible load range. The ratio between the displacement and the load is called rigidity value. (Rigidity values are obtained using the equation shown below.) The LM Guide's rigidity increases according to the magnitude of the preload. Fig.15 shows rigidity difference between normal, C1 and C0 clearances.

The effect of a preload for a 4-way equal load type is translated into the calculated load approx. 2.8 times greater than the magnitude of the preload.

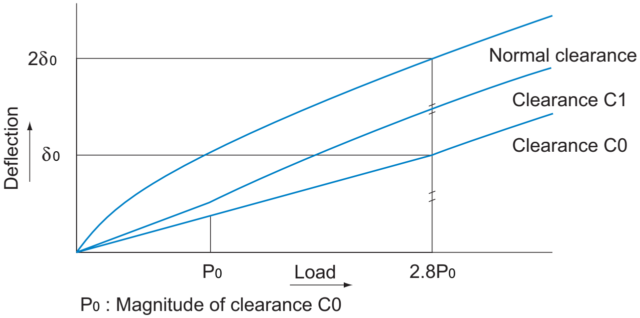
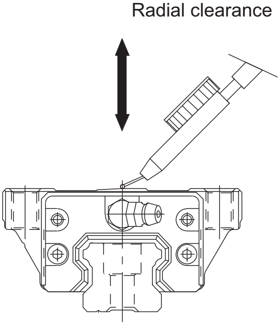


Fig.15 Rigidity Data

$$K=\frac{P}{\delta}$$

K	: Rigidity value	(N/μm)
δ	: Deflection	(μm)
P	: Calculated load	(N)

Radial Clearance Standard for Each Model



[Radial clearances of models SHS and SCR]

Unit: μm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
15	-5 to 0	-12 to -5	—
20	-6 to 0	-12 to -6	-18 to -12
25	-8 to 0	-14 to -8	-20 to -14
30	-9 to 0	-17 to -9	-27 to -17
35	-11 to 0	-19 to -11	-29 to -19
45	-12 to 0	-22 to -12	-32 to -22
55	-15 to 0	-28 to -16	-38 to -28
65	-18 to 0	-34 to -22	-45 to -34

[Radial clearance for model SSR]

Unit: μm

Indication symbol	Normal	Light preload
Model No.	No Symbol	C1
15	-4 to +2	-10 to -4
20	-5 to +2	-12 to -5
25	-6 to +3	-15 to -6
30	-7 to +4	-18 to -7
35	-8 to +4	-20 to -8

[Radial clearance for models SNR/SNS and NR/NRS]

Unit: μm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
25	-3 to +2	-6 to -3	-9 to -6
30	-4 to +2	-8 to -4	-12 to -8
35	-4 to +2	-8 to -4	-12 to -8
45	-5 to +3	-10 to -5	-15 to -10
55	-6 to +3	-11 to -6	-16 to -11
65	-8 to +3	-14 to -8	-20 to -14
75	-10 to +4	-17 to -10	-24 to -17
85	-13 to +4	-20 to -13	-27 to -20
100	-14 to +4	-24 to -14	-34 to -24

[Radial clearance for model SHW]

Unit: μm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
12	-1.5 to 0	-4 to -1	—
14	-2 to 0	-5 to -1	—
17	-3 to 0	-7 to -3	—
21	-4 to +2	-8 to -4	—
27	-5 to +2	-11 to -5	—
35	-8 to +4	-18 to -8	-28 to -18
50	-10 to +5	-24 to -10	-38 to -24

[Radial clearance for model SRS]

Unit: μm

Indication symbol	Normal	Light preload
Model No.	No Symbol	C1
7	-2 to +2	-3 to 0
9	-2 to +2	-4 to 0
12	-3 to +3	-6 to 0
15	-5 to +5	-10 to 0
20	-5 to +5	-10 to 0
25	-7 to +7	-14 to 0

[Radial clearance for models HSR, CSR and HSR-M1]

Unit: µm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
8	−1 to +1	−4 to −1	—
10	−2 to +2	−5 to −1	—
12	−3 to +3	−6 to −2	—
15	−4 to +2	−12 to −4	—
20	−5 to +2	−14 to −5	−23 to −14
25	−6 to +3	−16 to −6	−26 to −16
30	−7 to +4	−19 to −7	−31 to −19
35	−8 to +4	−22 to −8	−35 to −22
45	−10 to +5	−25 to −10	−40 to −25
55	−12 to +5	−29 to −12	−46 to −29
65	−14 to +7	−32 to −14	−50 to −32
85	−16 to +8	−36 to −16	−56 to −36
100	−19 to +9	−42 to −19	−65 to −42
120	−21 to +10	−47 to −21	−73 to −47
150	−23 to +11	−51 to −23	−79 to −51

[Model HSR Grade Ct Radial Clearance]

Unit: µm

Indication symbol	Normal
Model No.	No Symbol
15	−8 to +2
20	−14 to +2
25	−16 to +2
30	−18 to +4
35	−20 to +4

[Radial clearances of models SR and SR-M1]

Unit: µm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
15	−4 to +2	−10 to −4	—
20	−5 to +2	−12 to −5	−17 to −12
25	−6 to +3	−15 to −6	−21 to −15
30	−7 to +4	−18 to −7	−26 to −18
35	−8 to +4	−20 to −8	−31 to −20
45	−10 to +5	−24 to −10	−36 to −24
55	−12 to +5	−28 to −12	−45 to −28
70	−14 to +7	−32 to −14	−50 to −32
85	−20 to +9	−46 to −20	−70 to −46
100	−22 to +10	−52 to −22	−78 to −52
120	−25 to +12	−57 to −25	−87 to −57
150	−29 to +14	−69 to −29	−104 to −69

[Radial clearance for model HRW]

Unit: µm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
12	−1.5 to +1.5	−4 to −1	—
14	−2 to +2	−5 to −1	—
17	−3 to +2	−7 to −3	—
21	−4 to +2	−8 to −4	—
27	−5 to +2	−11 to −5	—
35	−8 to +4	−18 to −8	−28 to −18
50	−10 to +5	−24 to −10	−38 to −24
60	−12 to +5	−27 to −12	−42 to −27

[Radial clearance for models RSR, RSR-W, RSR-Z, RSR-WZ, RSH, RSH-Z and RSR-M1]

Unit: µm

Indication symbol	Normal	Light preload
Model No.	No Symbol	C1
3	0 to +1	−0.5 to 0
5	0 to +1.5	−1 to 0
7	−2 to +2	−3 to 0
9	−2 to +2	−4 to 0
12	−3 to +3	−6 to 0
15	−5 to +5	−10 to 0
20	−7 to +7	−14 to 0

[Radial clearance for model MX]

Unit: µm

Indication symbol	Normal	Light preload
Model No.	No Symbol	C1
5	0 to +1.5	−1 to 0
7	−2 to +2	−3 to 0

[Radial clearance for model JR]

Unit: µm

Indication symbol	Normal
Model No.	No Symbol
25	0 to +30
35	0 to +30
45	0 to +50
55	0 to +50

[Radial clearances for models HCR and HMG]

Unit: µm

Indication symbol	Normal	Light preload
Model No.	No Symbol	C1
12	−3 to +3	−6 to −2
15	−4 to +2	−12 to −4
25	−6 to +3	−16 to −6
35	−8 to +4	−22 to −8
45	−10 to +5	−25 to −10
65	−14 to +7	−32 to −14

[Radial clearance for model NSR-TBC]

Unit: µm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
20	−5 to +5	−15 to −5	−25 to −15
25	−5 to +5	−15 to −5	−25 to −15
30	−5 to +5	−15 to −5	−25 to −15
40	−8 to +8	−22 to −8	−36 to −22
50	−8 to +8	−22 to −8	−36 to −22
70	−10 to +10	−26 to −10	−42 to −26

[Radial clearance for model HSR-M2]

Unit: µm

Indication symbol	Normal	Light preload
Model No.	No Symbol	C1
15	−4 to +2	−12 to −4
20	−5 to +2	−14 to −5
25	−6 to +3	−16 to −6

[Radial clearances for models SRG and SRN]

Unit: µm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
15	−0.5 to 0	−1 to −0.5	−2 to −1
20	−0.8 to 0	−2 to −0.8	−3 to −2
25	−2 to −1	−3 to −2	−4 to −3
30	−2 to −1	−3 to −2	−4 to −3
35	−2 to −1	−3 to −2	−5 to −3
45	−2 to −1	−3 to −2	−5 to −3
55	−2 to −1	−4 to −2	−6 to −4
65	−3 to −1	−5 to −3	−8 to −5

[Radial clearance for model SRW]

Unit: µm

Indication symbol	Normal	Light preload	Medium preload
Model No.	No Symbol	C1	C0
70	−2 to −1	−3 to −2	−5 to −3
85	−2 to −1	−4 to −2	−6 to −4
100	−3 to −1	−5 to −3	−8 to −5

Determining the Accuracy

Accuracy Standards

Accuracy of the LM Guide is specified in terms of running parallelism, dimensional tolerance for height and width, and height and width difference between a pair when 2 or more LM blocks are used on one rail or when 2 or more rails are mounted on the same plane.
For details, see “Accuracy Standard for Each Model” on A-118 to A-128.

[Running of Parallelism]

It refers to the tolerance for parallelism between the LM block and the LM rail reference surface when the LM block travels the whole length of the LM rail with the LM rail secured on the reference reference surface using bolts.

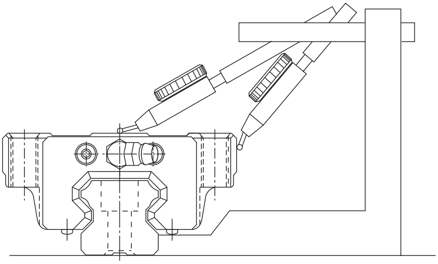


Fig.16 Running of Parallelism

[Difference in Height M]

Indicates a difference between the minimum and maximum values of height (M) of each of the LM blocks used on the same plane in combination.

[Difference in Width W_2]

Indicates a difference between the minimum and maximum values of the width (W_2) between each of the LM blocks, mounted on one LM rail in combination, and the LM rail.

Note1) When 2 or more rails are used on the same plane in parallel, only the width (W_2) tolerance and the difference on the master rail apply. The master LM rail is imprinted with "KB" (except for normal grade products) following the serial number.

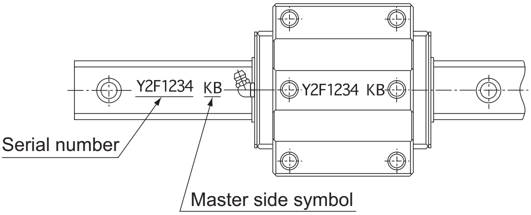


Fig.17 Master LM Rail

Note2) Accuracy measurements each represent the average value of the central point or the central area of the LM block.
Note3) The LM rail is smoothly curved so that the required accuracy is easily achieved by pressing the rail to the reference surface of the machine.
If it is mounted on a less rigid base such as an aluminum base, the curve of the rail will affect the accuracy of the machine. Therefore, it is necessary to define straightness of the rail in advance.

Guidelines for Accuracy Grades by Machine Type

Table14 shows guidelines for selecting an accuracy grade of the LM Guide according to the machine type.

Table14 Guideline for Accuracy Grades by Machine Type

Type of machine		Accuracy grades						
		Ct7	Ct5	Normal	H	P	SP	UP
Machine tool	Machining center					●	●	
	Lathe					●	●	
	Milling machine					●	●	
	Boring machine					●	●	
	Jig borer						●	●
	Grinding machine						●	●
	Electric discharge machine					●	●	●
	Punching press				●	●		
	Laser beam machine				●	●	●	
	Woodworking machine	●	●	●	●	●		
	NC drilling machine				●	●		
	Tapping center				●	●		
	Palette changer			●				
	ATC	●	●	●				
	Wire cutting machine					●	●	
	Dressing machine						●	●
Industrial robot	Cartesian coordinate			●	●	●		
	Cylindrical coordinate			●	●			
Semiconductor manufacturing equipment	Wire bonding machine					●	●	
	Prober						●	●
	Electronic component inserter				●	●		
	Printed circuit board drilling machine				●	●	●	
Other equipment	Injection molding machine			●	●			
	3D measuring instrument						●	●
	Office equipment	●	●	●	●			
	Conveyance system	●	●	●	●			
	XY table				●	●	●	
	Coating machine	●	●	●	●			
	Welding machine	●	●	●	●			
	Medical equipment			●	●			
	Digitizer				●	●	●	
	Inspection equipment					●	●	●

Ct7 : Grade Ct7
Ct5 : Grade Ct5
Normal : Normal grade
H : High accuracy grade
P : Precision Grade
SP : Super precision grade
UP : Ultra precision grade

Accuracy Standard for Each Model

- Accuracies of models XSHS, SSR, SNR/SNS, SHW, HSR, SR, NR/NRS, HRW, NSR-TBC, HSR-M1, SR-M1 HSR-M2, SRG and SRN are categorized into Ct7 grade (Ct7), Ct5 grade (Ct5), Normal grade (no symbol), High accuracy grade (H), Precision grade (P), Super precision grade (SP) and Ultra precision grade (UP) by model numbers, as indicated in Table16 on A-119.

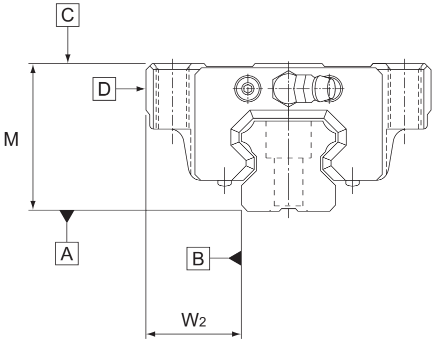


Fig.18

Table15 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: µm

LM rail length (mm)		Running Parallelism Values						
Above	Or less	Grade Ct7	Grade Ct5	Normal grade	High-accuracy grade	Precision grade	Super precision grade	Ultra precision grade
—	50	6	6	5	3	2	1.5	1
50	80	6	6	5	3	2	1.5	1
80	125	6	6	5	3	2	1.5	1
125	200	7	6	5	3.5	2	1.5	1
200	250	9.5	6.5	6	4	2.5	1.5	1
250	315	11	7.5	7	4.5	3	1.5	1
315	400	13	8.5	8	5	3.5	2	1.5
400	500	16	11	9	6	4.5	2.5	1.5
500	630	18	13	11	7	5	3	2
630	800	20	15	12	8.5	6	3.5	2
800	1000	23	16	13	9	6.5	4	2.5
1000	1250	26	18	15	11	7.5	4.5	3
1250	1600	28	20	16	12	8	5	4
1600	2000	31	23	18	13	8.5	5.5	4.5
2000	2500	34	25	20	14	9.5	6	5
2500	3150	36	27	21	16	11	6.5	5.5
3150	4000	40	29	23	17	12	7.5	6
4000	5000	41	30	24	18	13	8.5	6.5

Note) Ct7 and Ct5 class are only applicable for model HSR.

Table16 Accuracy Standards for Models SHS, SSR, SNR/SNS, SHW, HSR, SR, NR/NRS, HRW, NSR-TBC, HSR-M1, SR-M1, HSR-M2, SRG, and SRN.

Unit: mm

Model No.	Accuracy standards	Grade Ct7	Grade Ct5	Normal grade	High-accuracy grade	Precision grade	Super precision grade	Ultra precision grade
	Item	Ct7	Ct5	No Symbol	H	P	SP	UP
8 10 12 14	Dimensional tolerance in height M	—	—	±0.07	±0.03	±0.015	±0.007	—
	Difference in height M	—	—	0.015	0.007	0.005	0.003	—
	Dimensional tolerance in width W_2	—	—	±0.04	±0.02	±0.01	±0.007	—
	Difference in width W_2	—	—	0.02	0.01	0.006	0.004	—
	Running parallelism of surface C against surface A	ΔC (as shown in A-118 Table15)						
	Running parallelism of surface D against surface B	ΔD (as shown in A-118 Table15)						
15 17 20 21	Dimensional tolerance in height M	±0.12	±0.12	±0.07	±0.03	0 −0.03	0 −0.015	0 −0.008
	Difference in height M	0.025	0.025	0.02	0.01	0.006	0.004	0.003
	Dimensional tolerance in width W_2	±0.12	±0.12	±0.06	±0.03	0 −0.02	0 −0.015	0 −0.008
	Difference in width W_2	0.025	0.025	0.02	0.01	0.006	0.004	0.003
	Running parallelism of surface C against surface A	ΔC (as shown in A-118 Table15)						
	Running parallelism of surface D against surface B	ΔD (as shown in A-118 Table15)						
25 27 30 35	Dimensional tolerance in height M	±0.12	±0.12	±0.08	±0.04	0 −0.04	0 −0.02	0 −0.01
	Difference in height M	0.025	0.025	0.02	0.015	0.007	0.005	0.003
	Dimensional tolerance in width W_2	±0.12	±0.12	±0.07	±0.03	0 −0.03	0 −0.015	0 −0.01
	Difference in width W_2	0.035	0.035	0.025	0.015	0.007	0.005	0.003
	Running parallelism of surface C against surface A	ΔC (as shown in A-118 Table15)						
	Running parallelism of surface D against surface B	ΔD (as shown in A-118 Table15)						
40 45 50 55 60	Dimensional tolerance in height M	—	—	±0.08	±0.04	0 −0.05	0 −0.03	0 −0.015
	Difference in height M	—	—	0.025	0.015	0.007	0.005	0.003
	Dimensional tolerance in width W_2	—	—	±0.07	±0.04	0 −0.04	0 −0.025	0 −0.015
	Difference in width W_2	—	—	0.03	0.015	0.007	0.005	0.003
	Running parallelism of surface C against surface A	ΔC (as shown in A-118 Table15)						
	Running parallelism of surface D against surface B	ΔD (as shown in A-118 Table15)						
65 70 75 85 100 120 150	Dimensional tolerance in height M	—	—	±0.08	±0.04	0 −0.05	0 −0.04	0 −0.03
	Difference in height M	—	—	0.03	0.02	0.01	0.007	0.005
	Dimensional tolerance in width W_2	—	—	±0.08	±0.04	0 −0.05	0 −0.04	0 −0.03
	Difference in width W_2	—	—	0.03	0.02	0.01	0.007	0.005
	Running parallelism of surface C against surface A	ΔC (as shown in A-118 Fig.18)						
	Running parallelism of surface D against surface B	ΔD (as shown in A-118 Fig.18)						

Note) XFor models SRG and SRN, only precision or higher grades apply. (Ct7 grade, Ct5 grade, normal grade and high accuracy grade are not available.)
Note) Ct7 and Ct5 class are only applicable for model HSR.

- Accuracies of model HMG are defined by model number as indicated in Table17.

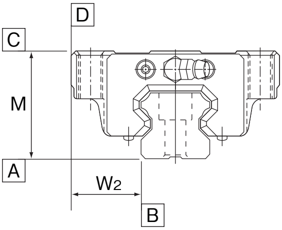


Fig.19

Table17 Model HMG Accuracy Standard

Unit: mm

Model No.	Accuracy Standards Item	Normal grade No symbol
15	Dimensional tolerance in height M	±0.1
	Difference in height M	0.02
	Dimensional tolerance in width W_2	±0.1
	Difference in width W_2	0.02
	Running parallelism of surface C against surface A	ΔC (as shown in Table18)
	Running parallelism of surface D against surface B	ΔD (as shown in Table18)
25 35	Dimensional tolerance in height M	±0.1
	Difference in height M	0.02
	Dimensional tolerance in width W_2	±0.1
	Difference in width W_2	0.03
	Running parallelism of surface C against surface A	ΔC (as shown in Table18)
	Running parallelism of surface D against surface B	ΔD (as shown in Table18)
45 65	Dimensional tolerance in height M	±0.1
	Difference in height M	0.03
	Dimensional tolerance in width W_2	±0.1
	Difference in width W_2	0.03
	Running parallelism of surface C against surface A	ΔC (as shown in Table18)
	Running parallelism of surface D against surface B	ΔD (as shown in Table18)

Table18 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: µm

LM rail length (mm)		Running Parallelism Values
Above	Or less	Normal grade
—	125	30
125	200	37
200	250	40
250	315	44
315	400	49
400	500	53
500	630	58
630	800	64
800	1000	70
1000	1250	77
1250	1600	84
1600	2000	92

- Accuracies of model HCR are categorized into normal and high accuracy grades by model number as indicated in Table19.

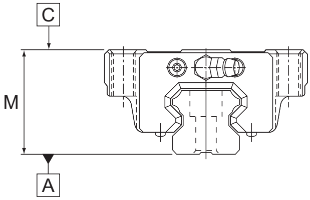


Fig.20

Table19 Accuracy Standard for Model HCR

Unit: mm

Model No.	Accuracy standards	Normal grade	High-accuracy grade
	Item	No Symbol	H
12 15 25 35	Dimensional tolerance in height M	±0.2	±0.2
	Difference in height M	0.05	0.03
	Running parallelism of surface C against surface A	ΔC (as shown in Table20)	
45 65	Dimensional tolerance in height M	±0.2	±0.2
	Difference in height M	0.06	0.04
	Running parallelism of surface C against surface A	ΔC (as shown in Table20)	

Table20 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values	
Above	Or less	Normal grade	High-accuracy grade
—	125	30	15
125	200	37	18
200	250	40	20
250	315	44	22
315	400	49	24
400	500	53	26
500	630	58	29
630	800	64	32
800	1000	70	35
1000	1250	77	38
1250	1600	84	42
1600	2000	92	46

- Accuracies of model JR are defined by model number as indicated in Table21.

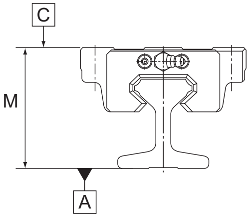


Fig.21

Table21 Accuracy Standard for Model JR

Unit: mm

Model No.	Accuracy standards	Normal grade
	Item	No Symbol
25 35	Difference in height M	0.05
	Running parallelism of surface C against surface A	ΔC (as shown in Table22)
45 55	Difference in height M	0.06
	Running parallelism of surface C against surface A	ΔC (as shown in Table22)

Table22 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values
Above	Or less	Normal grade
—	50	5
50	80	5
80	125	5
125	200	6
200	250	8
250	315	9
315	400	11
400	500	13
500	630	15
630	800	17
800	1000	19
1000	1250	21
1250	1600	23
1600	2000	26
2000	2500	28
2500	3150	30
3150	4000	33
4000	5000	34

- Accuracies of models SCR and CSR are categorized into precision, super precision and ultra precision grades by model number as indicated in Table23.

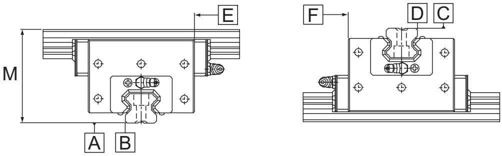


Fig.22

Table23 Accuracy Standard for Models SCR and CSR

Unit: mm

Model No.	Accuracy standards	Precision grade	Super precision grade	Ultra precision grade
	Item	P	SP	UP
15 20	Difference in height M	0.01	0.007	0.005
	Perpendicularity of surface D against surface B	0.005	0.004	0.003
	Running parallelism of surface E against surface B	ΔC (as shown in Table24)		
	Running parallelism of surface F against surface D	ΔD (as shown in Table24)		
25	Difference in height M	0.01	0.007	0.005
	Perpendicularity of surface D against surface B	0.008	0.006	0.004
	Running parallelism of surface E against surface B	ΔC (as shown in Table24)		
	Running parallelism of surface F against surface D	ΔD (as shown in Table24)		
30 35	Difference in height M	0.01	0.007	0.005
	Perpendicularity of surface D against surface B	0.01	0.007	0.005
	Running parallelism of surface E against surface B	ΔC (as shown in Table24)		
	Running parallelism of surface F against surface D	ΔD (as shown in Table24)		
45	Difference in height M	0.012	0.008	0.006
	Perpendicularity of surface D against surface B	0.012	0.008	0.006
	Running parallelism of surface E against surface B	ΔC (as shown in Table24)		
	Running parallelism of surface F against surface D	ΔD (as shown in Table24)		
65	Difference in height M	0.018	0.012	0.009
	Perpendicularity of surface D against surface B	0.018	0.012	0.009
	Running parallelism of surface E against surface B	ΔC (as shown in Table24)		
	Running parallelism of surface F against surface D	ΔD (as shown in Table24)		

Table24 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values		
Above	Or less	Precision grade	Super precision grade	Ultra precision grade
—	50	2	1.5	1
50	80	2	1.5	1
80	125	2	1.5	1
125	200	2	1.5	1
200	250	2.5	1.5	1
250	315	3	1.5	1
315	400	3.5	2	1.5
400	500	4.5	2.5	1.5
500	630	5	3	2
630	800	6	3.5	2
800	1000	6.5	4	2.5
1000	1250	7.5	4.5	3
1250	1600	8	5	4
1600	2000	8.5	5.5	4.5
2000	2500	9.5	6	5
2500	3150	11	6.5	5.5
3150	4000	12	7.5	6
4000	5000	13	8.5	6.5

- Accuracies of model HR are categorized into normal, high accuracy, precision, super precision and ultra precision grades as indicated in Table25.

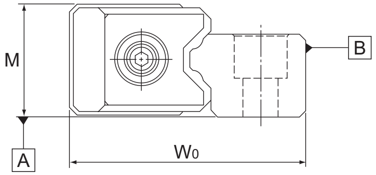


Fig.23

Table25 Accuracy Standard for Model HR

Unit: mm

Accuracy standards	Normal grade	High-accuracy grade	Precision grade	Super precision grade	Ultra precision grade
Item	No Symbol	H	P	SP	UP
Dimensional tolerance in height M	±0.1	±0.05	±0.025	±0.015	±0.01
Difference in height M Note 1)	0.03	0.02	0.01	0.005	0.003
Dimensional tolerance for total width W_0	±0.1		±0.05		
Difference in total width W_0 Note 2)	0.03	0.015	0.01	0.005	0.003
Parallelism of the raceway against surfaces A and B	ΔC (as shown in Table26)				

Note1) Difference in height M applies to a set of LM Guides used on the same plane.
Note2) Difference in total width W_0 applies to LM blocks used in combination on one LM rail.
Note3) Dimensional tolerance and difference in total width W_0 for precision and higher grades apply only to the master-rail side among a set of LM Guides. The master rail is imprinted with "KB" following a serial number.

Table26 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: µm

LM rail length (mm)		Running Parallelism Values				
Above	Or less	Normal grade	High-accuracy grade	Precision grade	Super precision grade	Ultra precision grade
—	50	5	3	2	1.5	1
50	80	5	3	2	1.5	1
80	125	5	3	2	1.5	1
125	200	5	3.5	2	1.5	1
200	250	6	4	2.5	1.5	1
250	315	7	4.5	3	1.5	1
315	400	8	5	3.5	2	1.5
400	500	9	6	4.5	2.5	1.5
500	630	11	7	5	3	2
630	800	12	8.5	6	3.5	2
800	1000	13	9	6.5	4	2.5
1000	1250	15	11	7.5	4.5	3
1250	1600	16	12	8	5	4
1600	2000	18	13	8.5	5.5	4.5
2000	2500	20	14	9.5	6	5
2500	3150	21	16	11	6.5	5.5
3150	4000	23	17	12	7.5	6
4000	5000	24	18	13	8.5	6.5

- Accuracies of model GSR are categorized into normal, high accuracy and precision grades by model number as indicated in Table27.

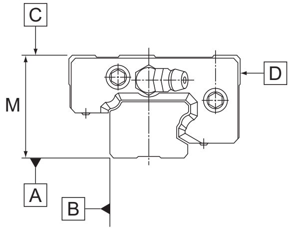


Fig.24

Table27 Accuracy Standard for Model GSR

Unit: mm

Model No.	Accuracy standards	Normal grade	High-accuracy grade	Precision grade
	Item	No Symbol	H	P
15 20	Dimensional tolerance in height M	±0.02		
	Running parallelism of surface C against surface A	ΔC (as shown in Table28)		
	Running parallelism of surface D against surface B	ΔD (as shown in Table28)		
25 30 35	Dimensional tolerance in height M	±0.03		
	Running parallelism of surface C against surface A	ΔC (as shown in Table28)		
	Running parallelism of surface D against surface B	ΔD (as shown in Table28)		

Table28 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values		
Above	Or less	Normal grade	High-accuracy grade	Precision grade
—	50	5	3	2
50	80	5	3	2
80	125	5	3	2
125	200	5	3.5	2
200	250	6	4	2.5
250	315	7	4.5	3
315	400	8	5	3.5
400	500	9	6	4.5
500	630	11	7	5
630	800	12	8.5	6
800	1000	13	9	6.5
1000	1250	15	11	7.5
1250	1600	16	12	8
1600	2000	18	13	8.5
2000	2500	20	14	9.5
2500	3150	21	16	11
3150	4000	23	17	12
4000	5000	24	18	13

- Accuracies of model GSR-R are categorized into normal and high accuracy grades by model number as indicated in Table29.

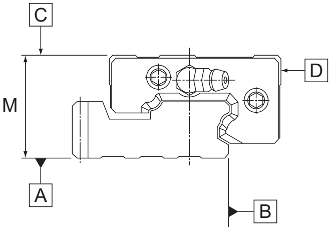


Fig.25

Table29 Accuracy Standard for GSR-R

Unit: mm

Model No.	Accuracy standards	Normal grade	High-accuracy grade
	Item	No Symbol	H
25 30 35	Dimensional tolerance in height M	±0.03	
	Running parallelism of surface C against surface A	ΔC (as shown in Table30)	
	Running parallelism of surface D against surface B	ΔD (as shown in Table30)	

Table30 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values	
Above	Or less	Normal grade	High-accuracy grade
—	50	5	3
50	80	5	3
80	125	5	3
125	200	5	3.5
200	250	6	4
250	315	7	4.5
315	400	8	5
400	500	9	6
500	630	11	7
630	800	12	8.5
800	1000	13	9
1000	1250	15	11
1250	1600	16	12
1600	2000	18	13
2000	2500	20	14
2500	3150	21	16
3150	4000	23	17
4000	5000	24	18

- Accuracies of models SRS, RSR, RSR-M1, RSR-W, RSR-Z, RSR-WZ, RSH and RSH-Z are categorized into normal, high accuracy and precision grades by model number as indicated in Table31.

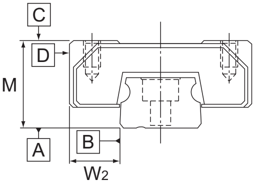


Fig.26

Table31 Accuracy Standards for Models SRS, RSR, RSR-M1, RSR-W, RSR-Z, RSR-WZ, RSH and RSH-Z

Unit: mm

Model No.	Accuracy standards	Normal grade	High-accuracy grade	Precision grade
	Item	No Symbol	H	P
3 5	Dimensional tolerance in height M	±0.03	—	±0.015
	Difference in height M	0.015	—	0.005
	Dimensional tolerance in width W_2	±0.03	—	±0.015
	Difference in width W_2	0.015	—	0.005
	Running parallelism of surface C against surface A	ΔC (as shown in Table32)		
	Running parallelism of surface D against surface B	ΔD (as shown in Table32)		
7 9 12 14 15 20 25	Dimensional tolerance in height M	±0.04	±0.02	±0.01
	Difference in height M	0.03	0.015	0.007
	Dimensional tolerance in width W_2	±0.04	±0.025	±0.015
	Difference in width W_2	0.03	0.02	0.01
	Running parallelism of surface C against surface A	ΔC (as shown in Table33)		
	Running parallelism of surface D against surface B	ΔD (as shown in Table33)		

Table32 LM Rail Length and Running Parallelism for Models RSR3 and 5 by Accuracy Standard

Unit: µm

LM rail length (mm)		Running Parallelism Values	
Above	Or less	Normal grade	Precision grade
—	25	2.5	1.5
25	50	3.5	2
50	100	5.5	3
100	150	7	4
150	200	8.4	5

Table33 LM Rail Length and Running Parallelism for Models SRS, RSR7 to 25, and RSH by Accuracy Standard

Unit: µm

LM rail length (mm)		Running Parallelism Values		
Above	Or less	Normal grade	High-accuracy grade	Precision grade
—	40	8	4	1
40	70	10	4	1
70	100	11	4	2
100	130	12	5	2
130	160	13	6	2
160	190	14	7	2
190	220	15	7	3
220	250	16	8	3
250	280	17	8	3
280	310	17	9	3
310	340	18	9	3
340	370	18	10	3
370	400	19	10	3
400	430	20	11	4
430	460	20	12	4
460	490	21	12	4
490	520	21	12	4
520	550	22	12	4
550	580	22	13	4
580	610	22	13	4
610	640	22	13	4
640	670	23	13	4
670	700	23	13	5
700	730	23	14	5
730	760	23	14	5
760	790	23	14	5
790	820	23	14	5
820	850	24	14	5
850	880	24	15	5
880	910	24	15	5
910	940	24	15	5
940	970	24	15	5
970	1000	25	16	5
1000	1030	25	16	5
1030	1060	25	16	6
1060	1090	25	16	6
1090	1120	25	16	6
1120	1150	25	16	6
1150	1180	26	17	6
1180	1210	26	17	6
1210	1240	26	17	6
1240	1270	26	17	6
1270	1300	26	17	6
1300	1330	26	17	6
1330	1360	27	18	6
1360	1390	27	18	6
1390	1420	27	18	6
1420	1450	27	18	7
1450	1480	27	18	7
1480	1510	27	18	7
1510	1540	28	19	7
1540	1570	28	19	7
1570	1600	28	19	7

- Accuracies of model MX are categorized into normal and precision grades by model number as indicated in Table34.

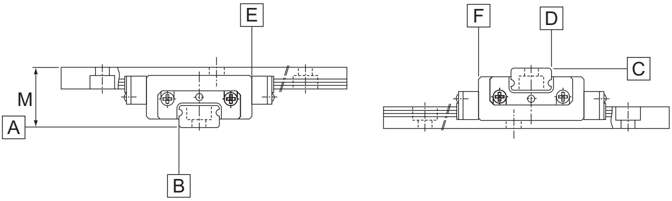


Fig.27

Table34 Accuracy Standard for Model MX

Unit: mm

Model No.	Accuracy standards Item	Normal grade No Symbol	Precision grade P
5	Difference in height M	0.015	0.005
	Perpendicularity of surface D against surface B	0.003	0.002
	Running parallelism of surface E against surface B	ΔC (as shown in Table35)	
	Running parallelism of surface F against surface D	ΔD (as shown in Table35)	
7	Difference in height M	0.03	0.007
	Perpendicularity of surface D against surface B	0.01	0.005
	Running parallelism of surface E against surface B	ΔC (as shown in Table36)	
	Running parallelism of surface F against surface D	ΔD (as shown in Table36)	

Table35 LM Rail Length and Running Parallelism for Model MX5 by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values	
Above	Or less	Normal grade	Precision grade
—	25	2.5	1.5
25	50	3.5	2
50	100	5.5	3
100	150	7	4
150	200	8.4	5

Table36 LM Rail Length and Running Parallelism for Model MX7 by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values	
Above	Or less	Normal grade	Precision grade
—	40	8	1
40	70	10	1
70	100	11	2
100	130	12	2
130	160	13	2
160	190	14	2
190	220	15	3
220	250	16	3
250	280	17	3
280	310	17	3
310	340	18	3
340	370	18	3
370	400	19	3
400	430	20	4
430	460	20	4
460	500	21	4

- Accuracies of model SRW are categorized into precision, super precision and ultra precision grades by model number as indicated in Table37.

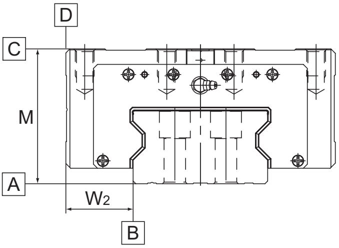


Fig.28

Table37 Accuracy Standard for Model SRW

Unit: mm

Model No.	Accuracy standards	Precision grade	Super precision grade	Ultra precision grade
	Item	P	SP	UP
70 85	Dimensional tolerance in height M	0 −0.05	0 −0.03	0 −0.015
	Difference in height M	0.007	0.005	0.003
	Dimensional tolerance in width W_2	0 −0.04	0 −0.025	0 −0.015
	Difference in width W_2	0.007	0.005	0.003
	Running parallelism of surface C against surface A	ΔC (as shown in Table38)		
	Running parallelism of surface D against surface B	ΔD (as shown in Table38)		
100	Dimensional tolerance in height M	0 −0.05	0 −0.04	0 −0.03
	Difference in height M	0.01	0.007	0.005
	Dimensional tolerance in width W_2	0 −0.05	0 −0.04	0 −0.03
	Difference in width W_2	0.01	0.007	0.005
	Running parallelism of surface C against surface A	ΔC (as shown in Table38)		
	Running parallelism of surface D against surface B	ΔD (as shown in Table38)		

Table38 LM Rail Length and Running Parallelism by Accuracy Standard

Unit: μm

LM rail length (mm)		Running Parallelism Values		
Above	Or less	Precision grade	Super precision grade	Ultra precision grade
—	50	2	1.5	1
50	80	2	1.5	1
80	125	2	1.5	1
125	200	2	1.5	1
200	250	2.5	1.5	1
250	315	3	1.5	1
315	400	3.5	2	1.5
400	500	4.5	2.5	1.5
500	630	5	3	2
630	800	6	3.5	2
800	1000	6.5	4	2.5
1000	1250	7.5	4.5	3
1250	1600	8	5	4
1600	2000	8.5	5.5	4.5
2000	2500	9.5	6	5
2500	3000	11	6.5	5.5

LM Guide

Feature of Each Model

Structure and Features of the Caged Ball LM Guide

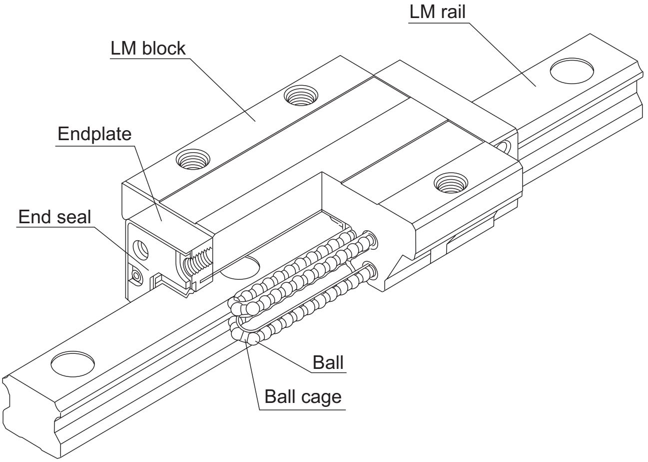


Fig.1 Structural Drawing of the Caged Ball LM Guide Model SHS

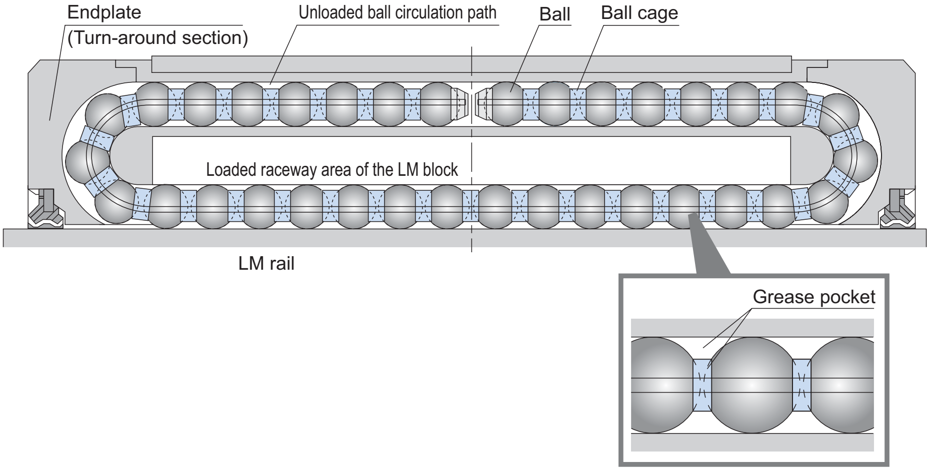


Fig.2 Circulation Structure inside the LM Block of the Caged Ball LM Guide

With the Caged Ball LM Guide, the use of a ball cage allows lines of evenly spaced balls to circulate, thus to eliminate friction between the balls.

In addition, grease held in a space between the ball circulation path and the ball cage (grease pocket) is applied on the contact surface between each ball and the ball cage as the ball rotates, forming an oil film on the ball surface. As a result, an oil film is not easily broken.

Advantages of the Ball Cage Technology

(1) The absence of friction between balls, together with increased grease retention, achieves long service life and long-term maintenance-free (lubrication-free) operation.
(2) The absence of ball-to-ball collision achieves low noise and acceptable running sound.
(3) The absence of friction between balls achieves low heat generation and high speed operation.
(4) The circulation of lines of evenly spaced balls ensures smooth ball rotation.
(5) The absence of friction between balls allows high grease retention and low dust generation.

[Long Service Life and Long-term Maintenance-free Operation]

- **Nominal Life Equation for the LM Guide**

$$L = \left(\frac{C}{P}\right)^3 \times 50$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P : Applied load (N)

As indicated in the equation, the greater the basic dynamic load rating, the longer the nominal life of the LM Guide.

[Example of Calculation]

Comparison of Nominal Life Between the Caged Ball LM Guide model SHS25LR and the Conventional Full-ball Type Model HSR25LR

Calculation Assuming P = 13.6 kN
Basic dynamic rated load (C) of SHS25LR = 36.8 kN
Basic dynamic rated load (C) of HSR25LR = 27.2 kN

Model SHS25LR $$L = \left(\frac{C}{P}\right)^3 \times 50 = \left(\frac{36.8}{13.6}\right)^3 \times 50 = 990 \text{ km}$$

Model HSR25LR $$L = \left(\frac{C}{P}\right)^3 \times 50 = \left(\frac{27.2}{13.6}\right)^3 \times 50 = 400 \text{ km}$$

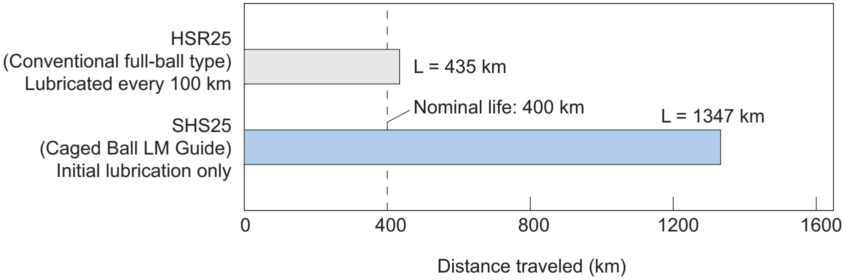
The nominal life of the Caged Ball LM Guide model SHS25LR is 2.4 times* longer than the conventional full-ball type model HSR25LR.

* When selecting a model number, it is necessary to perform a service life calculation according to the conditions.

● Data on Long Service Life and Long-term Maintenance-free Operation

Use of a ball cage eliminates friction between balls and increases grease retention, thus to achieve long service life and long-term maintenance-free operation.

[Condition]
Model No. : SHS25/HSR25
Speed : 60m/min
Stroke : 350mm
Acceleration: 9.8m/s^2
Orientation : horizontal
Load : Caged Ball LM Guide model SHS: 11.1kN
Conventional full-ball type model HSR: 9.8kN

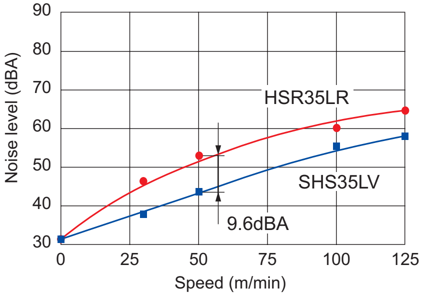


[Low Noise, Acceptable Running Sound]

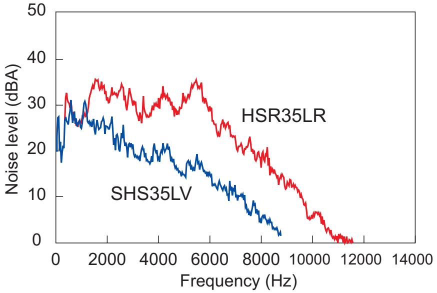
● Noise Level Data

Since the ball circulation path inside the LM block is made of resin, metallic noise between balls and the LM block is eliminated. In addition, use of a ball cage eliminates metallic noise of ball-to-ball collision, allowing a low noise level to be maintained even at high speed.

Model SHS35LV: Caged Ball LM Guide
Model HSR35LR: conventional full-ball type



Comparison of Noise Levels between Model SHS35LV and Model HSR35LR



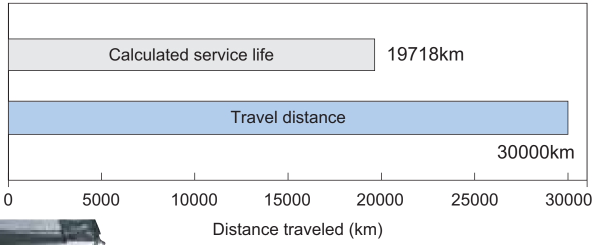
Comparison of Noise Levels between Model SHS35LV and Model HSR35LR (at speed of 50 m/min)

[High Speed]

● High-speed Durability Test Data

Since use of a ball cage eliminates friction between balls, only a low level of heat is generated and superbly high speed is achieved.

[Condition]
Model No. : Caged Ball LM Guide Model SHS65LVSS
Speed : 200m/min
Stroke : 2500mm
Lubrication : initial lubrication only
Applied load: 34.5kN
Acceleration: 1.5G



Grease remains, and no anomaly is observed in the balls and grease.

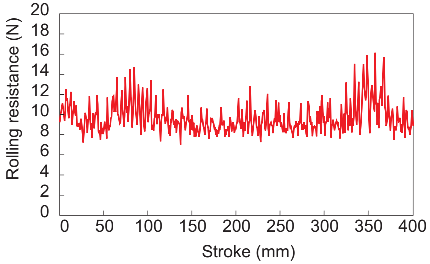
Detail view of the ball cage

[Smooth Motion]

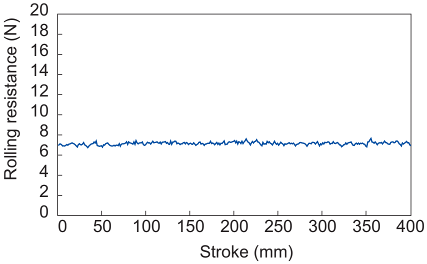
● Rolling Resistance Data

Use of a ball cage allows the balls to be uniformly aligned and prevents a line of balls from meandering as they enter the LM block. This enables smooth and stable motion to be achieved, minimizes fluctuations in rolling resistance, and ensures high accuracy, in any mounting orientation.

Model SHS25LV: Caged Ball LM Guide
Model HSR25LR: conventional full-ball type



Rolling Resistance Fluctuation Data with HSR25LR
(Feeding speed: 10mm/sec)



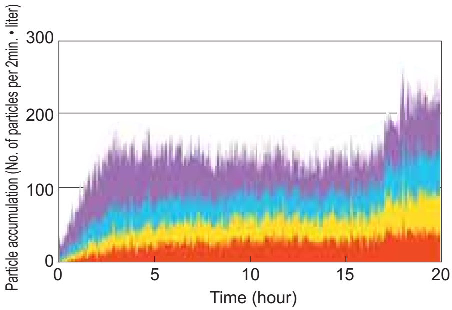
Rolling Resistance Fluctuation Data with SHS25LV
(Feeding speed: 10mm/sec)

[Low dust generation]

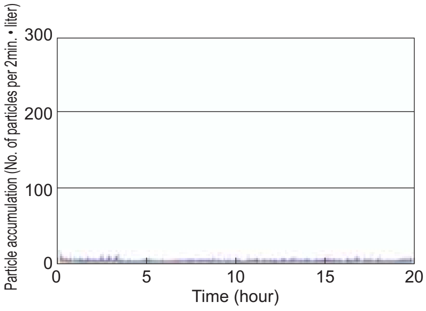
● Low Dust Generation Data

In addition to friction between balls, metallic contact has also been eliminated by using resin for the through holes. Furthermore, the Caged Ball LM Guide has a high level of grease retention and minimizes fly loss of grease, thus to achieve superbly low dust generation.

Particle diameter (μm)
🟪 0.3-0.5
🟦 0.5-1.0
🟨 1.0-2.0
🟥 2.0-5.0
⬛ 5.0-



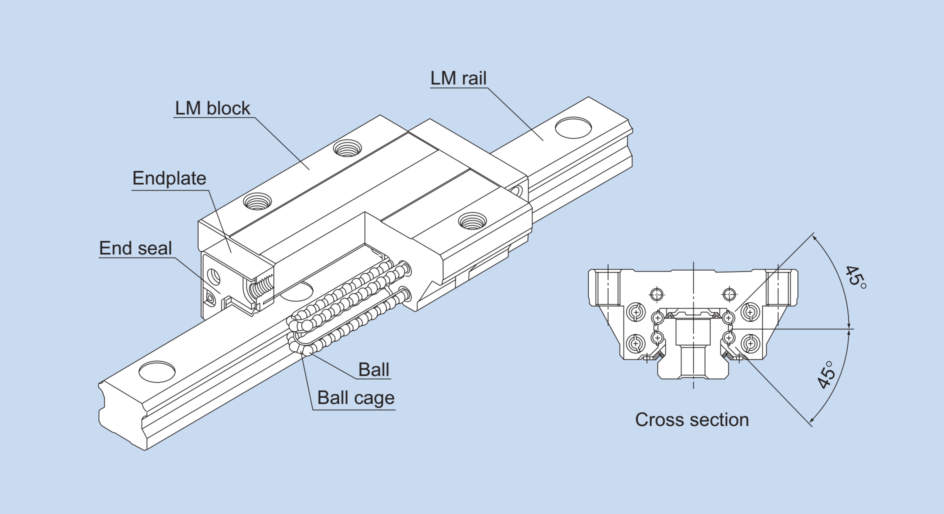
Conventional Full-ball Type



Caged Ball LM Guide Model SSR20

SHS

Caged Ball LM Guide
Global Standard Size Model SHS



* For the ball cage, see A-130.

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and ball cages and endplates incorporated in the LM block allow the balls to circulate.
Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations. In addition, the LM block can receive a well-balanced preload, increasing the rigidity in the four directions while maintaining a constant, low friction coefficient. With the low sectional height and the high rigidity design of the LM block, this model achieves highly accurate and stable straight motion.

[4-way Equal Load]

Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations and in extensive applications.

[Self-adjustment Capability]

The self-adjustment capability through front-to-front configuration of THK's unique circular-arc grooves (DF set) enables a mounting error to be absorbed even under a preload, thus to achieve highly accurate, smooth straight motion.

[Global Standard Size]

SHS is designed to have dimensions almost the same as that of Full Ball LM Guide model HSR, which THK as a pioneer of the linear motion system has developed and is practically a global standard size.

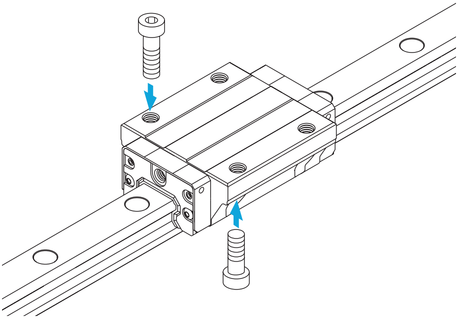
[Low Center of Gravity, High Rigidity]

As a result of downsizing the LM rail section, the center of gravity is lowered and the rigidity is increased.

Model SHS-C

Specification Table⇒B-6

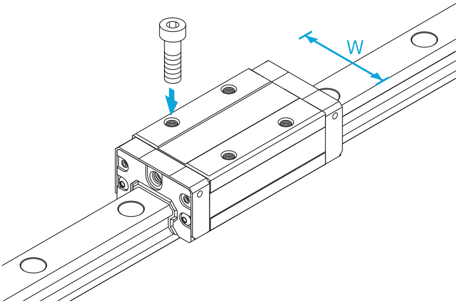
The flange of the LM block has tapped holes.
Can be mounted from the top or the bottom.
Used in places where the table cannot have through holes for mounting bolts.



Model SHS-V

Specification Table⇒B-8

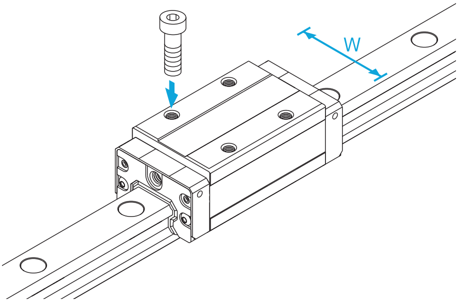
With this type, the LM block has a smaller width (W) and tapped holes.
Used in places where the space for table width is limited.



Model SHS-R

Specification Table⇒B-10

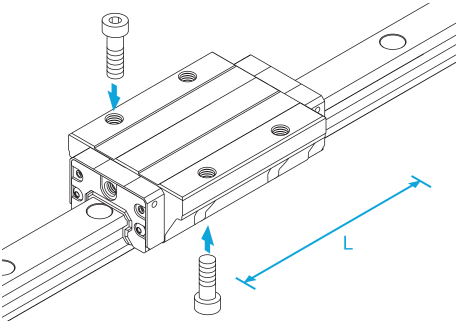
The LM block has a smaller width (W) and the mounting holes are tapped.
It succeeds the height dimension of full-ball type LM Guide HSR-R.



Model SHS-LC

Specification Table⇒B-6

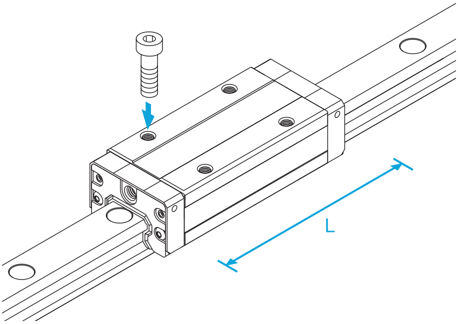
The LM block has the same cross-sectional shape as model SHS-C, but has a longer overall LM block length (L) and a greater rated load.



Model SHS-LV

Specification Table⇒B-8

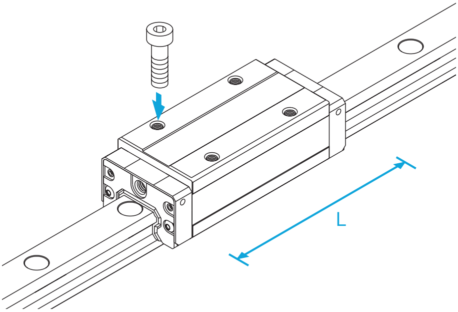
The LM block has the same cross-sectional shape as model SHS-V, but has a longer overall LM block length (L) and a greater rated load.



Model SHS-LR

Specification Table⇒B-10

The LM block has the same cross-sectional shape as model SHS-R, but has a longer overall LM block length (L) and a greater rated load.



Rated Loads in All Directions

Model SHS is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for SHS.

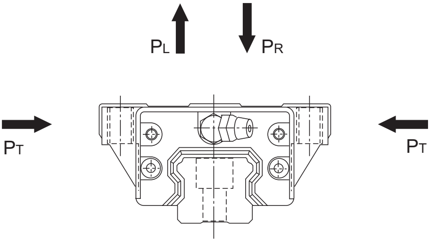


Fig.1

Equivalent Load

When the LM block of model SHS receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \; (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-327.

Error Allowance in the Parallelism between Two Rails

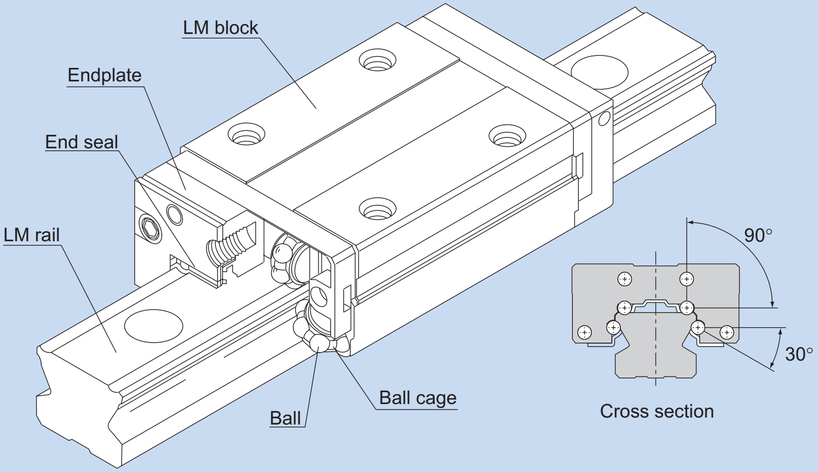
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

SSR

Caged Ball LM Guide
Radial Type Model SSR



* For the ball cage, see A-130.

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and ball cages and endplates incorporated in the LM block allow the balls to circulate.
Use of the ball cage eliminates friction between balls and increases grease retention, thus to achieve low noise, high speed and long-term maintenance-free operation.

[Compact, Radial Type]
The compact design with a low sectional height and the ball contact structure at 90° make SSR an optimal model for horizontal guides.

[Superb Planar Running Accuracy]
Use of a ball contact structure at 90° in the radial direction reduces displacement in the radial direction under a radial load and achieves highly accurate, smooth straight motion.

[Self-adjustment Capability]
The self-adjustment capability through front-to-front configuration of THK's unique circular-arc grooves (DF set) enables a mounting error to be absorbed even under a preload, thus to achieve highly accurate, smooth straight motion.

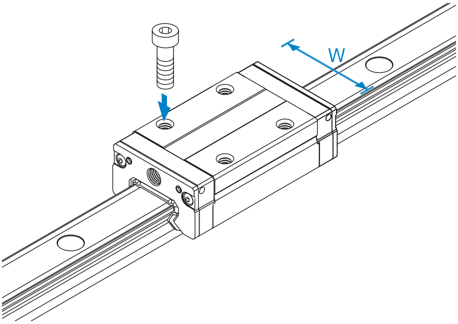
[Stainless Steel Type also Available as Standard]
A stainless steel type with its LM block, LM rail and balls all made of stainless steel, which is superbly corrosion resistant, is also available as standard.

Types and Features

Model SSR-XW

Specification Table⇒B-16

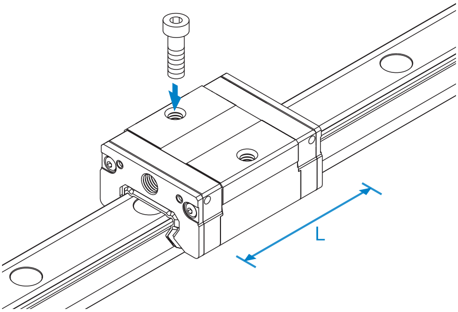
With this type, the LM block has a smaller width (W) and tapped holes.



Model SSR-XV

Specification Table⇒B-18

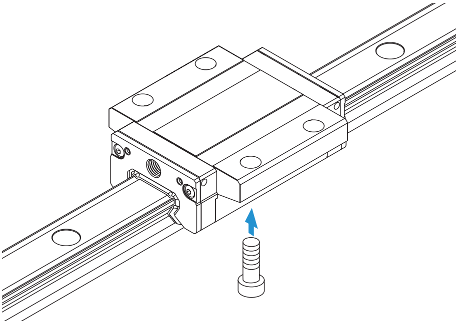
This type has the same cross-sectional shape as SSR-XW but has a shorter overall LM block length (L).



Model SSR-XTB

Specification Table⇒B-20

Since the LM block can be mounted from the bottom, this type is optimal for applications where through holes for mounting bolts cannot be drilled on the table.



Rated Loads in All Directions

Model SSR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

Its basic dynamic load rating is represented by the symbol in the radial direction indicated in Fig.1, and the actual value is provided in the specification table for SSR. The values in the reverse radial and lateral directions are obtained from Table1 below.

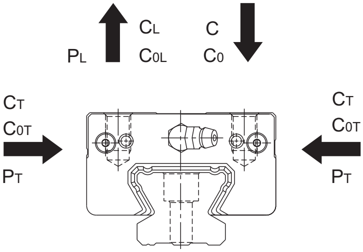


Fig.1

Table1 Rated Load of Model SSR in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	C_L=0.50C	C_{0L}=0.50C_0
Lateral directions	C_T=0.53C	C_{0T}=0.43C_0

Equivalent Load

When the LM block of model SSR receives a reverse radial direction and a lateral direction simultaneously, the equivalent load is obtained in the equation below.

$$P_E = X \cdot P_L + Y \cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model SSR

P_E	X	Y
Equivalent load in reverse radial direction	1	1.155
Equivalent load in lateral direction	0.866	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-330.

Error Allowance in the Parallelism between Two Rails

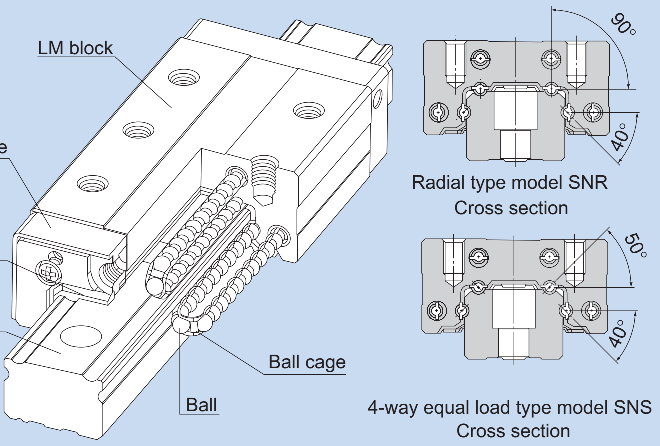
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

SNR/SNS

Caged Ball LM Guide
Ultra-heavy Load Type Models SNR/SNS



Radial type model SNR
Cross section

4-way equal load type model SNS
Cross section

* For the ball cage, see A-130.

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and ball cages and endplates incorporated in the LM block allow the balls to circulate. Use of the ball cage eliminates friction between balls and increases grease retention, thus to achieve low noise, high speed and long-term maintenance-free operation.

[High Rigidity]

Models SNR/SNS are the most rigid types among the Caged Ball LM Guide series.
Both the radial type SNR and the 4-way equal load type SNS are available for each size variation. Depending on the intended use, you can select either type.

[Ultra-heavy Load]

Since the curvature of the raceway is approximated to the ball diameter, the ball contact area under a load is increased and the LM Guide is capable of receiving an ultra-heavy load.

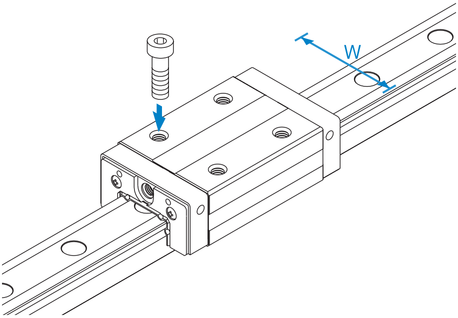
[Increased Damping Effect]

In rapid traverse where the LM block travels at high speed, no differential slip occurs and smooth motion is maintained, thus achieving highly accurate positioning. In heavy cutting where the LM block travels at low speed, favorable differential slip according to the cutting load occurs to increase frictional resistance, thus increasing the damping capacity.

Models SNR-R/SNS-R

Specification Table⇒B-26/B-28

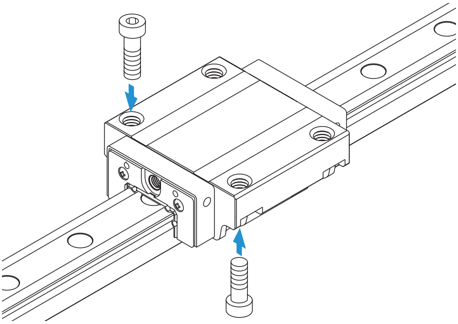
With this type, the LM block has a smaller width (W) and tapped holes.
Used in places where the space for table width is limited.



Models SNR-C/SNS-C

Specification Table⇒B-30/B-32

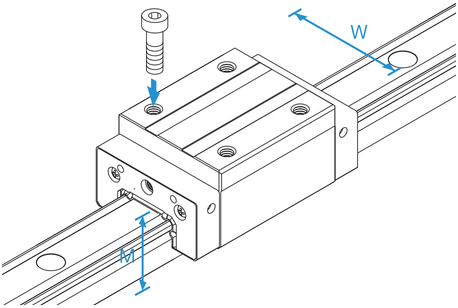
The flange of the LM block has tapped holes.
Can be mounted from the top or the bottom.
Used in places where the table cannot have through holes for mounting bolts.



Models SNR-RH/SNS-RH (Build to Order)

Specification Table⇒B-34/B-36

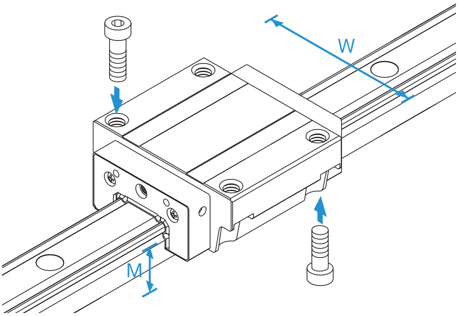
The dimensions are almost the same as that of LM Guide models SHS and HSR, and the LM block has tapped holes.



Models SNR-CH/SNS-CH (Build to Order)

Specification Table⇒B-38/B-40

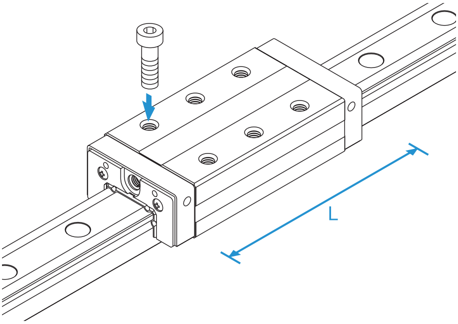
The dimensions are almost the same as that of LM Guide models SHS and HSR, and the flange of the LM block has tapped holes.



Models SNR-LR/SNS-LR

Specification Table⇒B-26/B-28

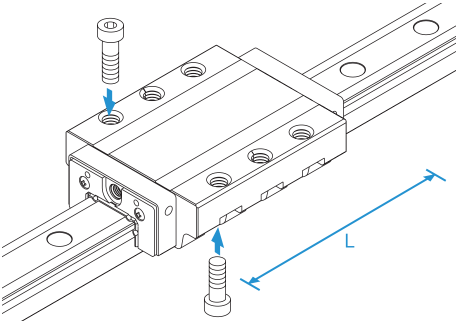
The LM block has the same cross-sectional shape as models SNR-R/SNS-R, but has a longer overall LM block length (L) and a greater rated load.



Models SNR-LC/SNS-LC

Specification Table⇒B-30/B-32

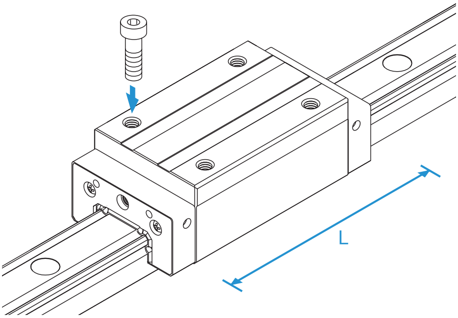
The LM block has the same cross-sectional shape as models SNR-C/SNS-C, but has a longer overall LM block length (L) and a greater rated load.



Models SNR-LRH/SNS-LRH (Build to Order)

Specification Table⇒B-34/B-36

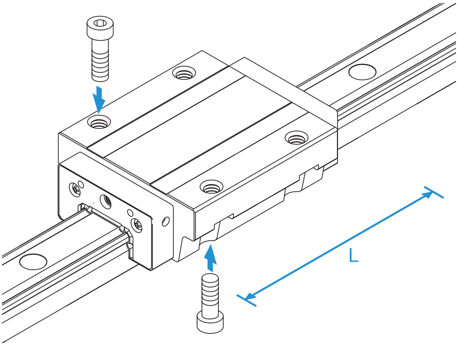
The LM block has the same cross-sectional shape as models SNR-RH/SNS-RH, but has a longer overall LM block length (L) and a greater rated load.



Models SNR-LCH/SNS-LCH (Build to Order)

Specification Table⇒B-38/B-40

The LM block has the same cross-sectional shape as models SNR-CH/SNS-CH, but has a longer overall LM block length (L) and a greater rated load.



Rated Loads in All Directions

Model SNR/SNS is capable of receiving loads in four directions: radial, reverse radial and lateral directions. Their basic dynamic load ratings are represented by the symbols in the radial direction indicated in Fig.1, and the actual values are provided in the specification tables for SNR/SNS. The values in the reverse radial and lateral directions are obtained from Table1 and Table2 below.

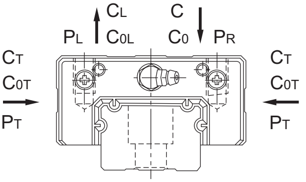


Fig.1

Table1 Basic Load Ratings of Model SNR in All Directions

Direction	SNR	
	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.64C$	$C_{0L}=0.64C_0$
Lateral directions	$C_T=0.47C$	$C_{0T}=0.38C_0$

Table2 Basic Load Ratings of Model SNS in All Directions

Direction	SNS	
	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.84C$	$C_{0L}=0.84C_0$
Lateral directions	$C_T=0.84C$	$C_{0T}=0.84C_0$

Equivalent Load

When the LM block of model SNR receives a reverse radial load and a lateral load simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X\cdot P_L + Y\cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table3)

Table3 Equivalent Factor of Model SNR

P_E	X	Y
Equivalent load in reverse radial direction	1	1.678
Equivalent load in lateral direction	0.596	1

When the LM block of model SNS receives a radial load and a lateral load, or a reverse radial load and a lateral load, simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X\cdot P_R\ (P_L) + Y\cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor
(see Table4 and Table5)

Table4 Equivalent Factor of Model SNS
(When radial and lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	0.935
Equivalent load in lateral direction	1.07	1

Table5 Equivalent Factor of Model SNS
(When reverse radial load and lateral load are applied)

P_E	X	Y
Equivalent load in reverse radial direction	1	1.02
Equivalent load in lateral direction	0.986	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-327.

Error Allowance in the Parallelism between Two Rails

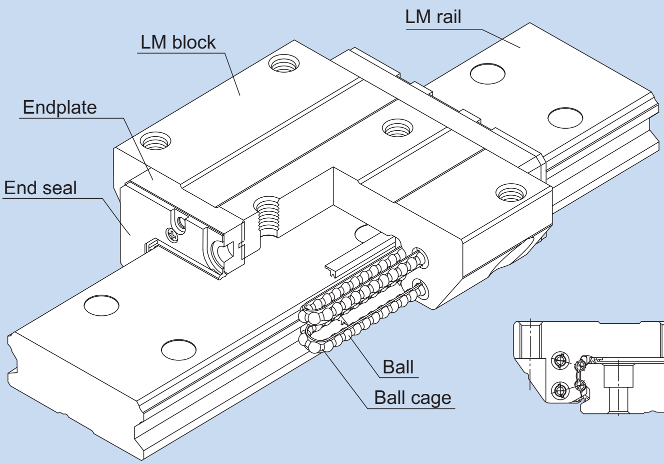
For details, A-333 and A-334.

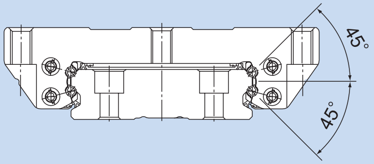
Error Allowance in Vertical Level between Two Rails

For details, A-336 and A-337.

SHW

Caged Ball LM Guide
Wide Rail Model SHW





* For the ball cage, see A-130.

Structure and Features

A wide and highly rigid LM Guide that uses ball cages to achieve low noise, long-term maintenance-free operation and high speed.

[Wide, Low Center of Gravity]

Model SHW, which has a wide LM rail and a low center of gravity, is optimal for locations requiring space saving and large M_C moment rigidity.

[4-way Equal Load]

Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations and in extensive applications.

[Self-adjustment Capability]

The self-adjustment capability through front-to-front configuration of THK's unique circular-arc grooves (DF set) enables a mounting error to be absorbed even under a preload, thus to achieve highly accurate, smooth straight motion.

[Low Dust Generation]

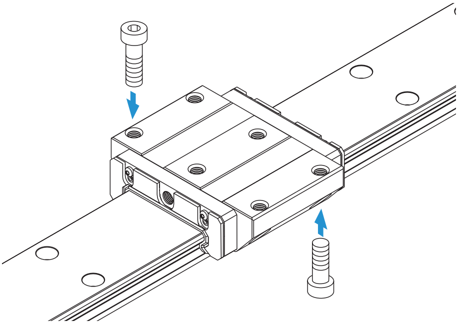
Use of ball cages eliminates friction between balls and retains lubricant, thus achieving low dust generation.

Types and Features

Model SHW-CA

Specification Table⇒B-44

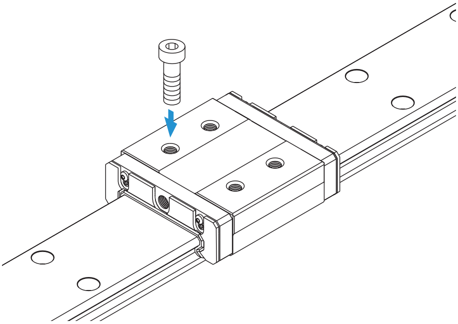
The flange of the LM block has tapped holes.
Can be mounted from the top or the bottom.



Model SHW-CR

Specification Table⇒B-46

The LM block has tapped holes.



Rated Loads in All Directions

Model SHW is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for SHW.

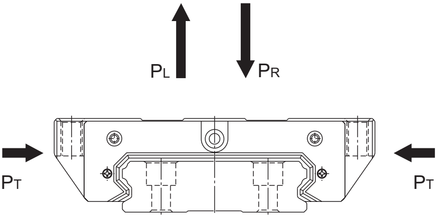


Fig.1

Equivalent Load

When the LM block of model SHW receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-330.

Error Allowance in the Parallelism between Two Rails

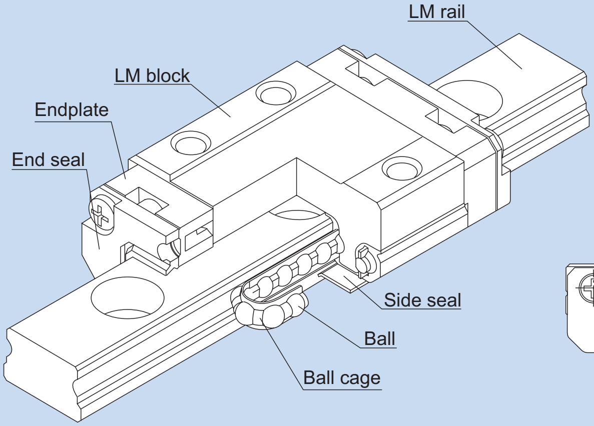
For details,see A-334.

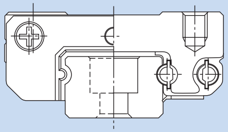
Error Allowance in Vertical Level between Two Rails

For details,see A-337.

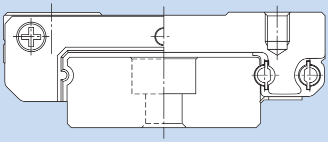
SRS

Caged Ball LM Guide
Miniature Type Model SRS





Compact type
Model SRS-M



Wide type
Model SRS-WM

* For the ball cage, see A-130.

Structure and Features

Caged Ball LM Guide model SRS has a structure where two raceways are incorporated into the compact body, enabling the model to receive loads in all directions, and to be used in locations where a moment is applied with a single rail. In addition, use of ball cages eliminates friction between balls, thus achieving high speed, low noise, acceptable running sound, long service life, and long-term maintenance-free operation.

[Low Dust Generation]

Use of ball cages eliminates friction between balls and retains lubricant, thus achieving low dust generation. In addition, the LM block and LM rail use stainless steel, which is highly resistant to corrosion.

[4-way Equal Load Type]

Since the right and left rows of balls under a load contact the raceway at 45°, this LM Guide is capable of receiving loads in the radial, reverse radial and lateral directions at equal values and being used in any orientations. With this well-balanced structure, this model can be used in extensive applications.

[Compact]

Since SRS has a compact structure where the rail cross section is designed to be low and that contains only two rows of balls, it can be installed in space-saving locations.

[Lightweight]

Since part of the LM block (e.g., around the ball relief hole) is made of resin and formed through insert molding, SRS is a lightweight, low inertia type of LM Guide.

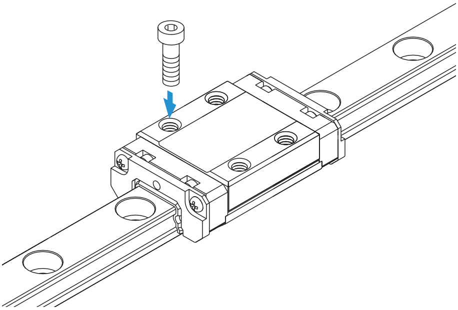
Types and Features

Model SRS-M

Specification Table⇒B-50

A standard type of SRS.

Note) In addition to model SRS-M, a full-ball type without ball cage is also available.If desiring this type, indicate type "SRS-G" when placing an order.However, since SRS-G does not have a ball cage, its dynamic load rating is smaller than SRS-M. See the table of basic load ratings for SRS-G on B-51 for details.

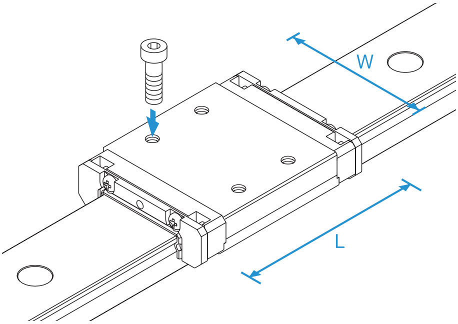


Model SRS-WM

Specification Table⇒B-52

Has a longer overall LM block length (L), a greater width and a larger rated load and permissible moment than SRS-M.

Note) In addition to model SRS-WM, a full-ball type without ball cage is also available.If desiring this type, indicate type "SRS-G" when placing an order.However, since SRS-G does not have a ball cage, its dynamic load rating is smaller than SRS-WM. See the table of basic load ratings for SRS-G on B-53 for details.



Rated Loads in All Directions

Model SRS is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
Their basic dynamic load ratings are represented by the symbols in the radial direction indicated in Fig.1, and the actual values are provided in the specification table for SRS. The values in the reverse radial and lateral directions are obtained from Table1 below.

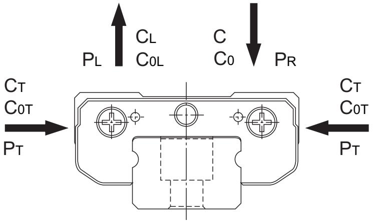


Fig.1

Table1 Rated Loads of Model SRS in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=C$	$C_{0L}=C_0$
Lateral directions (7M/7WM/9M/9WM/20M)	$C_T=1.19C$	$C_{0T}=1.19C_0$
Lateral directions (12M/12WM/15M/15WM/25M)	$C_T=C$	$C_{0T}=C_0$

Equivalent Load

When the LM block of model SRS receives a reverse radial load and a lateral load simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_R\,(P_L) + Y \cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model SRS

Equivalent Load P_E	Model No.	X	Y
Radial and reverse radial direction	7M/7WM/9M/9WM/20M	1	0.839
	12M/12WM/15M/15WM/25M	1	1
Lateral directions	7M/7WM/9M/9WM/20M	1.192	1
	12M/12WM/15M/15WM/25M	1	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

For details,see A-126.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-332.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

Flatness of the LM Rail and the LM Block Mounting Surface

The values in Table3 apply when the clearance is a normal clearance. If the clearance is C1 clearance and two rails are used in combination, we recommend using 50% or less of the value in the table.

Note) Since SRS has Gothic-arch grooves, any accuracy error in the mounting surface may negatively affect the operation. Therefore, we recommend using SRS on a highly accurate mounting surface.

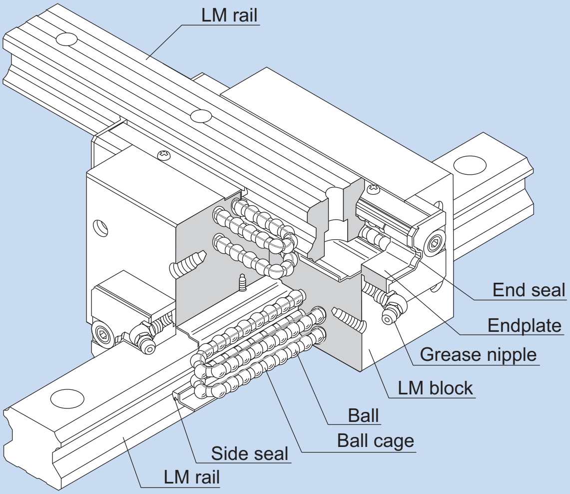
Table3 Flatness of the LM Rail and the LM Block Mounting Surface

Unit: mm

Model No.	Flatness error
SRS 7M	0.025/200
SRS 7WM	0.025/200
SRS 9M	0.035/200
SRS 9WM	0.035/200
SRS 12M	0.050/200
SRS 12WM	0.050/200
SRS 15M	0.060/200
SRS 15WM	0.060/200
SRS 20M	0.070/200
SRS 25M	0.070/200

SCR

Caged Ball LM Guide
Cross LM Guide Model SCR



* For the ball cage, see A-130.

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and ball cages and endplates incorporated in the LM block allow the balls to circulate.
This model is an integral type of Caged Ball LM Guide that squares an internal structure similar to model SHS, which has a proven track record and is highly reliable, with another and uses two LM rails in combination. Since an orthogonal LM system can be achieved with model SCR alone, a conventionally required saddle is no longer necessary, the structure for X-Y motion can be simplified and the whole system can be downsized.

[4-way Equal Load]
Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations and in extensive applications.

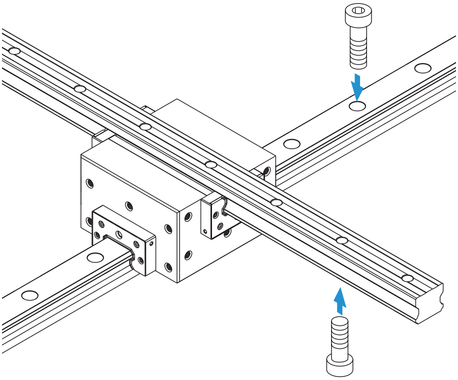
[High Rigidity]
Since balls are arranged in four rows in a well-balanced manner, this model is stiff against a moment, and smooth straight motion is ensured even a preload is applied to increase the rigidity.
Since the rigidity of the LM block is higher than that of a combination of two LM blocks of the conventional type secured together back-to-back with bolts, this model is optimal for building an X-Y table that requires a high rigidity.

[Compact]
This model is an integral type of Caged Ball LM Guide that squares an internal structure similar to model SHS, which has a proven track record and is highly reliable, with another and uses two LM rails in combination. Since an orthogonal LM Guide can be achieved with model SCR alone, a conventionally required saddle is no longer necessary, the structure for X-Y motion can be simplified and the whole system can be downsized.

Model SCR

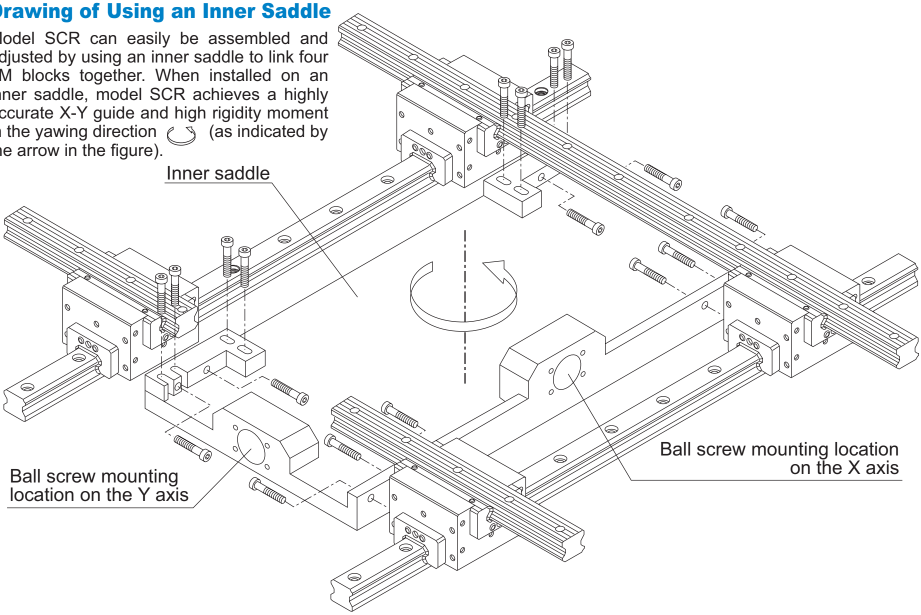
Specification Table⇒B-56

This model is a standard type.



Drawing of Using an Inner Saddle

Model SCR can easily be assembled and adjusted by using an inner saddle to link four LM blocks together. When installed on an inner saddle, model SCR achieves a highly accurate X-Y guide and high rigidity moment in the yawing direction ↺ (as indicated by the arrow in the figure).



Rated Loads in All Directions

Model SCR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are defined with a LM rail and a LM block, and uniform in the four directions (radial, reverse radial and lateral directions). Their actual values are provided in the specification table for SCR.

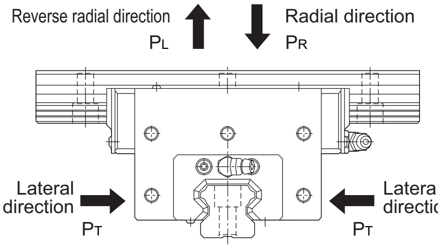


Fig.1

Equivalent Load

When the LM block of model SCR receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

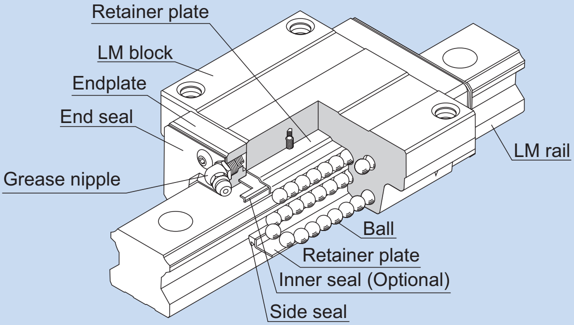
For details,see A-122.

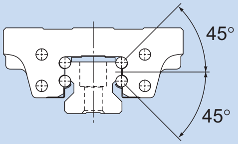
Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-327.

HSR

LM Guide
Global Standard Size Model HSR





Cross section

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Since retainer plates hold the balls, they do not fall off even if the LM rail is pulled out (except models HSR 8, 10 and 12).
Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations. In addition, the LM block can receive a well-balanced preload, increasing the rigidity in the four directions while maintaining a constant, low friction coefficient. With the low sectional height and the high rigidity design of the LM block, this model achieves highly accurate and stable straight motion.

[4-way Equal Load Type]

Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations and in extensive applications.

[High Rigidity Type]

Since balls are arranged in four rows in a well-balanced manner, a large preload can be applied and the rigidity in four directions can easily be increased.

[Self-adjustment Capability]

The self-adjustment capability through front-to-front configuration of THK's unique circular-arc grooves (DF set) enables a mounting error to be absorbed even under a preload, thus to achieve highly accurate, smooth straight motion.

[High Durability]

Even under a preload or excessive biased load, differential slip of balls does not occur. As a result, smooth motion, high wear resistance, and long-term maintenance of accuracy are achieved.

[Stainless Steel Type also Available]

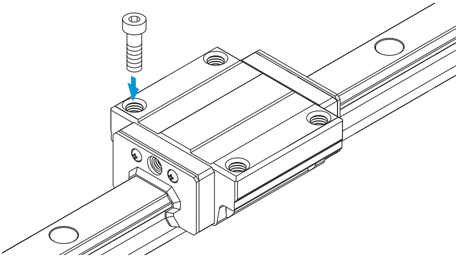
A special type which LM block, LM rail and balls are made of stainless steel is also available.

Types

Model HSR-A

Specification Table⇒B-62

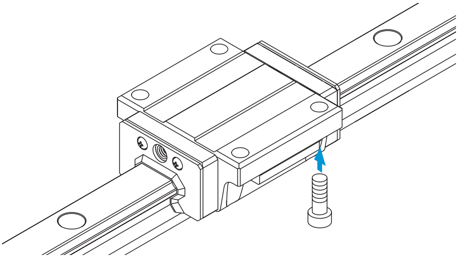
The flange of its LM block has tapped holes.



Model HSR-B

Specification Table⇒B-64

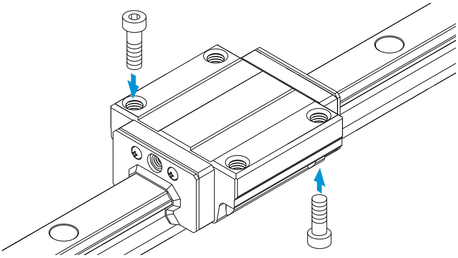
The flange of the LM block has through holes. Used in places where the table cannot have through holes for mounting bolts.



Model HSR-R Grade Ct

Specification Table⇒B-66

The flange of its LM block has tapped holes. Can be mounted from the top or the bottom.

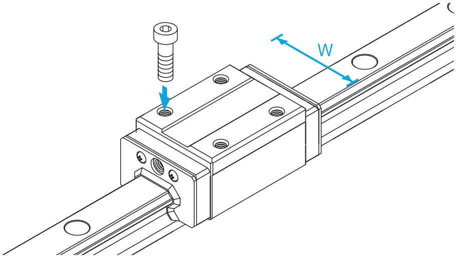


Model HSR-R

Specification Table⇒B-70

Having a smaller LM block width (W) and tapped holes, this model is optimal for compact design.

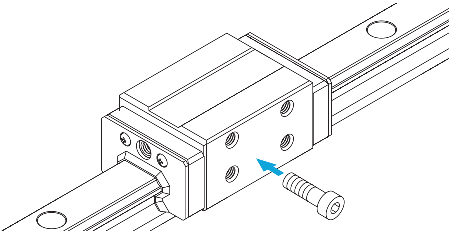
Low-priced LM rails and LM blocks are individually stocked. We also have Ct grade model HSR-R available with a short delivery time.



Model HSR-YR

Specification Table⇒B-74

When using two units of LM Guide facing each other, the previous model required much time in machining the table and had difficulty achieving the desired accuracy and adjusting the clearance. Since model HSR-YR has tapped holes on the side of the LM block, a simpler structure is gained and reduced man-hour and increase in accuracy can be achieved.



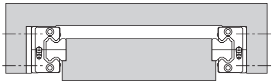


Fig.1 Conventional Structure

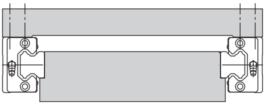
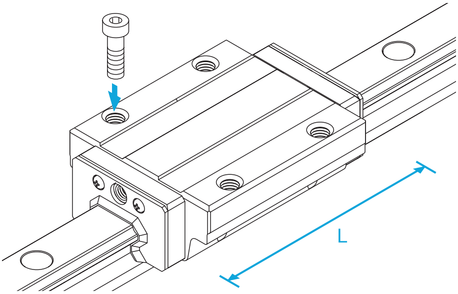


Fig.2 Mounting Structure for Model HSR-YR

Model HSR-LA

Specification Table⇒B-62

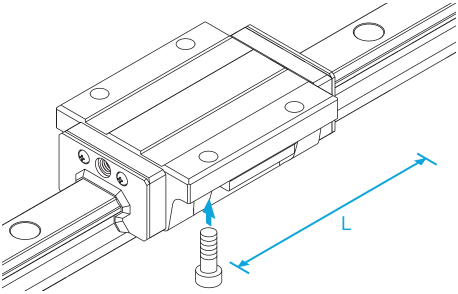
The LM block has the same cross-sectional shape as model HSR-A, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-LB

Specification Table⇒B-64

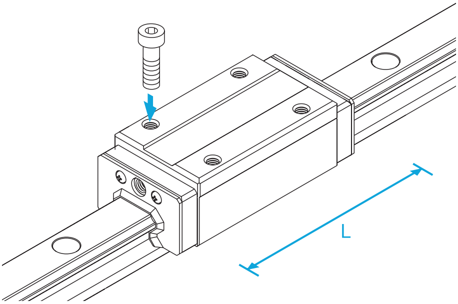
The LM block has the same cross-sectional shape as model HSR-B, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-LR

Specification Table⇒B-70

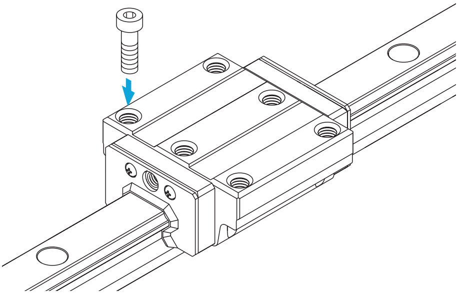
The LM block has the same cross-sectional shape as model HSR-R, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-CA

Specification Table⇒B-76

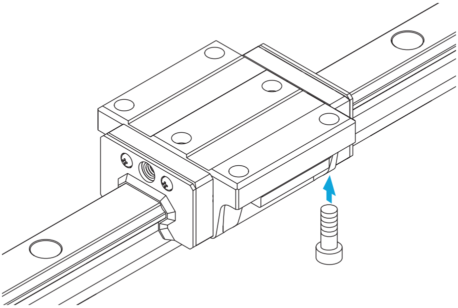
Has six tapped holes on the LM block.



Model HSR-CB

Specification Table⇒B-78

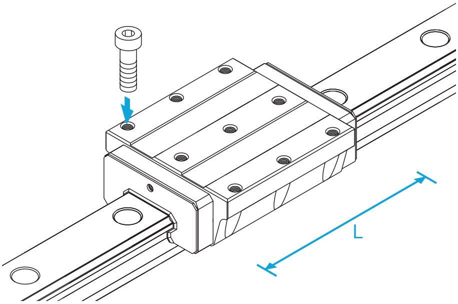
The LM block has six through holes. Used in places where the table cannot have through holes for mounting bolts.



Model HSR-HA

Specification Table⇒B-76

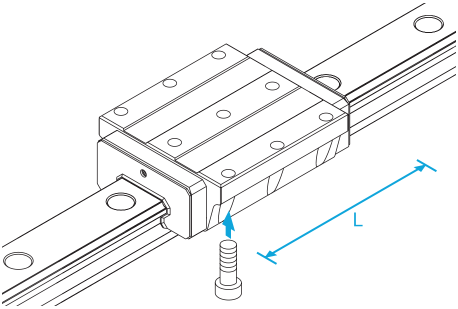
The LM block has the same cross-sectional shape as model HSR-CA, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-HB

Specification Table⇒B-78

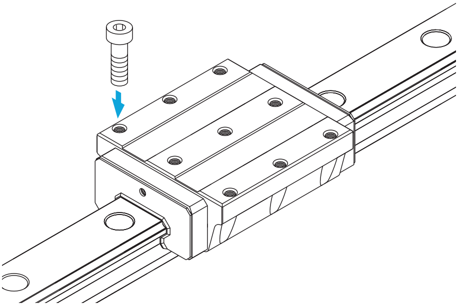
The LM block has the same cross sectional shape as model HSR-CB, but has a longer overall LM block length (L) and a greater rated load.



Models HSR 100/120/150 HA/HB/HR

Specification Table⇒B-80

Large types of model HSR that can be used in large-scale machine tools and building structures.



Rated Loads in All Directions

The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for HSR.

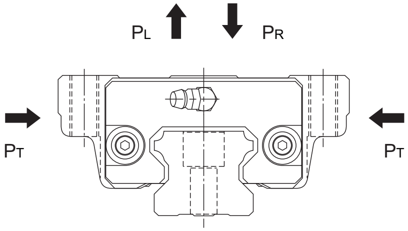


Fig.3 Model HSR

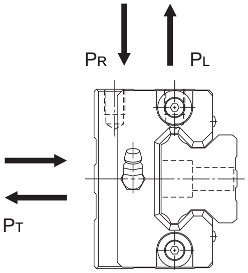


Fig.4 Model HSR-YR

Equivalent Load

When the LM block of model HSR receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-328.

Error Allowance in the Parallelism between Two Rails

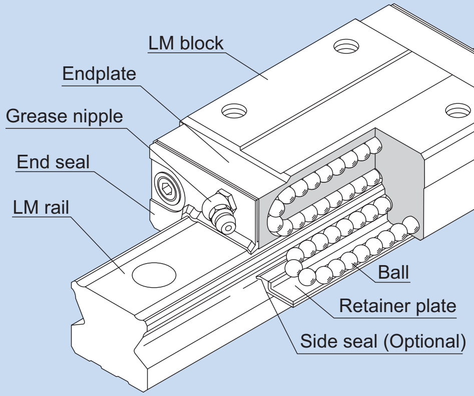
For details,see A-333.

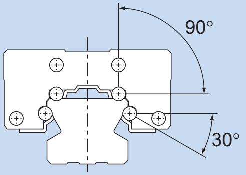
Error Allowance in Vertical Level between Two Rails

For details,see A-336.

SR

LM Guide
Radial Type Model SR





Cross section

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since a retainer plate holds the balls, they will not fall off even if the LM block is removed from the LM rail. With the low sectional height and the high rigidity design of the LM block, this model achieves highly accurate and stable straight motion.

[Compact, Heavy Load]

Since it is a compact designed model that has a low sectional height and a ball contact structure rigid in the radial direction, this model is optimal for horizontal guide units.

[Mounting accuracy can easily be achieved]

Since this model is a self-adjusting type capable of easily absorbing an accuracy error in parallelism and level between two rails, highly accurate and smooth motion can be achieved.

[Low Noise]

The endplate installed at each end of the LM block is designed to ensure the smooth and low-noise circulation of the balls at the turning areas.

[High Durability]

Even under a preload or excessive biased load, differential slip of balls is minimal. As a result, high wear resistance and long-term maintenance of accuracy are achieved.

[Stainless Steel Type also Available]

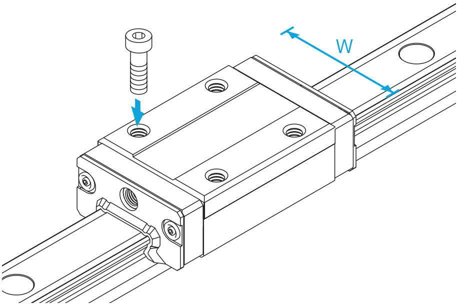
A special type which LM block, LM rail and balls are made of stainless steel is also available.

Types and Features

Model SR-W

Specification Table⇒B-86

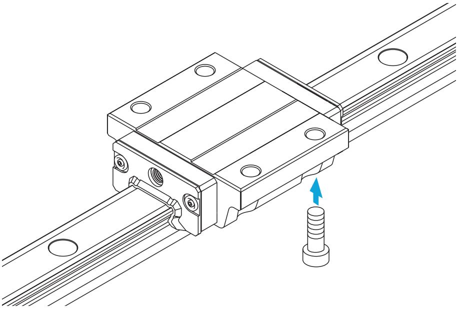
With this type, the LM block has a smaller width (W) and tapped holes.



Model SR-TB

Specification Table⇒B-88

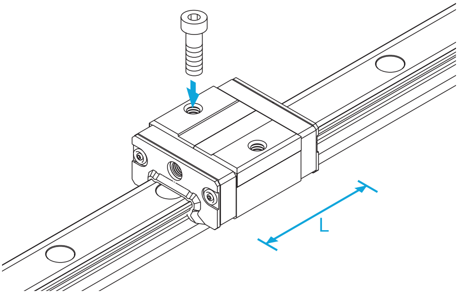
The LM block has the same height as model SR-W and can be mounted from the bottom.



Model SR-V

Specification Table⇒B-86

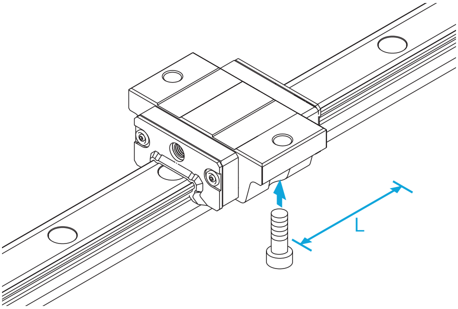
A space-saving type whose LM block has the same cross-sectional shape as model SR-W, but has a smaller overall LM block length (L).



Model SR-SB

Specification Table⇒B-88

A space-saving type whose LM block has the same cross-sectional shape as model SR-TB, but has a smaller overall LM block length (L).



Characteristics of Model SR

When compared to models having a contact angle of 45°, model SR shows excellent characteristics as indicated below. Using these characteristics, you can design and manufacture highly accurate and highly rigid machines or equipment.

Difference in Rated Load and Service Life

Since SR has a contact angle of 90°, its rated load and service life are different from those with a contact angle of 45°. When comparing model SR with a model that has a contact angle of 45° and when the same radial load is applied to the two models with the same ball diameter as shown in the figure below, the load applied to SR is 70% of the other model. As a result, the service life of SR is more than twice that of the other model.

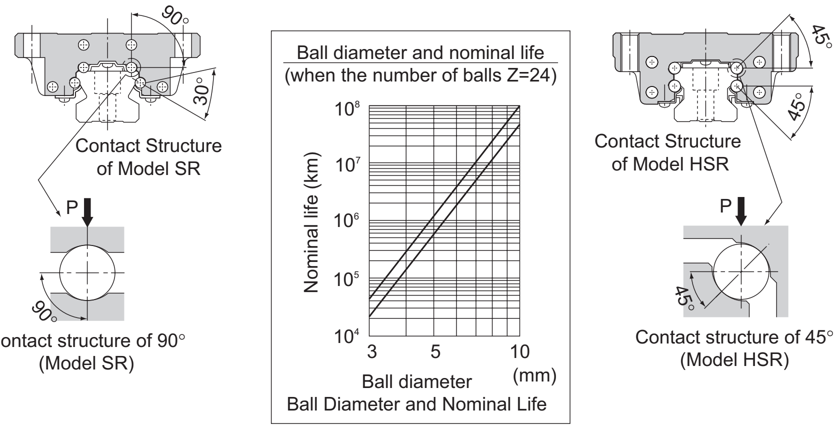


Fig.1

Difference in Accuracy

If a machining error (grinding error) occurs in the LM rail or LM block, it will affect the running accuracy. Assuming that there is a machining error of Δ on the raceway, it results in an error in the radial direction, and the error with the contact angle of 45° (model HSR) is 1.4 times greater than that of the contact angle of 90° (model SR). As for the machining error resulting in horizontal direction error, the error with the contact angle of 45° is 1.22 times greater than the contact angle of 30° .

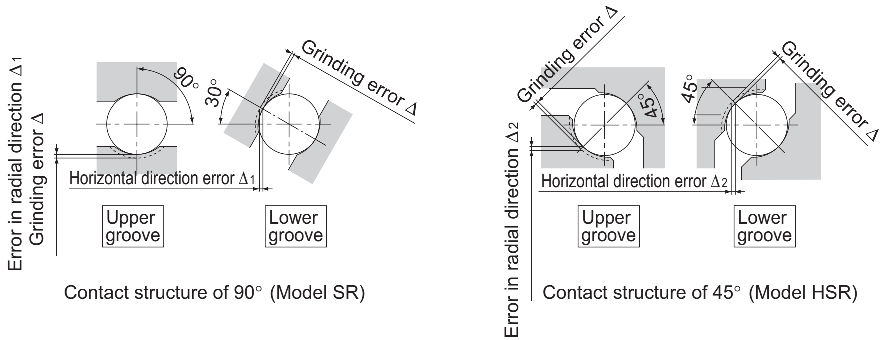


Fig.2 Machining Error and Accuracy

Difference in Rigidity

The 90° contact angle adopted by model SR has a difference with the 45° contact angle also in rigidity.
When the same radial load "P" is applied, the displacement in the radial direction with model SR is only 56% of that with the contact angle of 45°. Accordingly, where high rigidity in the radial direction is required, model SR is more advantageous. The figure below shows the difference in radial load and displacement.

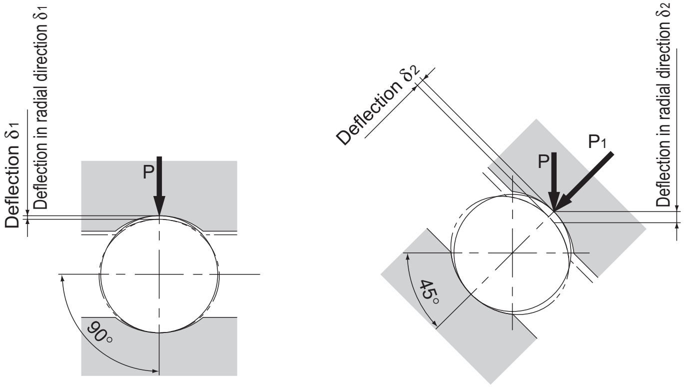


Fig.3 Deflection under a Radial Load

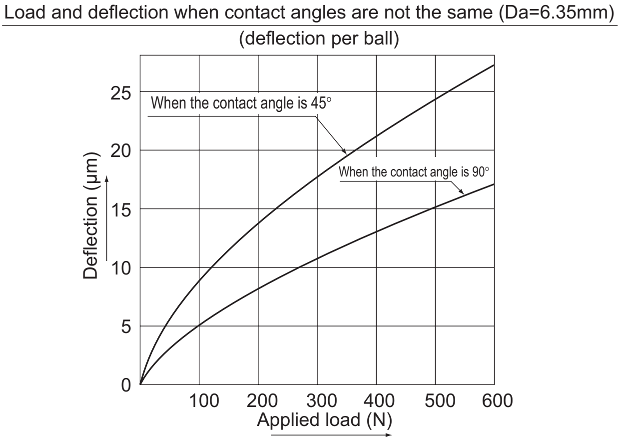


Fig.4 Radial Load and Deflection

Conclusion

As suggested above, model SR, which has a contact angle of 90° in the radial direction, is optimal for locations where the radial load is large, high rigidity is required or high running accuracy in the vertical and horizontal directions is required.
However, if the reverse radial load, the lateral load or the moment is large, we recommend model HSR, which has a contact angle of 45° (4-way equal load).

Rated Loads in All Directions

Model SR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings indicate the values in the radial directions in Fig.5, and their actual values are provided in the specification table for SR. The values in the reverse radial and lateral directions are obtained from Table1 below.

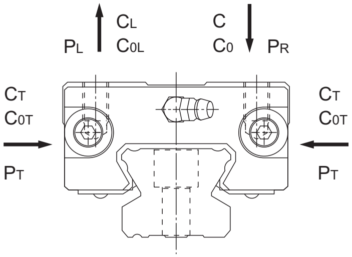


Fig.5

Table1 Rated Loads in All Directions with Model SR

Model No.	Direction	Basic dynamic load rating	Basic static load rating
SR 15 to 70	Radial direction	C	C_0
	Reverse radial direction	$C_L=0.62C$	$C_{0L}=0.50C_0$
	Lateral directions	$C_T=0.56C$	$C_{0T}=0.43C_0$
SR 85 to 150	Radial direction	C	C_0
	Reverse radial direction	$C_L=0.78C$	$C_{0L}=0.71C_0$
	Lateral directions	$C_T=0.48C$	$C_{0T}=0.35C_0$

Equivalent Load

When the LM block of model SR receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_L + Y \cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model SR

Model No.	P_E	X	Y
SR 15 to 70	Equivalent load in reverse radial direction	1	1.155
	Equivalent load in lateral direction	0.866	1
SR 85 to 150	Equivalent load in reverse radial direction	1	2
	Equivalent load in lateral direction	0.5	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-326.

Error Allowance in the Parallelism between Two Rails

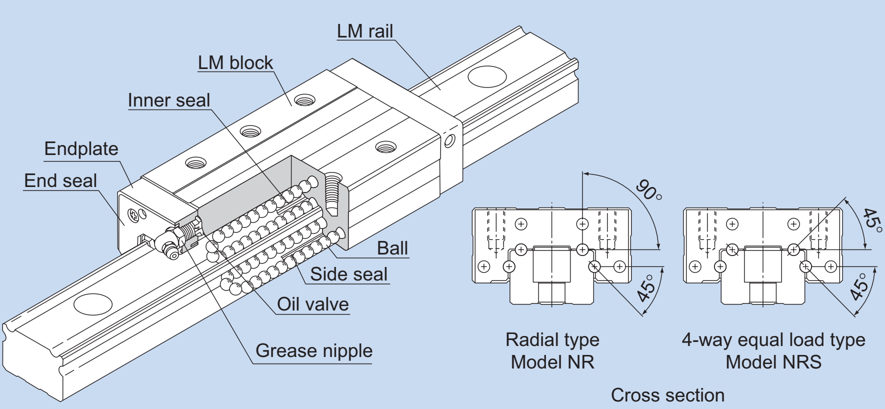
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

NR/NRS

LM Guide
Ultra-heavy Load Type Models NR/NRS



Cross section

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. The raceways are cut into deep grooves that have a radius closer to that of the balls than in the conventional design, using special equipment and an extremely precise cutting technique. This design allows high rigidity, high vibration/impact resistance and high damping capacity, all of which are required for machine tools, thus making these models capable of bearing ultra-heavy loads.

[Improved Damping Capacity]

While the machine tool (equipped with NR or NRS) is not cutting a workpiece during operation, the LM Guide travels normally and smoothly. While the machine tool is cutting the workpiece, the cutting force is applied to the LM Guide to increase and the contact area between the balls and the raceway, allowing an appropriate mixture of rolling and sliding motions to be achieved. Accordingly, the friction resistance is increased and the damping capacity is improved.

Since the absolute slip during the rolling and sliding motion is insignificant, it causes little wear and does not affect the service life.

[Highly Rational LM Guide]

The excessively large differential slip occurring in a Gothic-arch groove does not happen with these models. They smoothly travel and achieve high positioning accuracy during fast feeding. During the cutting operation, appropriate slip occurs according to the cutting load, the rolling resistance is increased and the damping capacity is increased. Thus, models NR and NRS are highly rational LM Guides.

[High Rigidity]

To increase the rigidity of the LM block and the LM rail, which may deteriorate the overall rigidity of the LM Guide in the reverse radial and lateral directions, THK made full use of FEM to achieve optimal design within the limited dimensional range.

For both the radial type model NR and the 4-way equal load type model NRS, THK offers two types with the same dimensions and different characteristics. It allows you to select the desired type according to the application.

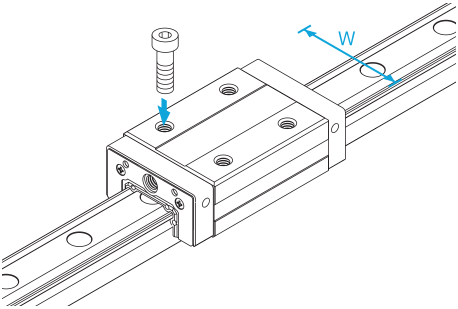
[Ultra-heavy Load]

Since the curvature of the raceway is approximated to the ball diameter, the ball contact area under a load is increased and the LM Guide is capable of receiving an ultra-heavy load.

Models NR-R/NRS-R

Specification Table⇒B-94/B-96

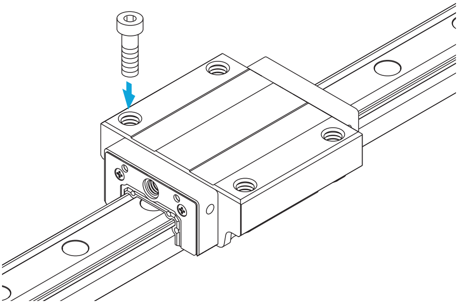
With this type, the LM block has a smaller width (W) and tapped holes. Used in places where the space for table width is limited.



Models NR-A/NRS-A

Specification Table⇒B-98/B-100

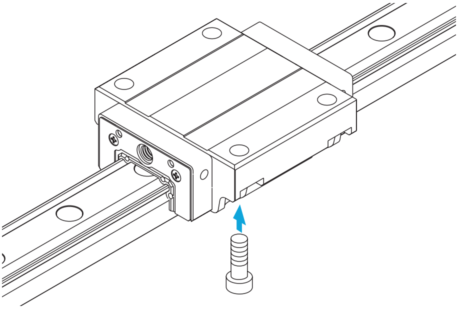
The flange of its LM block has tapped holes.



Models NR-B/NRS-B

Specification Table⇒B-102/B-104

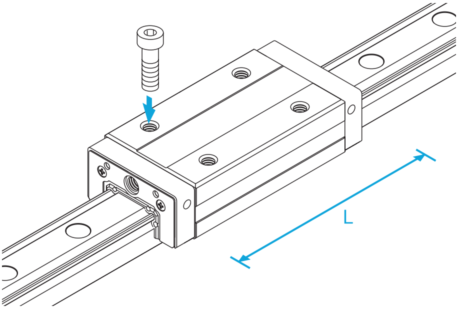
The flange of the LM block has through holes. Used in places where the table cannot have through holes for mounting bolts.



Models NR-LR/NRS-LR

Specification Table⇒B-94/B-96

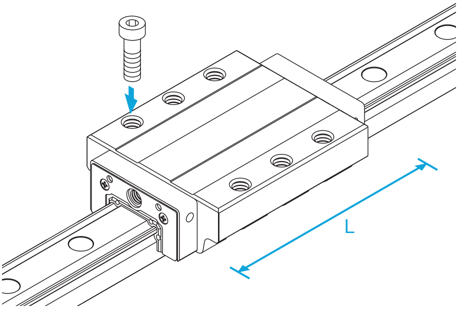
The LM block has the same cross-sectional shape as models NR-R/NRS-R, but has a longer overall LM block length (L) and a greater rated load.



Models NR-LA/NRS-LA

Specification Table⇒B-98/B-100

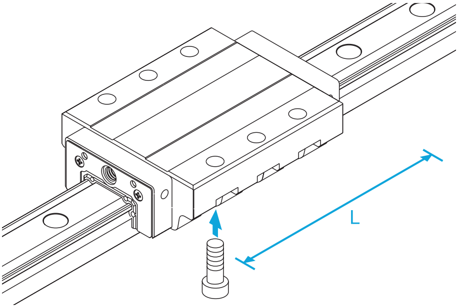
The LM block has the same cross-sectional shape as models NR-A/NRS-A, but has a longer overall LM block length (L) and a greater rated load.



Models NR-LB/NRS-LB

Specification Table⇒B-102/B-104

The LM block has the same cross-sectional shape as models NR-B/NRS-B, but has a longer overall LM block length (L) and a greater rated load.



Characteristics of Models NR and NRS

[Increased Rigidity in Major Load Directions]

The structure with a contact angle of 90° used in model NR differs from that with a 45° contact angle also in rigidity. Under the same radial load P, the displacement in the radial direction with model NR having a contact angle of 90° is 44% less than the 45°.

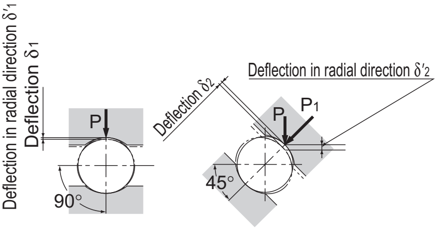
Fig.2 shows the difference in radial load and displacement. Accordingly, where high rigidity in the radial direction is required, model NR is more advantageous.

[Increased Rigidity in the Lateral and Reverse-radial Directions]

Since with LM Guide model NR, the distance "H" between the rail bottom and the lower-groove balls (balls receiving lateral loads) is short, the ratio between the rail width "W" and the distance "H" is small, and the distance "T" between the LM rail mounting bolt seat and the LM rail bottom is short. Accordingly, the deformation of the LM rail under a lateral load is minimal, and the rigidity in the lateral directions is increased.

Since the dimension "B" of the LM block is short and the thickness "A" is large, the lateral extension of the LM block under a reverse radial or lateral load is minimized. This structure allows the rigidity in the reverse radial direction to be increased.

In comparison to the old model with the same model number, the ball diameter of NR is smaller and the number of effective balls is approximately 1.3 times greater, thus increasing the static rigidity.



Contact structure of 90° (Model NR)

Contact structure of 45°

Fig.1 Deflection under a Radial Load

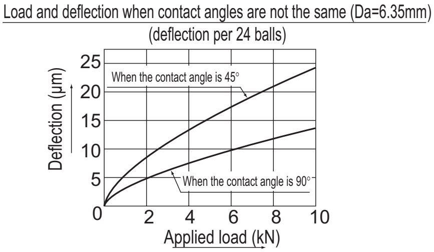
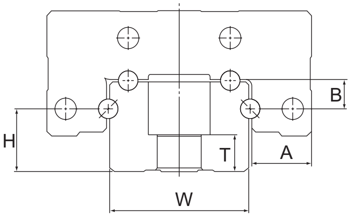


Fig.2 Radial Load and Deflection (normal clearance, no preload)



Radial type structure

Fig.3 Cross Section of Model NR

[Comparison of Contact Surface and Internal Stress between Different Contact Structures]

As shown in Fig.4, the contact area and the internal stress of a ball greatly vary depending on the shape of contact surface.

With the conventional roller guide, the effective length is shorter than the apparent value due to the retention of the rollers. Additionally, the change of stress distribution in the contact section caused by a mounting error significantly affects the differential slip.

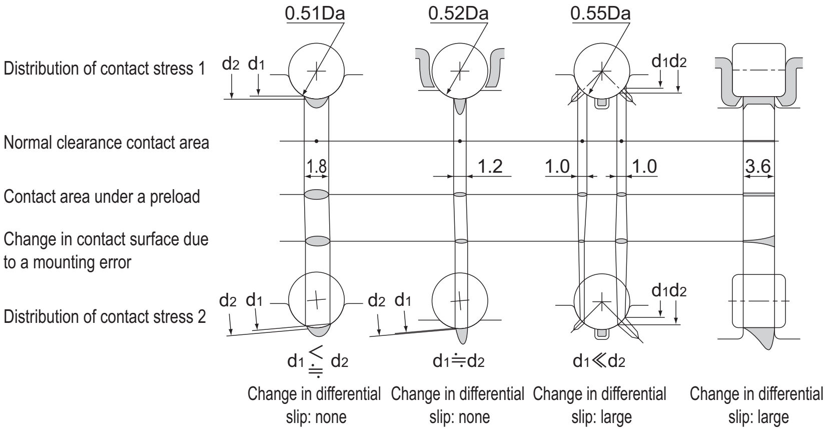


Fig.4 Comparison of Contact Surface (ϕ 6.350 ball, ϕ 6 x 6ℓ roller)

Rated Loads in All Directions

Models NR/NRS are capable of receiving loads in all four directions: radial, reverse radial and lateral directions.

The basic load ratings of model NR are indicated by the values in the radial directions in Fig.5, and their actual values are provided in the specification table for NR/NRS. The values in the reverse radial and lateral directions are obtained from table 1 below.

The basic load ratings of model NRS are equal in all the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for NR/NRS.

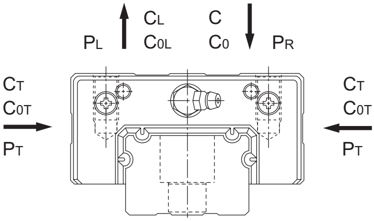


Fig.5

Table1 Rated Loads in All Directions with Model NR

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.78C$	$C_{0L}=0.71C_0$
Lateral directions	$C_T=0.48C$	$C_{0T}=0.45C_0$

Equivalent Load

When the LM block of model NR receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_L + Y \cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model NR

P_E	X	Y
Equivalent load in reverse radial direction	1	2
Equivalent load in lateral direction	0.5	1

When the LM block of model NRS receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-113.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-327.

Error Allowance in the Parallelism between Two Rails

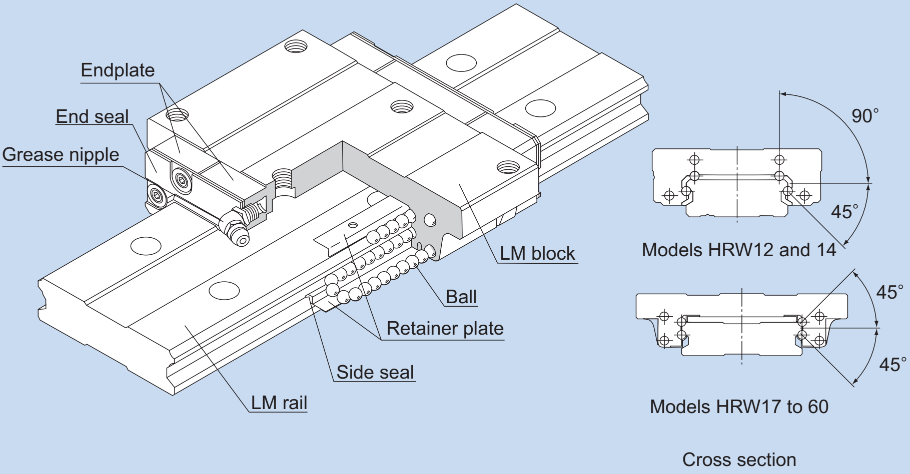
For details, A-333 and A-334.

Error Allowance in Vertical Level between Two Rails

For details, A-336 and A-337.

HRW

LM Guide
Wide Rail Model HRW



Cross section

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Since retainer plates hold the balls, they do not fall off even if the LM rail is pulled out. (except models HRW 12 and 14LR).
Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations. In addition, the LM block can receive a well-balanced preload, increasing the rigidity in four directions while maintaining a constant, low friction coefficient. In a low center of gravity structure with a large rail width and a low overall height, this model can be used in places where space saving is required or high rigidity against a moment is required even in a single axis configuration.

[Compact, Heavy Load]

Since the number of effective balls is large, this model is highly rigid in all directions. It can adequately receive a moment even in a single rail configuration.
Additionally, since the second moment of inertia of the rail is large, the rigidity in the lateral directions is also high. Accordingly, it does not need reinforcement such as a side support.

[Self-adjustment Capability]

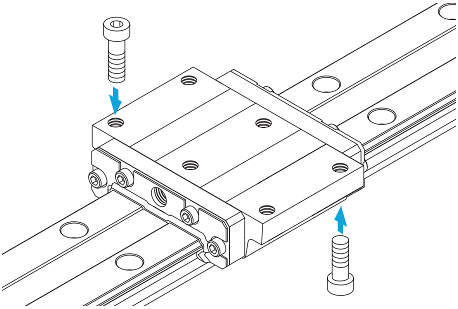
The self-adjustment capability through front-to-front configuration of THK's unique circular-arc grooves (DF set) enables a mounting error to be absorbed even under a preload, thus to achieve highly accurate, smooth straight motion.

Types and Features

Model HRW-CA

Specification Table⇒B-108

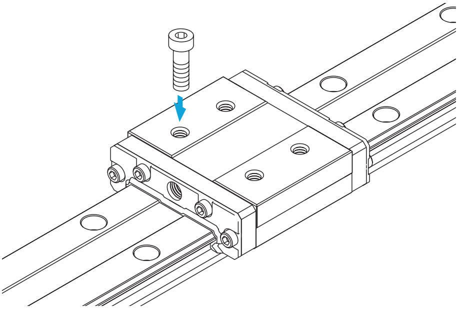
The flange of this LM block has tapped holes.
Can be mounted from the top or the bottom.



Model HRW-CR

Specification Table⇒B-110

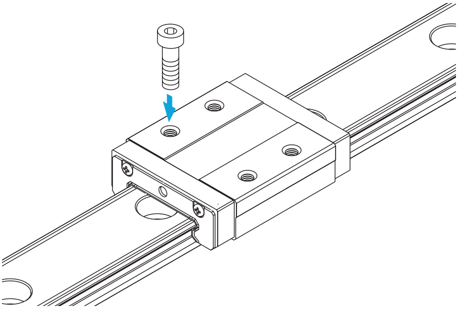
The LM block has tapped holes.



Miniature Type Model HRW-LR

Specification Table⇒B-110

The LM block has tapped holes.



Rated Loads in All Directions

Model HRW is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings of model HRW 17 to 60 are equal in all the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for HRW.

The basic load ratings of models HRW 12 and 14 indicate the values in the radial directions in Fig.1, and their actual values are provided in the specification table for HRW. The values in the reverse radial and lateral directions are obtained from Table1 below.

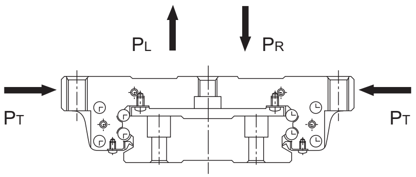


Fig.1

Table1 Rated Loads in All Directions with Models HRW 12 and 14

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	C_L=0.78C	C_{0L}=0.71C_0
Lateral directions	C_T=0.48C	C_{0T}=0.35C_0

Equivalent Load

When the LM block of models HRW 17 to 60 receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

When the LM block of models HRW 12 and 14 receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_L + Y \cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Models HRW12 and 14

P_E	X	Y
Equivalent load in reverse radial direction	1	2
Equivalent load in lateral direction	0.5	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-330.

Error Allowance in the Parallelism between Two Rails

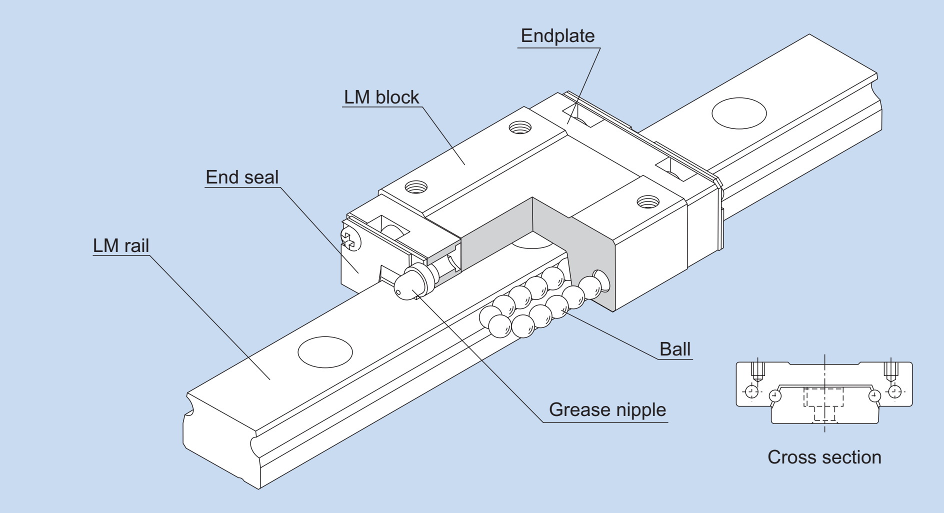
For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

RSR/RSR-W

LM Guide
Miniature Type Models RSR/RSR-W



Structure and Features

With models RSR and RSR-W, balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Balls circulate in a compact structure and perform infinite straight motion with no limit in stroke.
The LM block is designed to have a shape with high rigidity in a limited space, and in combination with large-diameter balls, demonstrates high rigidity in all directions.

[Ultra Compact]

The absence of cage displacement, a problem that cross-roller guides and types of ball slides with finite stroke tend to cause, make these models highly reliable LM systems.

[Capable of Receiving Loads in All Directions]

These models are capable of receiving loads in all directions, and a single-rail guide can adequately operate under a small moment load. Model RSR-W, in particular, has a greater number of effective balls and a broader LM rail to increase its rigidity against a moment. Thus, it achieves a more compact structure and more durable straight motion than a pair of linear bushes in parallel use.

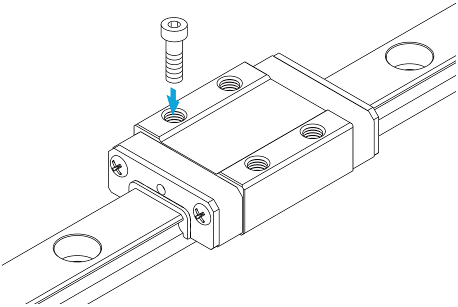
[Stainless Steel Type also Available]

A special type where LM block, LM rail and balls are made of stainless steel is also available.

Models RSR/RSR-K/RSR-V

Specification Table⇒B-116

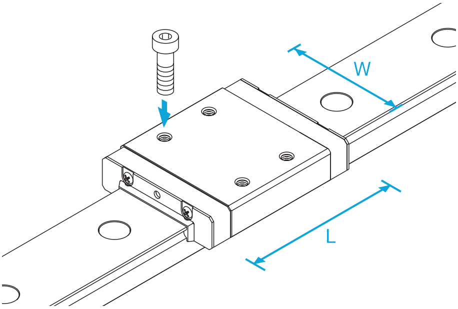
This model is a standard type.



Models RSR-W/WV

Specification Table⇒B-118

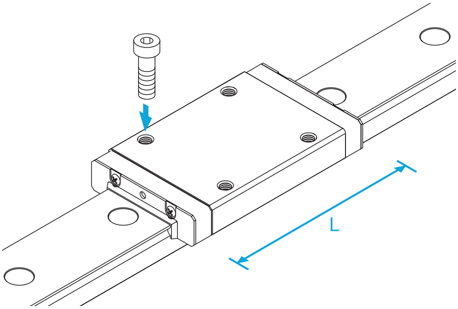
These models have greater overall LM block lengths (L), broader widths (W) and greater rated loads and permissible moments than standard types.



Model RSR-N

Specification Table⇒B-114

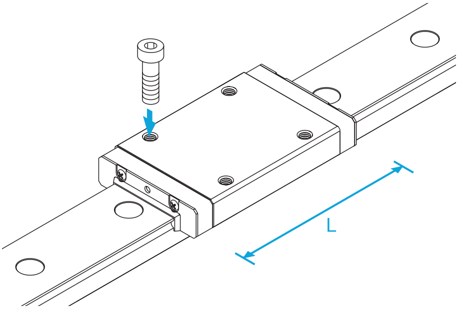
It has a longer overall LM block length (L) and a greater rated load than standard types.



Model RSR-WN

Specification Table⇒B-118

It has a longer overall LM block length (L), a greater rated load than standard types. Achieves the greatest load capacity among the miniature type LM Guide models.



Comparison of Model RSR-W with Other Model Numbers

[Locations where a Pair of Linear Bushes are Used]

- Unlike the linear bushes, model RSR-W can be used in a single-rail configuration and allows space saving.
- Since model RSR-W has more load-bearing balls per row and wider LM block and LM rail, thus to achieve high rigidity against an overhung load.
- Accuracy can be achieved simply by mounting the LM rail using bolts. Therefore, the assembly time can be shortened.

Example of comparing model RSR12W with model LM 10 in use

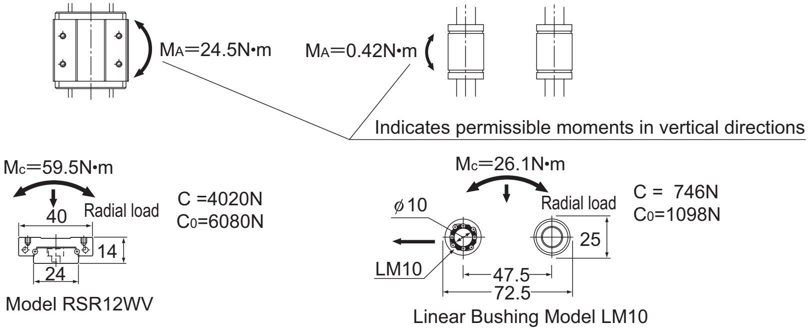


Fig.1

[Locations where a Cross-roller Table is Used]

- Does not show cage displacement even with vertical mount, and capable of performing infinite straight motion.
- Eliminates the need for difficult clearance adjustment and achieves long-term, smooth motion over a long period of time.
- Since the LM block width is large, the model can be used as a miniature table without any modification.

Example of comparing model RSR9WV with model VRM1035 in use

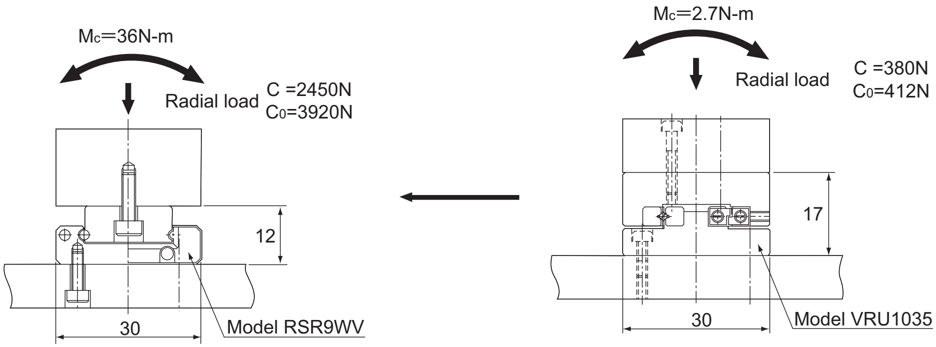


Fig.2

Rated Loads in All Directions

Model RSR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings of models RSR3 to 9 are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for RSR.

The basic load ratings of models RSR12 to 20 indicate the values in the radial direction in Fig.3, and their actual values are provided in the specification table for RSR. The values in the reverse radial and lateral directions are obtained from Table1 below.

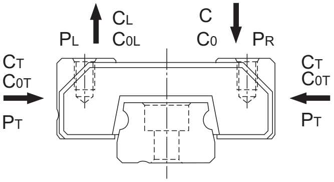


Fig.3

Table1 Basic Load Ratings of Models RSR12 to 20 in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	C_L=0.78C	C_{0L}=0.70C_0
Lateral directions	C_T=0.78C	C_{0T}=0.71C_0

Equivalent Load

When the LM block of models RSR3 to 9 receives loads in all four directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

When the LM block of model RSR12 to 20 receives loads in the radial and lateral directions, or the reverse radial and lateral directions, simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_R \ (P_L) + Y \cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor
(see Table2 and Table3)

Table2 Equivalent Factor of Models RSR12 to 20
(When radial and lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	0.83
Equivalent load in lateral direction	1.2	1

Table3 Equivalent Factor of Models RSR12 to 20
(When reverse radial and lateral loads are applied)

P_E	X	Y
Equivalent load in reverse radial direction	1	0.99
Equivalent load in lateral direction	1.01	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-126.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-332.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

Accuracy of the Mounting Surface

Model RSR uses Gothic arch grooves in the ball raceways. When two rails of RSR are used in parallel, any error in accuracy of the mounting surface may increase rolling resistance and negatively affect the smooth motion of the guide. For specific accuracy of the mounting surface, see Permissible Error of the Mounting Surface on A-333.

When using this model in locations where it is difficult to obtain satisfactory accuracy of the mounting surface, we recommend using types RSR⋯A (semi standard) whose ball raceways have circular-arc grooves. (avoid using these types in a single-rail configuration).

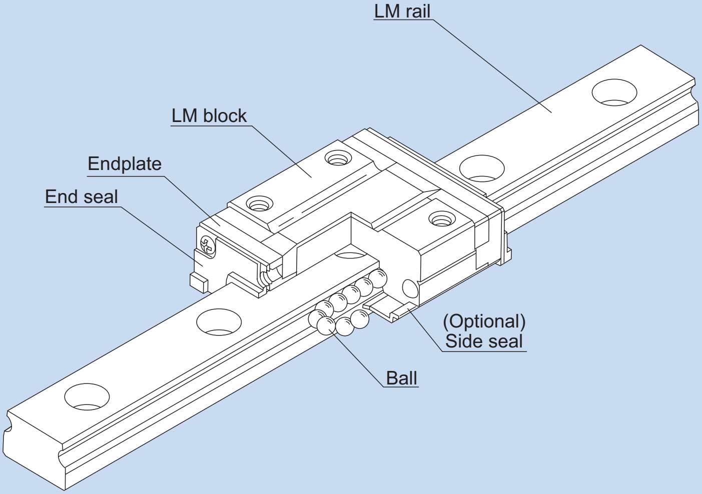
For specific accuracy of the mounting surface for types RSR⋯A, Permissible Error of the Mounting Surface is on A-333.

Flatness of the Mounting Surface

For details,see A-335.

RSR-Z

LM Guide
Miniature Type (Low Cost Type) Model RSR-Z



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Balls of model RSR-Z circulate in a compact structure and perform infinite straight motion with no limit in stroke.
Also, it has the same dimensions as models RSR/RSR-W, but achieves a lighter weight and a lower price.

[Lightweight]

Since part of the LM block body uses a resin material, the block mass is reduced by up to 28% from the conventional type model RSR-V. This makes RSR-Z a low-inertia type.

[Smooth Motion]

The unique structure of the endplate allows the balls to circulate smoothly and infinitely.

[Highly Corrosion Resistant]

Since the LM block, LM rail and balls use stainless steel, which is highly corrosion resistant, this model is optimal for clean room applications.

[Low Noise]

Since the unloaded ball path is made of resin, there is no metal to metal contact and low noise is achieved.

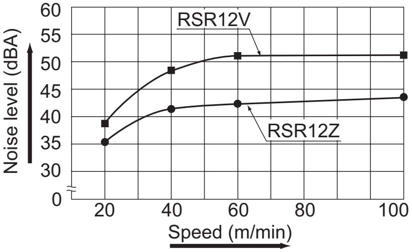


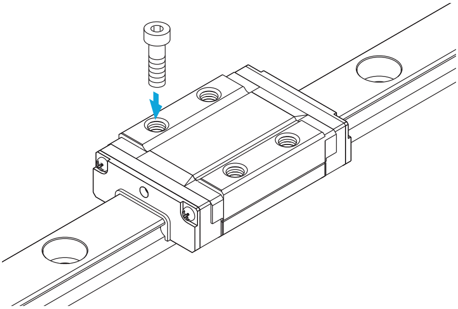
Fig.1 Noise Levels of Models RSR12Z and RSR12V

Types and Features

Model RSR-Z

Specification Table⇒B-122

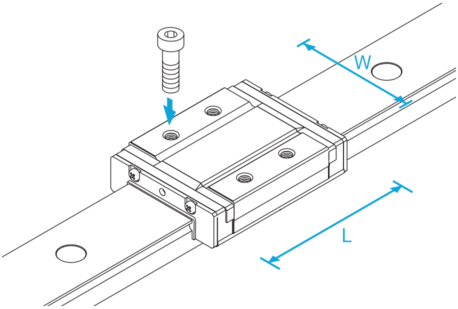
This model is a standard type.



Models RSR-WZ

Specification Table⇒B-124

It has a longer overall LM block length (L), a broader width (W) and greater rated load and permissible moment than RSR-Z.



Rated Loads in All Directions

Model RSR-Z is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings of models RSR7Z/WZ and 9Z/WZ are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for RSR-Z.

The basic load ratings of models RSR12Z/WZ and 15Z/WZ indicate the values in the radial direction in Fig.2, and their actual values are provided in the specification table for RSR-Z. The values in the reverse radial and lateral directions are obtained from Table1.

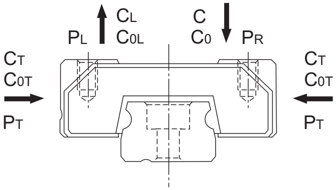


Fig.2

Table1 Basic Load Ratings of Models RSR12Z/WZ and 15Z/WZ in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radialdirection	C	C_0
Reverse radial direction	$C_L=0.78C$	$C_{0L}=0.70C_0$
Lateraldirections	$C_T=0.78C$	$C_{0T}=0.71C_0$

Equivalent Load

When the LM block of models RSR7Z/WZ and 9Z/WZ receives loads in all four directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

When the LM block of model RSR12Z/WZ and 15Z/WZ receives loads in the radial and lateral directions, or the reverse radial and lateral directions, simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_R\ (P_L) + Y \cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor
(see Table2 and Table3)

Table2 Equivalent Factor of Models RSR12Z/WZ and 15Z/WZ (when radial and lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	0.83
Equivalent load in lateral direction	1.2	1

Table3 Equivalent Factor of Models RSR12Z/WZ and 15Z/WZ (when reverse radial and lateral loads are applied)

P_E	X	Y
Equivalent load in reverse radial direction	1	0.99
Equivalent load in lateral direction	1.01	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-126.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-332.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

Accuracy of the Mounting Surface

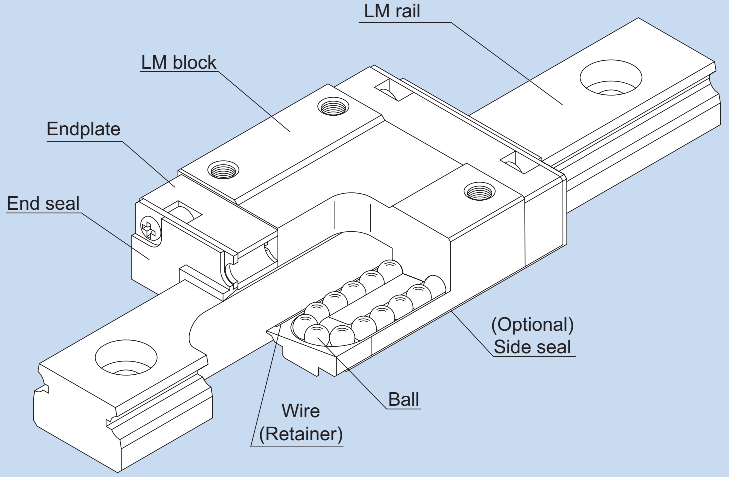
Model RSR-Z uses Gothic arch grooves in the ball raceways. When two rails are used in parallel, any error in accuracy of the mounting surface may increase rolling resistance and negatively affect the smooth motion of the guide. For specific accuracy of the mounting surface, see Permissible Error of the Mounting Surface on A-333.

Flatness of the Mounting Surface

For details,see A-335.

RSH

LM Guide
Miniature Type (with a Ball Retainer) Model RSH



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since a retainer holds the balls, they will not fall off even if the LM block is removed from the LM rail.
With the Miniature Type LM Guide Equipped with a Ball Retainer model RSH, balls circulate in a compact structure and perform infinite straight motion with no limit in stroke. The LM block is designed to have a shape with high rigidity in a limited space, and in combination with large-diameter balls, demonstrates high rigidity in all directions.

[Miniature Size]
This model is a highly reliable, ultra compact LM Guide that responds to weight saving and space saving.

[Capable of Receiving Loads in All Directions]
This model is capable of receiving loads in all directions, and has a high load capacity because of large-diameter balls incorporated in two rows of raceways.

[Highly Corrosion Resistant]
Since the LM block, LM rail and balls use stainless steel, which is highly corrosion resistant, this model is optimal for clean room applications.

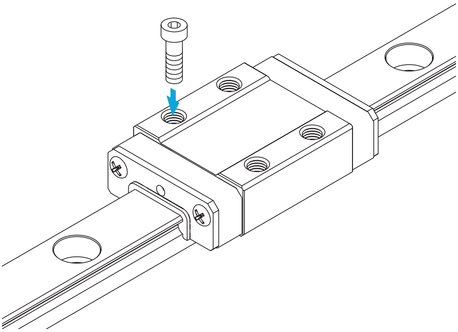
[Equipped with a Ball Retainer]
The LM block contains a retainer capable of preventing balls from falling off. Since the balls will not fall even if the LM block is removed from the LM rail, you can use this LM Guide at ease.

Types and Features

Model RSH

Specification Table⇒B-128

This model is a standard type.



Rated Loads in All Directions

Model RSH is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings of models RSH7 and 9 are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for RSH.

The basic load ratings of model RSH12 indicate the values in the radial direction in Fig.1, and their actual values are provided in the specification table for RSH. The values in the reverse radial and lateral directions are obtained from Table1 below.

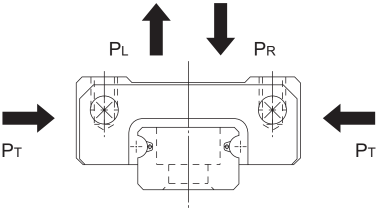


Fig.1

Table1 Basic Load Ratings of Model RSH12 in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.78C$	$C_{0L}=0.70C_0$
Lateral directions	$C_T=0.78C$	$C_{0T}=0.71C_0$

Equivalent Load

When the LM block of models RSH7 and 9 receives loads in all four directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

When the LM block of model RSH12 receives loads in the radial and lateral directions, or the reverse radial and lateral directions, simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X\cdot P_R\ (P_L) + Y\cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor
(see Table2 andTable3)

Table2 Equivalent Factor of Model RSH12
(when radial and lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	0.83
Equivalent load in lateral direction	1.2	1

Table3 Equivalent Factor of Model RSH12
(when reverse radial and lateral loads are applied)

P_E	X	Y
Equivalent load in reverse radial direction	1	0.99
Equivalent load in lateral direction	1.01	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-126.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-332.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

Accuracy of the Mounting Surface

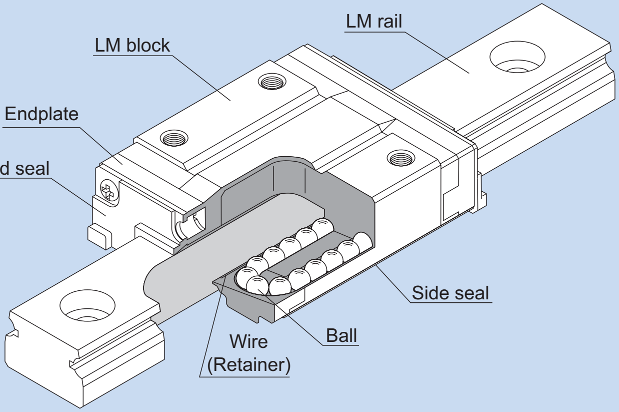
Model RSH uses Gothic arch grooves in the ball raceways. When two rails are used in parallel, any error in accuracy of the mounting surface may increase rolling resistance and negatively affect the smooth motion of the guide. For specific accuracy of the mounting surface, see Permissible Error of the Mounting Surface on A-333.

Flatness of the Mounting Surface

For details,see A-335.

RSH-Z

LM Guide
Miniature Type (with a Ball Retainer) Model RSH-Z



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since a retainer holds the balls, they will not fall off even if the LM block is removed from the LM rail.
With model RSH-Z, balls circulate in a compact structure and perform infinite straight motion with no limit in stroke.
Also, it has the same dimensions as the conventional model, but achieves a lower price.

[Equipped with a Ball Retainer]

Model RSH-Z has a retainer capable of preventing balls from falling off. Since the balls will not fall even if the LM block is removed from the LM rail, you can use this LM Guide at ease.

[Lightweight]

Since part of the LM block body uses a resin material, the block mass is reduced by up to 30% from the conventional type. This makes RSH-Z a low-inertia type.

[Highly Corrosion Resistant]

Since the LM block, LM rail and balls use stainless steel, which is highly corrosion resistant, this model is optimal for clean room applications.

[Low Noise]

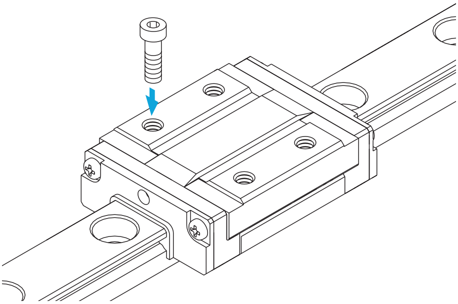
Since the unloaded ball path is made of resin, there is no metal to metal contact and low noise is achieved.

Types and Features

Model RSH-Z

Specification Table⇒B-132

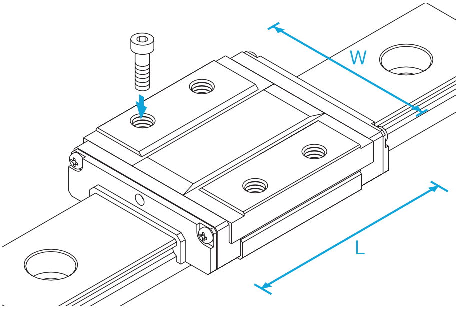
This model is a standard type.



Model RSH-WZ

Specification Table⇒B-134

This model has a greater overall LM block length (L), broader width (W) and greater rated load and permissible moment than model RSH-Z.



Rated Loads in All Directions

Model RSH-Z is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings of models RSH7Z/WZ and 9Z/WZ are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for RSH-Z.
The basic load ratings of models RSH12Z/WZ and 15Z/WZ indicate the values in the radial direction in Fig.1, and their actual values are provided in the specification table for RSH-Z. The values in the reverse radial and lateral directions are obtained from Table1 below.

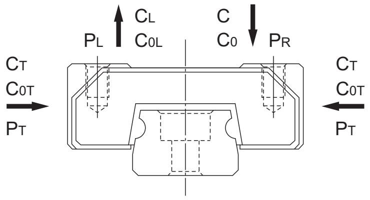


Fig.1

Table1 Basic Load Ratings of Models RSH12Z/WZ and 15Z/WZ in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.78C$	$C_{0L}=0.70C_0$
Lateral directions	$C_T=0.78C$	$C_{0T}=0.71C_0$

Equivalent Load

When the LM block of models RSH7Z/WZ and 9Z/WZ receives loads in all four directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

When the LM block of models RSH12Z/WZ and 15Z/WZ receives loads in the radial and lateral directions, or the reverse radial and lateral directions, simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X\cdot P_R\ (P_L) + Y\cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor
(see Table2 andTable3)

Table2 Equivalent Factor of Models RSH12Z/WZ and 15Z/WZ (when radial and lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	0.83
Equivalent load in lateral direction	1.2	1

Table3 Equivalent Factor of Models RSH12Z/WZ and 15Z/WZ (when reverse radial and lateral loads are applied)

P_E	X	Y
Equivalent load in reverse radial direction	1	0.99
Equivalent load in lateral direction	1.01	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-126.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-332.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

Accuracy of the Mounting Surface

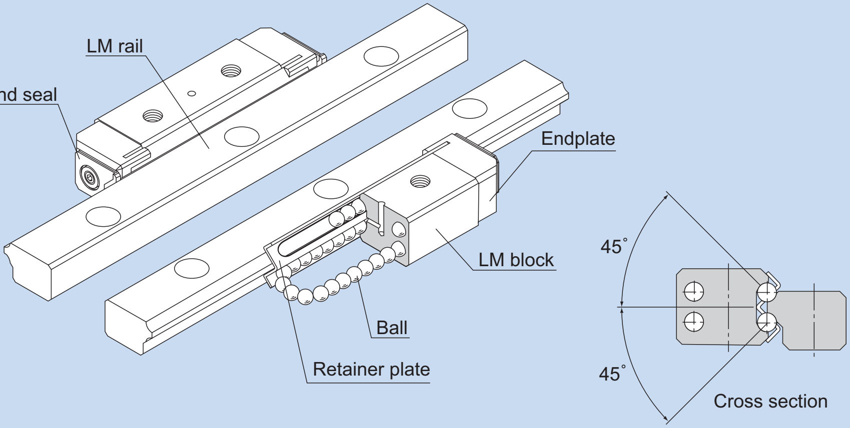
Models RSH-Z and WZ uses Gothic arch grooves in the ball raceways. When two rails are used in parallel, any error in accuracy of the mounting surface may increase rolling resistance and negatively affect the smooth motion of the guide. For specific accuracy of the mounting surface, see Permissible Error of the Mounting Surface on A-333.

Flatness of the Mounting Surface

For details,see A-335.

HR

LM Guide
Separate Type (4-way Equal Load) Model HR



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since retainer plates hold the balls, they do not fall off.

Because of the angular contact structure where two rows of balls rolling on the LM rail each contact the raceway at 45°, the same load can be applied in four directions (radial, reverse radial and lateral directions) if a set of LM rails and LM block is mounted on the same plane (i.e., when two LM rails are combined with an LM block on the same plane). Furthermore, since the sectional height is low, a compact and stable linear guide mechanism is achieved.

This structure makes clearance adjustment relatively easy, and is highly capable of absorbing a mounting error.

[Easy Installation]

Model HR is easier to adjust a clearance and achieve more accuracy than cross-roller guides.

[Self-adjustment Capability]

Even if the parallelism or the level between the two rails is poorly established, the self-adjustment capability through front-to-front configuration of THK's unique circular-arc grooves (DF set) enables a mounting error to be absorbed and smooth straight motion to be achieved even under a preload.

[4-way Equal Load Type]

When the two rails are mounted in parallel, each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in various orientations and in applications.

[Sectional Dimensions Approximate to Cross-roller Guides]

Since model HR is an infinite motion type whose retainer plate does not move, it is not associated with cage displacement that occurs with cross-roller guides. In addition, the sectional shape of model HR is approximate to that of cross-roller guides, therefore, its components are interchangeable with that of cross-roller guides.

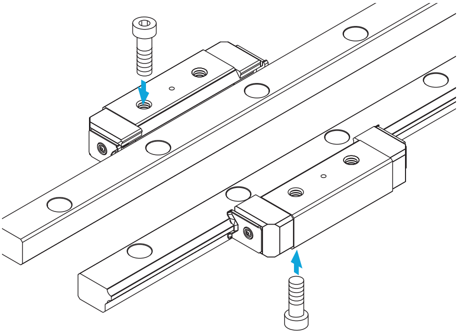
[Stainless Steel Type also Available]

A special type whose LM block, LM rail and balls are made of stainless steel is also available.

Model HR - Heavy-load Type

Specification Table⇒B-138

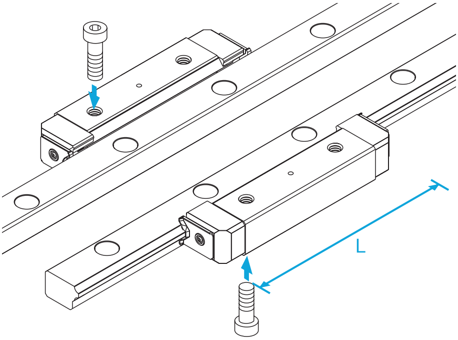
The LM blocks can be mounted from the top and the bottom.



Model HR-T-Ultra-heavy Load Type

Specification Table⇒B-140

Has the same cross-sectional shape as model HR, but has a greater overall LM block length (L) and a higher load rating.



Rated Loads in All Directions

When installed, one set of model HR is capable of receiving loads in all four directions: radial, reverse radial and lateral directions.

The basic load ratings of an installed set of model HR are equal in all four directions (radial, reverse radial and lateral directions). The basic load ratings in the specification table for model HR indicate the values in the radial direction per LM block as shown in Fig.1.

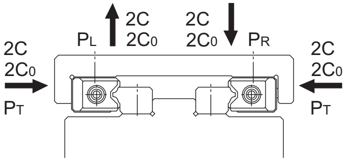


Fig.1

Equivalent Load

When the LM block of model HR receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + \frac{1}{2} P_T$$

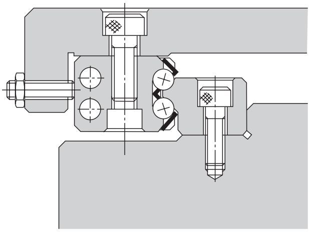
P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

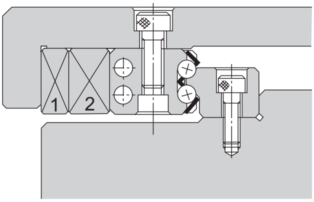
For details,see A-100.

Example of Clearance Adjustment

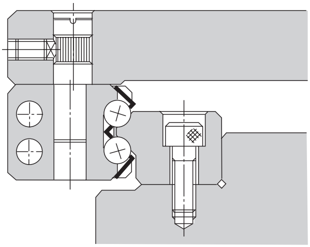
Design the clearance adjustment bolt so that it presses the center of the side face of the LM block.



a. Using an adjustment screw
Normally, an adjustment screw is used to press the LM block.



b. Using tapered gibs
When high accuracy and high rigidity are required, use tapered gibs 1) and 2).



c. Using an eccentric pin
A type using an eccentric pin to adjust the clearance is also available.

Accuracy Standards

For details,see A-123.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-331.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

Comparison of Model Numbers with Cross-roller Guides

Each type of LM Guide model HR has sectional dimensions approximate to that of the corresponding cross roller guide model.

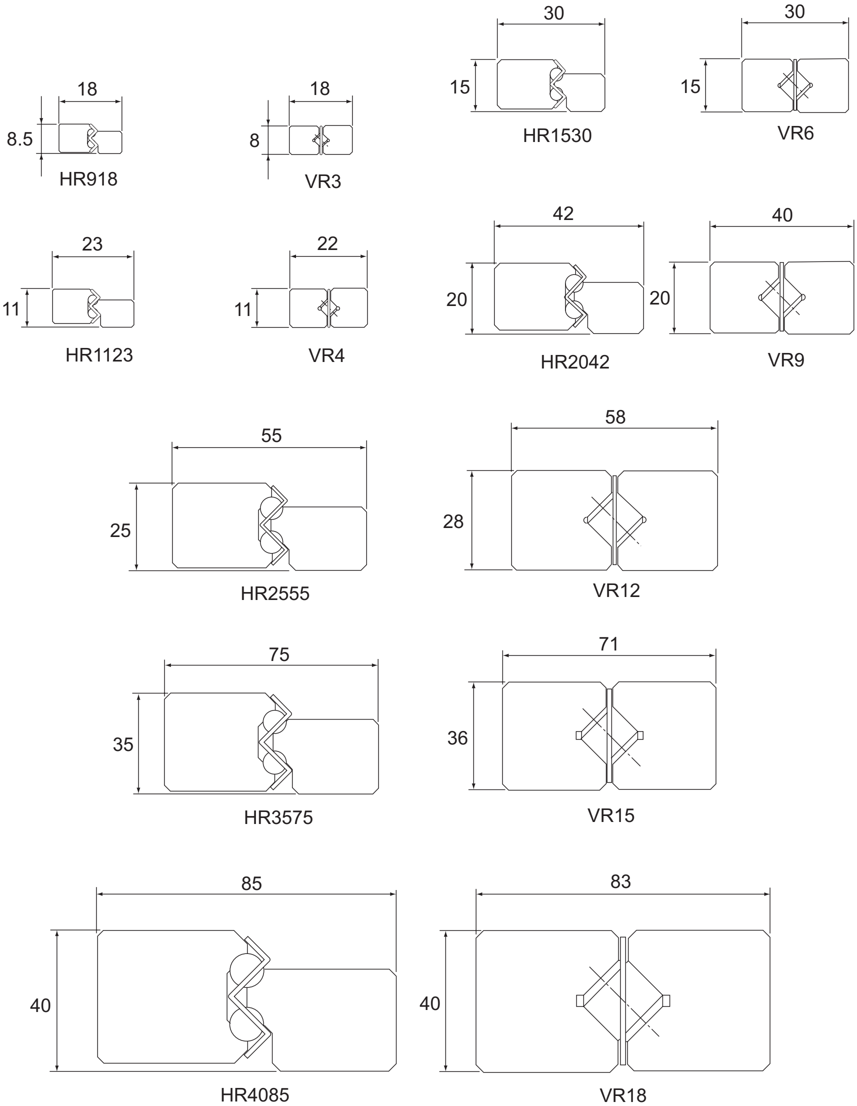
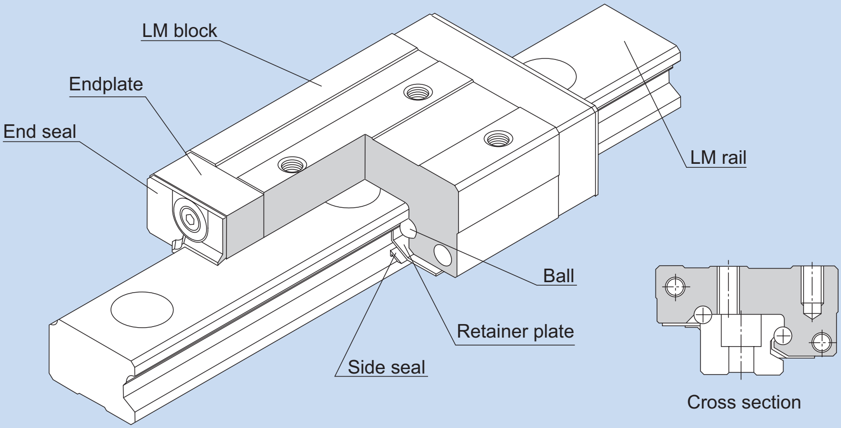


Fig.2

GSR

LM Guide
Separate Type (Radial) Model GSR



Cross section

Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since retainer plates hold the balls, they do not fall off.
As the top face of the LM block is inclined, a clearance is eliminated and an appropriate preload is applied simply by securing the LM block with mounting bolts.
Model GSR has a special contact structure using circular-arc grooves. This increases self-adjusting capability and makes GSR an optimal model for places associated with difficulty establishing high accuracy and for general industrial machinery.

[Interchangeability]

Both the LM block and LM rail are interchangeable and can be stored separately. Therefore, it is possible to store a long-size LM rail and cut it to a desired length before using it.

[Compact]

Since model GSR has a low center of gravity structure with a low overall height, the machine can be downsized.

[Capable of Receiving a Load in any Direction]

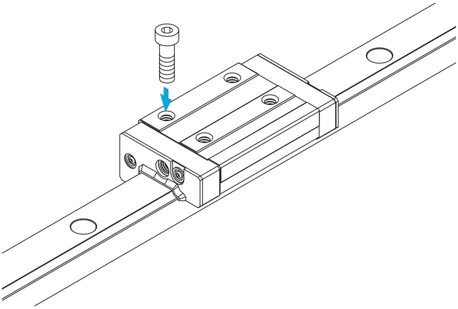
The ball contact angle is designed so that this model can receive a load in any direction. As a result, it can be used in places where a reverse radial load, lateral load or a moment in any direction is applied.

Types and Features

Model GSR-T

Specification Table⇒B-146

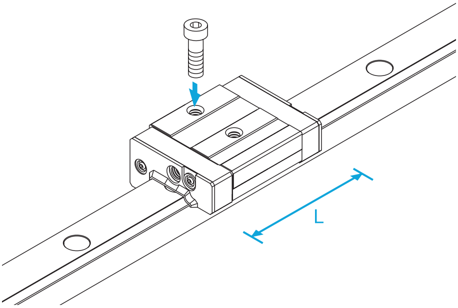
This model is a standard type.



Model GSR-V

Specification Table⇒B-146

A space-saving type that has the same cross-sectional shape as GSR-T, but has a shorter overall LM block length (L).



Rated Loads in All Directions

Model GSR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings indicate the values in the radial direction in Fig.1, and their actual values are provided in the specification table for GSR. The values in the radial direction, tensile lateral direction and compressive lateral direction are obtained from Table1.

Note) Not available for a single-axis configuration.

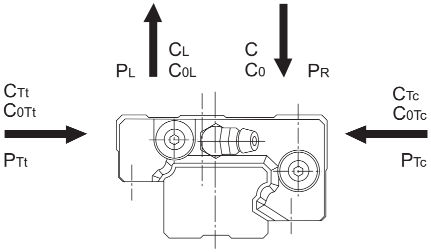


Fig.1

Table1 Basic Load Ratings of Model GSR in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	C_L=0.93C	C_{0L}=0.90C_0
Tensile lateral direction	C_{Tt}=0.84C	C_{0Tt}=0.78C_0
Compressive lateral direction	C_{Tc}=0.93C	C_{0Tc}=0.90C_0

Equivalent Load

When the LM block of model GSR receives loads in the radial, tensile lateral, reverse radial and compressive lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_R + Y \cdot P_{Tt}$$
$$P_E = P_L + P_{Tc}$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Tensile lateral direction
: Compressive lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_{Tt} : Tensile lateral load (N)
P_{Tc} : Compressive lateral direction load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model GSR
(when radial and tensile lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	1.28
Equivalent load in tensile lateral direction	0.781	1

Service Life

For details,see A-100.

Example of Clearance Adjustment

By providing a shoulder maybe on the side face of each LM block and pressing either LM block with a bolt, a preload is applied and the rigidity is increased.

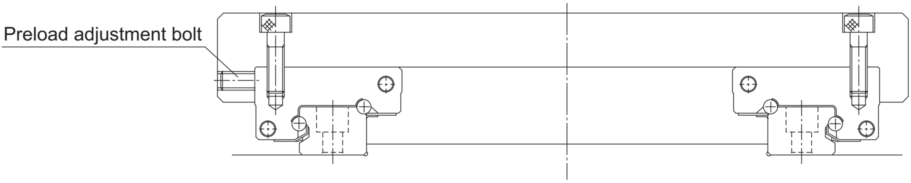


Fig.2 Example of Adjusting a Preload with a Push Bolt

Accuracy Standards

For details,see A-124.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-331.

Error Allowance in the Parallelism between Two Rails

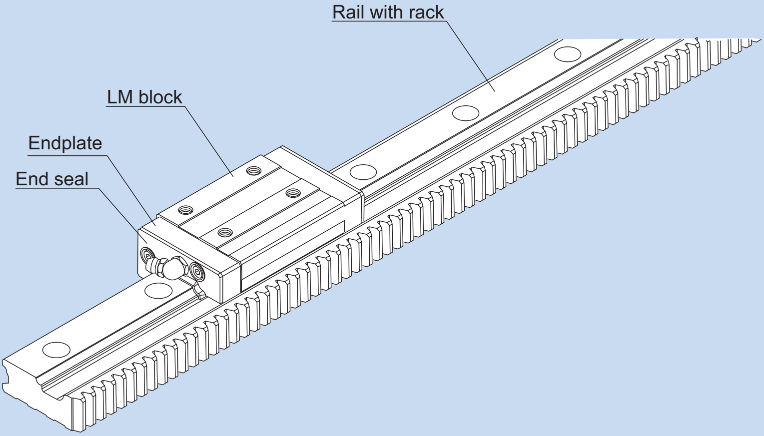
For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

GSR-R

LM Guide
Separate Type (Radial) Model GSR-R



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since retainer plates hold the balls, they do not fall off.
As the top face of the LM block is inclined, a clearance is eliminated and an appropriate preload is applied simply by securing the LM block with mounting bolts.
Model GSR-R is based on model GSR, but has rack teeth on the LM rail. This facilitates the design and assembly of drive mechanisms.

[Reduced Machining and Assembly Costs]

The single-piece structure integrating the LM rail (linear guide) and rack (drive) reduces labor and time for machining the rack mounting surface and assembling and adjusting the guide system, thus to achieve significant cost reduction.

[Easy Designing]

The travel distance per turn of the pinion is specified by the integer value. This makes it easy to calculate the travel distance per pulse when the LM Guide is used in combination with a stepping motor or servomotor.

[Space Saving]

Since the rail has a rack, the machine size can be reduced.

[Long Stroke]

The end faces of the LM rail are machined for jointed use. To obtain a long stroke, simply joint LM rails of the standard length.

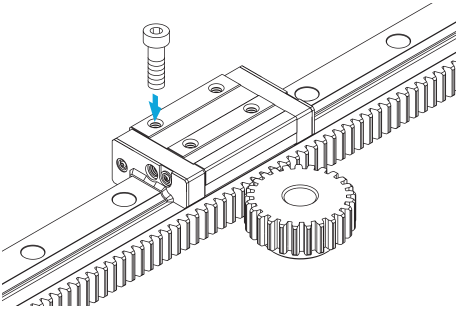
[High Durability]

The rack tooth has a width equal to the LM rail height, the rack uses high-grade steel with proven performance and the tooth surface are heat-treated, thereby to ensure high durability.

Model GSR-R (Rail with Rack)

Specification Table⇒B-150

Since the thrust load on the pinion shaft can be kept low due to rack-pinion meshing, it is easy to design systems with pinion shaft bearings and tables that are not so rigid.



Rated Loads in All Directions

Model GSR-R is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings indicate the values in the radial direction in Fig.1, and their actual values are provided in the specification table for GSR-R. The values in the radial direction, tensile lateral direction and compressive lateral direction are obtained from Table1.

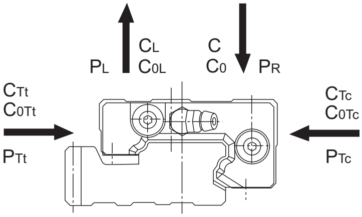


Fig.1

Table1 Basic Load Ratings of Model GSR-R in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.93C$	$C_{0L}=0.90C_0$
Tensile lateral direction	$C_{Tt}=0.84C$	$C_{0Tt}=0.78C_0$
Compressive lateral direction	$C_{Tc}=0.93C$	$C_{0Tc}=0.90C_0$

Equivalent Load

When the LM block of model GSR-R receives loads in the radial, tensile lateral, reverse radial and compressive lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_R + Y \cdot P_{Tt}$$
$$P_E = P_L + P_{Tc}$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Tensile lateral direction
: Compressive lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_{Tt} : Tensile lateral load (N)
P_{Tc} : Compressive lateral direction load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model GSR-R
(when radial and tensile lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	1.28
Equivalent load in tensile lateral direction	0.781	1

Service Life

For details,see A-100.

Accuracy Standards

For details,see A-125.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-331.

Error Allowance in the Parallelism between Two Rails

For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

[Joining Two or More Rails]

The end faces of the rail with rack are machined so that a clearance is left after assembly in order to facilitate the assembly.
Use of a special jig as shown in Fig.2 will make the connection easier.
(THK also offers the rack-aligning jig.)

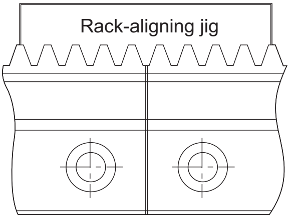


Fig.2 Rack Connection Method

[Reworking the Pinion Hole]

Only the teeth of the reworkable pinion-hole-diameter type (type C) are heat-treated. The hole and keyway can therefore be reworked by the user to the desired diameter and shape.
When reworking the pinion hole, be sure to take the following into account.
The material of the reworkable hole diameter type (type C): S45C

(1) When chucking the teeth of a reworkable hole diameter type, use a jaw scroll chuck or something like it to maintain the tooth profile.

(2) The pinion is produced using the center of the hole as a reference point. The center of the hole should therefore be used as a reference point when the pinion is aligned.
When checking the pinion runout, refer to the boss sides.

(3) Keep the reworked hole diameter within roughly 60 to 70% of the boss diameter.

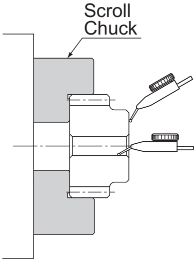


Fig.3

[Lubricating the Rack and Pinion]

To ensure smooth sliding on tooth surfaces and prevent wear, the teeth should be provided with a lubricant.

Note) Use a lubricant of the same type as that contained in the LM Guide.

[Checking Strength]

The strength of the assembled rack and pinion must be checked in advance.

(1) Calculate the maximum thrust acting on the pinion.

(2) Divide the permissible power transmission capacity of the pinion to be used (Table3) by an overload factor (Table4).

(3) By comparing the thrust acting on the pinion obtained in step 1 with the pinion power transmission capacity obtained in step 2, make sure the applied thrust does not exceed the permissible power transmission capacity.

[Example of calculation]

Model GSR-R is used in a horizontal conveyance system receiving a medium impact (assuming external load to be zero).

● Conditions

Subject model No. (pinion)	GP6-20A
Mass (table + work)	m=100kg
Speed	v=1 m/s
Acceleration/deceleration time	T_1 =0.1 s

● Consideration

(1) Calculating the maximum thrust

Calculated the thrust during acceleration/deceleration.

$$\mathbf{Fmax} = \mathbf{m} \cdot \frac{\mathbf{v}}{\mathbf{T_1}} = \mathbf{1.00kN}$$

(2) Permissible power transmission capacity of the pinion

$$\mathbf{Pmax} = \frac{\textbf{Permissible power transmission capacity (see Table 3)}}{\textbf{Overload factor (see Table 4)}} = \frac{\mathbf{2.33}}{\mathbf{1.25}}$$

$$= \mathbf{1.86kN}$$

(3) Comparison between the maximum thrust and the permissible power transmission capacity of the pinion

Fmax<Pmax

Therefore, it is judged that the subject model number can be used.

Table3 Permissible Power transmission Capacity

Unit: kN

Model No.	Permissible Power transmission Capacity	Supported model
GP 6-20A	2.33	GSR 25-R
GP 6-20C	2.05	
GP 6-25A	2.73	
GP 6-25C	2.23	
GP 8-20A	3.58	GSR 30-R
GP 8-20C	3.15	
GP 8-25A	4.19	
GP 8-25C	3.42	
GP10-20A	5.19	GSR 35-R
GP10-20C	4.57	
GP10-25A	6.06	
GP10-25C	4.96	

Table4 Overload Factor

Impact from the prime mover	Impact from the driven machine		
	Uniform load	Medium impact	Large impact
Uniform load (electric motor, turbine, hydraulic motor, etc.)	1.0	1.25	1.75

(Excerpt from JGMA401-01)

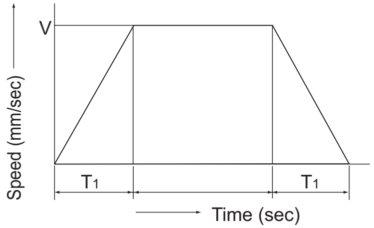
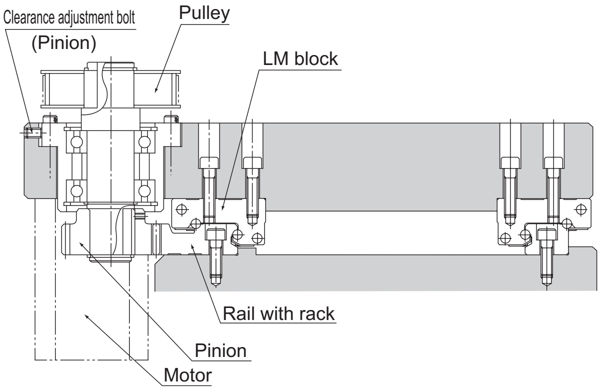
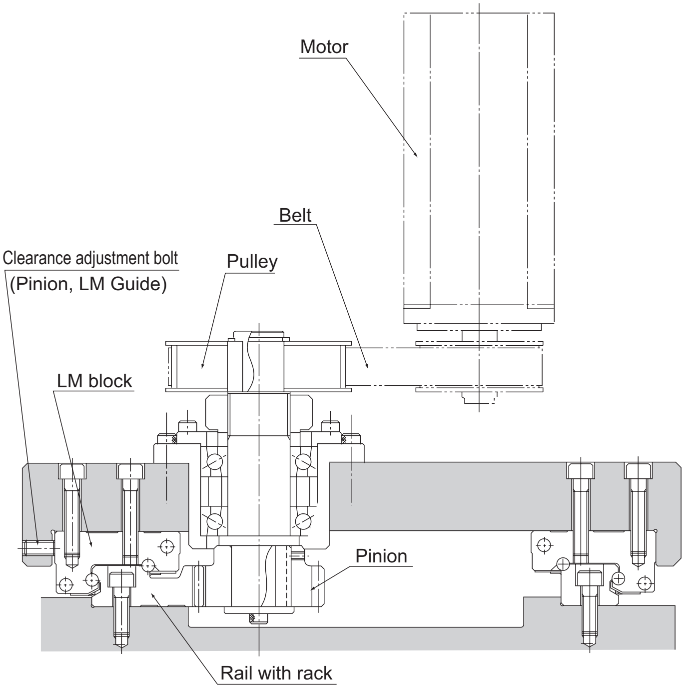


Fig.4

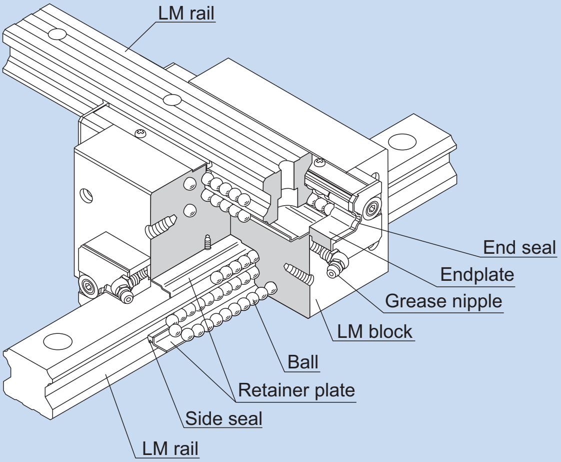
[Example of Assembling Model GSR-R with the Table]





CSR

LM Guide
Cross LM Guide Model CSR



Structure and Features

Balls roll in four rows of raceways precision-ground on a LM rail and a LM block, and endplates incorporated in the LM block allow the balls to circulate. Since retainer plates hold the balls, they do not fall off even if the LM rail is pulled out.
This model is an integral type of LM Guide that squares an internal structure similar to model HSR, which has a proven track record and is highly reliable, with another and uses two LM rails in combination. It is machined with high precision so that the perpendicularity of the hexahedron of the LM block is within 2 µm per 100 mm in error. The two rails are also machined with high precision in relative straightness. As a result, extremely high accuracy in orthogonality is achieved. Since an orthogonal LM system can be achieved with model CSR alone, a conventionally required saddle is no longer necessary, the structure for X-Y motion can be simplified and the whole system can be downsized.

[4-way Equal Load Type]

Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations.

[High Rigidity]

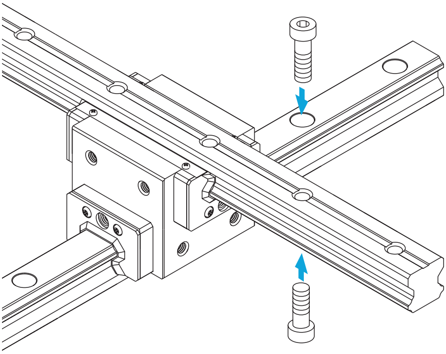
Since balls are arranged in four rows in a well-balanced manner, this model is stiff against a moment, and smooth straight motion is ensured even a preload is applied to increase the rigidity.
The rigidity of the LM blocks is 50% higher than that of a combination of two HSR LM blocks secured together back-to-back with bolts. Thus, CSR is an optimal LM Guide for building an X-Y table that requires high rigidity.

Types and Features

Model CSR-S

Specification Table⇒B-154

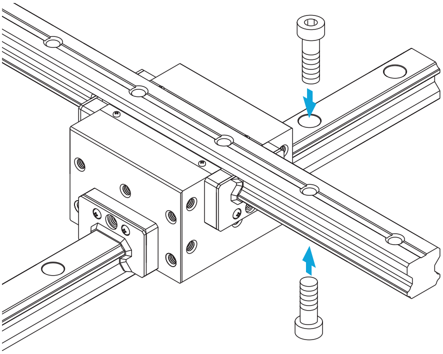
This model is a standard type.



Model CSR

Specification Table⇒B-154

It has a longer overall LM block length (L) and a greater rated load.



Rated Loads in All Directions

Model CSR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings are defined with an LM rail and two LM blocks, and uniform in the four directions (radial, reverse radial and lateral directions). Their actual values are provided in the specification table for CSR.

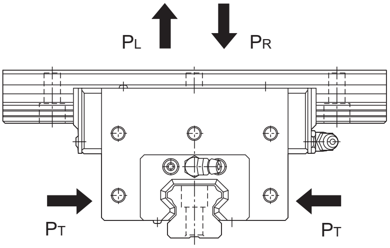


Fig.1

Equivalent Load

When the LM block of model CSR receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-122.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-326.

Error Allowance in the Parallelism between Two Rails

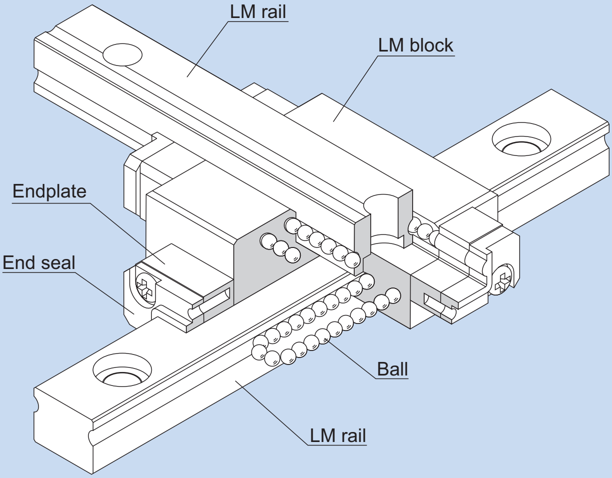
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

MX

LM Guide
Miniature Cross Guide Model MX



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. This model is an integral type of LM Guide that squares a unit of miniature LM Guide model RSR with another and uses two LM rails in combination. Since an orthogonal LM system with an extremely low height can be achieved with model MX alone, a conventionally required saddle is no longer necessary and the whole system can be downsized.

[4-way Equal Load Type]

Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations.

[Tapped-hole LM Rail Type]

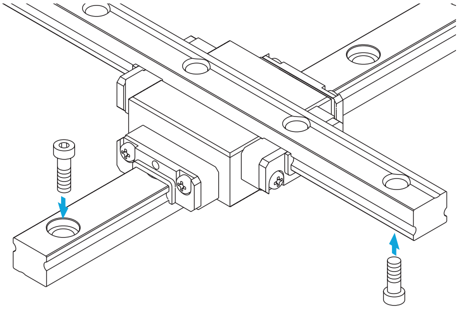
There are two types of the LM rail: one designed to be mounted from the top with bolts, and a semi-standard type whose bottom face has tapped holes, allowing the rail to be mounted from the bottom.

Types and Features

Model MX

Specification Table⇒B-160

MX is divided into two types: RSR5M cross type and RSR7WM cross type.



Rated Loads in All Directions

Model MX is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are defined with an LM rail and an LM block, and uniform in the four directions (radial, reverse radial and lateral directions). Their actual values are provided in the specification table for MX.

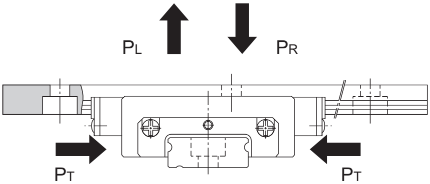


Fig.1

Equivalent Load

When the LM block of model MX receives loads in the radial, reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

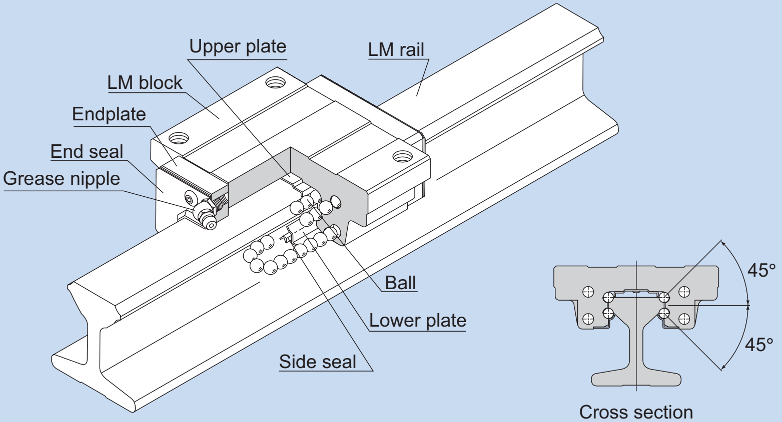
For details,see A-127.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-327.

JR

LM Guide
Structural Member Rail Model JR



Cross section

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate. Since retainer plates hold the balls, they do not fall off even if the LM rail is pulled out.
Model JR uses the same LM block as model HSR, which has a proven track record and is highly reliable. The LM rail has a sectional shape with high flexural rigidity, and therefore can be used as a structural member.
Unlike the conventional LM Guide type, whose LM rail was secured onto the base with bolts when installed, model JR's LM rail is integrated with the mounting base, and the top of the LM rail has the same structure as LM Guide model HSR. The lower part of the LM rail has a hardness of HRC25 or less, making it easy to cut the rail and enabling the rail to be welded.
When welding the rail, we recommend using welding rods compliant with JIS D 5816. (suggested manufacturer and model number: Kobelco LB-52).

[4-way Equal Load Type]

Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations.

[Can be Mounted Even Under Rough Conditions]

Since the central part of the LM rail is slightly thinner than the ends, even if the parallelism between two rails is poor the LM rail is capable of absorbing the error by bending inward or outward.

[Sectional Shape with High Flexural Rigidity]

Since the LM rail has a sectional shape with high flexural rigidity, it can also be used as a structural member. In addition, even when the LM rail is partially fastened or supported in cantilever, the distortion is minimal.

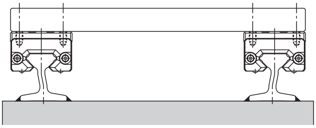


Fig.1

Second Moment of Inertia of the LM Rail

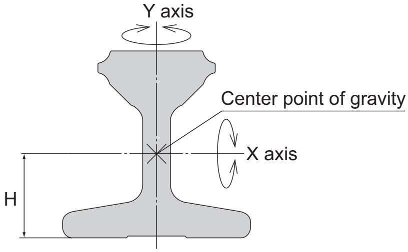


Fig.2

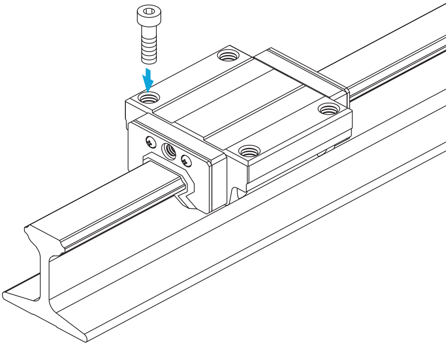
	Geometrical moment of inertia I [$\times 10^5$ mm^4]		Modulus of section Z [$\times 10^4$ mm^3]		Height of gravitational center H [mm]
	About X axis	About Y axis	About X axis	About Y axis	
JR 25	1.90	0.51	0.69	0.21	19.5
JR 35	4.26	1.32	1.43	0.49	24.3
JR 45	12.1	3.66	3.31	1.04	33.1
JR 55	27.6	6.54	5.89	1.40	43.3

Types and Features

Model JR-A

Specification Table⇒B-164

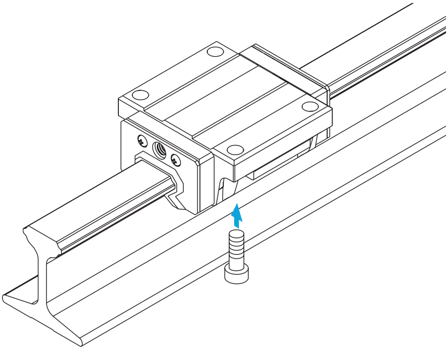
The flange of its LM block has tapped holes.



Model JR-B

Specification Table⇒B-164

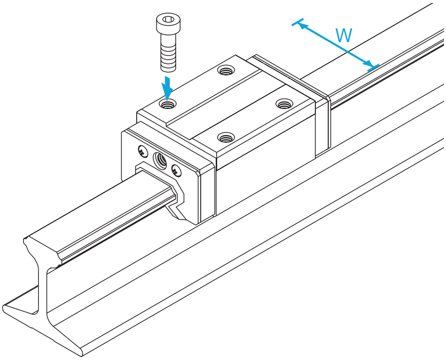
The flange of the LM block has through holes. Used in places where the table cannot have through holes for mounting bolts.



Model JR-R

Specification Table⇒B-164

With this type, the LM block has a smaller width (W) and tapped holes. Used in places where the space for table width is limited.



Rated Loads in All Directions

Model JR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for JR.

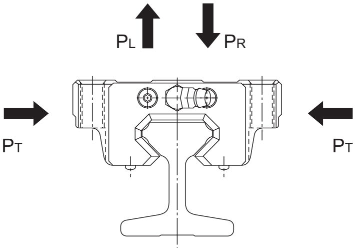


Fig.3

Equivalent Load

When the LM block of model JR receives loads in the radial, reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

For details,see A-121.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-326.

Error Allowance in the Parallelism between Two Rails

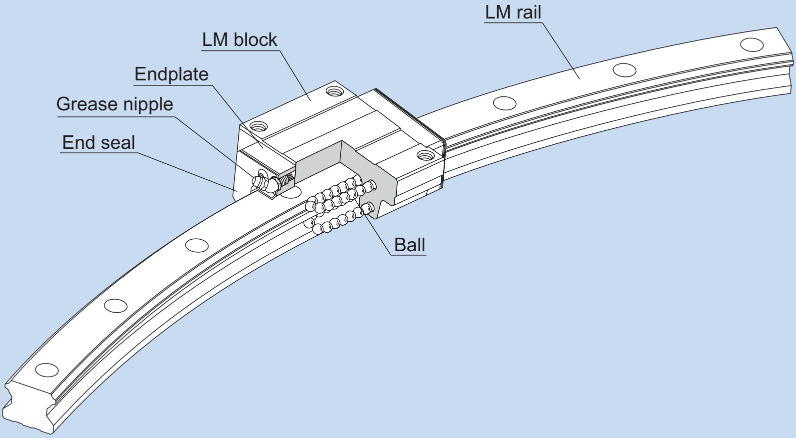
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

HCR

LM Guide
R Guide Model HCR



Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
With a structure that is basically the same as four-way equal load type LM Guide model HSR, which has a proven track record, this R Guide is a new concept product that allows highly accurate circular motion.

[Freedom of Design]

Multiple LM blocks can individually move on the same rail. By arranging LM blocks on the load points, efficient structural design is achieved.

[Shortened Assembly Time]

This model allows clearance-free, highly accurate circular motion as opposed to sliding guides or cam followers. You can easily assemble this model simply by mounting the LM rail and LM blocks with bolts.

[Allows Circular Motion of 5m or Longer]

It allows circular motion of 5 m or longer, which is impossible with swivel bearings.
In addition, use of this model makes it easy to assemble, disassemble and reassemble equipment that circularly moves.

[Capable of Receiving Loads in All Directions]

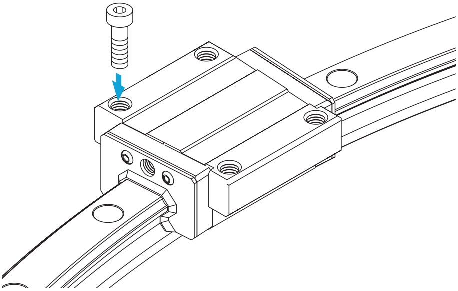
This model is capable of receiving loads in all directions since it has a structure that is basically the same as model HSR.

Types and Features

Model HCR

Specification Table⇒B-168

The flange of its LM block has tapped holes.



Rated Loads in All Directions

Model HCR is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for HCR.

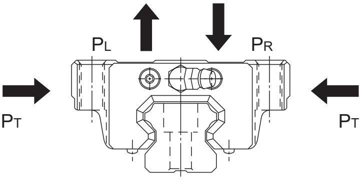


Fig.1

Equivalent Load

When the LM block of model HCR receives loads in all four directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

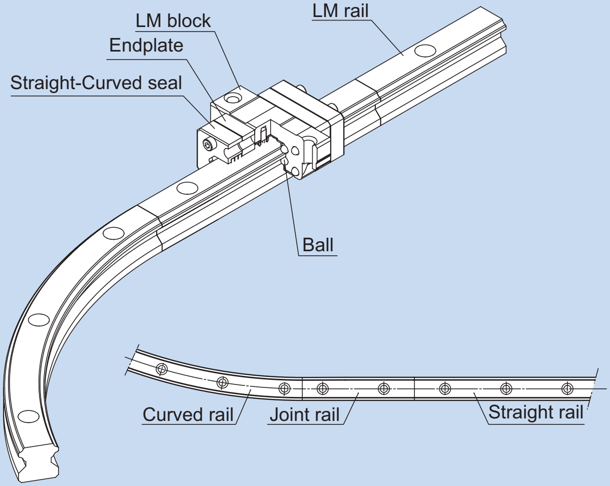
For details,see A-121.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-328.

HMG

LM Guide
Straight-Curved Guide Model HMG



Structure and Features

The Straight-Curved Guide HMG is a new straight-curved guide that allows the same type of LM blocks to continuously move on straight and curved rails by combining the technologies of the LM Guide HSR and the R Guide HCR. It achieves drastic cost reduction through improvement of work efficiency at the assembly and conveyance lines and the inspection equipment and simplification of the structure by eliminating a lift and a table.

[Freedom of Design]

It allows free combinations of straight and curved shapes.

Since LM blocks can smoothly transit between the straight and curved sections, various combinations of straight and curved rails can be joined into various shapes such as O, U, L and S shapes. In addition, HMG allows a large table to be mounted and a heavy object to be carried through combinations of multiple blocks on a single rail or 2 or more LM rails. Thus, it provides great freedom of design.

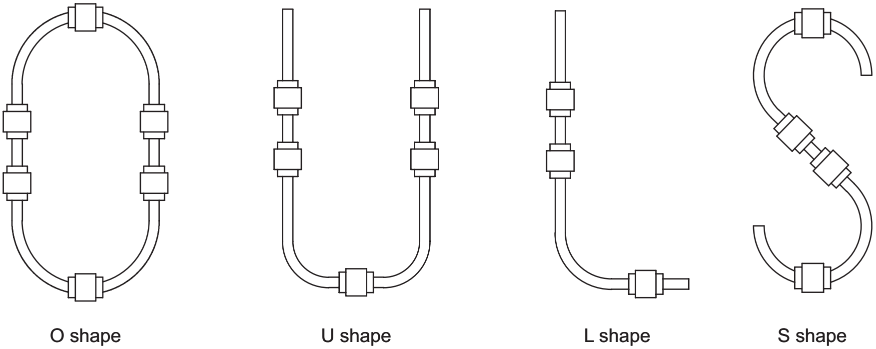
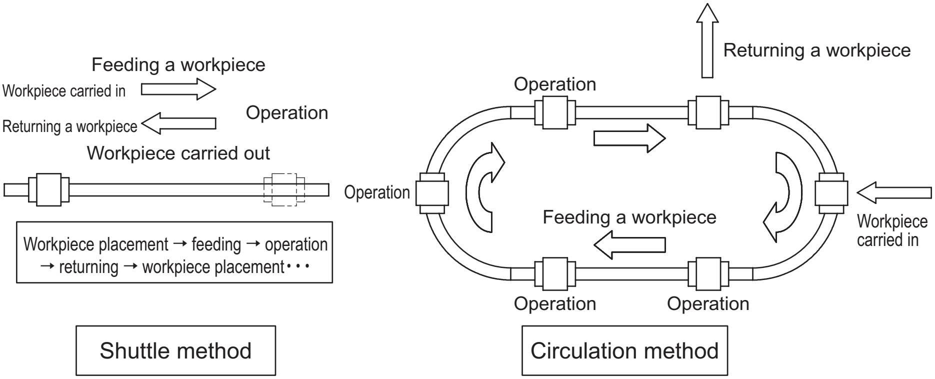


Fig.1 Examples of Joining Rails into Different Shapes

[Shortened Transportation Time]

Unlike the shuttle method, using HMG units in a circulating system allows workpieces to be placed while other workpieces are being inspected or mounted, thus to significantly improve process time. Increasing the number of tables can further shorten process time.



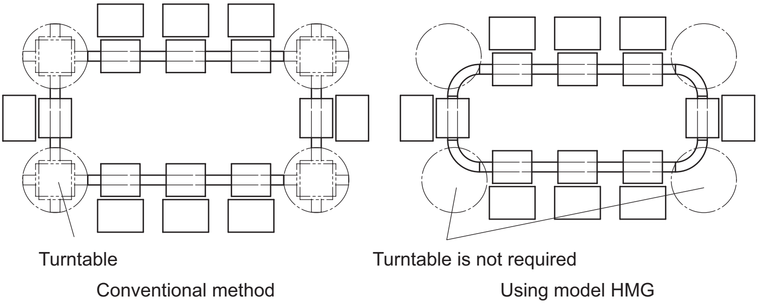
Shuttle method

Circulation method

Fig.2 Improved process time

[Cost Reduction through a Simplified Mechanism]

Combination of straight and curved rails eliminates a lift and a turntable conventionally used for changing directions in the conveyance and production lines. Therefore, use of HMG simplifies the mechanism and eliminates a large number of parts, allowing the cost to be reduced. Additionally, man-hours in designing can also be reduced.



Conventional method

Using model HMG

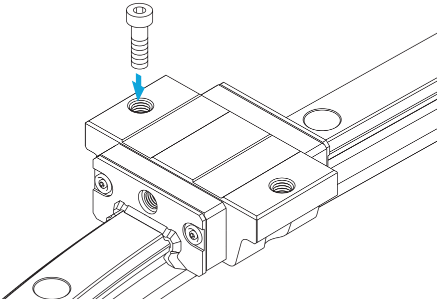
Fig.3

Types and Features

Model HMG

Specification Table⇒B-172

The flange of the LM block has tapped holes. Can be mounted from the top or the bottom.



Rated Loads in All Directions

Model HMG is capable of receiving loads in all four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for HMG.

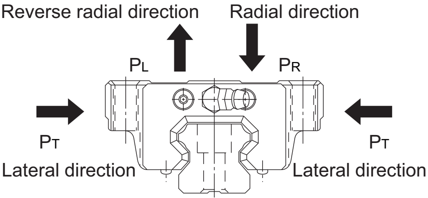


Fig.4

Equivalent Load

When the LM block of model HMG receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \, (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

For details,see A-121.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-328.

Examples of Table Mechanisms

The Straight-Curved Guide HMG requires a rotating mechanism or a slide mechanism for the table to rotate the curved sections when 2 or more rails are used or when 2 or more LM blocks are connected on a single rail. Refer to Fig.5 for examples of such mechanisms.

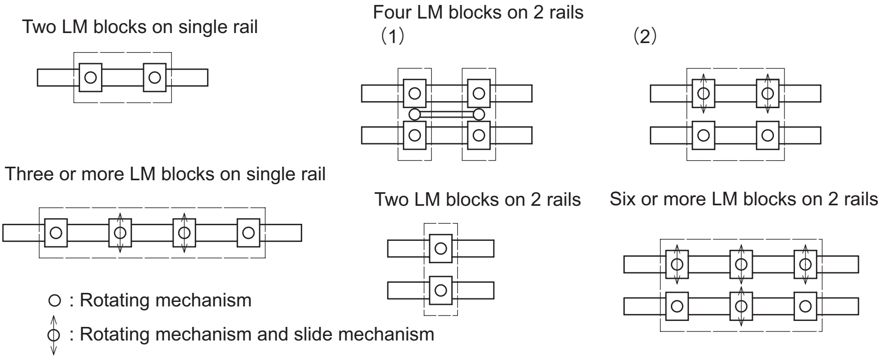


Fig.5 Examples of Table Mechanisms

Fig.6 shows examples of designing a table when units are used on multiple axes. HMG requires a rotating mechanism and a slide mechanism since the table is decentered when an LM block transits from a straight section to a curved section. The amount of decentering differs according to the radius of the curved section and the LM block span. Therefore, it is necessary to design the system in accordance with the corresponding specifications.

Fig.7 shows detail drawings of the slide and rotating mechanisms. In the figure, LM Guides are used in the slide mechanism and Cross-Roller Rings in the rotating mechanism to achieve smooth sliding and rotating motions.

For driving the Straight-Curved Guide, belt drives and chain drives are available.

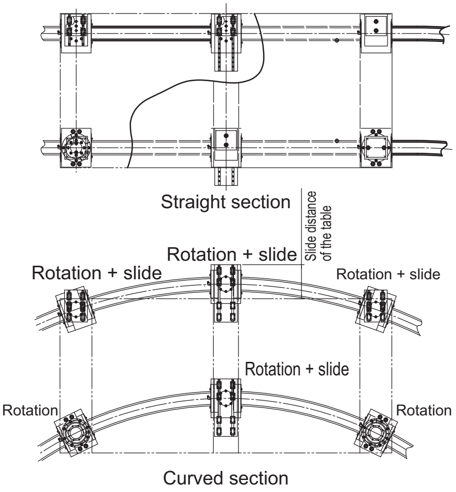


Fig.6

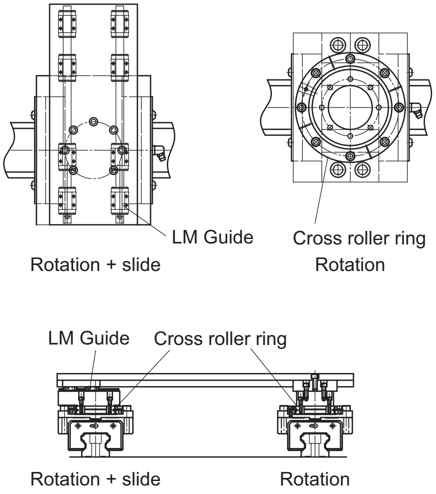
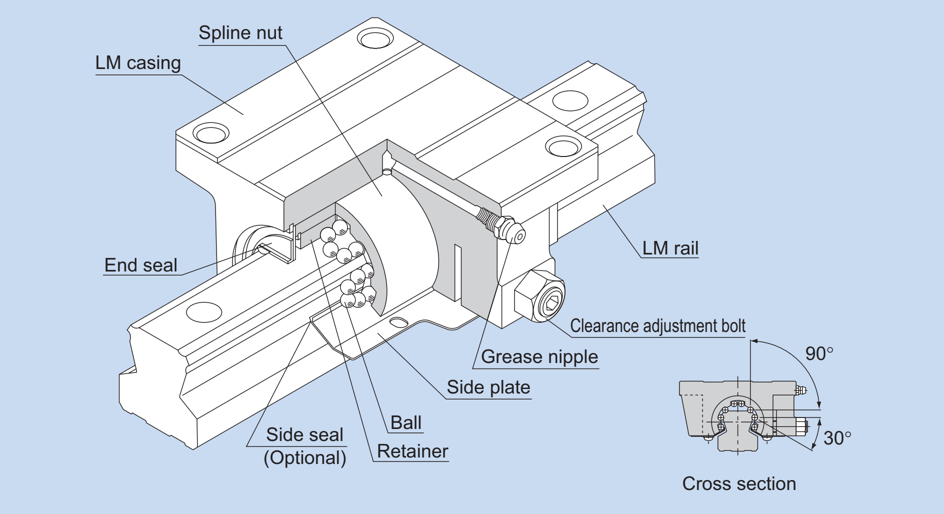


Fig.7

NSR-TBC

LM Guide
Self-aligning Type Model NSR-TBC



Cross section

Structure and Features

Model NSR-TBC is the only LM Guide whose casing consists of two pieces instead of a single-piece LM block. The rigid, cast iron casing contains a cylindrical spline nut that is partially cut at an angle of 120°. This enables the model to self-aligning on the fitting surface with the casing, thus to permit rough installation.

[Capable of Receiving Loads in All Directions]

NSR-TBC has four rows of balls. The balls are arranged in two rows on each shoulder of the LM rail, and can receive loads in all four directions: upward, downward and lateral directions. Due to the self-aligning structure, however, a rotational moment (M_C) cannot be applied in a single-rail configuration.

[Easy Installation and Accuracy Establishment]

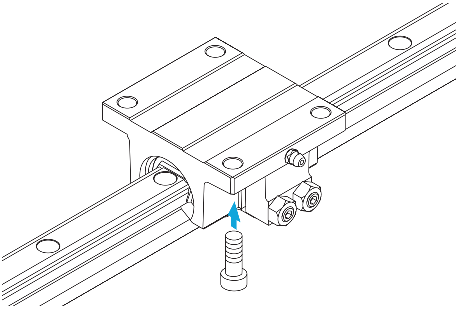
Model NSR-TBC is highly capable of performing self-adjustment and self-alignment. As a result, even if two rails are not mounted with accuracy, the LM casing absorbs the error and it does not affect the traveling performance. Accordingly, the machine performance will not be deteriorated.

Types and Features

Model NSR-TBC

Specification Table⇒B-178

The flange of the LM casing has through holes, allowing the LM Guide to be mounted from the bottom.



Rated Loads in All Directions

Model NSR-TBC is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings indicate the values in the radial direction in Fig.1, and their actual values are provided in the specification table for NSR-TBC. The values in the reverse radial and lateral directions are obtained from Table1 below.

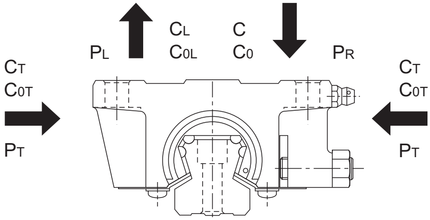


Fig.1

Table1 Basic Load Ratings of Model NSR-TBC in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.62C$	$C_{0L}=0.50C_0$
Lateral directions	$C_T=0.56C$	$C_{0T}=0.43C_0$

Equivalent Load

When the LM casing of model NSR-TBC receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_L + Y \cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model NSR-TBC

P_E	X	Y
Equivalent load in reverse radial direction	1	1.155
Equivalent load in lateral direction	0.866	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-326.

Error Allowance in the Parallelism between Two Rails

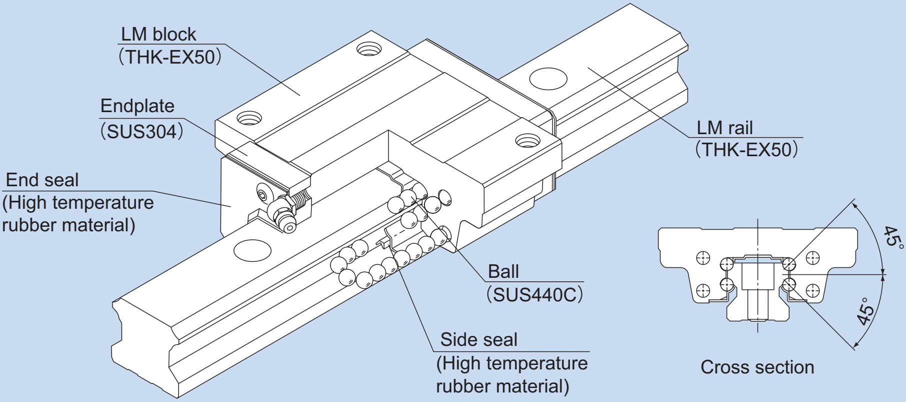
For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

HSR-M1

LM Guide
High Temperature Type Model HSR-M1



Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations.
The high temperature type LM Guide is capable of being used at service temperature up to 150 ℃ thanks to THK's unique technologies in material, heat treatment and lubrication.

[Maximum Service Temperature: 150℃]
Use of stainless steel in the endplates and high temperature rubber in the end seals achieves the maximum service temperature of 150℃.

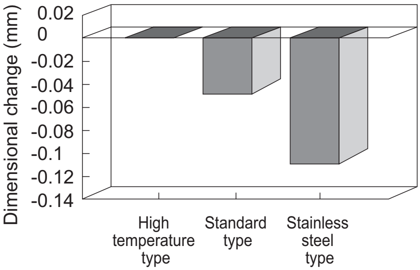
[Dimensional Stability]
Since it is dimensionally stabilized, it demonstrates superb dimensional stability after being heated or cooled (note that it shows linear expansion at high temperature).

[Highly Corrosion Resistant]
Since the LM block, LM rail and balls use stainless steel, which is highly corrosion resistant, this model is optimal for clean room applications.

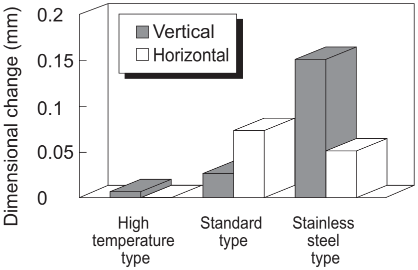
[High Temperature Grease]
This model uses high temperature grease that shows little grease-based fluctuation in rolling resistance even if temperature changes from low to high levels.

● Dimensional Stability Data

Since this model has been treated for dimensional stability, its dimensional change after being cooled or heated is only minimal.



Overall LM Rail Length

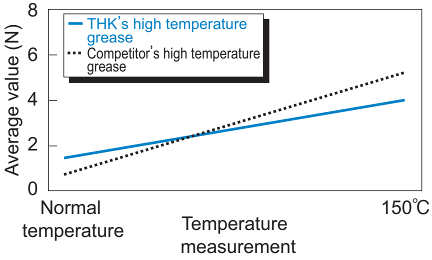


Curvature of the LM Rail

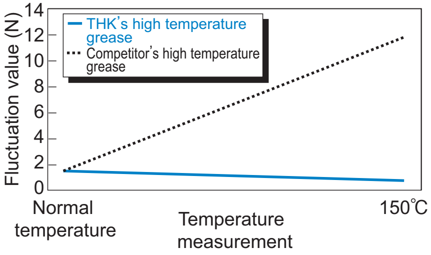
Note1) The above data on overall length and curvature indicate dimensional change when the LM rail is cooled to normal temperature after being heated at 150℃ for 100 hours.
Note2) The samples consist of high temperature, standard and stainless steel types of model HSR25 + 580L.

● Rolling Resistance Data in Relation to Grease

Use a high temperature grease with which the rolling resistance of the LM system little fluctuates even temperature changes from a normal to high range.



Average Value



Fluctuation Value

For the measurements above, model HSR25M1R1C1 is used.

● Thermal Characteristics of LM Rail and LM Block Materials

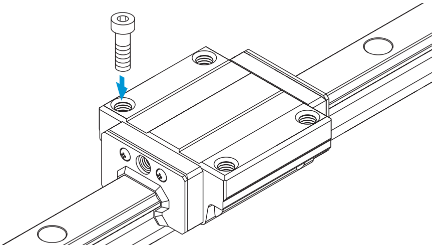
Specific heat capacity: 0.481 J/(g･K)
Thermal conductivity: 20.67 W/(m･K)
Average coefficient of linear expansion: 11.8×10^{-6}/℃

Types and Features

Model HSR-M1A

Specification Table⇒B-182

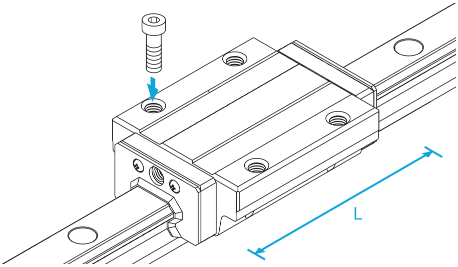
The flange of its LM block has tapped holes.



Model HSR-M1LA

Specification Table⇒B-182

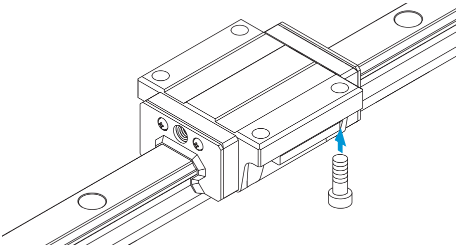
The LM block has the same cross-sectional shape as model HSR-M1A, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-M1B

Specification Table⇒B-184

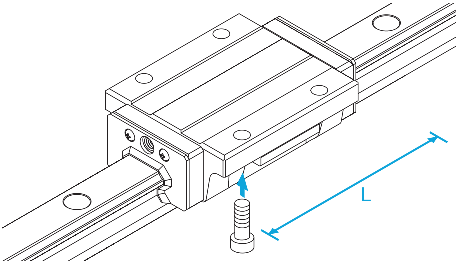
The flange of the LM block has through holes. Used in places where the table cannot have through holes for mounting bolts.



Model HSR-M1LB

Specification Table⇒B-184

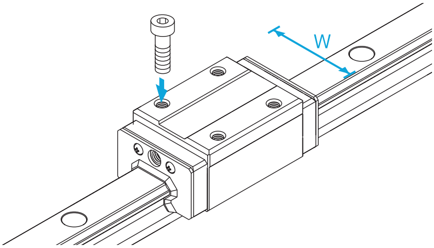
The LM block has the same sectional shape as model HSR-M1B, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-M1R

Specification Table⇒B-186

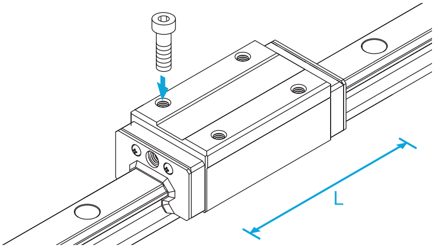
With this type, the LM block has a smaller width (W) and tapped holes. Used in places where the space for table width is limited.



Model HSR-M1LR

Specification Table⇒B-186

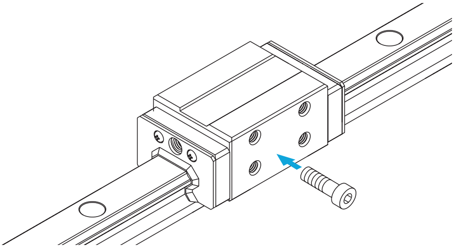
The LM block has the same sectional shape as model HSR-M1R, but has a longer overall LM block length (L) and a greater rated load.



Model HSR-M1YR

Specification Table⇒B-188

When using two units of LM Guide facing each other, the previous model required much time in machining the table and had difficulty achieving the desired accuracy and adjusting the clearance. Since model HSR-M1YR has tapped holes on the side of the LM block, a simpler structure is gained and significant man-hour cutting and accuracy increase can be achieved.



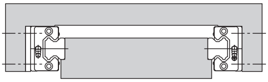


Fig.1 Conventional Structure

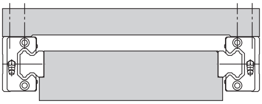


Fig.2 Mounting Structure for Model HSR-M1YR

Rated Loads in All Directions

Model HSR-M1 is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for HSR-M1.

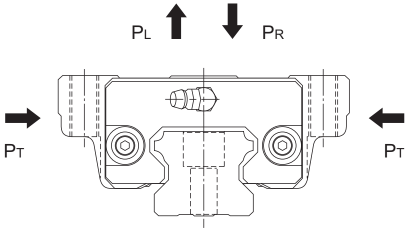


Fig.3 Model HSR-M1

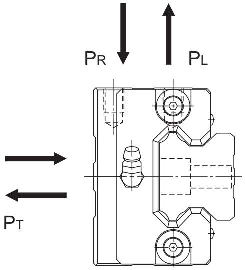


Fig.4 Model HSR-M1YR

Equivalent Load

When the LM block of model HSR-M1 receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-328.

Error Allowance in the Parallelism between Two Rails

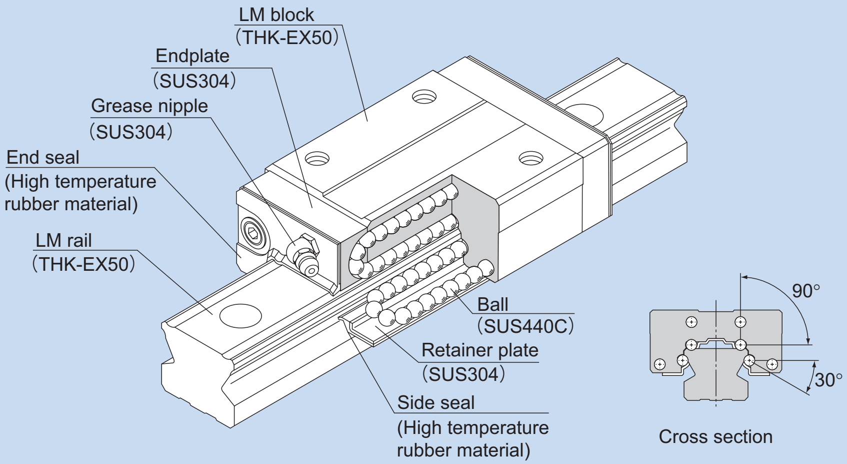
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

SR-M1

LM Guide
High Temperature Type Model SR-M1



Cross section

Structure and Features

Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Since it is a compactly designed model that has a low sectional height and a ball contact structure rigid in the radial direction, this model is optimal for horizontal guide units.
High temperature type LM Guide model SR-M1 is capable of being used at service temperature up to 150℃ thanks to THK's unique technologies in material, heat treatment and lubrication.

[Maximum Service Temperature: 150℃]
Use of stainless steel in the endplates and high temperature rubber in the end seals achieves the maximum service temperature of 150℃.

[Dimensional Stability]
Since it is dimensionally stabilized, it demonstrates superb dimensional stability after being heated or cooled (note that it shows linear expansion at high temperature).

[Highly Corrosion Resistant]
Since the LM block, LM rail and balls use stainless steel, which is highly corrosion resistant, this model is optimal for clean room applications.

[High Temperature Grease]
This model uses high temperature grease that shows little grease-based fluctuation in rolling resistance even if temperature changes from low to high levels.

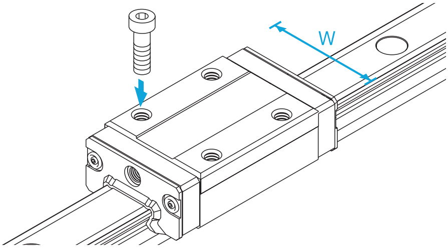
Thermal Characteristics of LM Rail and LM Block Materials

- Specific heat capacity: 0.481 J/(g・K)
- Thermal conductivity: 20.67 W/(m・K)
- Average coefficient of linear expansion: 11.8×10^{-6}/℃

Model SR-M1W

Specification Table⇒B-192

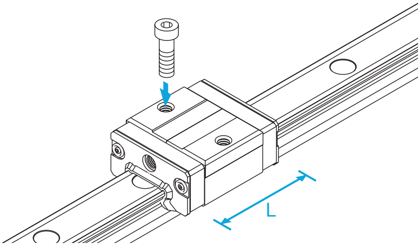
With this type, the LM block has a smaller width (W) and tapped holes.



Model SR-M1V

Specification Table⇒B-192

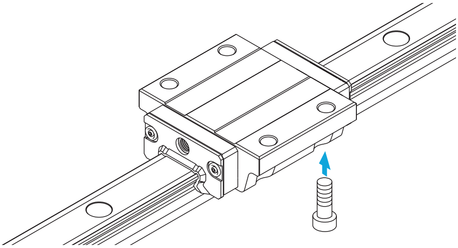
A space-saving type whose LM block has the same cross-sectional shape as model SR-M1W, but has a smaller overall LM block length (L).



Model SR-M1TB

Specification Table⇒B-194

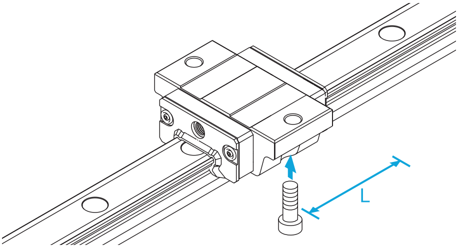
The LM block has the same height as model SR-M1W and can be mounted from the bottom.



Model SR- M1SB

Specification Table⇒B-194

A space-saving type whose LM block has the same sectional shape as model SR-M1TB, but has a smaller overall LM block length (L).



Rated Loads in All Directions

Model SR-M1 is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings indicate the values in the radial directions in Fig.1, and their actual values are provided in the specification table for SR-M1. The values in the reverse radial and lateral directions are obtained from Table1 below.

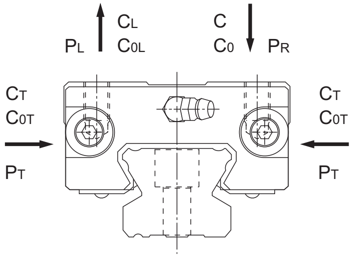


Fig.1

Table1 Rated Loads in All Directions with Model SR-M1

Model No.	Direction	Basic dynamic load rating	Basic static load rating
SR-M1 15 to 35	Radial direction	C	C_0
	Reverse radial direction	C_L=0.62C	C_{0L}=0.50C_0
	Lateral directions	C_T=0.56C	C_{0T}=0.43C_0

Equivalent Load

When the LM block of model SR-M1 receives loads in the reverse radial and lateral directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_L + Y \cdot P_T$$

P_E : Equivalent load (N)
: Reverse radial direction
: Lateral direction
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor (see Table2)

Table2 Equivalent Factor of Model SR-M1

Model No.	P_E	X	Y
SR-M1 15 to 35	Equivalent load in reverse radial direction	1	1.155
	Equivalent load in lateral direction	0.866	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-326.

Error Allowance in the Parallelism between Two Rails

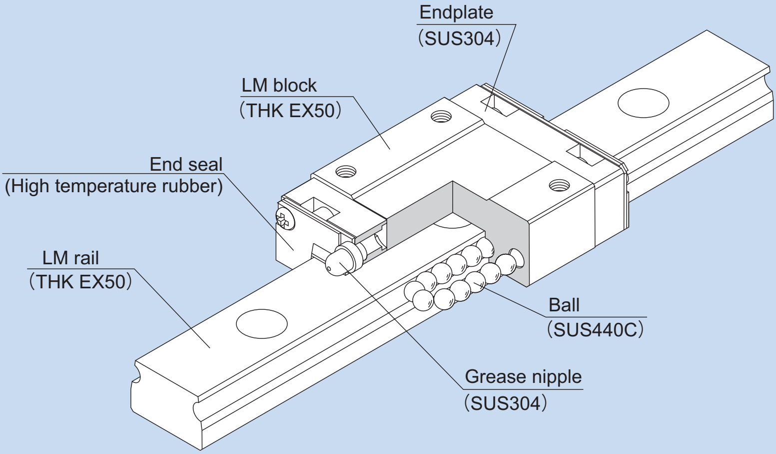
For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

RSR-M1

LM Guide
High Temperature Type Model RSR-M1



Structure and Features

Balls roll in two rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
High temperature type miniature LM Guide model RSR-M1 is capable of being used at service temperature up to 150℃ thanks to THK's unique technologies in material, heat treatment and lubrication.

[Maximum Service Temperature: 150℃]

Use of stainless steel in the endplates and high temperature rubber in the end seals achieves the maximum service temperature of 150℃.

[Dimensional Stability]

Since it is dimensionally stabilized, it demonstrates superb dimensional stability after being heated or cooled (note that it shows linear expansion at high temperature).

[Highly Corrosion Resistant]

Since the LM block, LM rail and balls use stainless steel, which is highly corrosion resistant, this model is optimal for clean room applications.

[High Temperature Grease]

This model uses high temperature grease that shows little grease-based fluctuation in rolling resistance even if temperature changes from low to high levels.

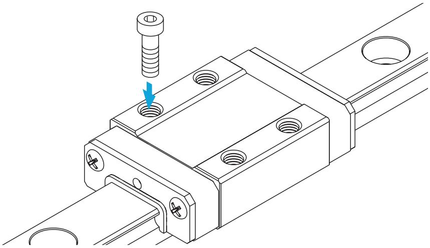
Thermal Characteristics of LM Rail and LM Block Materials

- Specific heat capacity: 0.481 J/(g･K)
- Thermal conductivity: 20.67 W/(m･K)
- Average coefficient of linear expansion: 11.8×10^{-6}/℃

Models RSR-M1, RSR-M1K, M1V

Specification Table⇒B-198

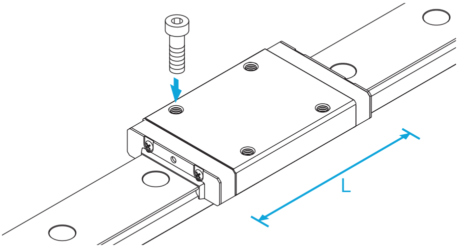
This model is a standard type.



Model RSR-M1N

Specification Table⇒B-198

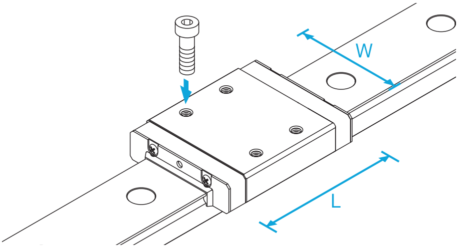
It has a longer overall LM block length (L) and a greater rated load than standard types.



Models RSR-M1W, M1WV

Specification Table⇒B-200

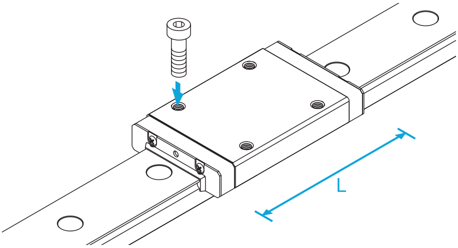
These models have greater overall LM block lengths (L), broader widths (W) and greater rated loads and permissible moments than standard types.



Model RSR-M1WN

Specification Table⇒B-200

It has a longer overall LM block length (L), a greater rated load than standard types. Achieves the greatest load capacity among the high temperature type miniature LM Guide models.



Rated Loads in All Directions

Model RSR-M1 is capable of receiving loads in four directions: radial, reverse radial and lateral directions.

The basic load ratings of models RSR9M1/M1W are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for RSR-M1.

The basic load ratings of models RSR12M1 to 20M1 indicate the values in the radial direction in Fig.1, and their actual values are provided in the specification table for RSR-M1. The values in the reverse radial and lateral directions are obtained from Table1 below.

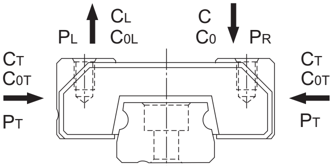


Fig.1

Table1 Basic Load Ratings of Models RSR12M1 to 20M1 in All Directions

Direction	Basic dynamic load rating	Basic static load rating
Radial direction	C	C_0
Reverse radial direction	$C_L=0.78C$	$C_{0L}=0.70C_0$
Lateral directions	$C_T=0.78C$	$C_{0T}=0.71C_0$

Equivalent Load

When the LM block of models RSR9M1/M1W receives loads in all four directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

When the LM block of models RSR12M1 to 20M1 receives loads in the radial and lateral directions, or the reverse radial and lateral directions, simultaneously, the equivalent load is obtained from the equation below.

$$P_E = X \cdot P_R\ (P_L) + Y \cdot P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)
X, Y : Equivalent factor
(see Table2 and Table3)

Table2 Equivalent Factor of Models RSR12M1 to 20M1(when radial and lateral loads are applied)

P_E	X	Y
Equivalent load in the radial direction	1	0.83
Equivalent load in lateral direction	1.2	1

Table3 Equivalent Factor of Models RSR12M1 to 20M1 (when reverse radial and lateral loads are applied)

P_E	X	Y
Equivalent load in reverse radial direction	1	0.99
Equivalent load in lateral direction	1.01	1

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-114.

Accuracy Standards

For details,see A-126.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-332.

Error Allowance in the Parallelism between Two Rails

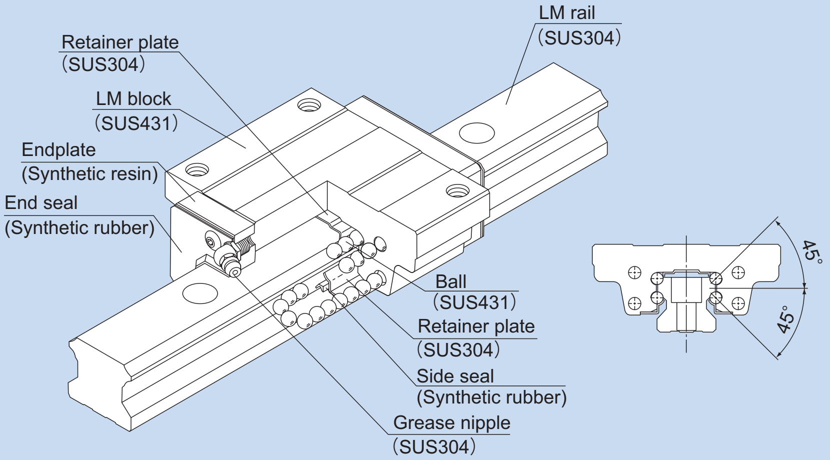
For details,see A-334.

Error Allowance in Vertical Level between Two Rails

For details,see A-337.

HSR-M2

LM Guide
High Corrosion Resistance Type Model HSR-M2



Structure and Features

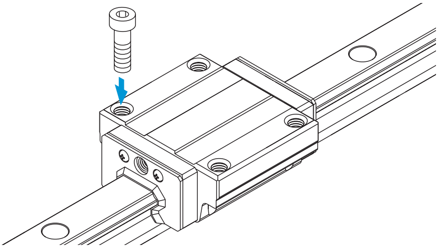
Balls roll in four rows of raceways precision-ground on an LM rail and an LM block, and endplates incorporated in the LM block allow the balls to circulate.
Each row of balls is placed at a contact angle of 45° so that the rated loads applied to the LM block are uniform in the four directions (radial, reverse radial and lateral directions), enabling the LM Guide to be used in all orientations.
The LM rail, LM block and balls are made of highly corrosion resistant stainless steel and the other metal parts are made of stainless steel, allowing superb corrosion resistance to be achieved. As a result, the need for surface treatment is eliminated.

Types and Features

Model HSR-M2A

Specification Table⇒B-204

The flange of its LM block has tapped holes.



Rated Loads in All Directions

Model HSR-M2 is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for HSR-M2.

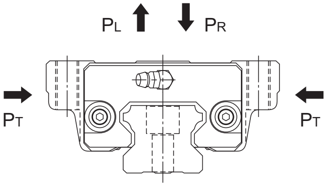


Fig.1 Model HSR-M2

Equivalent Load

When the LM block of model HSR-M2 receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \; (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction

P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-328.

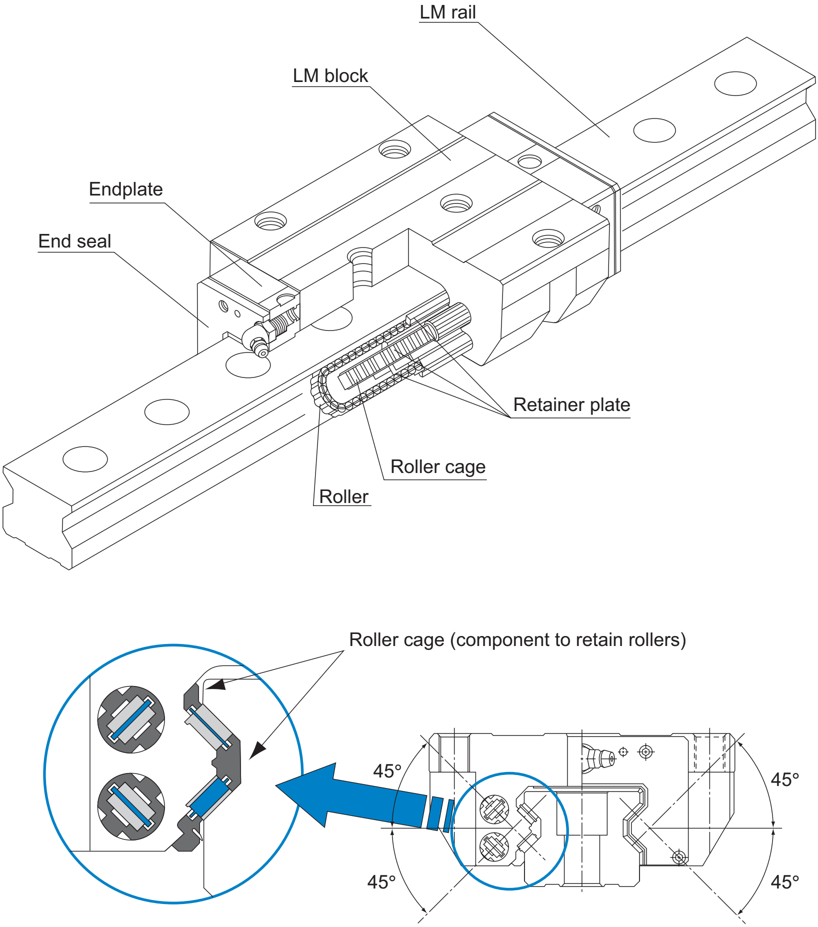
Error Allowance in the Parallelism between Two Rails

For details,see A-333.

Error Allowance in Vertical Level between Two Rails

For details,see A-336.

Structure and Features of the Caged Roller LM Guide



Magnified view of the circulation path

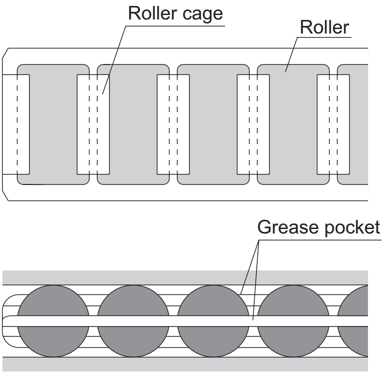
Cross section

Fig.1 Structural Drawing of the Caged Roller LM Guide Model SRG

Caged Roller LM Guide is a roller guide that achieves low-friction, smooth motion and long-term maintenance-free operation by using a roller cage. In addition, to ensure ultra-high rigidity, rollers with low elastic deformation are used as the rolling elements and the roller diameter and the roller length are optimized.

Furthermore, the lines of rollers are placed at a contact angle of 45° so that the same rated load is applied in the four (radial, reverse and lateral) directions.

Advantages of the Caged Roller Technology

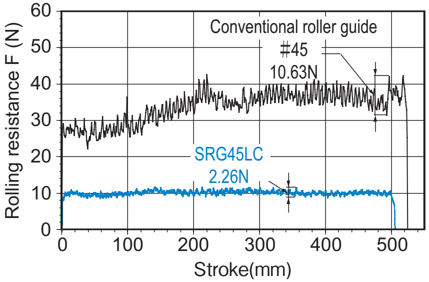


(1) Evenly spaced and aligned rollers circulate, preventing the rollers from skewing, minimizing rolling resistance fluctuations and achieving smooth and stable motion.
(2) The absence of friction between rollers allows grease to be retained in grease pockets and achieves long-term maintenance-free operation.
(3) The absence of friction between rollers achieves low heat generation and superbly high speed.
(4) The absence of roller-to-roller collision ensures low noise and acceptable running sound.

[Smooth Motion]

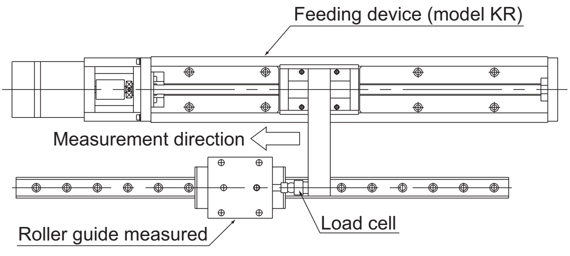
● Rolling Resistance Data

Evenly spaced and aligned rollers circulate, minimizing rolling resistance fluctuations and achieving smooth and stable motion.



Result of Measuring Rolling Resistance Fluctuations

[Conditions]
Feeding speed: 10mm/s
Applied load: no load (one block)



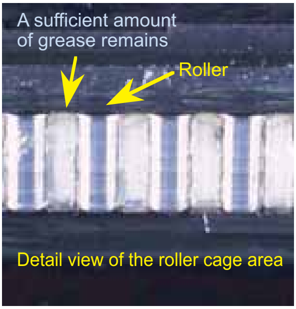
Rolling Resistance Measuring Machine

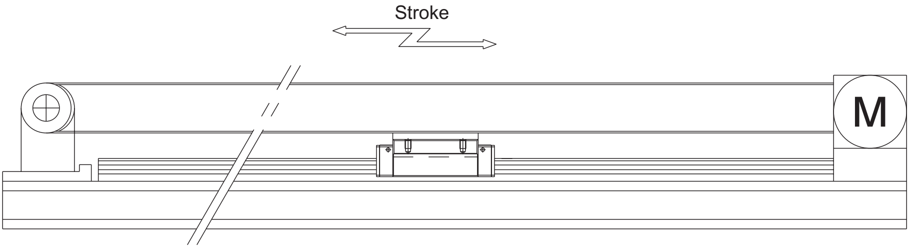
[Long-term Maintenance-free Operation]

● High-speed Durability Test Data

Use of a roller cage eliminates friction between rollers, minimizes heat generation and increases grease retention, thus to achieve long-term maintenance-free operation.

[Conditions]
Model No.: SRG45LC
Magnitude of preload: clearance C0
Speed: 180m/min
Acceleration: 1.5G
Stroke: 2300mm
Lubrication : Initial lubrication only
(THKAFB-LF Grease)





Test result: No anomaly observed after running 15,000 km

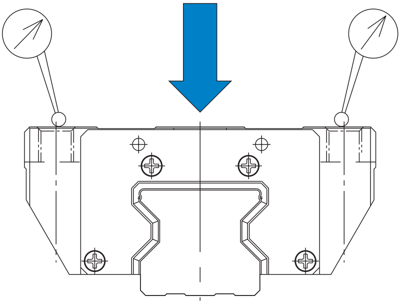
Result of High-speed Durability Test

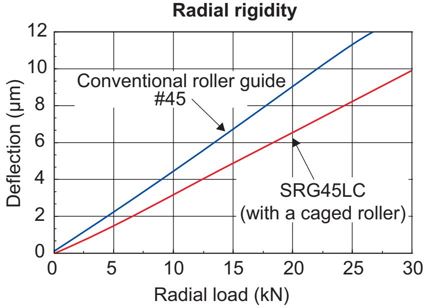
[Ultra-high Rigidity]

● High Rigidity Evaluation Data

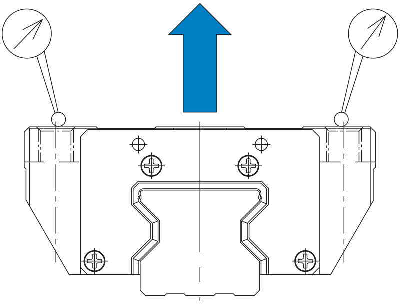
[Preload] SRG : radial clearance C0
Conventional type : radial clearance equivalent to C0

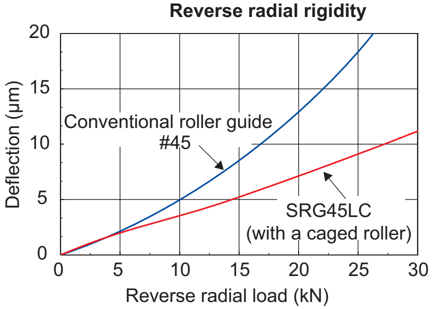
Radial rigidity



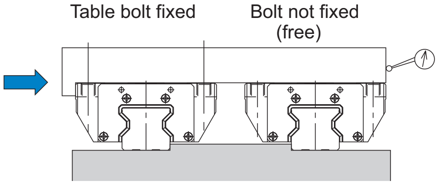


Reverse radial rigidity

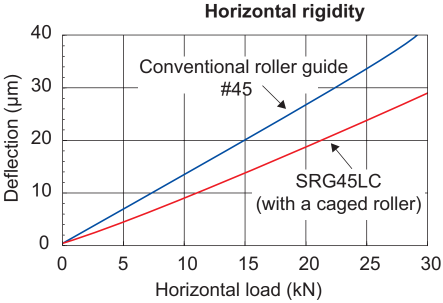




Horizontal rigidity

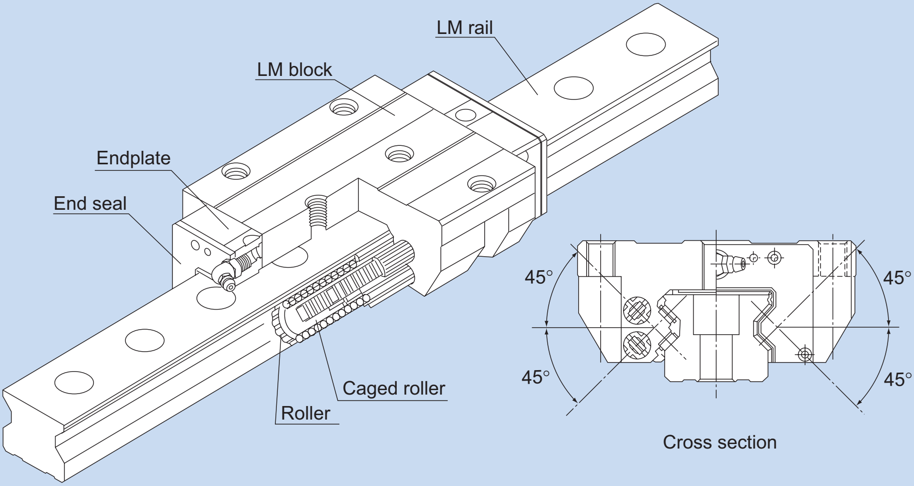


Rigidity is measured with the two axes placed in parallel and one of the axes not fixed with a bolt in order not to apply a moment.



SRG

Caged Roller LM Guide
Ultra-high Rigidity Type Model SRG



* For the caged roller, see A-296.

Structure and Features

SRN is an ultra-high rigidity Roller Guide that uses roller cages to allow low-friction, smooth motion and achieve long-term maintenance-free operation.

[Ultra-high Rigidity]

A higher rigidity is achieved by using highly rigid rollers as the rolling elements and having the overall roller length more than 1.5 times greater than the roller diameter.

[4-way Equal Load]

Since each row of rollers is arranged at a contact angle of 45° so that the LM block receives an equal load rating in all four directions (radial, reverse radial and lateral directions), high rigidity is ensured in all directions.

[Smooth Motion through Skewing Prevention]

The roller cage allows rollers to form an evenly spaced line while circulating, thus preventing the rollers from skewing as the block enters an loaded area. As a result, fluctuation of the rolling resistance is minimized, and stable, smooth motion is achieved.

[Long-term Maintenance-free Operation]

Use of roller cages eliminates friction between rollers and increases grease retention, enabling long-term maintenance-free operation to be achieved.

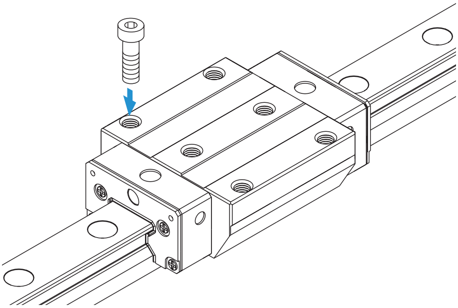
[Global Standard Size]

SRG is designed to have dimensions almost the same as that of Full Ball LM Guide model HSR, which THK as a pioneer of the linear motion system has developed and is practically a global standard size.

Models SRG-15A, 20A

Specification Table⇒B-208

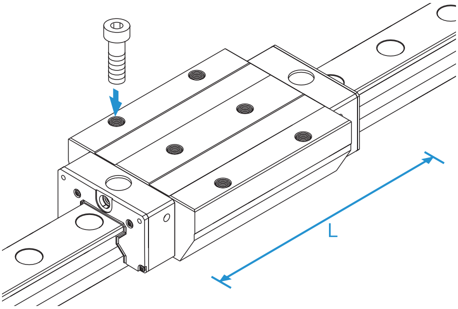
The flange of the LM block has tapped holes.
Can be mounted from the top or the bottom.



Model SRG-20L

Specification Table⇒B-208

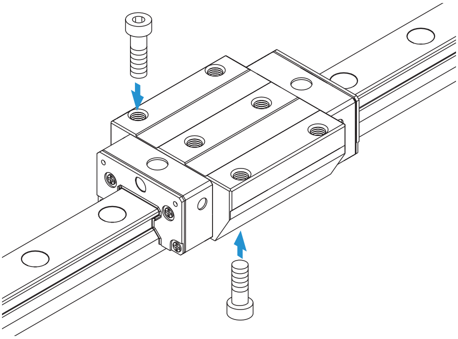
The LM block has the same cross-sectional shape as model SRG-A, but has a longer overall LM block length (L) and a greater rated load.



Model SRG-C

Specification Table⇒B-208

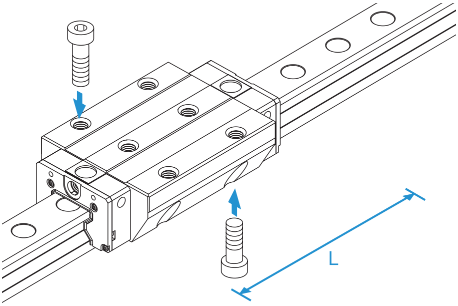
The flange of the LM block has tapped holes.
Can be mounted from the top or the bottom.
Used in places where the table cannot have through holes for mounting bolts.



Model SRG-LC

Specification Table⇒B-208

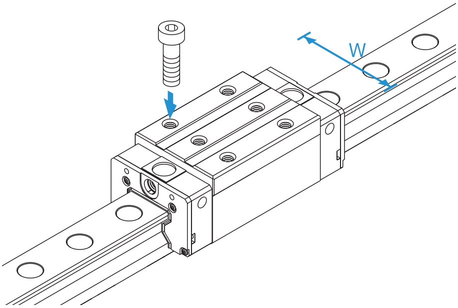
The LM block has the same cross-sectional shape as model SRG-C, but has a longer overall LM block length (L) and a greater rated load.



Model SRG-R

Specification Table⇒B-210

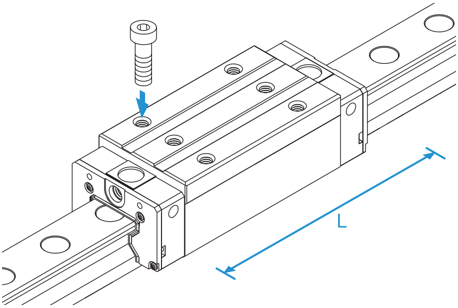
With this type, the LM block has a smaller width (W) and tapped holes.
Used in places where the space for table width is limited.



Model SRG-R

Specification Table⇒B-210

The LM block has the same cross-sectional shape as model SRG-R, but has a longer overall LM block length (L) and a greater rated load.



Rated Loads in All Directions

Model SRG is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for SRG.

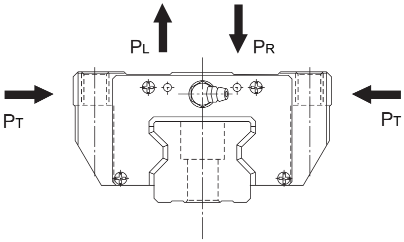


Fig.1

Equivalent Load

When the LM block of model SRG receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-329.

Error Allowance of the Mounting Surface

Caged Roller LM Guide model SRG is highly rigid since it uses rollers as its rolling elements, and the roller cage prevents the rollers from skewing. However, the mounting surface needs to be finished with high accuracy. If the error on the mounting surface is large, it will affect the rolling resistance and the service life. The following shows the maximum permissible value (limit value) according to the radial clearance.

Table1 Error Allowance in Parallelism (P) between Two Rails

Unit: mm

Radial clearance Model No.	Normal	C1	C0
SRG 15	0.005	0.003	0.003
SRG 20	0.008	0.006	0.004
SRG 25	0.009	0.007	0.005
SRG 30	0.011	0.008	0.006
SRG 35	0.014	0.010	0.007
SRG 45	0.017	0.013	0.009
SRG 55	0.021	0.014	0.011
SRG 65	0.027	0.018	0.014

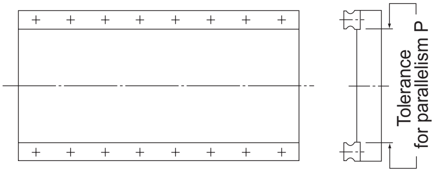


Fig.2

Table2 Error Allowance in Level (X) between the Rails

Unit: mm

Radial clearance	Normal	C1	C0
Permissible error on the mounting surface X	0.00030 a	0.00021 a	0.00011 a

$X=X_1+X_2$

X_1 : Level difference on the rail mounting surface

X_2 : Level difference on the block mounting surface

Example of calculation

Rail span	when a ＝ 500mm
Error allowance of the mounting surface	$X = 0.0003 \times 500$ $= 0.15$

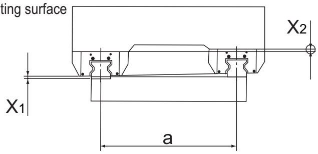


Fig.3

Table3 Error Allowance in Level (Y) in the Axial Direction

Unit: mm

Permissible error on the mounting surface	0.000036 b

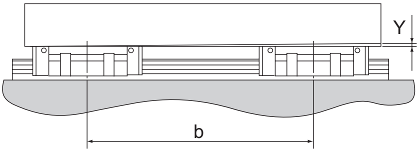
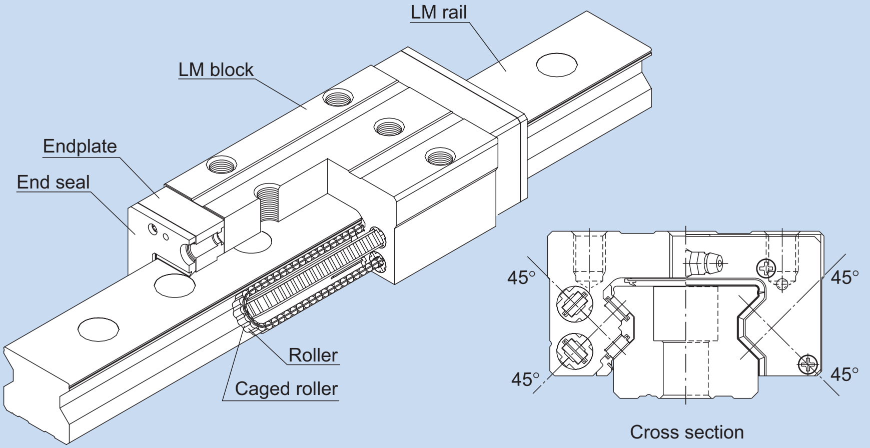


Fig.4

SRN

Caged Roller LM Guide
Ultra-high Rigidity Type (Low Center of Gravity) Model SRN



Cross section

* For the caged roller, see A-306.

Structure and Features

SRN is an ultra-high rigidity Roller Guide that uses roller cages to allow low-friction, smooth motion and achieve long-term maintenance-free operation.

[Ultra-high Rigidity]

A higher rigidity is achieved by using highly rigid rollers as the rolling elements and having the overall roller length more than 1.5 times greater than the roller diameter.

[4-way Equal Load]

Since each row of rollers is arranged at a contact angle of 45° so that the LM block receives an equal load rating in all four directions (radial, reverse radial and lateral directions), high rigidity is ensured in all directions.

[Smooth Motion through Skewing Prevention]

The roller cage allows rollers to form an evenly spaced line while circulating, thus preventing the rollers from skewing as the block enters an loaded area. As a result, fluctuation of the rolling resistance is minimized, and stable, smooth motion is achieved.

[Long-term Maintenance-free Operation]

Use of roller cages eliminates friction between rollers and increases grease retention, enabling long-term maintenance-free operation to be achieved.

[Global Standard Size]

SRG is designed to have dimensions almost the same as that of Full Ball LM Guide model HSR, which THK as a pioneer of the linear motion system has developed and is practically a global standard size.

[Thin, Low Center of Gravity]

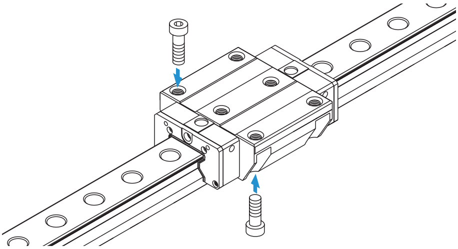
Since the overall height is lower than Caged Roller LM Guide model SRG, this model is optimal for compact design.

Types and Features

Model SRN-C

Specification Table⇒B-214

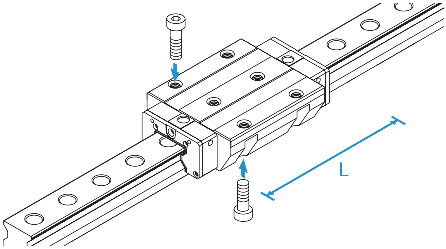
The flange of the LM block has tapped holes.
Can be mounted from the top or the bottom.
Used in places where the table cannot have through holes for mounting bolts.



Model SRN-LC

Specification Table⇒B-214

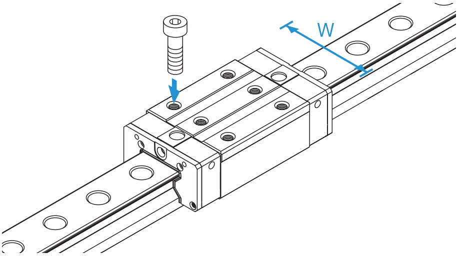
The LM block has the same cross-sectional shape as model SRN-C, but has a longer overall LM block length (L) and a greater rated load.



Model SRN-R

Specification Table⇒B-216

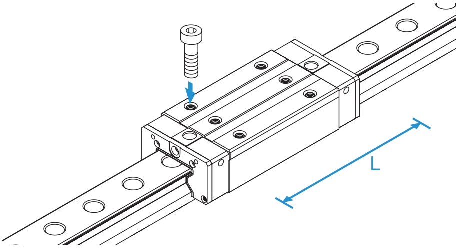
With this type, the LM block has a smaller width (W) and tapped holes.
Used in places where the space for table width is limited.



Model SRN-LR

Specification Table⇒B-216

The LM block has the same cross-sectional shape as model SRN-R, but has a longer overall LM block length (L) and a greater rated load.



Rated Loads in All Directions

Model SRN is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table for SRN.

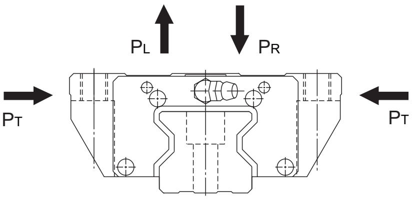


Fig.1

Equivalent Load

When the LM block of model SRN receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \; (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance Standard

For details,see A-115.

Accuracy Standards

For details,see A-119.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-329.

Error Allowance of the Mounting Surface

Caged Roller LM Guide model SRN is highly rigid since it uses rollers as its rolling elements, and the roller cage prevents the rollers from skewing. However, the mounting surface needs to be finished with high accuracy. If the error on the mounting surface is large, it will affect the rolling resistance and the service life. The following shows the maximum permissible value (limit value) according to the radial clearance.

Table1 Error Allowance in Parallelism (P) between Two Rails

Unit: mm

Radial clearance Model No.	Normal	C1	C0
SRN 35	0.014	0.010	0.007
SRN 45	0.017	0.013	0.009
SRN 55	0.021	0.014	0.011
SRN 65	0.027	0.018	0.014

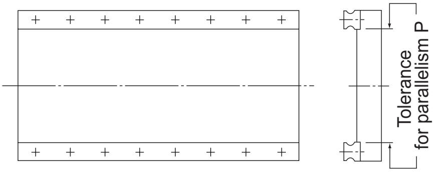


Fig.2

Table2 Error Allowance in Level (X) between the Rails

Unit: mm

Radial clearance	Normal	C1	C0
Permissible error on the mounting surface X	0.00030 a	0.00021 a	0.00011 a

$X = X_1 + X_2$

X_1 : Level difference on the rail mounting surface

X_2 : Level difference on the block mounting surface

Example of calculation

Rail span	when a = 500mm
Error allowance of the mounting surface	$X = 0.0003 \times 500$ $= 0.15$

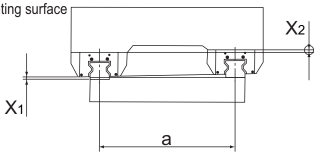


Fig.3

Table3 Error Allowance in Level (Y) in the Axial Direction

Unit: mm

Permissible error on the mounting surface	0.000036 b

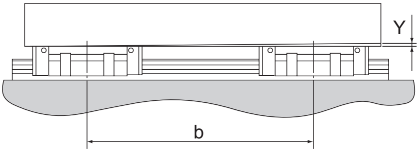
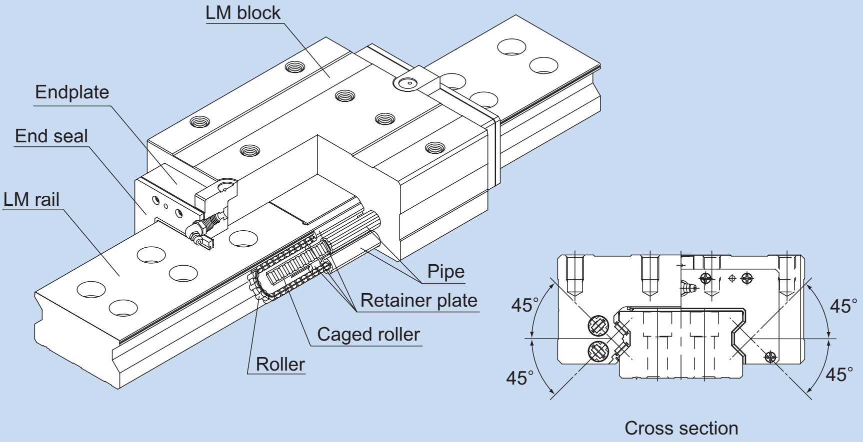


Fig.4

SRW

Caged Roller LM Guide
Ultra-high Rigidity Type (Wide) Model SRW



* For the caged roller, see A-296.

Structure and Features

Based on Caged Roller LM Guide model SRG, this model has a wider rail and two rows of LM rail mounting holes to achieve high mounting strength and mounting stability. SRW is an ultra-high rigidity Roller Guide that uses roller cages to allow low-friction, smooth motion and achieve long-term maintenance-free operation.

[Ultra-high Rigidity]

Since it has a wide rail and can be secured on the table using two rows of mounting bolts, the mounting strength is significantly increased. In addition, since the crosswise raceway distance (L) is large, model SRW is structurally strong against a moment load (Mc moment) in the rolling direction.
Furthermore, model SRW uses rollers that show little elastic deformation as its rolling elements, and the overall length of each roller is 1.5 times greater than the diameter, thus to increase the rigidity.

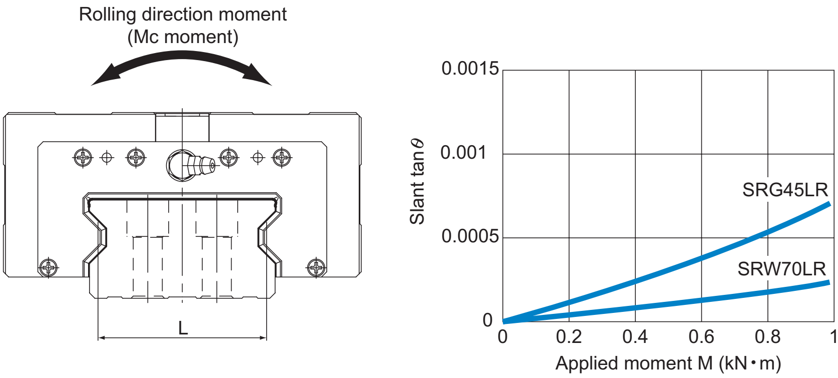


Fig.1 Result of Comparison between Models SRW and SRG in Moment Rigidity in the Rolling Direction (Mc Moment)

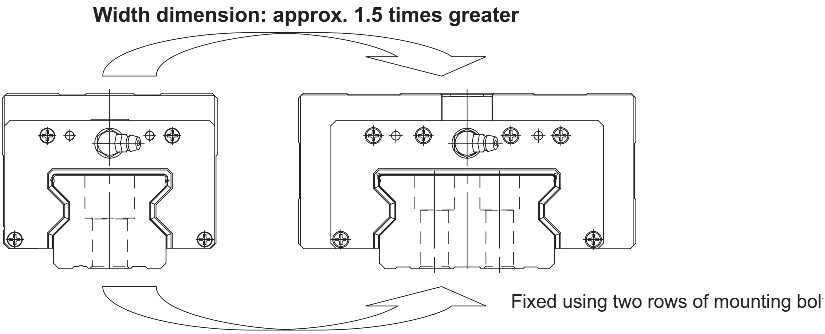


Fig.2 Comparison between Models SRW and SRG in Cross Section

[Smoothness Achieved through Skewing Prevention]
The roller cage allows rollers to form an evenly spaced line while circulating, thus preventing the rollers from skewing as the block enters an loaded area. As a result, fluctuation of the rolling resistance is minimized, and stable, smooth motion is achieved.

[Long-term Maintenance-free Operation]
Use of the roller cage eliminates friction between rollers and enables the lubricant to be retained in grease pockets formed between adjacent rollers. As the rollers circulate, the grease pocket serves to provide the required amount of lubricant to the contact curvature of the spacer and the roller, thus to achieve long-term maintenance-free operation.

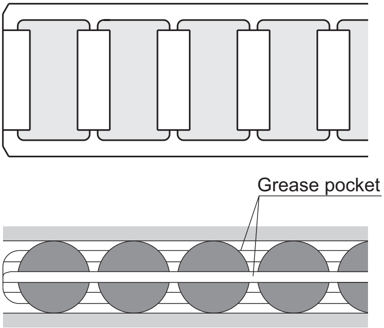


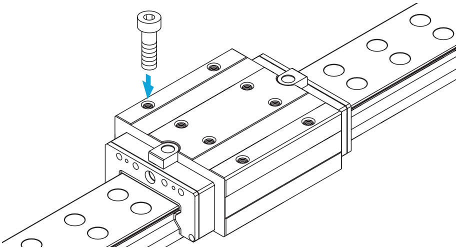
Fig.3

Types and Features

Model SRW-LR

Specification Table⇒B-220

The LM block has tapped holes.



Rated Loads in All Directions

Model SRW is capable of receiving loads in four directions: radial, reverse radial and lateral directions.
The basic load ratings are uniform in the four directions (radial, reverse radial and lateral directions), and their actual values are provided in the specification table.

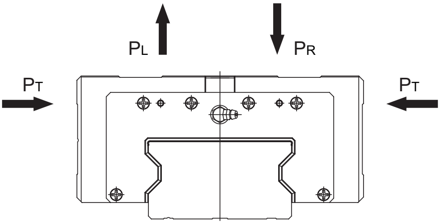


Fig.4

Equivalent Load

When the LM block of model SRW receives loads in all directions simultaneously, the equivalent load is obtained from the equation below.

$$P_E = P_R \ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Service Life

For details,see A-100.

Radial Clearance

For details,see A-115.

Accuracy Standards

For details,see A-128.

Shoulder Height of the Mounting Base and the Corner Radius

For details,see A-329.

Permissible Error of the Mounting Surface

Caged Roller LM Guide model SRW is highly rigid since it uses rollers as its rolling elements, and the roller cage prevents the rollers from skewing. However, the mounting surface needs to be finished with high accuracy. If the error on the mounting surface is large, it will affect the rolling resistance and the service life. The following shows the maximum permissible value (limit value) according to the radial clearance.

Table1 Error in Parallelism (P) between Two Rails

Unit: mm

Radial clearance Model No.	Normal	C1	C0
SRW 70	0.013	0.009	0.007
SRW 85	0.016	0.011	0.008
SRW 100	0.020	0.014	0.011

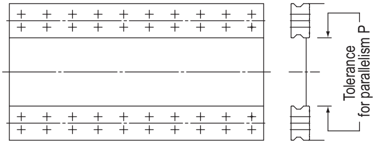


Fig.5

Table2 Error in Level (X) between Two Rails

Unit: mm

Radial clearance	Normal	C1	C0
Accuracy of the mounting surface X	0.00020a	0.00014a	0.000072a

$X=X_1+X_2$

X_1: Level difference on the rail mounting surface

X_2: Level difference on the block mounting surface

Table3 Error in Level (Y) in the Axial Direction

Unit: mm

Accuracy of the mounting surface	0.000036 b

Example of calculation

When the rail span :
a=500mm

Accuracy of the mounting surface
X=0.0002×500
=0.1

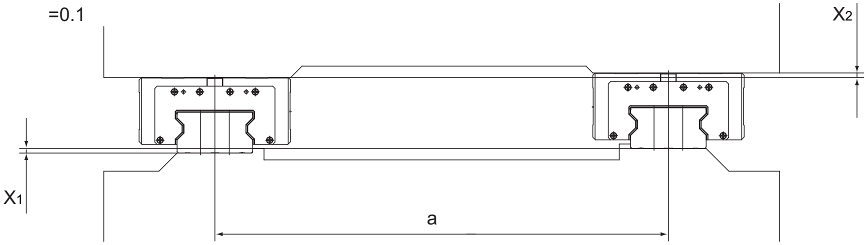


Fig.6

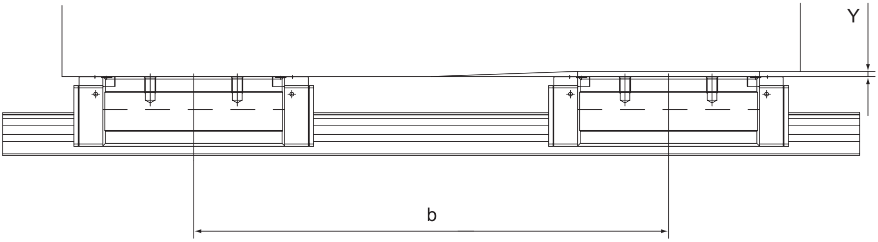


Fig.7

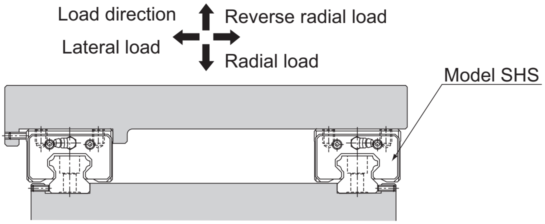
Designing the Guide System

THK offers various types of LM Guides in order to meet diversified conditions. Supporting ordinary horizontal mount, vertical mount, inverted mount, slant mount, wall mount and single-axis mount, the wide array of LM Guide types makes it easy to achieve a linear guide system with a long service life and high rigidity while minimizing the required space for installation.

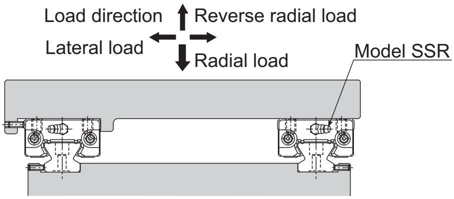
Examples of Arrangements of the Guide System

The following are representative guide systems and arrangements when installing the LM Guide. (For indication of the reference surface, see A-338.)

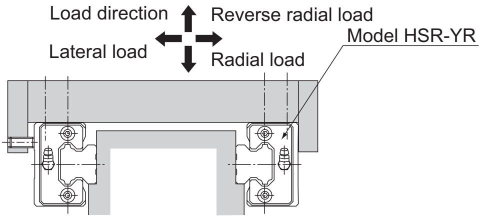
Double-rail configuration when high rigidity is required in all directions



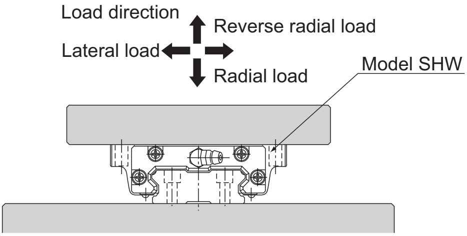
Double-rail configuration when high rigidity is required in the radial direction



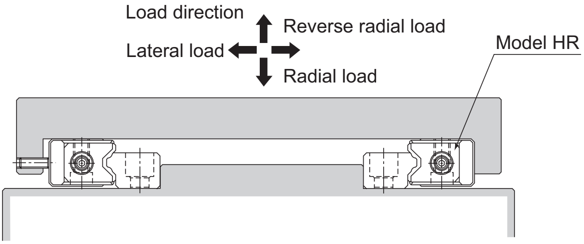
When high rigidity is required in all directions and the installation space is limited in height



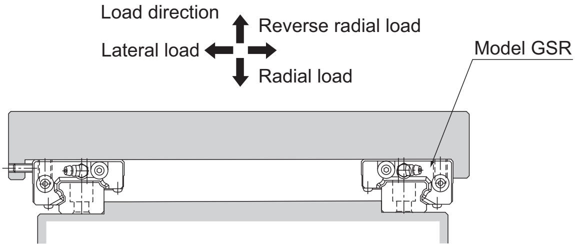
Single-rail configuration



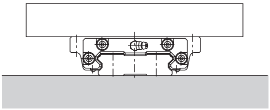
When the minimum possible height of the equipment is allowed (Adjustable preload type)



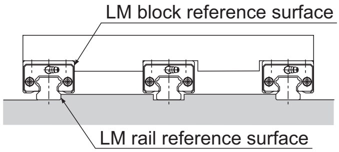
When a medium load is applied and the mounting surface is rough (Preload, self-adjusting type)



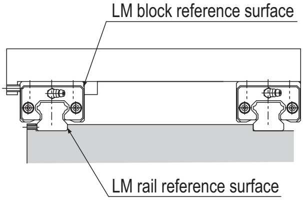
Single-rail configuration

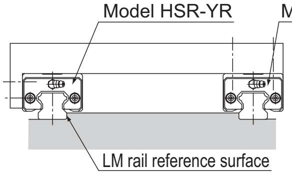


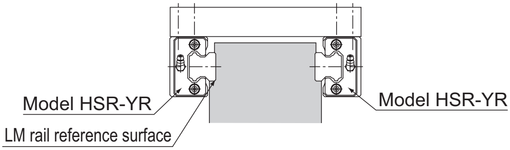
Triple-rail configuration

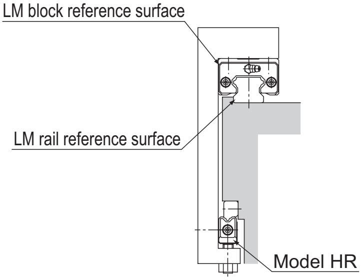


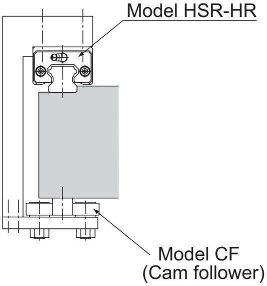
Double-rail configuration

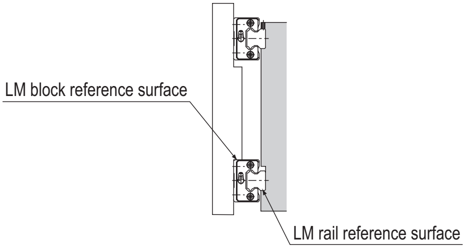


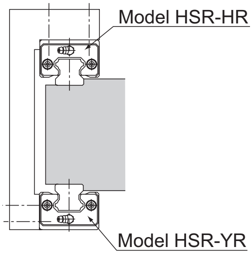




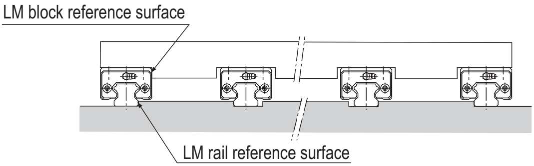


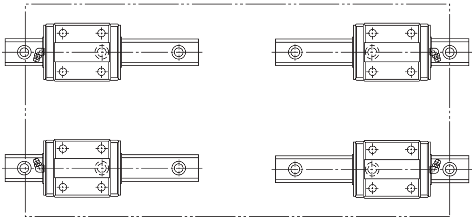


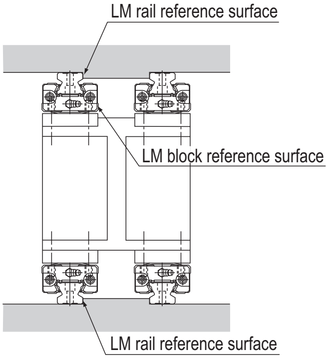


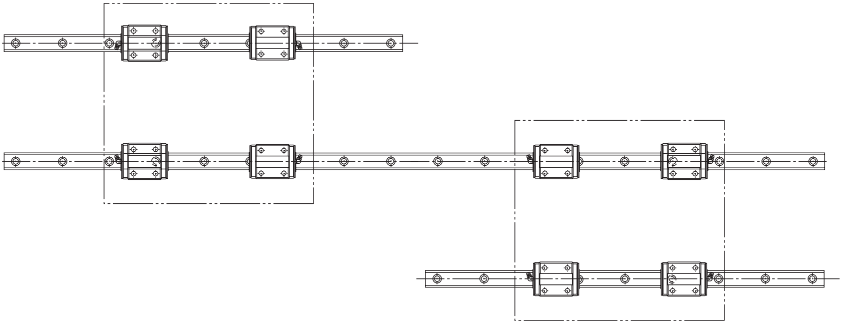


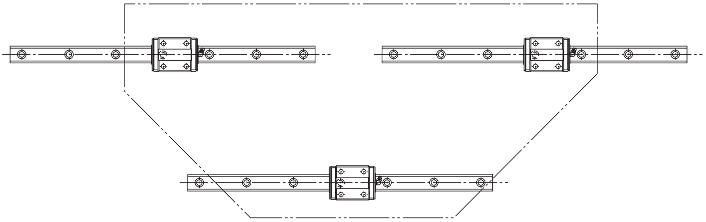
4-rail configuration









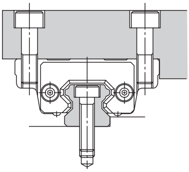
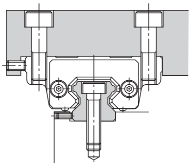
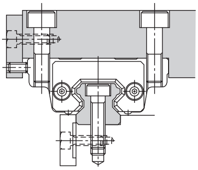
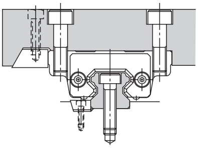


Method for Securing an LM Guide to Meet the Conditions

LM Guides are categorized into groups of types by mounting space and structure: a group of types to be mounted with bolts from the top, and another of types to be mounted from the bottom. LM rails are also divided into types secured with bolts and those secured with clamps (model JR). This wide array of types allows you to make a choice according to the application.

There are several ways of mounting the LM Guide as shown in Table1. When the machine is subject to vibrations that may cause the LM rail(s) or LM blocks to loosen, we recommend the securing method indicated by Fig.1 on A-323. (If 2 or more rails are used in parallel, only the LM block on the master rail should be secured in the crosswise direction.) If this method is not applicable for a structural reason, hammer in knock pins to secure the LM block(s) as shown in Table2 on A-323 When using knock pins, machine the top/bottom surfaces of the LM rail by 2 to 3 mm using a carbide end mill before drilling the holes since the surfaces are hardened.

Table1 Major Securing Methods on the Master-rail Side

(a) Secured only with side reference surfaces	**(b) Secured with set screws**
	
(c) Secured with a presser plate	**(d) Secured with tapered gibs**
	

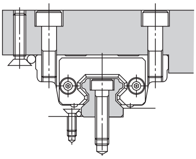
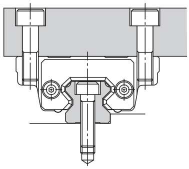
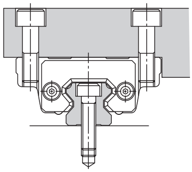
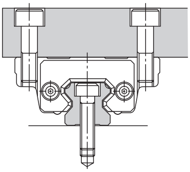
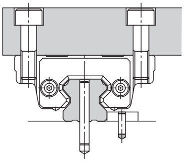
(e) Secured with pins


Table2 Major Securing Methods on the Subsidiary-rail Side

(a) Secured only with the side reference surface of the rail	**(b) Secured only with the side reference surface of the block**
	
(c) Secured without a side reference surface	**(d) Secured with dowel pins**
	

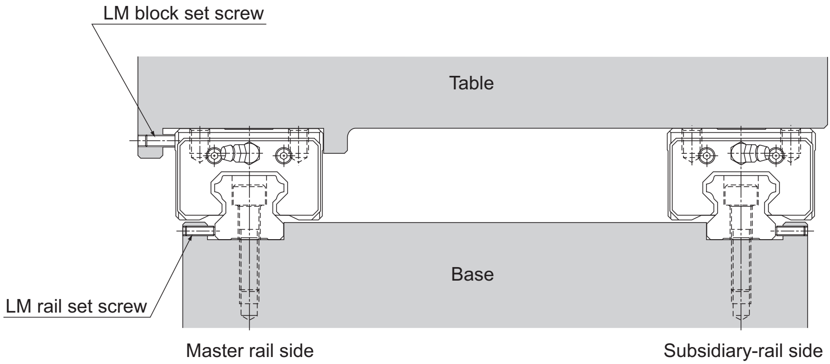
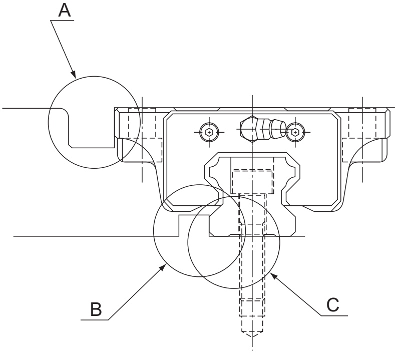


Fig.1 When the Machine Receives Vibrations or Impact

Designing a Mounting Surface

Designing a Mounting Surface

If particularly high accuracy is required for the machine to which an LM Guide is to be mounted, it is necessary to mount the LM rail with high accuracy. To achieve the desired accuracy, be sure to design the mounting surface while taking the following points into account.



[Corner Shape]

If the corner on the surface on which the LM rail or LM block is to be mounted is machined to be shaped R, which is greater than the chamfer dimension of the LM rail or LM block, then the rail or the block may not closely contact its reference surface. Therefore, when designing a mounting surface, it is important to carefully read the description on the “corner shape” of the subject model . (Fig.2)

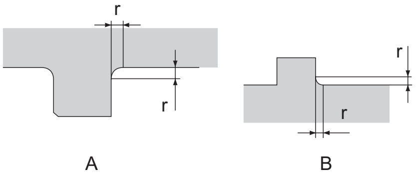


Fig.2

[Perpendicularity with the Reference Surface]

If the perpendicularity between the base mounting surface for the LM rail or the LM block and the reference surface is not accurate, the rail or the block may not closely contact the reference surface. Therefore, it is important to take into account an error of the perpendicularity between the mounting surface and the reference surface . (Fig.3)

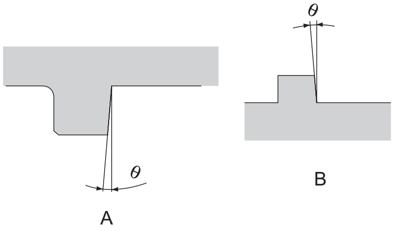


Fig.3

[Dimensions of the Reference Surface]

When designing the reference surface, be sure to take into account the height and the thickness of the datum area. If the datum area is too high, it may interfere with the LM block. If it is too low, the LM rail or the LM block may not closely contact the reference-surface depending on the chamfer of the rail or the block. Additionally, if the datum area is too thin, the desired accuracy may not be obtained due to poor rigidity of the datum area when a lateral load is applied or when performing positioning using a lateral mounting bolt . (Fig.4)

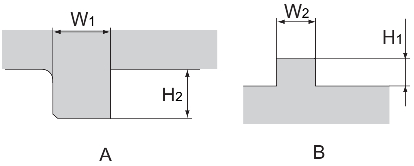


Fig.4

[Dimensional Tolerance between the Reference Surface and the Mounting Hole]

If the dimensional tolerance between the reference surface of the LM rail or the LM block and the mounting hole is too large, the rail or the block may not closely contact the reference surface when mounted on the base.

Normally, the tolerance should be within ±0.1 mm depending on the model. (Fig.5)

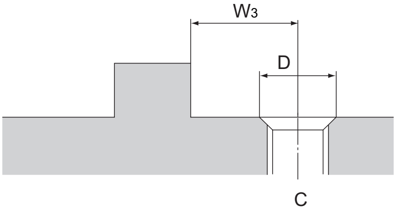


Fig.5

[Chamfer of the Tapped Mounting Hole]

To mount the LM rail, the mounting surface needs to be tapped and the tapped hole has to be chamfered. If the chamfer of the tapped hole is too large or too small, it may affect the accuracy . (Fig.6)

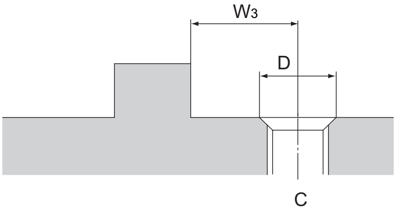


Fig.6

Guidelines for the chamfer dimension:

Chamfer diameter D = nominal diameter of the bolt + pitch

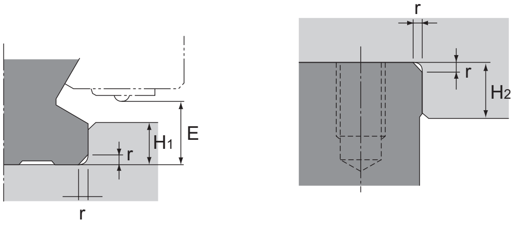
Example: Chamfer diameter D with M6 (pitch):

D = 6 + 1 = 7

Shoulder Height of the Mounting Base and the Corner Radius

Normally, the mounting base for the LM rail and the LM block has a reference-surface on the side face of the shoulder of the base in order to allow easy installation and highly accurate positioning. The height of the datum shoulder varies with model numbers. See A-326 to A-332 for details.

The corner of the mounting shoulder must be machined to have a recess, or machined to be smaller than the corner radius "r," to prevent interference with the chamfer of the LM rail or the LM block. The corner radius varies with model numbers. See A-326 to A-332 for details.



Shoulder for the LM Rail

Shoulder for the LM Block (LM casing)

Fig.7

[Model SR, SR-M1]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Maximum shoulder height for the LM block H_2	E
15	0.5	3.8	4	4.5
20	0.5	5	5	6
25	1	5.5	5	7
30	1	8	6	9.5
35	1	9	6	11.5
45	1	10	8	12.5
55	1.5	11	8	13.5
70	1.5	12	10	15
85	1.2	8	12	18.5
100	1.2	10	15	19
120	1.2	12	20	15
150	1.2	12	20	22

[Model JR]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM block H_2
25	1	5
35	1	6
45	1	8
55	1.5	10

[Model CSR]

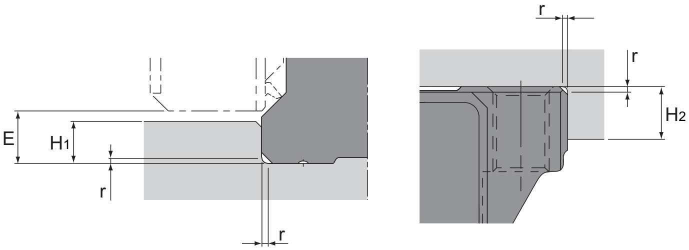
Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	E
15	0.5	3	3.5
20	0.5	3.5	4
25	1	5	5.5
30	1	5	7
35	1	6	7.5
45	1	8	10

[Model NSR-TBC]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
20	1	5	5	5.5
25	1	6	6	6.5
30	1	7	6	9
40	1	7	8	10.5
50	1	7	8	8
70	1	7	10	9.5



Shoulder for the LM Rail Shoulder for the LM Block

Fig.8

[Model SHS]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
15	0.5	2.5	4	3
20	0.5	3.5	5	4.6
25	1	5	5	5.8
30	1	5	5	7
35	1	6	6	7.5
45	1	7.5	8	8.9
55	1.5	10	10	12.7
65	1.5	15	10	19

[Model SCR]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	E
15	0.5	2.5	3
20	0.5	3.5	4.6
25	1	5	5.8
30	1	5	7
35	1	6	7.5
45	1	7.5	8.9
65	1.5	15	19

[Models SNR/SNS, SNR/SNS-H and NR/NRS]

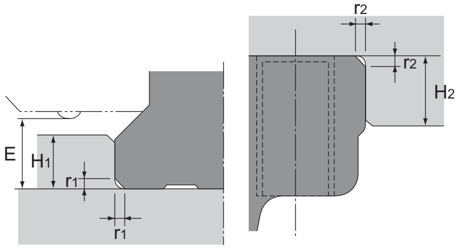
Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
25X	1.5	5	5	5.5
30	1	5	5	7
35	1	6	6	9
45	1	8	8	11.5
55	1.5	10	10	14
65	1.5	10	10	15
75	1.5	12	12	15
85	1.5	14	14	17
100	2	16	16	20

[Model MX]

Unit: mm

Model No.	Corner radius for the LM rail r(max)	Shoulder height for the LM rail H_1	E
5	0.1	1.2	1.5
7W	0.1	1.7	2



Shoulder for the LM Rail Shoulder for the LM Block

Fig.9

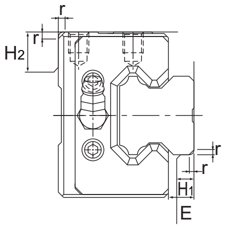


Fig.10

[Model HSR, HSR-M1 and HSR-M2]

Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
8	0.3	0.5	1.6	6	2.1
10	0.3	0.5	1.7	5	2.2
12	0.8	0.5	2.6	4	3.1
15	0.5	0.5	3	4	4.7
20	0.5	0.5	3.5	5	4
25	1	1	5	5	5.5
30	1	1	5	5	7
35	1	1	6	6	7.5
45	1	1	8	8	10
55	1.5	1.5	10	10	13
65	1.5	1.5	10	10	14
85	1.5	1.5	12	14	16
100	2	2	16	16	20.5
120	2.5	2.5	17	18	20
150	2.5	2.5	20	20	22.5

[Model HSR-YR]

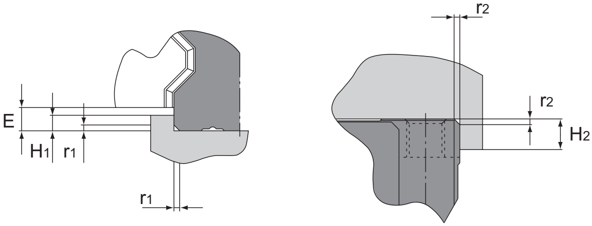
Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
15	0.5	3	4	3.5
20	0.5	3.5	5	4
25	1	5	5	5.5
30	1	5	5	7
35	1	6	6	7.5
45	1	8	8	10
55	1.5	10	10	13
65	1.5	10	10	14

[Models HCR and HMG]

Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Maximum shoulder height for the LM block H_2	E
12	0.8	0.5	2.6	6	3.1
15	0.5	0.5	3	4	3.5
25	1	1	5	5	5.5
35	1	1	6	6	7.5
45	1	1	8	8	10
65	1.5	1.5	10	10	14



Shoulder for the LM Rail

Shoulder for the LM Block

Fig.11

[Model SRG]

Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
15	0.5	0.5	2.5	4	3.0
20	0.5	0.5	3.5	5	4.6
25	1	1	4	5	4.5
30	1	1	4.5	5	5
35	1	1	5	6	6
45	1.5	1.5	6	8	8
55	1.5	1.5	8	10	10
65	1.5	2	9	10	11.5

[Model SRN]

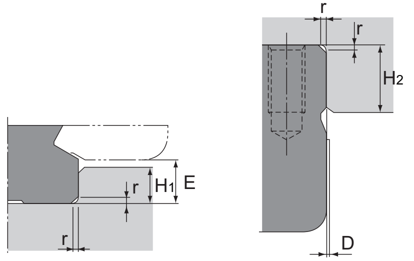
Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
35	1	1	5	6	6
45	1.5	1.5	6	8	7
55	1.5	1.5	8	10	10
65	1.5	2	8	10	10

[Model SRW]

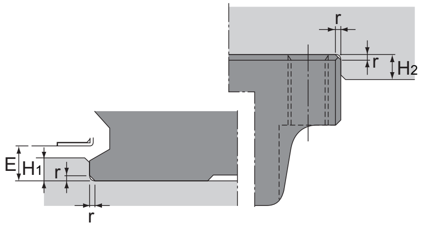
Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
70	1.5	1.5	6	8	8
85	1.5	1.5	8	10	10
100	1.5	2	9	10	11.5



Shoulder for the LM Rail Shoulder for the LM Block

Fig.12



Shoulder for the LM Rail Shoulder for the LM Block

Fig.13

[Model SSR]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Maximum shoulder height for the LM block H_2	E	D
15 X	0.5	3.8	5.5	4.5	0.3
20 X	0.5	5	7.5	6	0.3
25 X	1	5.5	8	6.8	0.4
30 X	1	8	11.5	9.5	0.4
35 X	1	9	16	11.5	0.4

Note) When closely contacting the LM block with the datum shoulder, the resin layer may stick out from the overall width of the LM block by the dimension D. To avoid this, machine the datum shoulder to have a recess or limit the datum shoulder's height below the dimension H_2.

[Models SHW and HRW]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
12	0.5	1.5	4	2
14	0.5	1.5	5	2
17	0.4	2	4	2.5
21	0.4	2.5	5	3
27	0.4	2.5	5	3
35	0.8	3.5	5	4
50	0.8	3	6	3.4
60	1	5	8	6.5

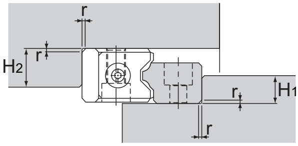


Fig.14

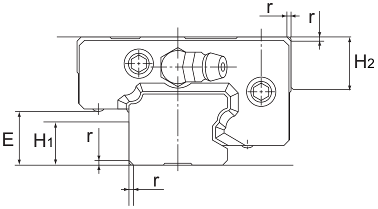


Fig.15

[Model HR]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2
918	0.3	5	6
1123	0.5	6	7
1530	0.5	8	10
2042	0.5	11	15
2555	1	13	18
3065	1	16	20
3575	1	18	26
4085	1.5	21	30
50105	1.5	26	32
60125	1.5	31	40

[Model GSR]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
15	0.6	7	7	8
20	0.8	9	8	10.4
25	0.8	11	11	13.2
30	1.2	11	13	15
35	1.2	13	14	17.5

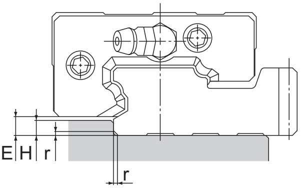
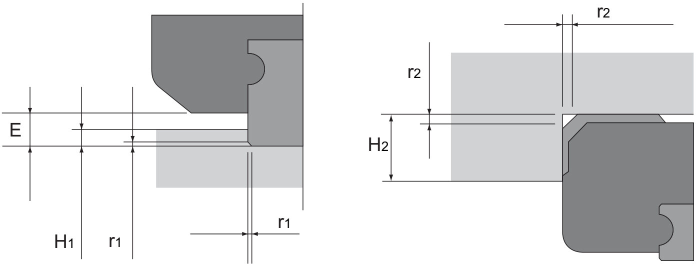


Fig.16

[Model GSR-R]

Unit: mm

Model No.	Corner radius r(max)	Shoulder height for the LM rail H	E
25	0.8	4	4.5
30	1.2	4	4.5
35	1.2	4.5	5.5



Shoulder for the LM Rail Shoulder for the LM Block

Fig.17

[Model SRS]

Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
7 M	0.1	0.2	0.9	3.3	1.3
7 WM	0.1	0.1	1.4	3.8	1.8
9 M	0.1	0.3	0.5	4.9	0.9
9 WM	0.1	0.5	2.5	4.9	2.9
12 M	0.3	0.2	1.5	5.7	2
12 WM	0.3	0.3	2.5	5.7	3
15 M	0.3	0.4	2.2	6.5	2.7
15 WM	0.3	0.3	2.2	6.5	2.7
20 M	0.3	0.5	3	8.7	3.4
25 M	0.5	0.5	4.5	10.5	5

[Models RSR-Z and RSH-Z]

Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
7 Z	0.1	0.5	1.2	3	1.5
9 Z	0.3	0.5	1.9	3	2.2
12 Z	0.3	0.3	2.1	4	2.4
15 Z	0.3	0.3	2.5	5	3.4
7 WZ	0.1	0.1	1.7	3	2
9 WZ	0.1	0.1	2.5	3	2.9
12 WZ	0.3	0.3	3	4	3.4
15 WZ	0.3	0.3	3	5	3.4

[Model RSR, RSR-M1 and RSH]

Unit: mm

Model No.	Corner radius for the LM rail r_1(max)	Corner radius for the LM block r_2(max)	Shoulder height for the LM rail H_1	Shoulder height for the LM block H_2	E
3	0.1	0.3	0.8	1.2	1
5	0.1	0.3	1.2	2	1.5
7	0.1	0.5	1.2	3	1.5
9	0.3	0.5	1.9	3	2.2
12	0.3	0.3	1.4	4	3
15	0.3	0.3	2.3	5	4
20	0.5	0.5	5.5	5	7.5
3 W	0.1	0.3	0.7	2	1
5 W	0.1	0.3	1.2	2	1.5
7 W	0.1	0.1	1.7	3	2
9 W	0.1	0.1	3.9	3	4.2
12 W	0.3	0.3	3.7	4	4
14 W	0.3	0.3	3.2	5	3.5
15 W	0.3	0.3	3.7	5	4

Permissible Error of the Mounting Surface

The LM Guide allows smooth straight motion through its self-aligning capability even when there is a slight distortion or error on the mounting surface.

[Error Allowance in the Parallelism between Two Rails]

The following tables show error allowances in parallelism between two rails that will not affect the service life in normal operation.

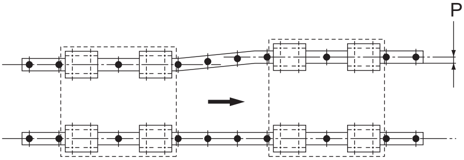


Fig.18 Error Allowance in Parallelism (P) between Two Rails

[Models SHS, HSR, CSR, HSR-M1, and HSR-M2]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
8	—	10	13
10	—	12	16
12	—	15	20
15	—	18	25
20	18	20	25
25	20	22	30
30	27	30	40
35	30	35	50
45	35	40	60
55	45	50	70
65	55	60	80
85	70	75	90
100	85	90	100
120	100	110	120
150	115	130	140

[Model JR]

Unit: µm

Model No.	—
25	100
35	200
45	300
55	400

[Model SSR, SR, SR-M1]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
15	—	25	35
20	25	30	40
25	30	35	50
30	35	40	60
35	45	50	70
45	55	60	80
55	65	70	100
70	65	80	110
85	80	90	120
100	90	100	130
120	100	110	140
150	110	120	150

[Models SNR, SNR-H and NR]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
25	14	15	21
30	19	21	28
35	21	25	35
45	25	28	42
55	32	35	49
65	39	42	56
75	44	47	60
85	49	53	63
100	60	63	70

[Models SNS, SNS-H and NRS]

Unit: μm

Model No.	Clearance C0	Clearance C1	Normal clearance
25	10	11	15
30	14	15	20
35	15	18	25
45	18	20	30
55	23	25	35
65	28	30	40
75	31	34	43
85	35	38	45
100	43	45	50

[Models SHW and HRW]

Unit: μm

Model No.	Clearance C0	Clearance C1	Normal clearance
12	—	10	13
14	—	12	16
17	—	15	20
21	—	18	25
27	—	20	25
35	20	22	30
50	27	30	40
60	30	35	50

[Models SRS, RSR, RSR-W, RSR-Z, RSH, RSH-Z and RSR-M1]

Unit: μm

Model No.	Gothic-arch groove		Circular-arc groove
	Clearance C1	Normal clearance	Normal clearance
3	—	2	—
5	—	2	—
7	—	3	—
9	3	4	11
12	5	9	15
14	6	10	—
15	6	10	18
20	8	13	25
25	10	15	30

[Model HR]

Unit: μm

Model No.	Clearance C0	Clearance C1	Normal clearance
918	—	7	10
1123	—	8	14
1530	—	12	18
2042	14	15	20
2555	20	24	35
3065	22	26	38
3575	24	28	42
4085	30	35	50
50105	38	42	55
60125	50	55	65

[Models GSR and GSR-R]

Unit: μm

Model No.	—
15	30
20	40
25	50
30	60
35	70

[Model NSR-TBC]

Unit: μm

Model No.	Clearance C1	Normal clearance
20	40	50
25	50	70
30	60	80
40	70	90
50	80	110
70	90	130

[Flatness of the Mounting Surface]

The following tables show errors in flatness of the mounting surface with models SRS, RSR, RSR-W and RSH that will not affect their service lives in normal operation. Note that if the flatness of the mounting surface is poorly established for models other than those above, it may affect the service life.

[Model SRS]

Unit: mm

Model No.	Flatness error
7 M	0.025/200
7 WM	0.025/200
9 M	0.035/200
9 WM	0.035/200
12 M	0.050/200
12 WM	0.050/200
15 M	0.060/200
15 WM	0.060/200
20 M	0.070/200
25 M	0.070/200

[Models RSR, RSR-W, RSR-Z, RSH and RSH-Z]

Unit: mm

Model No.	Flatness error
3	0.012/200
5	0.015/200
7	0.025/200
9	0.035/200
12	0.050/200
15	0.060/200
20	0.110/200
7 A	0.100/200
9 A	0.160/200
12 A	0.200/200
15 A	0.250/200
20 A	0.300/200

Note1) With the mounting surface, multiple accuracies are combined in many cases. Therefore, we recommend using 70% or less of the values above.

Note2) The above figures apply to normal clearances. When using two or more rails with clearance C1, we recommend using 50% or less of the values above.

[Error Allowance in Vertical Level between Two Rails]

The values in the tables on A-336 and A-337 represent error allowances in vertical level between two rails per axis-to-axis distance of 500 mm and are proportionate to axis-to-axis distances (200 mm for model RSR).

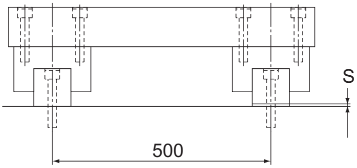


Fig.19 Error Allowance in Vertical Level (S) between Two Rails

[Models SHS, HSR, CSR, HSR-M1, and HSR-M2]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
8	—	11	40
10	—	16	50
12	—	20	65
15	—	85	130
20	50	85	130
25	70	85	130
30	90	110	170
35	120	150	210
45	140	170	250
55	170	210	300
65	200	250	350
85	240	290	400
100	280	330	450
120	320	370	500
150	360	410	550

[Model SSR, SR, SR-M1]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
15	—	100	180
20	80	100	180
25	100	120	200
30	120	150	240
35	170	210	300
45	200	240	360
55	250	300	420
70	300	350	480
85	350	420	540
100	400	480	600
120	450	540	720
150	500	600	780

[Models SNR, SNR-H and NR]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
25	35	43	65
30	45	55	85
35	60	75	105
45	70	85	125
55	85	105	150
65	100	125	175
75	110	135	188
85	120	145	200
100	140	165	225

[Model JR]

Unit: µm

Model No.	—
25	400
35	500
45	800
55	1000

[Models SNS, SNS-H and NRS]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
25	49	60	91
30	63	77	119
35	84	105	147
45	98	119	175
55	119	147	210
65	140	175	245
75	154	189	263
85	168	203	280
100	196	231	315

[Models SRS, RSR, RSR-W, RSR-Z, RSH, RSH-Z and RSR-M1]

Unit: µm

Model No.	Gothic-arch groove		Circular-arc groove
	Clearance C1	Normal clearance	Normal clearance
3	—	15	—
5	—	20	—
7	—	25	—
9	6	35	160
12	12	50	200
14	20	60	—
15	20	60	250
20	30	70	300
25	40	80	350

[Models SHW and HRW]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
12	—	11	40
14	—	16	50
17	—	20	65
21	—	85	130
27	—	85	130
35	70	85	130
50	90	110	170
60	120	150	210

[Model HR]

Unit: µm

Model No.	Clearance C0	Clearance C1	Normal clearance
918	—	15	45
1123	—	20	50
1530	—	60	90
2042	50	60	90
2555	85	100	150
3065	95	110	165
3575	100	120	175
4085	120	150	210
50105	140	175	245
60125	170	200	280

[Models GSR and GSR-R]

Unit: µm

Model No.	—
15	240
20	300
25	360
30	420
35	480

[Model NSR-TBC]

Unit: µm

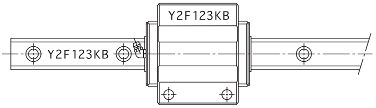
Model No.	Clearance C1	Normal clearance
20	210	300
25	240	360
30	270	420
40	360	540
50	420	600
70	480	660

Marking on the Master LM Guide and Combined Use

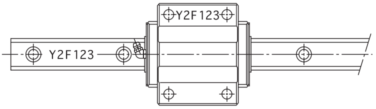
[Marking on the Master LM Guide]

All LM rails mounted on the same plane are marked with the same serial number. Of those LM rails, the one marked with "KB" after the serial number is the master LM rail. The LM block on the master LM rail has its reference surface finished to a designated accuracy, allowing it to serve as the positioning reference for the table. (See Fig.20.)

LM Guides of normal grade are not marked with "KB." Therefore, any one of the LM rails having the same serial number can be used as the master LM rail.



Master LM Guide



Subsidiary LM Guide

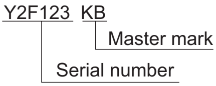
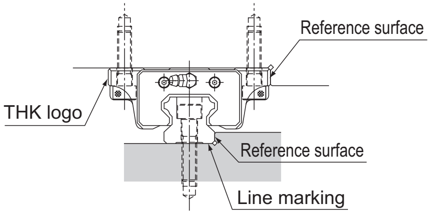


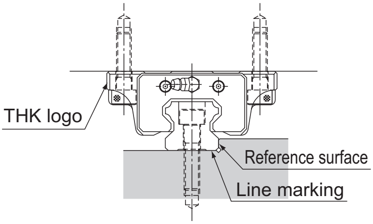
Fig.20 Master LM Guide and Subsidiary LM Guide

[Markings on the Reference Surface]

In the LM Guide, the reference surface of the LM block is opposite the surface marked with the THK logo, and that of the LM rail is on the surface marked with a line (see Fig.21). If it is necessary to reverse the reference surface of the LM rail and block, or if the grease nipple must be oriented in the opposite direction, specify it.



Master LM Guide



Subsidiary LM Guide

Fig.21 Markings on the Reference Surface

[Serial Number Marking and Combined Use of an LM Rail and LM Blocks]

An LM rail and LM block(s) used in combination must have the same serial number. When removing an LM block from the LM rail and reinstalling the LM block, make sure that they have the same serial number and the numbers are oriented in the same direction. (Fig.22)

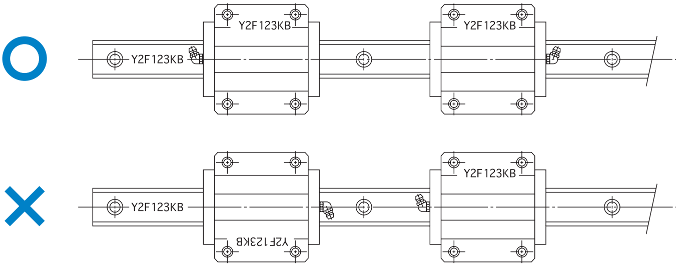
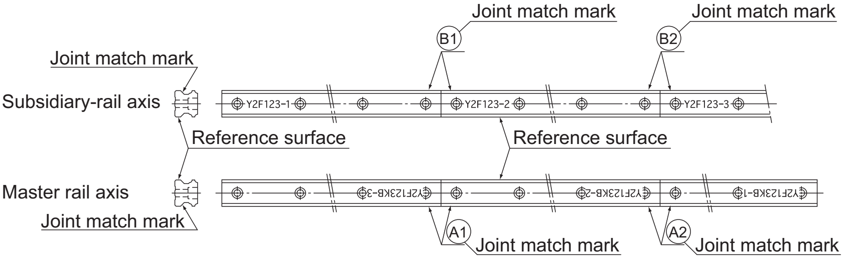


Fig.22 Serial Number Marking and Combined Use of an LM Rail and LM Blocks

[Use of Jointed Rails]

When a long LM rail is ordered, two or more rails will be jointed together to the desired length. When jointing rails, make sure that the joint match marks shown in Fig.23 are correctly positioned.
When two LM Guides with connected rails are to be arranged in parallel to each other, the two LM Guides will be manufactured so that the two LM Guides are axisymmetrically aligned.



Joint match mark indication

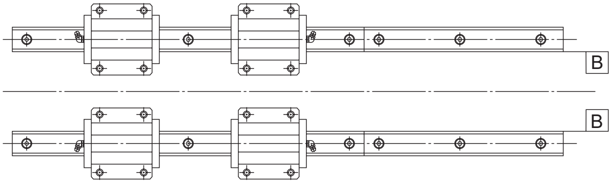


Fig.23 Use of Jointed Rails

Mounting the LM Guide

Mounting Procedure

[Example of Mounting the LM Guide When an Impact Load is Applied to the Machine and therefore Rigidity and High Accuracy are Required]

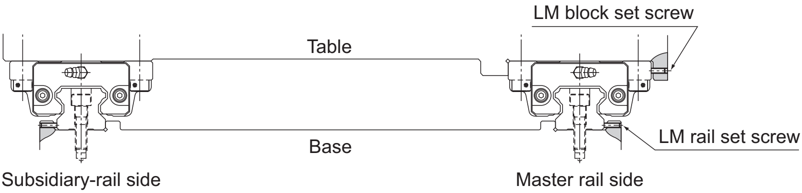


Fig.1 When an Impact Load is Applied to the Machine

● Mounting the LM Rail(s)

(1) Be sure to remove burr, dent and dust from the mounting surface of the machine to which the LM Guide is to be mounted before installing the LM Guide. (Fig.2)

Note) Since the LM Guide is coated with anti-rust oil, remove it from the reference surface by wiping the surface with washing oil before using the guide. Once the anti-rust oil has been removed, the reference surface is prone to getting rusted. We recommend applying low-viscosity spindle oil.

(2) Gently place the LM rail onto the base, and temporarily secure the bolts to the extent that the LM rail lightly contacts the mounting surface (align the line-marked side of the LM rail with the side reference-surface of the base). (Fig.3)

Note) The bolts for securing the LM Guide must be clean. When placing the bolts into the mounting holes of the LM rail, check if the bolt holes are displaced.(Fig.4) Forcibly tightening the bolt into a displaced hole may deteriorate the accuracy.

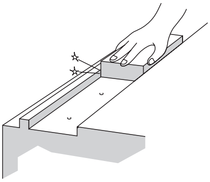


Fig.2 Checking the Mounting Surface

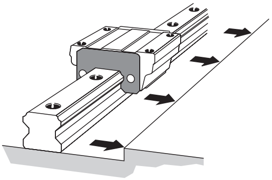


Fig.3 Aligning the LM Rail with the Reference-Surface

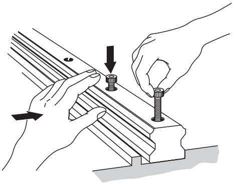


Fig.4 Checking with the Bolt for an Allowance

(3) Secure the set screws for the LM rail in order with a tightening force just enough to have the rail closely contact the side mounting surface. (Fig.5)

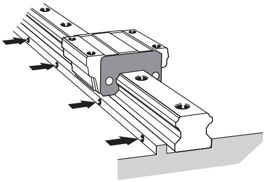


Fig.5 Tightening the Set screws

(4) Tighten the mounting bolts at the designated torque using a torque wrench. (See Fig.6, and Table1 and Table2 on A-350.)

Note) To achieve stable accuracy when tightening the LM rail mounting bolts, tighten them in order from the center to the rail ends.

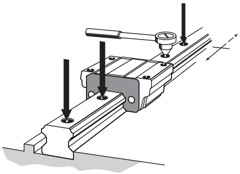


Fig.6 Fully Fastening the Mounting Bolts

(5) Mount the other rail in the same manner to complete the installation of the LM rails.

(6) Hammer in caps into the bolt holes on the top face of each LM rail until the top of the cap is on the same level as the top face of the rail.

● Mounting the LM Blocks

(1) Gently place the table on the LM blocks and temporarily fasten the mounting bolts.

(2) Press the master side LM blocks to the side reference surface of the table using set screws and position the table. (See Fig.1 on A-340.)

(3) Fully fasten the mounting bolts on the master side and the subsidiary side to complete the installation.

Note) To evenly secure the table, tighten the mounting bolts in diagonal order as shown in Fig.7.

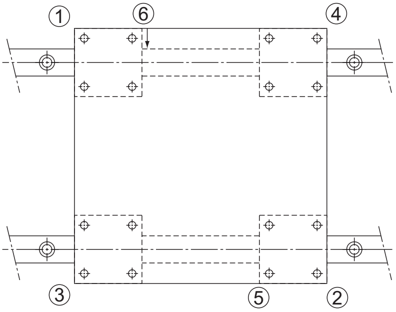


Fig.7 Sequence of Tightening the LM Blocks

This method saves time in establishing straightness of the LM rail and eliminates the need to machine securing dowel pins, thus to drastically shorten the installation man-hours.

[Example of Mounting the LM Guide When the Master LM Rail is not Provided with Set screws]

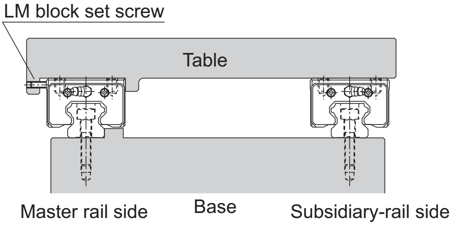


Fig.8 When the Master LM Rail is not Provided with Set screws

● Mounting the Master LM Rail

After temporarily fastening the mounting bolts, firmly press the LM rail to the side reference surface at the position of each mounting bolt using a small vice and fully fasten the bolt. Perform this in order from either rail end to the other. (Fig.9)

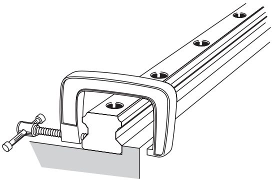


Fig.9

● Mounting the Subsidiary LM Rail

To mount the subsidiary LM rail in parallel with the master LM rail, which has been correctly installed, we recommend adopting the methods below.

■Using a Straight-edge

Place straight-edges between the two rails, and arrange the straight-edges in parallel with the side reference surface of the master LM rail using a dial gauge. Then, secure the mounting bolts in order while achieving straightness of the subsidiary rail with the straight edge as the reference by using the dial gauge. (Fig.10)

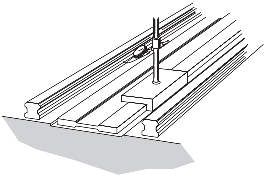


Fig.10

■Using Parallelism of the Table

Secure the two LM blocks on the master LM rail with the table (or a temporary table for measurement), and temporarily fasten the LM rail and the LM block on the subsidiary LM rail with the table. Place a dial gauge to the side face of the LM block on the subsidiary rail from the dial stand fixed on the table top, then fasten the bolts in order while achieving parallelism of the subsidiary LM rail by moving the table from the rail end. (Fig.11)

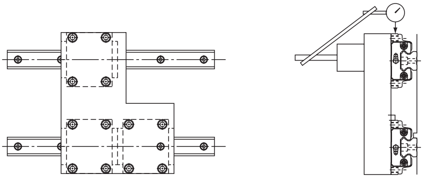


Fig.11

■Having the Subsidiary LM Rail Follow the Master LM Rail

Place the table on the blocks of the correctly mounted master LM rail and the temporarily fastened subsidiary LM rail, and fully fasten the two LM blocks on the master rail and one of the two LM blocks on the subsidiary rail with bolts. Fully tighten the mounting bolts on the subsidiary LM rail in order while temporarily fastening the remaining LM block on the subsidiary LM rail. (Fig.12)

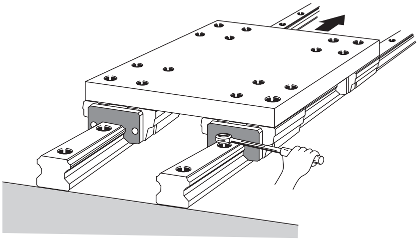


Fig.12

■Using a Jig

Use a jig like the one shown in Fig.13 to achieve parallelism of the reference surface on the subsidiary side against the side reference surface of the master side from one end of the rail by the mounting pitch, and at the same time, fully fasten the mounting bolts in order. (Fig.13)

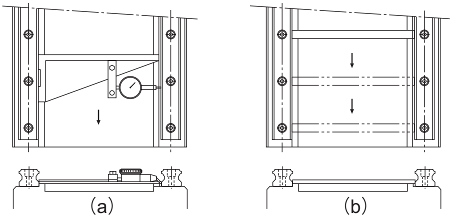


Fig.13

[Example of Mounting the LM Guide When the Master LM Rail Does not Have a Reference Surface]

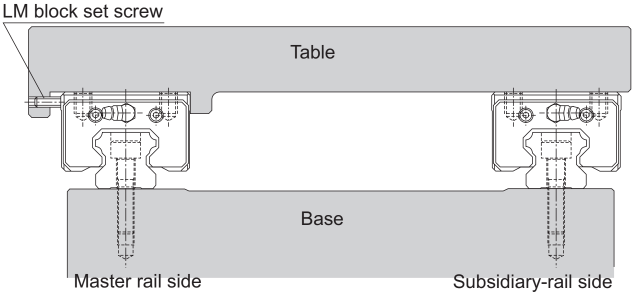


Fig.14

● Mounting the Master LM Rail

■Using a Temporary Reference Surface

You can temporarily set a reference surface near the LM rail mounting position on the base to achieve straightness of the LM rail from the rail end. In this method, two LM blocks must be joined together and attached to a measurement plate, as shown in Fig.15.

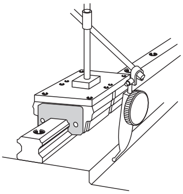


Fig.15

■Using a Straight-edge

After temporarily fastening the mounting bolts, use a dial gauge to check the straightness of the side reference surface of the LM rail from the rail end, and at the same time, fully fasten the mounting bolts.(Fig.16)

To mount the subsidiary LM rail, follow the procedure described on A-342.

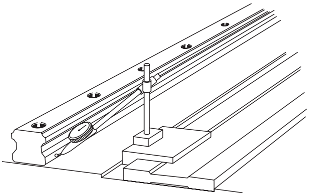


Fig.16

[Procedure for Assembling Model HR]

The following procedure is recommended for assembling model HR.

(1) Remove burr or knots from the LM rail mounting surface of the base using an oil-stone. (Fig.17)

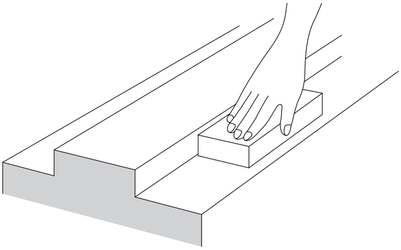


Fig.17

(2) Use a small vice to press the two LM rails to the base so that they closely contact the reference surface, then tighten the mounting bolts to the recommended torque (see A-350). (Fig.18)
- a. Check if any of the bolts has a sinking.
- b. Use a torque wrench to tighten the bolts in order from the center to both ends.

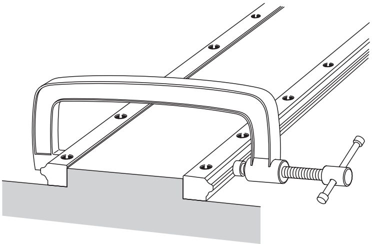


Fig.18

(3) Mount the LM blocks on the table, then install them onto the LM rails. Be sure the mounting bolts for the LM blocks are temporarily fastened.

(4) Tighten the clearance adjustment bolt alternately to adjust the clearance.
If a relatively large preload is applied in order to achieve high rigidity, control the tightening torque or the rolling resistance.
- a. It is preferable to use three clearance adjustment bolts for each LM block as shown in Fig.19.
- b. To obtain a favorable result of the clearance adjustment, set the tightening torque of the two outside screws at approx. 90% of that of the enter screw.

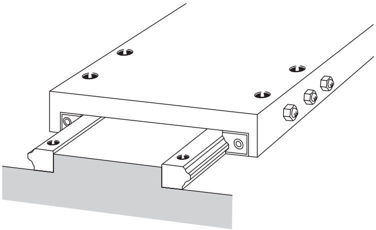


Fig.19

(5) Secure each LM block by gradually tightening the two LM block mounting bolts, which have temporarily been fastened, while sliding the table. (Fig.20)

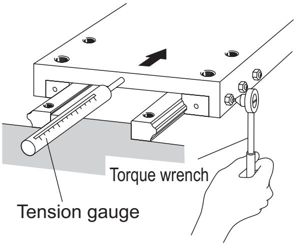


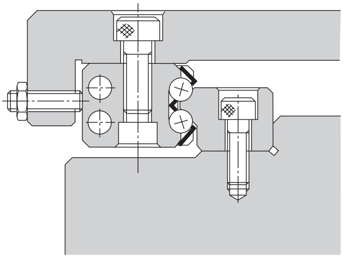
Fig.20

● Example of Clearance Adjustment

Design the clearance adjustment bolt so that it presses the center of the side face of the LM block.

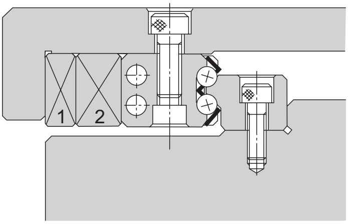
a. Using an adjustment screw

Normally, an adjustment screw is used to press the LM block.



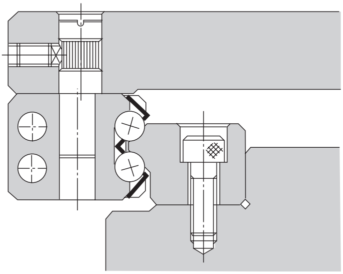
b. Using tapered gibs

When high accuracy and high rigidity are required, use tapered gibs 1) and 2).



c. Using an eccentric pin

A type using an eccentric pin to adjust the clearance is also available.



[Procedure for Assembling Model GSR]

The procedure for assembling model GSR is as follows:

(1) Align the table with the reference-surface of each LM block and fully fasten the mounting bolts to secure the blocks.
Both ends of the table must have a datum surface. (Fig.21)

(2) Place LM rail A onto the base and align the rail with a straight-edge.
Fully fasten the mounting bolts using a torque wrench. (Fig.22)

(3) Temporarily secure LM rail B onto the base, then mount the blocks on the rail by sliding the blocks.
Temporarily fasten LM rail B while pressing it toward the LM blocks. (Fig.23)

(4) Slide the table a few strokes to fit the LM blocks to LM rail B, then fully fasten LM rail B using a torque wrench. (Fig.24)

If there are more GSR units to be assembled, we recommend producing a jig like the one shown in Fig.25 first. You can easily mount LM rails while achieving parallelism of the LM rails using the jig.

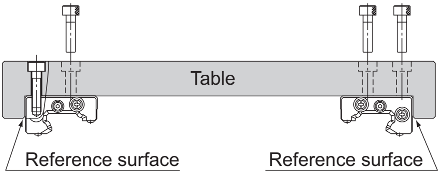


Fig.21

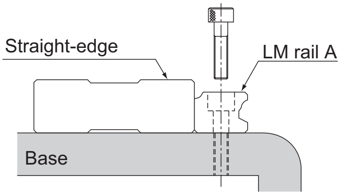


Fig.22

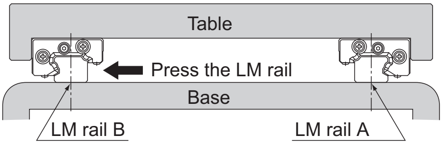


Fig.23

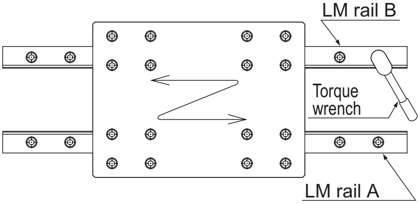


Fig.24

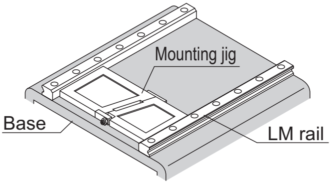


Fig.25

[Procedure for Assembling Model JR]

● Mounting the LM Rails

When two LM rails are to be used in parallel as shown in Fig.26, first secure one LM rail on the base, and place a dial gauge on the LM block. Then, place the pointer of the dial gauge on the side face and top face of the other LM rail to simultaneously adjust the parallelism and the level, thus to complete mounting the LM rails.

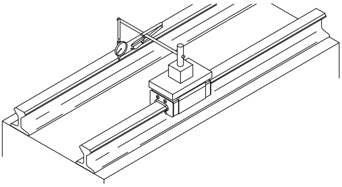


Fig.26

● Jointing LM Rails

When two or more LM rails are to be jointed, a special metal fitting as shown in Fig.27 is available. For such applications, specify this fitting when ordering the LM Guide.

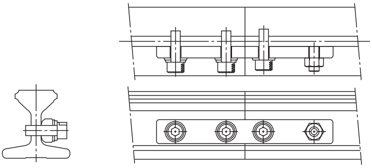


Fig.27

● Welding the LM Rail

When welding the LM rail, it is best to weld the LM rail while clamping it at the welding point with a small vice or the like as shown in Fig.28. For effective welding, we recommend the following welding conditions. (During welding the LM rail, take care to prevent spatter from contacting the LM rail raceway.)

[Welding conditions]
Preheating temperature:200℃
Postheating temperature:350℃

Note) If the temperature exceeds 750℃, the LM rail may be hardened again.

[For shielded metal arc welding]
Welding rod: LB-52 (Kobelco)

[For carbon dioxide arc welding]
Wire: YGW12
Electric current: 200A

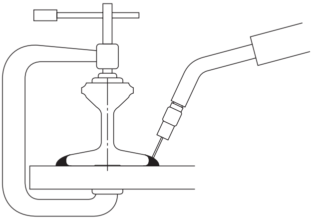


Fig.28

[Procedure for Assembling Model HCR]

To install the LM rails of R Guide model HCR, we recommend having any form of datum point (such as a pin) on the reference side (inside) of the LM rail, and pressing the LM rail to the datum point then stopping the LM rail with a presser plate from the counter-reference surface.

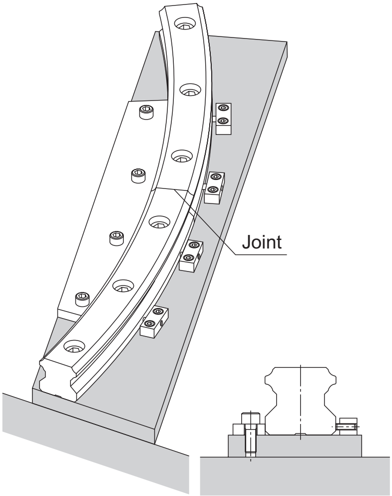


Fig.29 Method for Securing the LM Rails at the Joint

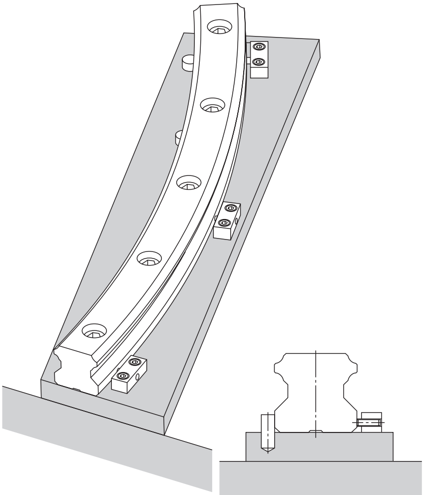
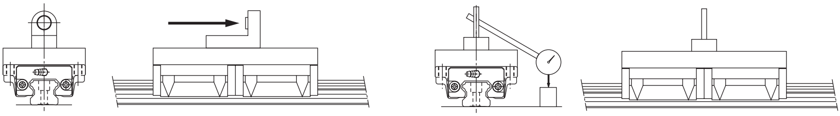


Fig.30 Method for Securing the LM Rail Using a Pin as a Datum Point

Methods for Measuring Accuracy after Installation

[When Measuring Running Accuracy for Single Rail Application]

When measuring running accuracy of the LM block, stable accuracy can be obtained by securing two LM blocks on an inspection plate, as shown in Fig.31. When using a dial gauge, we recommend placing the straight-edge as close as possible to the LM block in order to perform accurate measurement.



1) Measurement method using an auto-collimator 2) Measurement method using a dial gauge

Fig.31 Methods for Measuring Accuracy after Installation

Recommended Tightening Torque for LM Rails

With high-precision LM rails for the LM Guide, their raceways are ground and accuracy is inspected with the rails tightened with bolts. When mounting a high-precision LM rail on a machine, we recommend using the corresponding tightening torque indicated in Table1 or Table2

Table1 Tightening Torques when Pan Head Screws are Used

Unit: N-cm

Screw model No.	Tightening torque	
	Not hardened	Hardened
M 2	17.6	21.6
M 2.3	29.4	35.3
M 2.6	44.1	52.9

Table2 Tightening Torques when Hexagonal-Socket-Head Type Bolts are Used

Unit: N-cm

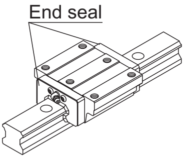
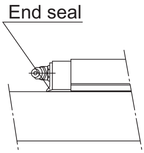
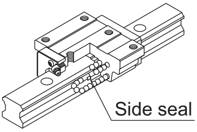
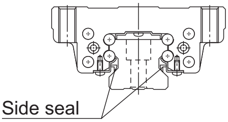
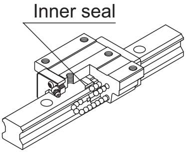
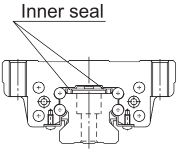
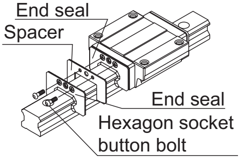
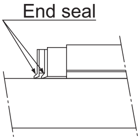
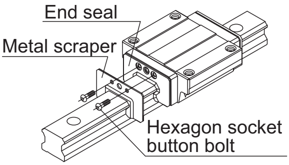
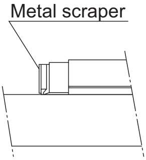
Screw model No.	Tightening torque		
	Iron	Casting	Aluminum
M 2	58.8	39.2	29.4
M 2.3	78.4	53.9	39.2
M 2.6	118	78.4	58.8
M 3	196	127	98
M 4	412	274	206
M 5	882	588	441
M 6	1370	921	686
M 8	3040	2010	1470
M 10	6760	4510	3330
M 12	11800	7840	5880
M 14	15700	10500	7840
M 16	19600	13100	9800
M 20	38200	25500	19100
M 22	51900	34800	26000
M 24	65700	44100	32800
M 30	130000	87200	65200

LM Guide

Options

Seal and Metal Scraper

- For the supported models, see the table of options by model number on A-370.
- For the LM block dimension (dimension L) with seal attached, see B-224 to B-230.
- For the seal resistance, see A-372 to A-374.

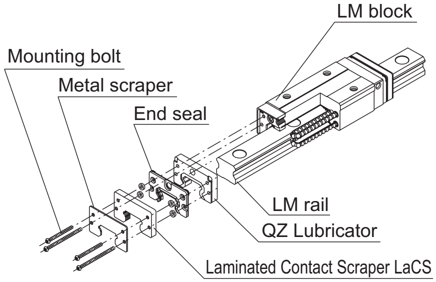
<table>
<tr><th>Item name</th><th>Schematic diagram / mounting location</th><th>Purpose/location of use</th></tr>
<tr><td>End Seal</td><td>  </td><td>Used in locations exposed to dust</td></tr>
<tr><td>Side Seal</td><td>  </td><td>Used in locations where dust may enter the LM block from the side or bottom surface, such as vertical, horizontal and inverted mounts</td></tr>
<tr><td>Inner Seal</td><td>  </td><td>Used in locations severely exposed to dust or cutting chips</td></tr>
<tr><td>Double Seals</td><td>  </td><td>Used in locations exposed to much dust or many cutting chips</td></tr>
<tr><td>Metal Scraper (Non-contact)</td><td>  </td><td>Used in locations where welding spatter may adhere to the LM rail</td></tr>
</table>

Symbol	Contamination protection accessory
UU	End seal
SS	With end seal + side seal + inner seal
DD	With double seals + side seal + inner seal
ZZ	With end seal + side seal + inner seal + metal scraper
KK	With double seals + side seal + inner seal + metal scraper

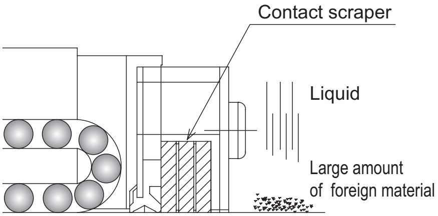
Laminated Contact Scraper LaCS

●For the supported models, see the table of options by model number on A-370.
●For the LM block dimension (dimension L) with LaCS attached, see B-224 to B-230.
●For the resistance of LaCS, see A-375.

For locations with adverse environment, Laminated Contact Scraper LaCS is available.
LaCS removes minute foreign material adhering to the LM rail in multiple stages and prevents it from entering the LM block with laminated contact structure (3-layer scraper).



Appearance Drawing



Structural Drawing

[Features]

- Since the 3 layers of scrapers fully contact the LM rail, LaCS is highly capable of removing minute foreign material.
- Since it uses oil-impregnated, foam synthetic rubber with a self-lubricating function, low friction resistance is achieved.

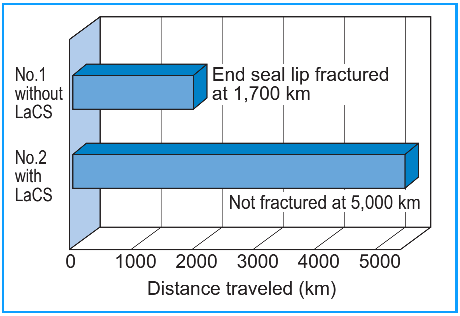
Symbol	Contamination protection accessory
SSHH	With end seal + side seal + inner seal + LaCS
DDHH	With double seals + side seal + inner seal + LaCS
ZZHH	With end seal + side seal + inner seal + metal scraper + LaCS
KKHH	With double seals + side seal + inner seal + metal scraper + LaCS

● Test under an Environment with a Water-soluble Coolant

[Test conditions] Test environment: water-soluble coolant

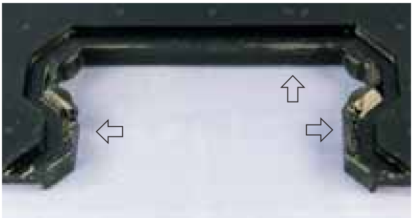
Item		Description
Tested model	No.1	SHS45R1SS+3000L (end seal only)
	No.2	SHS45R1SSHH+3000L (end seal and LaCS)
Maximum speed		200m/min
Environmental conditions		Coolant sprayed: 5 time per day

[Test result]



Magnified view of the end seal lip

No. 1: without LaCS - lip fractured at 1,700 km



⇦ Areas marked with arrow are fractured

No. 2: with LaCS - no anomaly observed after traveling 5,000 km

Lip has not been fractured

● Test under an Environment with Minute Foreign Matter

[Test conditions] Test environment: minute foreign material

Item		Description
Tested model	No.1	SNR45R1DD+600L (double seals only)
	No.2	SNR45R1HH+600L (LaCS only)
Max speed/ acceleration		60m/min, 1G
External load		9.6kN
Foreign material conditions		Type: FCD450#115 (particle diameter: 125 μm or less)
		Sprayed amount: 1g/1hour (total sprayed amount: 120 g)

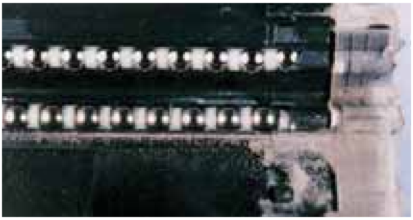
[Test result] Amount of foreign material entering the raceway

Seal configuration		Amount of foreign material entering the raceway g
Double-seal configuration (2 end seals superposed with each other)	Tested model 1	0.3
	Tested model 2	0.3
	Tested model 3	0.3
LaCS	Tested model 1	0
	Tested model 2	0
	Tested model 3	0

No. 1 Traveled 100 km (double-seal configuration)

Large amount of foreign matter has entered the raceway

No. 2 Traveled 100 km (LaCS only)



No foreign matter entering the raceway observed

Light-Resistance Contact Seal LiCS

- ●For the supported models, see the table of options by model number on A-370.
- ●For the LM block dimension (dimension L) with LiCS attached, see B-233.
- ●For the resistance of LiCS, see A-376.

LiCS is a light sliding resistance contact seal. It is effective in removing dust on the raceway and retaining a lubricant such as grease. It achieves extremely low drag and smooth, stable motion.

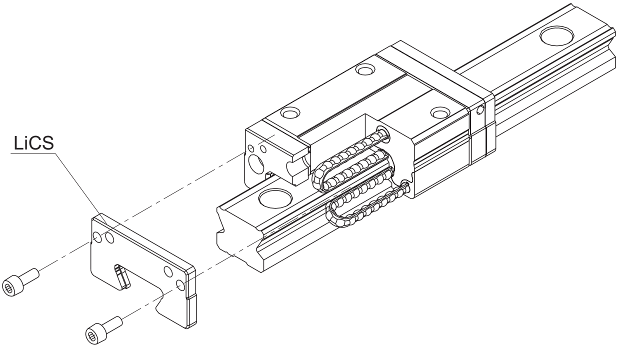


Fig.1 Structural Drawing of SSR + LiCS

[Features]

Light-Resistance Contact Seal LiCS is a seal that uses a light-resistance material in its sealing element and contacts the LM rail raceway to achieve low drag resistance. It is optimal for applications where low drag resistance is required, such as semiconductor-related devices, inspection devices and OA equipment all of which are used in favorable environments.

- Since the sealing element contacts the LM rail raceway, it is effective in removing dust on the raceway.
- Use of oil-impregnated, expanded synthetic rubber, which has excellent self-lubricating property, achieves low drag resistance.

Model number coding

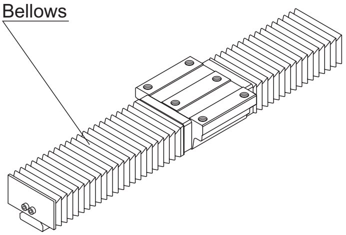
SSR20 XW 2 GG C1 +600L P -Ⅱ

SSR20: LM Guide model number
XW: Type of LM block
2: No. of LM blocks used on the same rail
GG: With LiCS seal on both ends
C1: Radial clearance symbol
Normal (No symbol)
Light preload (C1)
Medium preload (C0)
+600L: LM rail length (in mm)
P: Accuracy symbol
Normal grade (No Symbol) / High accuracy grade (H)
Precision grade (P) / Super precision grade (SP)
Ultra precision grade (UP)
-Ⅱ: Symbol for number of axes

Symbol	Contamination protection accessory
GG	LiCS
PP	With LiCS + side seal + inner seal

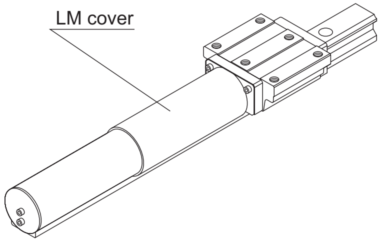
Dedicated Bellows

- ●For the supported models, see the table of options by model number on A-370.
- ●For the dedicated bellows dimensions, see B-235 to B-247.

Item name	Schematic diagram / mounting location	Purpose/location of use
Dedicated Bellows		Used in locations exposed to dust or cutting chips

Dedicated LM Cover

- ●For the supported models, see the table of options by model number on A-370.
- ●For the dimensions of the dedicated LM cover, see B-248 to B-249.

Item name	Schematic diagram / mounting location	Purpose/location of use
Dedicated LM Cover		Used in locations exposed to dust or cutting chips Used in locations where high temperature foreign material such as flying spatter

Cap C

If any of the LM rail mounting holes of an LM Guide is filled with cutting chips or foreign material, they may enter the LM block structure. Entrance of such foreign material can be prevented by covering each LM rail mounting hole with the dedicated cap.
Since the dedicated cap C for LM rail mounting holes uses a special synthetic resin with high oil resistance and high wear resistance, it is highly durable. Different sizes of the dedicated cap C are in stock as standard for hexagonal-socket-head type bolts of M3 to M22.
To attach the dedicated cap to the mounting hole, place a flat metal piece like one shown in Fig.1 on the cap and gradually hammer in the cap until it is on the same level as the top face of the LM rail.
When attaching the dedicated cap C for LM rail mounting holes, do not remove any of the LM blocks from the LM rail.

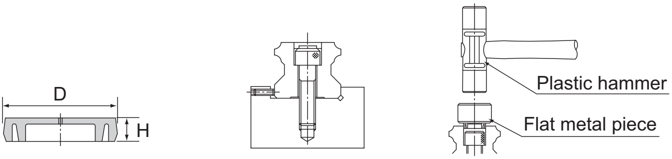


Fig.1 Cap C

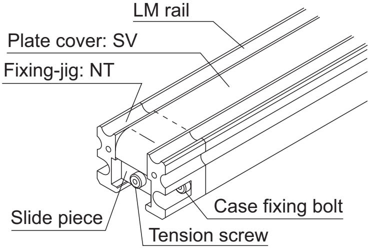
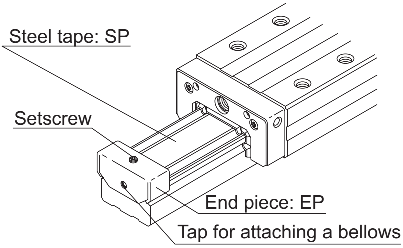
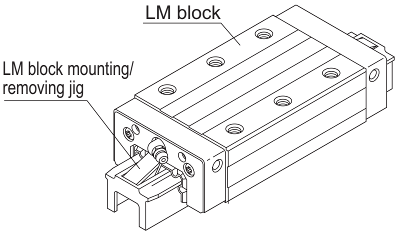
Table1 List of Model Numbers Supported for the Dedicated Cap C for LM Rail Mounting Holes

Model No.	Bolt used	Main dimensions (mm)		Supported model number														
		D	H	SSR	SCR	SR	SNR SNS	NR NRS	SHS HSR CSR HCR	HMG	SHW HRW	SRG SRN	GSR	HR	SRS RSR RSH	SRS-W RSR-W RSH-W	NSR-TBC	SRW
C3	M3	6.3	1.2	—	—	15	—	—	12	—	—	—	—	1123 1530	12 15	9	—	—
C4	M4	7.8	1.0	15Y	—	—	—	—	15	15	12,14,17,21,27	15	15	—	14	—	—	—
C5	M5	9.8	2.4	20	—	20	25	25X	20	—	—	20	20	2042	20	—	20	—
C6	M6	11.4	2.7	25Y 30	25	25Y 30	30	30	25	25	35	25	25	—	25	—	25 30	—
C8	M8	14.4	3.7	35	30 35	35	35	35	30 35	35	50	30 35	30	2555 3065	—	—	40	—
C10	M10	18.0	3.7	—	—	45	—	—	—	—	60	—	35	3575	—	—	50	70
C12	M12	20.5	4.7	—	45	55	45	45	45	45	—	45	—	4085	—	—	70	85
C14	M14	23.5	5.7	—	—	—	55	55	55	—	—	55	—	—	—	—	—	100
C16	M16	26.5	5.7	—	65	70 85	65	65	65	65	—	65	—	50105	—	—	—	—
C22	M22	35.5	5.7	—	—	—	—	85	85	—	—	—	—	—	—	—	—	—

Note) The dedicated cap for the LM rail mounting hole can be made of other materials (e.g., metal). Contact THK for details.

Plate Cover SV
Steel Tape SP

●For the supported models, see the table of options by model number on A-370.

Item name	Schematic diagram / mounting location	Purpose/location of use
Plate Cover SV		For the LM Guide, steel tapes are available as an essential means of contamination protection for machine tools. By covering the LM rail mounting holes with an ultra-thin stainless steel (SUS304) plate, the plate cover SV drastically increases sealability, thus to prevent the penetration of a coolant or cutting chips from the top face of the LM rail, which was previously impossible. For the mounting method, see A-359. Note) When mounting the plate cover, the LM rail needs to be machined. Indicate that the plate cover is required when ordering the LM Guide.
Steel Tape SP	 	For the LM Guide, steel tapes are available as an essential means of contamination protection for machine tools. By covering the LM rail mounting holes with an ultra-thin stainless steel (SUS304) plate, the plate cover SV drastically increases sealability, thus to prevent the penetration of a coolant or cutting chips from the top face of the LM rail, which was previously impossible. (When mounting the steel tape, end piece EP can be used as a means to secure the cover.) For the mounting method, see A-360. Note) When mounting the steel tape, the LM rail needs to be machined. Indicate that the steel tape is required when ordering the LM Guide.

[Mounting Procedure for Plate Cover SV]

(1) Attach slide pieces to the plate cover.
Place the slide pieces on the plate cover with their chamfered sides facing outward, hold the plate cover with the slide pieces and the securing plates, and then secure them with countersunk screws.

(2) Use an LM block mounting/removing jig to remove the LM block from the LM rail, and then mount the fixing-jigs onto the LM rail.
Identify the positions of the mounting holes on the fixing jigs, then secure the jigs with hexagonal-socket-head type bolts.

(3) Temporarily secure either slide piece.
Insert either slide piece into one of the fixing-jigs, then attach the slide piece to the LM rail's end face using the tension adjustment bolt and gently secure the bolt until the bolt head is inside the fixing-jig.

(4) Temporarily secure the other slide piece.
Temporarily secure the other slide piece in the same manner as above.

(5) Apply tension to the plate cover.
Apply tension to the plate cover by evenly securing the tension adjustment bolts on both ends of the LM rail. Make sure there is only a small difference between the H and H' dimensions in Fig.5. If the difference is too large, there may be no interference left on either end.

(6) Mount the LM block on the LM rail.
Identity the reference surface of the LM rail and the LM block, then insert the LM rail into the LM block using the LM block mounting /removing jig.

Note1) When removing or the mounting the LM block, use much care not to let the balls fall off.
Note2) The plate cover is an ultra-thin stainless steel (SUS304) plate. When handing it, use much care not to bend it.
Note3) The plate cover is available for models SNR/SNS35 to 65 and models NR/NRS35 to 100.

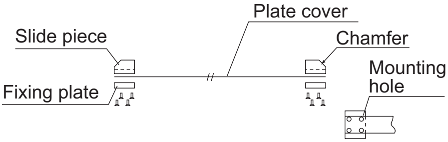


Fig.1

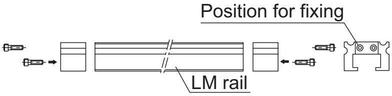


Fig.2

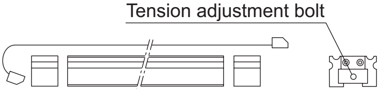


Fig.3

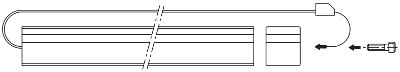


Fig.4

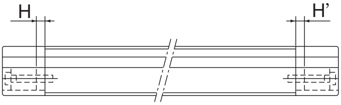


Fig.5

[Mounting Procedure for Steel Tape SP]

(1) Use an LM block mounting/removing jig to remove the LM block from the LM rail.

(2) Thoroughly degrease and clean the top face of the LM rail, to which the steel tape is to be adhered. For degreasing, use an adequately volatile detergent (e.g., industrial alcohol).

(3) Carefully adhere the steel tape from the end with care not to let it bend or sag, while gradually peeling the release paper from the steel tape.

(4) Have the steel tape settle on the rail by rubbing the tape. The adhesive strength increases with time. The adhering tape can be peeled off by pulling its end upward.

(5) Mount the LM block onto the LM rail using the LM block mounting/removing jig.

(6) Attach the end pieces on both ends of the LM rail and further secure the steel tape. When securing the end pieces, fasten only the setscrew on the top face of each end piece.
(The tap on the end face of the end piece is used for mounting a bellows.)

Note1) The setscrew on the side face is used to lightly secure the bent steel tape. Be sure to stop fastening the screw as soon as it hits the end face, and do not force the screw further.

Note2) Since the steel tape is a thin steel plate, mishandling it may cause an accident such as cutting your finger. When handling it, take an effective safety measure such as wearing rubber gloves.

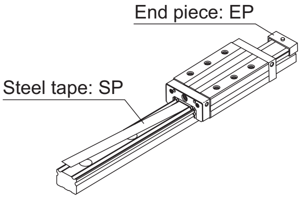


Fig.6

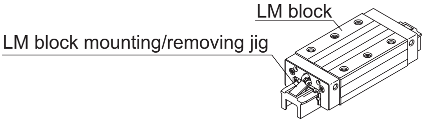


Fig.7

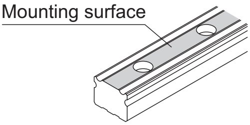


Fig.8

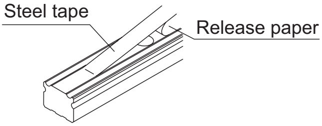


Fig.9

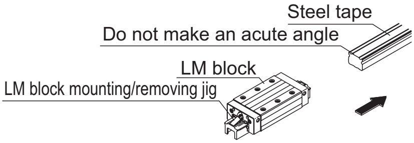


Fig.10

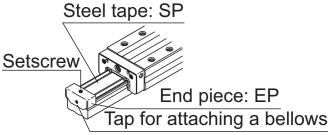


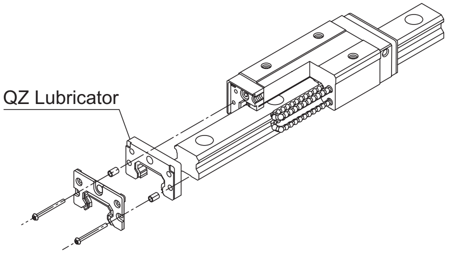
Fig.11

QZ Lubricator

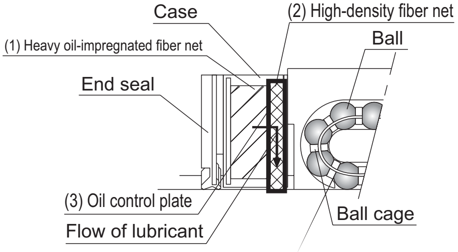
●For the supported models, see the table of options by model number on A-370.
●For the LM block dimension with QZ attached, see B-251 to B-253.

QZ Lubricator feeds the right amount of lubricant to the raceway on the LM rail. This allows an oil film to continuously be formed between the rolling element and the raceway, and drastically extends the lubrication and maintenance intervals.

The structure of QZ Lubricator consists of three major components: (1) a heavy oil-impregnated fiber net (function to store lubricant), (2) a high-density fiber net (function to apply lubricant to the raceway) and (3) an oil-control plate (function to adjust oil flow). The lubricant contained in QZ Lubricator is fed by the capillary phenomenon, which is used also in felt pens and many other products, as the fundamental principle.



Appearance Drawing



Structural Drawing

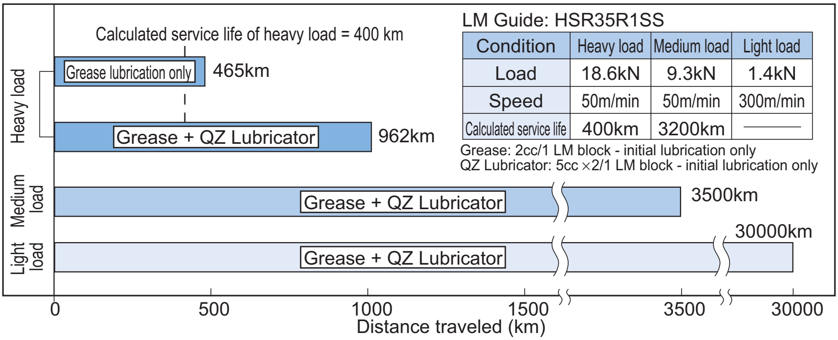
[Features]

- Since it supplements an oil loss, the lubrication maintenance interval can be significantly extended.
- Eco-friendly lubrication system that does not contaminate the surrounding area since it feeds the right amount of lubricant to the ball raceway.

Symbol	Contamination protection accessory
QZUU	With end seal + QZ
QZSS	With end seal + side seal + inner seal + QZ
QZDD	With double seals + side seal + inner seal + QZ
QZZZ	With end seal + side seal + inner seal + metal scraper + QZ
QZKK	With double seals + side seal + inner seal + metal scraper + QZ
QZGG	With LiCS + QZ
QZPP	With LiCS + side seal + inner seal + QZ
QZSSHH	With end seal + side seal + inner seal + LaCS + QZ
QZDDHH	With double seals + side seal + inner seal + LaCS + QZ
QZZZHH	With end seal + side seal + inner seal + metal scraper + LaCS + QZ
QZKKHH	With double seals + side seal + inner seal + metal scraper + LaCS + QZ

Significantly Extended Maintenance Interval

Attaching QZ Lubricator helps extend the maintenance interval throughout the whole load range from the light load area to the heavy load area.



LM Guide: HSR35R1SS

Condition	Heavy load	Medium load	Light load
Load	18.6kN	9.3kN	1.4kN
Speed	50m/min	50m/min	300m/min
Calculated service life	400km	3200km	———

Grease: 2cc/1 LM block - initial lubrication only
QZ Lubricator: 5cc ×2/1 LM block - initial lubrication only

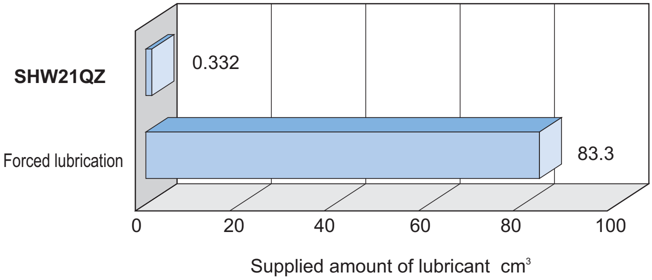
LM Guide Running Test without Replenishment of Lubricant

Effective Use of Lubricant

Since the lubricator feeds the right amount of lubricant to the ball raceway, lubricant can be used efficiently.

[Test conditions] speed: 300 m/min

Comparison of lubricant consumption after traveling 5,000 km



Amount of oil contained in QZ Lubricator
0.166cm³/ 2 units
(attached to both ends of the LM block)
=0.332cm³

Compared

Forced lubrication
0.03cm³/6min×16667min
=83.3cm³

Lubricant consumption is 1/250 less than forced lubrication.

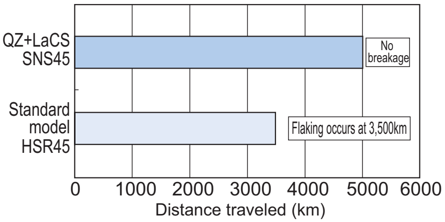
● Effective in Helping Lubrication under Severe Environments

A 5,000 km durability test was conducted under severe environments (containing coolant and contaminated environment).

[Test conditions]

Model No.	SNS45	HSR45
Load	8kN	6kN
Speed	60m/min	
Coolant	Immersed 48 hrs, dried 96 hrs	
Foreign material	Foundry dust (125 μm or less)	
Lubrication	AFA Grease + QZ	Super Multi 68 Oiling cycle: 0.1cc/shot Periodically lubricated every 16 min

[Test result]



* When using the LM system under severe environment, use QZ Lubricator and Laminated Contact Scraper LaCS (see "Laminated Contact Scraper LaCS" on A-353) in combination.

Lubrication Adapter

An oil lubricant-only lubrication adapter is available for models NR/NRS.
Even if the LM Guide is installed in an orientation where oil lubrication is difficult, such as wall mount and inversed mount, the adapter is capable of feeding a constant quantity of lubricant to the four raceways.

[Features]

The dedicated lubrication adapter for models NR-NRS is built in with a constant quantity distributor. Therefore, the adapter can accurately feed a constant quantity of lubricant to each raceway regardless of the mounting orientation.
The adapter is economical since it is capable of constantly feeding the optimum amount of lubricant and helping eliminate the supply of surplus lubricant.
To provide pipe arrangement, simply connect an intermittent lubrication pump widely used for ordinary machine tools to the greasing holes (M8) on the front and the side of the lubrication adapter.

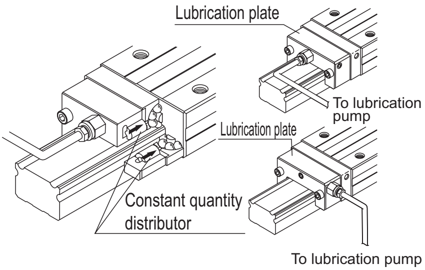


Fig.1 Structural Drawing

[Specifications]

Viscosity range of lubricant used	32 to 64 mm^2/s recommended
Discharge	0.03×4, 0.06×4cc/1shot
Diameter of pipe connected	$\phi 4$, $\phi 6$
Material	Aluminum alloy

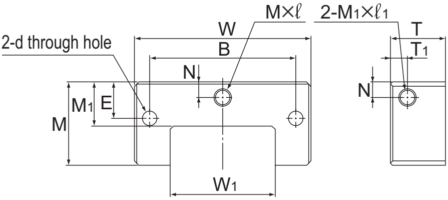


Fig.2

Table1 Dimension Table for Lubrication Adapter

Unit: mm

Model No.	Main dimensions												Quantity per shot (cc/shot)
	Width W	Height M	T	W_1	M_1	B	E	N	T_1	d	M×ℓ	M_1×ℓ_1	
A30N	56	29	25	29	14.5	46	14	5	5.3	3.5	M8×8	M8×8	0.03×4
A35N	66	33	25	35	17	54	16.5	6	5.3	4.5	M8×8	M8×8	
A45N	81	38	25	48	20	67	16.5	7	7.8	6.6	M8×8	M8×8	
A55N	94	45.5	25	56	22	76	20.5	7	7.8	6.6	M8×8	M8×8	0.06×4
A65N	119	55.5	25	67	26.3	92	25.5	11.5	7.8	9	M8×8	M8×8	
A85N	147	68.5	25	92	34	114	32	15.5	7.8	9	M8×8	M8×8	

Removing/mounting Jig

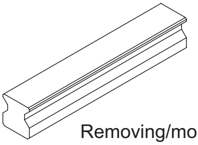
When assembling the guide, do not remove the LM block from the LM rail whenever possible. If it is inevitable to remove the LM block due to the plate cover type or the assembly procedure, be sure to use the removing/mounting jig.

Mounting the LM block without using the removing/mounting jig may cause rolling elements to fall from the LM block due to contamination by foreign material, damage to internal components or slight inclination. Mounting the LM block with some of the rolling elements missing may also cause damage to the LM block at an early stage.

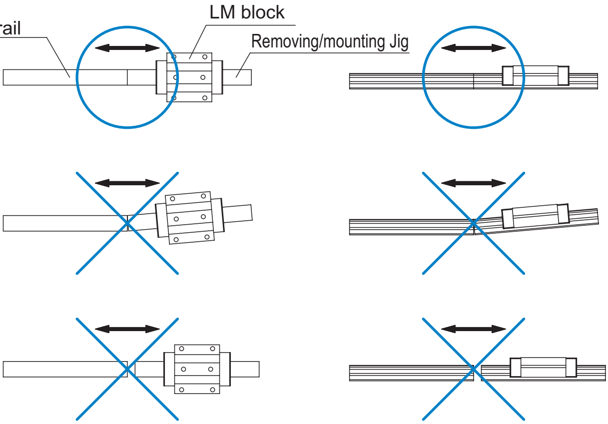
When using the removing/mounting jig, do not incline the jig and match the ends of both LM rails.

If any of the rolling elements falls from the LM block, contact THK instead of using the product.

Note that the removing/mounting jig is not included in the LM Guide package as standard. When desiring to use it, contact THK.



Removing/mounting Jig
(Material: ABS resin)



End Piece EP

For those models whose balls may fall if the LM rail is pulled out of the LM block, an end piece is attached to the product to prevent the LM block from being removed from the LM rail.

For models that can use the end piece, see the table below.

If removing the end piece when using the LM Guide, be sure that the LM block will not overshoot.

The end piece can also be used as a fixing jig for a steel tape, and is available also for the LM rail of models SSR, SR and HSR.

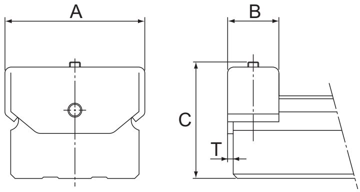


Fig.1 End Piece EP for Models NR/NRS

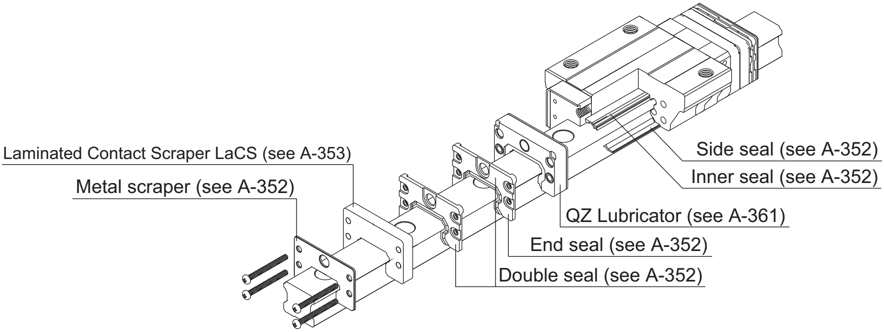
Table1 Dimension Table for End Piece EP for Models NR/NRS

Unit: mm

Model No.	A	B	C	T
NR/NRS 25X	26	14	25	1.5
NR/NRS 30	31	14	31	1.5
NR/NRS 35	38	16	32.5	2
NR/NRS 45	49	18	41	2
NR/NRS 55	57	20	46.5	2
NR/NRS 65	69.4	22	59	3.2
NR/NRS 75	81.7	28	56	3.2
NR/NRS 85	91.4	22	68	3.2
NR/NRS 100	106.4	25	73	3.2

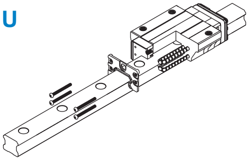
List of Parts Symbols

●For supported model numbers, see the correspondence table of options by model number on A-370.

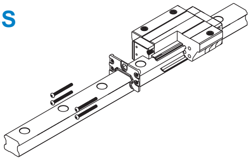


Symbol	Lubrication and Dust Prevention Accessories
UU	End seal
SS	With end seal + side seal + inner seal
DD	With double seals + side seal + inner seal
ZZ	With end seal + side seal + inner seal + metal scraper
KK	With double seals + side seal + inner seal + metal scraper
GG	LiCS
PP	With LiCS + side seal + inner seal
SSHH	With end seal + side seal + inner seal + LaCS
DDHH	With double seals + side seal + inner seal + LaCS
ZZHH	With end seal + side seal + inner seal + metal scraper + LaCS
KKHH	With double seals + side seal + inner seal + metal scraper + LaCS
QZUU	With end seal + QZ
QZSS	With end seal + side seal + inner seal + QZ
QZDD	With double seals + side seal + inner seal + QZ
QZZZ	With end seal + side seal + inner seal + metal scraper + QZ
QZKK	With double seals + side seal + inner seal + metal scraper + QZ
QZGG	With LiCS + QZ
QZPP	With LiCS + side seal + inner seal + QZ
QZSSHH	With end seal + side seal + inner seal + LaCS + QZ
QZDDHH	With double seals + side seal + inner seal + LaCS + QZ
QZZZHH	With end seal + side seal + inner seal + metal scraper + LaCS + QZ
QZKKHH	With double seals + side seal + inner seal + metal scraper + LaCS + QZ

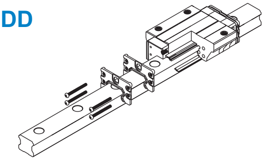
UU



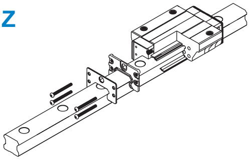
SS



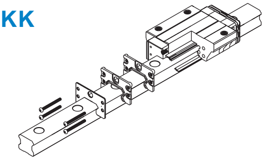
DD



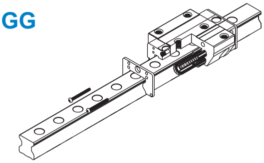
ZZ



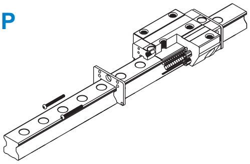
KK



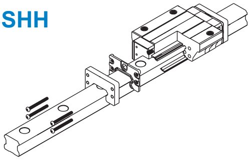
GG



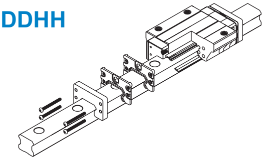
PP



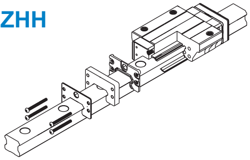
SSHH



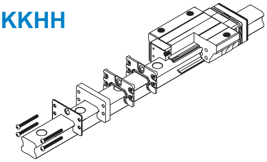
DDHH



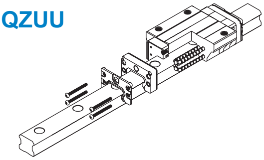
ZZHH



KKHH



QZUU



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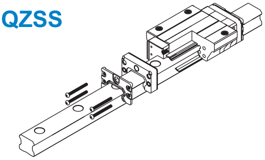

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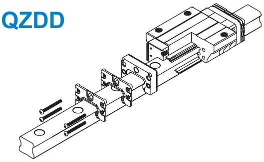

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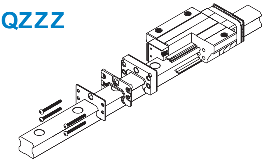

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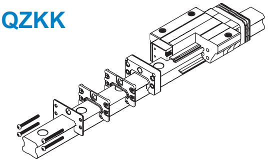

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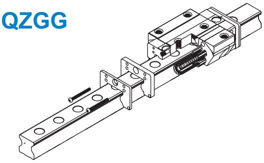

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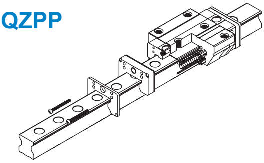

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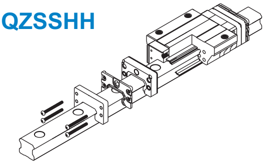

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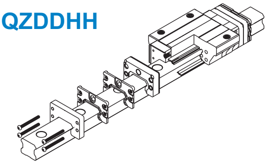

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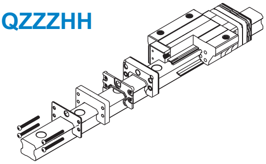

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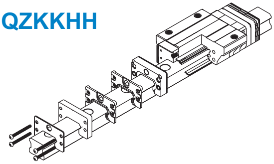

Table of Supported Options by Models

For the overall length with an option attached, see B-224 to B-255.

Type				Model No.		Caged Ball									
						*1 SHS	*2 SSR	*3 SNR SNS	*4 SHW	*5 SRS	SCR	*6 HSR	*7 SR	*8 NR NRS	*9 HRW
				Symbol	Reference page	A-136	A-142	A-148	A-156	A-160	A-166	A-170	A-178	A-186	A-194
Contamination Protection	[2]	End seal		UU	A-352 to A-353	○	○★	○	○★	○	○	○★	○★	○★	○★
		[1]		SS		◇★	○	◇★	◇	○★	○★	△	○	○	○
				DD		◇	○	◇	◇	—	○	△	△	○	△
				ZZ		◇	○	◇	◇	—	○	△	△	○	△
				KK		◇	○	◇	◇	—	○	△	△	○	△
		LaCS+[1]		HH		○	○	○	△	△	○	△	—	△	—
	Low-resistance end seal			LL	—	—	—	—	—	—	—	△	△	—	—
		+ Side seal		RR	—	—	—	—	—	—	—	○	○	—	—
	LiCS			GG	A-355	—	○	—	—	—	—	—	—	—	—
				PP		—	○	—	—	—	—	—	—	—	—
	Plate Cover SV			Z	A-358	—	—	△	—	—	—	—	—	○	—
	Steel Tape SP			Z		○	△	△	—	—	—	△	△	△	—
	Dedicated cap C *15			—	A-357	○	○	○	○	△	○	○	○	○	○
	Dedicated bellows			—	A-356	B-235	B-236	B-237	B-238	—	—	B-239	B-241	B-243	B-244
	Dedicated cover			—		—	—	—	—	—	—	B-248	B-249	—	—
	Tapped-hole LM rail type			K	—	○	○	—	—	—	B-59	B-83	B-91	—	—
Lubrication	QZ Lubricator	QZ+[2]		QZ	A-361	○	○	○	○	○	○	△	—	△	—
	End plate with/without side nipple			—	—	◎	◎	◎	△	△	○	—	—	○	—
Corrosion Prevention	AP-HC, AP-C, AP-CF			F	A-20	○	○	○	○	—	○	○	○	○	○
	Stainless Steel LM Guide			M	A-19	—	△	—	△	○	—	△	△	—	△

*1. Model SHS: steel tape SP – applicable to models SHS15 to 65.
*2. Model SSR: steel tape SP – not applicable to model SSR15; stainless steel type – not applicable to model SSR35.
*3. Models SNR/SNS: plate cover SV – applicable to models SNR/SNS35 to 65;
steel tape SP – applicable to models SNR/SNS25 to 65.
*4. Model SHW: inner seal and LaCS are not applicable to models SHW12, 14 and 17.
Models SHW12 and 14 cannot have a grease nipple; instead, a greasing hole is available.
stainless steel type – not applicable to some models (contact THK for details).
*5. Model SRS: LaCS – applicable to models SRS20 and 25.
Models SRS9M, 9WM, 12M and 12WM cannot have a grease nipple; instead, a greasing hole is available.
*6. Model HSR: SS – applicable to models HSR15 to 150; DD, ZZ and KK -- applicable to models HSR15 to 65;
LaCS -- applicable to models HSR15 to 35;
LL -- applicable to models HSR15 to 65;
steel tape SP: applicable to models HSR15 to 100; for models HSR8 to 12, only UU is applicable;
stainless steel type – not applicable to some models (contact THK for details).
for model Model HSR-R Grade Ct, only SS is applicable.
*7. Model SR: DD, ZZ and KK – applicable to models SR15 to 70; LL -- applicable to models SR15 to 25;
steel tape SP: applicable to models SR20 to 70;
for models SR85 to 150, only UU and SS are applicable;
stainless steel type – not applicable to some models (contact THK for details).

◎: Option ○: Applicable △: Not applicable for some models
★: THK recommendation (standard stock product) ◇: With inner seal attached

	Full-ball																	Caged roller		
	*10 RSR RSR-W	RSR-Z RSR-WZ	RSH	RSH-Z RSH-WZ	*11 HR	GSR	GSR-R	CSR	MX	JR	*12 HCR	HMG	NSR-TBC	HSR-M1	SR-M1	RSR-M1	HSR-M2	*13 SRG	*14 SRN	SRW
	A-200	A-208	A-214	A-218	A-224	A-230	A-236	A-244	A-248	A-252	A-258	A-262	A-268	A-272	A-280	A-286	A-292	A-300	A-306	A-312
	○ ★	○	○ ★	○	○ ★	○ ★	○	○	○ ★	○	○	○	○	○	○	○	○	○	○	○
	—	△ ★	—	△ ★	—	○	○	○	—	○	○	—	○	○	○	—	○	○ ★	○ ★	○
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	—	—	—	—	—	—	—	—	—	—	—	—	B-245	—	—	—	—	B-246	—	B-247
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	—	—	—	—	—	—	—	B-157	—	—	—	—	—	—	—	—	—	—	—	—
	△	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○	○
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	○	○	○
	○	—	○	—	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	△	—	—	—	○	—	—	—	—	—	—	—	—	—	—	—

*8. Models NR/NRS: LaCS and QZ – applicable to models NR/NRS25 to 65;
steel tape SP -- applicable to models NR/NRS25 to 100
*9. Model HRW: for models HRW12 and 14, only UU and SS is applicable; model HRW17 and 21 cannot have a side seal;
stainless steel type – not applicable to models HRW50 and 60
*10. Model RSR: QZ – applicable to models RSR9 to 15.
*11. Model HR: stainless steel type – applicable to models HR918 to 2555.
For locations where adequate dust prevention cannot be provided with the end seal alone, consider using also a bellows and a cover.
*12. Model HCR: DD, ZZ and KK – may not applicable depending on R; for model HCR12, only UU is applicable.
*13. Model SRG: LaCS – applicable to all model numbers except model SRG15;
plate cover SV – applicable to models SRG35 to 65; GG and PP – applicable to only model SRG15.
*14. Model SRN: LaCS – applicable to all model numbers except model SRN15;
plate cover SV – applicable to models SRN35 to 65.
*15. Dedicated cap C – may not be attached depending on the size of the model.

Seal Resistance Value

Unit: N

Model No.		Seal symbol	Seal resistance value
SHS	15	SS	4.5
	20		7.0
	25		10.5
	30		17.0
	35		20.5
	45		30.0
	55		31.5
	65		43.0
SSR	15X	UU	2.0
	20X		2.6
	25X		3.5
	30X		4.9
	35X		6.3
SNR/SNS	25	SS	8
	30		14
	35		14
	45		16
	55		20
	65		25
	85		30
SHW	12CA/CR	UU	1.0
	12HR		1.0
	14		1.2
	17		1.4
	21		4.9
	27		4.9
	35		9.8
	50		14.7
	12CA/CR	SS	1.4
	12HR		1.8
	14		1.8
	17		2.2
	21		6.9
	27		8.9
	35		15.8
	50		22.7

Unit: N

Model No.		Seal symbol	Seal resistance value
SRS	7M	SS	0.08
	7WM		0.12
	9M		0.2
	9WM		1.0
	12M		0.6
	12WM		1.3
	15M		1.0
	15WM		1.6
	20M		1.3
	25M		1.6
SCR	15	SS	2.5MAX
	20		3MAX
	25		5MAX
	30		10MAX
	35		12MAX
	45		20MAX
	65		30MAX
HSR	8	UU	0.5
	10		0.8
	12		1.2
	15		2.0
	20		2.5
	25		3.9
	30		7.8
	35		11.8
	45		19.6
	55		19.6
	65		34.3
	85		34.3
SR	15	UU	2.5
	20		3.4
	25		4.4
	30		8.8
	35		11.8
	45		12.7
	55		15.7
	70		19.6

Unit: N

Model No.		Seal symbol	Seal resistance value
NR/NRS	25X	UU	15
	30		17
	35		23
	45		24
	55		29
	65		42
	75		42
	85		42
	100		51
HRW	12	UU	0.2
	14		0.3
	17		2.9
	21		4.9
	27		4.9
	35		9.8
	50		14.7
	60		19.6
RSR	5	UU	0.06
	7		0.08
	9		0.1
	12		0.4
	15		0.8
	20		1.0
	3W		0.2
	5W		0.3
	7W		0.4
	9W		0.8
	12W		1.1
	14W		1.2
	15W		1.3
	7Z		0.08
	9Z		0.1
	12Z		0.4
	15Z		0.8
	7WZ		0.4
	9WZ		0.8
	12WZ		1.1
	15WZ		1.3

Unit: N

Model No.		Seal symbol	Seal resistance value
RSH	7	UU	0.08
	9		0.1
	12		0.4
	7Z		0.08
	9Z		0.1
	12Z		0.4
	15Z		0.8
	7WZ		0.4
	9WZ		0.8
	12WZ		1.1
	15WZ		1.3
HR	918	UU	0.5
	1123		0.7
	1530		1.0
	2042		2.0
	2555		2.9
	3065		3.4
	3575		3.9
	4085		4.4
	50105		5.9
	60125		9.8
GSR	15	UU	2.5
	20		3.1
	25		4.4
	30		6.3
	35		7.6
	25-R		4.4
	30-R		6.3
	35-R		7.6
CSR	15	UU	2.0
	20		2.5
	25		3.9
	30		7.8
	35		11.8
	45		19.6
MX	5	UU	0.06
	7W		0.4

Unit: N

Model No.		Seal symbol	Seal resistance value
JR	25	UU	3.9
	35		11.8
	45		19.6
	55		19.6
HCR	12	UU	1.2
	15		2.0
	25		3.9
	35		11.8
	45		19.6
	65		34.3
HMG	15	UU	3
	25		6
	35		8
	45		12
	65		40
NSR	20TBC	UU	4.9
	25TBC		4.9
	30TBC		6.9
	40TBC		9.8
	50TBC		14.7
	70TBC		24.5
HSR	15M1	UU	2.0
	20M1		2.5
	25M1		3.9
	30M1		7.8
	35M1		11.8
SR	15M1	UU	2.5
	20M1		3.4
	25M1		4.4
	30M1		8.8
	35M1		11.8

Unit: N

Model No.		Seal symbol	Seal resistance value
RSR	9M1	UU	0.1
	12M1		0.4
	15M1		0.8
	20M1		1.0
	9M1W		0.8
	12M1W		1.1
	15M1W		1.3
HSR	15M2	UU	2.0
	20M2		2.5
	25M2		3.9
SRG	15	SS	13
	20		18
	25		19
	30		24
	35		30
	45		30
	55		35
	65		40
SRN	35	SS	30
	45		30
	55		35
	65		40
SRW	70	SS	32
	85		37
	100		43

Resistance of LaCS

Unit: N

Model No.		Resistance of LaCS
SHS	15	5.2
	20	6.5
	25	11.7
	30	18.2
	35	20.8
	45	26.0
	55	32.5
	65	39.0
SSR	15	5.9
	20	6.9
	25	8.1
	30	12.8
	35	15.1
SNR/SNS NR/NRS	25	8.1
	30	13.4
	35	15.5
	45	23.3
	55	28.6
	65	39.6
	85	52.7
SHW	21	3.9
	27	6.5
	35	13.0
	50	19.5
SRS	20	5.2
	25	7.8

Unit: N

Model No.		Resistance of LaCS
SCR	15	5.2
	20	6.5
	25	11.7
	30	18.2
	35	20.8
	45	26.0
	65	39.0
HSR	15	3.8
	20	5.6
	25	7.5
	30	14.9
	35	22.4
SRG	20	6.1
	25	6.9
	30	8.2
	35	9.1
	45	14.3
	55	18.2
	65	26.0
SRN	35	9.1
	45	14.3
	55	18.2
	65	22.1
SRW	70	32.8
	85	39.7
	100	58.3

Note1) Each resistance value in the table only consists of that of LaCS, and does not include sliding resistances of seals and other accessories.

Note2) For the maximum service speed of LaCS, contact THK.

Maximum Seal Resistance of LiCS

Unit: N

Model No.		Resistance of LiCS
SSR	15X	1
	20X	1.1
	25X	1.6
	30X	1.6
	35X	2
SRG	15	0.7

Note) The value indicates the sliding resistance of two LiCS units per LM block and does not include the sliding resistances of the LM block and the side seals.

Greasing Hole

[Grease Nipple and Greasing Hole for Models SHW and SRS]

Models SHW and SRS do not have a grease nipple as standard. Installation of a grease nipple and the drilling of a greasing hole is performed at THK. When ordering SHW and SRS, indicate that the desired model requires a grease nipple or greasing hole. (For greasing hole dimensions and supported grease nipple types and dimensions, see Table1.)

When using SHW and SRS under harsh conditions, use QZ Lubricator* (optional) or Laminated Contact Scraper LaCS* (optional).

Note1) Grease nipple is not available for models SHW12, SHW14, SRS9M, SRS9WM, SRS12M and SRS12WM. They can have a greasing hole.
Note2) Using a greasing hole other than for greasing may cause damage.
Note3) For QZ Lubricator*, see A-361. For Laminated Contact Scraper LaCS*, see A-353.
Note4) When desiring a grease nipple for a model attached with QZ Lubricator, contact THK.

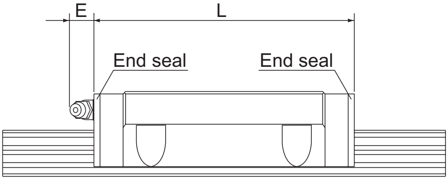


Fig.1 Dimensions of the Grease Nipple for Model SHW

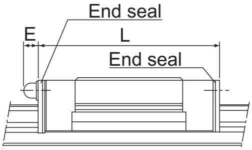


Fig.2 Dimensions of the Grease Nipple for Model SRS

Note) For the L dimension, see the corresponding specification table.

Table1 Table of Grease Nipple and Greasing Hole Dimensions

Unit: mm

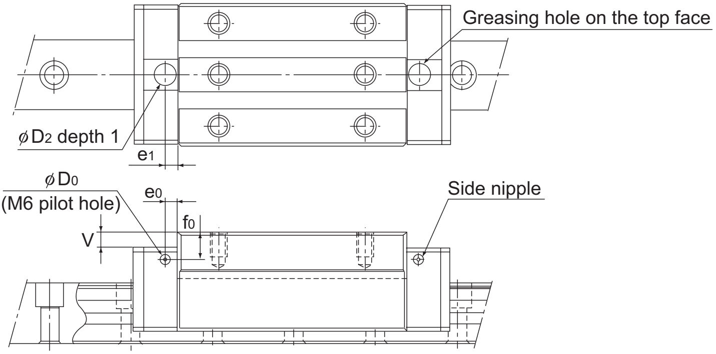
Model No.		E	Grease nipple or greasing hole
SHW	12	—	ϕ2.2 drilled hole
	14	—	ϕ2.2 drilled hole
	17	5	PB107
	21	5.5	PB1021B
	27	12	B-M6F
	35	12	B-M6F
	50	16	B-PT1/8
SRS	9M	—	ϕ1.5 drilled hole
	9WM	—	ϕ1.6 drilled hole
	12M	—	ϕ2.0 drilled hole
	12WM	—	ϕ2.0 drilled hole
	15M	4.0 (5.0)	PB107
	15WM	4.0 (5.0)	PB107
	20M	3.5 (5.0)	PB107
	25M	4.0 (5.5)	PB1021B

Note) Figures in the parentheses indicate dimensions without a seal.

[Greasing Hole for Model SRG]

Model SRG allows lubrication from both the side and top faces of the LM block. The greasing hole of standard types is not drilled through in order to prevent foreign material from entering the LM block. When using the greasing hole, contact THK.

When using the greasing hole on the top face of models SRG-R and SRG-LR, a greasing adapter is separately required. Contact THK for details.



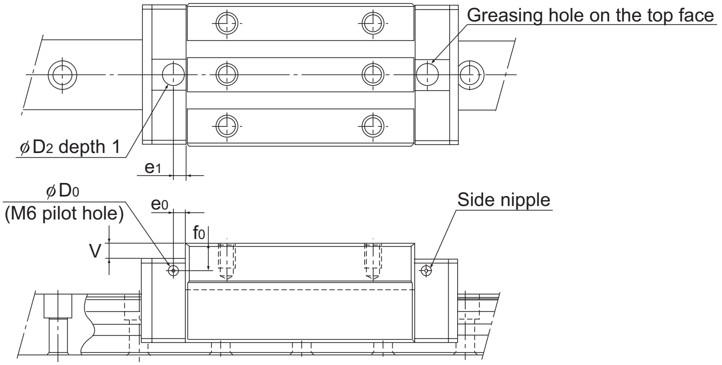
Unit: mm

Model No.		Pilot hole for side nipple			Applicable nipple	Greasing hole on the top face			
		e_0	f_0	D_0		D_2	(O-ring)	V	e_1
SRG	15A 15V	4	4	2.9	PB107	9.2	(P6)	0.5	5.5
	20A 20LA	4	5	2.9	PB107	9.2	(P6)	0.5	6.5
	20V 20LV	4	5	2.9	PB107	9.2	(P6)	0.5	6.5
	25C 25LC	6	6.3	5.2	M6F	10.2	(P7)	0.5	6
	25R 25LR	6	10.3	5.2	M6F	10.2	(P7)	4.5	6
	30C 30LC	6	5.8	5.2	M6F	10.2	(P7)	0.4	6
	30R 30LR	6	8.8	5.2	M6F	10.2	(P7)	3.4	6
	35C 35LC	6	6	5.2	M6F	10.2	(P7)	0.4	6
	35R 35LR	6	13	5.2	M6F	10.2	(P7)	7.4	6
	45C 45LC	7	7	5.2	M6F	10.2	(P7)	0.4	7
	45R 45LR	7	17	5.2	M6F	10.2	(P7)	10.4	7
	55C 55LC	9	8.5	5.2	M6F	10.2	(P7)	0.4	11
	55R 55LR	9	18.5	5.2	M6F	10.2	(P7)	10.4	11
	65LC	9	13.5	5.2	M6F	10.2	(P7)	0.4	10
	65LV	9	13.5	5.2	M6F	10.2	(P7)	0.4	10

Note) The greasing interval is longer than that of full-roller types because of the roller cage effect. However, the actual greasing interval may vary depending on the service environment, such as a high load and high speed. Contact THK for details.

[Greasing Hole for Model SRN]

Model SRN allows lubrication from both the side and top faces of the LM block. The greasing hole of standard types is not drilled through in order to prevent foreign material from entering the LM block. When using the greasing hole, contact THK.



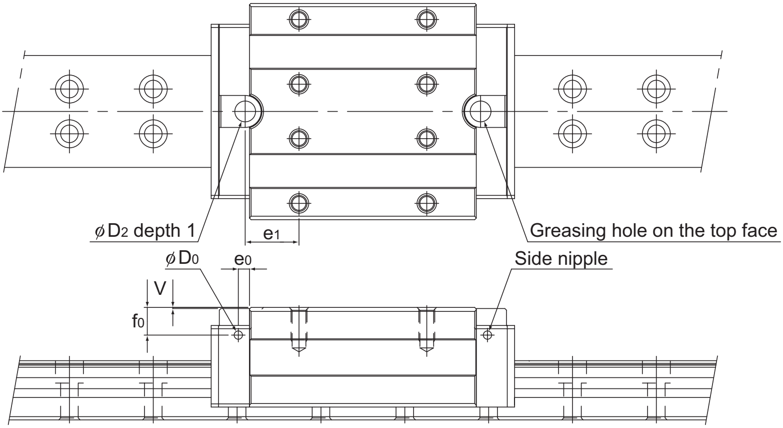
Unit: mm

Model No.		Pilot hole for side nipple			Applicable nipple	Greasing hole on the top face			
		e0	f0	D0		D2	(O-ring)	V	e1
SRN	35C 35LC	8	6.5	5.2	M6F	10.2	(P7)	0.4	6
	35R 35LR	8	6.5	5.2	M6F	10.2	(P7)	0.4	6
	45C 45LC	8.5	7	5.2	M6F	10.2	(P7)	0.4	7
	45R 45LR	8.5	7	5.2	M6F	10.2	(P7)	0.4	7
	55C 55LC	10	8	5.2	M6F	10.2	(P7)	0.4	11
	55R 55LR	10	8	5.2	M6F	10.2	(P7)	0.4	11
	65LC	9	11	5.2	M6F	10.2	(P7)	0.4	10
	65LR	9	11	5.2	M6F	10.2	(P7)	0.4	10

Note) The greasing interval is longer than that of full-roller types because of the roller cage effect. However, the actual greasing interval may vary depending on the service environment, such as a high load and high speed. Contact THK for details.

[Greasing Hole for Model SRW]

Model SRW allows lubrication from both the side and top faces of the LM block. The greasing hole of standard types is not drilled through in order to prevent foreign material from entering the LM block. When using the greasing hole, contact THK.



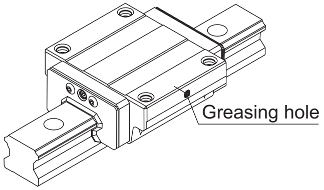
Unit: mm

Model No.		Pilot hole for side nipple			Applicable nipple	Greasing hole on the top face			
		e_0	f_0	D_0		D_2	(O-ring)	V	e_1
SRW	70	7	17	5.2	M6F	13	(P10)	0.4	33.7
	85	9	17.7	5.2	M6F	13	(P10)	0.4	42.75
	100	9	22.4	5.2	M6F	13	(P10)	0.4	55

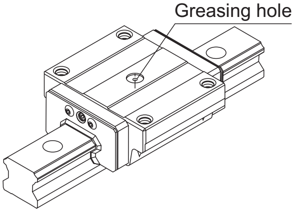
Note) The greasing interval is longer than that of full-roller types because of the roller cage effect. However, the actual greasing interval may vary depending on the service environment, such as a high load and high speed. Contact THK for details.

[Semi-standard Greasing Hole for Model HSR]

For model HSR, a semi-standard greasing hole is available. Specify the appropriate model number according to the application.



Type with a Greasing Hole Drilled on the Side Surface



Type with a Greasing Hole Drilled on the Top Face

[Lubrication for Model HR]

The LM block has a greasing hole in the center of its top face. To provide lubrication through this hole, the table must be machined to also have a greasing hole as shown in Fig.3 and attach a grease nipple or the like. When using oil lubrication, it is necessary to identify the lubrication route. Contact THK for details.

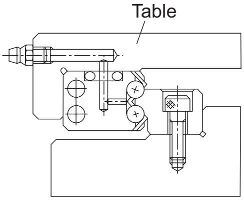


Fig.3 Example of Machining a Greasing Hole

Precautions on Using the LM Guide

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Tilting an LM block or LM rail may cause them to fall by their own weight.
(3) Dropping or hitting the LM Guide may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.
(2) Do not mix lubricants of different physical properties.
(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(4) When planning to use a special lubricant, contact THK before using it.
(5) When adopting oil lubrication, the lubricant may not be distributed throughout the LM system depending on the mounting orientation of the system. Contact THK for details.
(6) Lubrication interval varies according to the conditions. Contact THK for details.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball (roller) circulating path or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
(2) When planning to use the LM system in an environment where the coolant penetrates the LM block, it may cause trouble to product functions depending on the type of the coolant. Contact THK for details.
(3) Contact THK if you desire to use the product at a temperature of 80℃ or higher.
(4) If foreign material such as dust or cutting chips adheres to the product, replenish the lubricant after cleaning the product with pure white kerosene. For available types of detergent, contact THK.
(5) When using the LM Guide with inverted mount, breakage of the endplate due to an accident or the like may cause balls (rollers) to fall and the LM block to come off from the LM rail and fall. In these cases, take preventive measures such as adding a safety mechanism for preventing such falls.
(6) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
(7) When removing the LM block from the LM rail and then replacing the block, an LM block mounting/removing jig that facilitates such installation is available. Contact THK for details.

[Storage]

When storing the LM Guide, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

Precautions on Using Options for the LM Guide

QZ Lubricator

[Handling]

Dropping or hitting the product may damage it. Use much care when handling it.
Do not block the vent hole with grease or the like.

[Service Environment]

Be sure the service temperature of this product is between -10 to +50℃, and do not clean the product by immersing it in an organic solvent or white kerosene, or leave it unpacked. When using it out of the service temperature range, contact THK in advance.

[Use in a Special Environment]

When desiring to use the product in a special environment, contact THK.

[Precaution on Selection]

Secure a stroke longer than the overall LM block with QZ Lubricator attached.

[Corrosion Prevention]

QZ is a lubricating device designed to feed a minimum amount of oil to the raceway, and does not provide an anti-rust effect to the whole LM Guide. When using it in an environment subject to a coolant or the like, we strongly recommend applying grease to the mounting base of the LM Guide and to the rail ends as an anti-rust measure.

Laminated Contact Scraper LaCS, Side Scraper

[Service Environment]

Be sure the service temperature of this product is between -20 to +80℃, and do not clean the product by immersing it in an organic solvent or white kerosene, or leave it unpacked.

[Impregnating Oil]

The lubricant impregnated into the scraper is used to increase its sliding capability. For lubrication of the LM Guide, attach QZ Lubricator, or the grease nipple on the side face of the end plate of the LM block, before providing a lubricant.

[Function]

It is specifically designed to provide dust prevention capability to remove foreign material and liquid. To seal oil, an end seal is required.

[Design]

When using the product, be sure to attach the rail cap C or the plate cover.

Light Sliding Resistance Contact Seal LiCS

[Service Environment]

Be sure the service temperature of this product is between -20 to +80℃, and do not clean the product by immersing it in an organic solvent or white kerosene, or leave it unpacked.
It contacts only with the LM rail raceway. Do not use it in harsh environments.

[Impregnating Oil]

The lubricant impregnated into LiCS is used to increase its sliding capability. For lubrication of the LM Guide, attach the grease nipple on the end plate of the LM block before providing a lubricant.

LM Guide Actuator

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

Dimensional Drawing, Dimensional Table

* Please see the separate "B Product Specifications".

LM Guide Actuator

Model KR

LM Guide + Ball Screw = Integral-structure Actuator

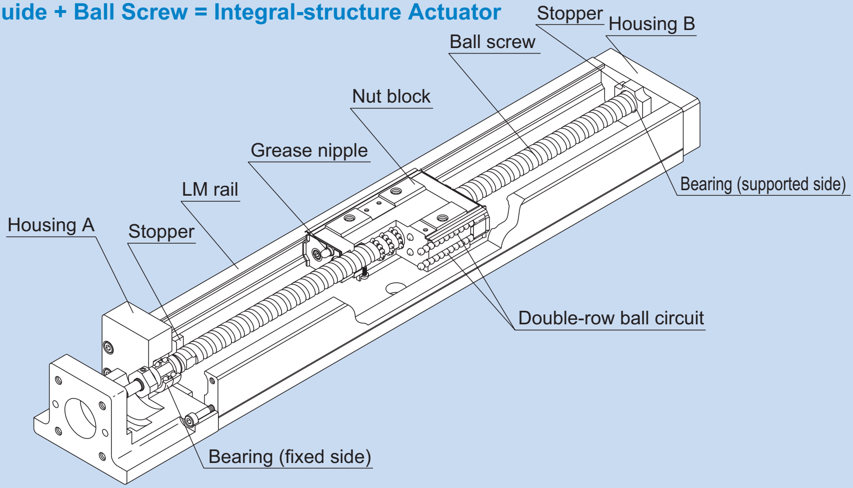


Fig.1 Structure of LM Guide Actuator Model KR

Structure and Features

Because of its integral-structure nut block consisting of a highly rigid LM rail with a U-shaped cross section, LM Guide units on both side faces and a Ball Screw unit in the center, LM Guide Actuator model KR achieves a highly rigid and highly accurate actuator in a minimal space.
In addition, since the housings A and B also serve as support units and the nut block as a table, the this model allows significant reduction of man-hours and time required for design and assembly since it incorporates a support unit and a table, thus to contribute to total cost cutting.

[4-way Equal Load]

Each train of balls is arranged at a contact angle of 45° so that the rated load on the nut block is uniform in the four directions (radial, reverse radial and lateral directions). As a result, model KR can be used in any mounting orientation.

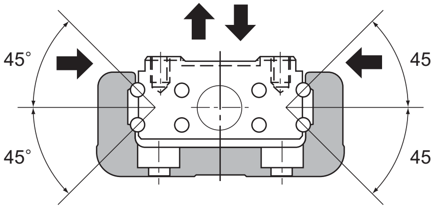


Fig.2 Load Capacity and Contact Angle of Model KR

[High Rigidity]

Unlike the conventional LM Guide, model KR uses an outer rail structure to achieve higher rigidity against an overhung load.

The LM rail has a wide U-shaped cross section to reduce the weight and minimize deflection.

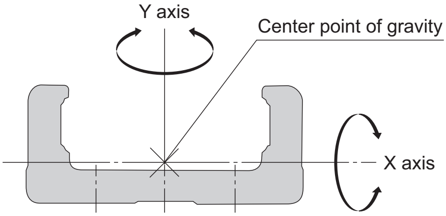


Fig.3 Cross Section of the LM Rail

Table1 Cross-sectional Characteristics of the LM Rail

Unit: mm^4

Model No.	I_X	I_Y	Mass (kg/100mm)
KR15	9.08×10^2	1.42×10^4	0.104
KR20	6.1×10^3	6.2×10^4	0.26
KR26	1.7×10^4	1.5×10^5	0.39
KR30H	2.7×10^4	2.8×10^5	0.5
KR33	6.2×10^4	3.8×10^5	0.66
KR45H	8.4×10^4	8.9×10^5	0.9
KR46	2.4×10^5	1.5×10^6	1.26
KR55	2.2×10^5	2.3×10^6	1.5
KR65	4.6×10^5	5.9×10^6	2.31

I_X=geometrical moment of inertia around X axis
I_Y=geometrical moment of inertia around Y axis

[High Accuracy]

Since the linear guide section consists of 4 rows of circular-arc grooves that enable balls to smoothly move even under a preload, a highly rigid guide with no clearance is achieved. Additionally, variation in frictional resistance caused by load fluctuation is minimized, allowing the system to follow highly accurate feed.

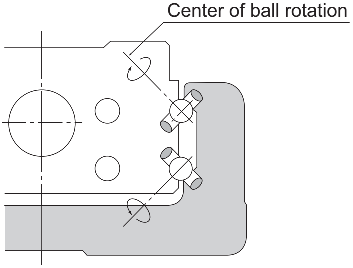


Fig.4 Contact Structure of Model KR

[Space Saving]

Use of a nut block integrating LM Guide units on both ends and a Ball Screw unit in the center makes model KR a highly rigid and highly accurate actuator in a minimal space.

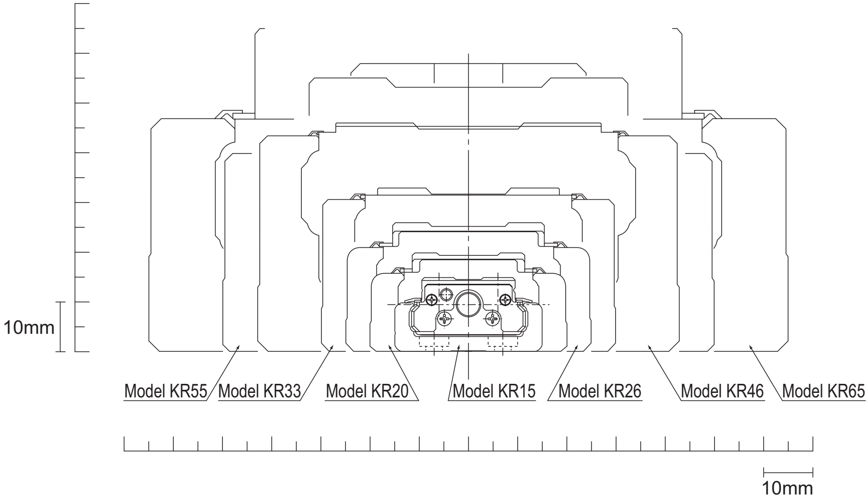


Fig.5 Cross Sectional Drawing

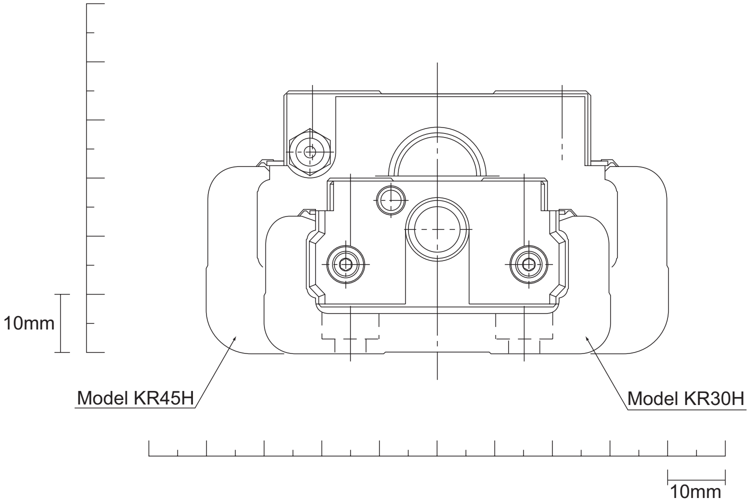


Fig.6 Cross Sectional Drawing

[Seal]

Model KR is equipped with end seals and side seals for dust prevention as standard.

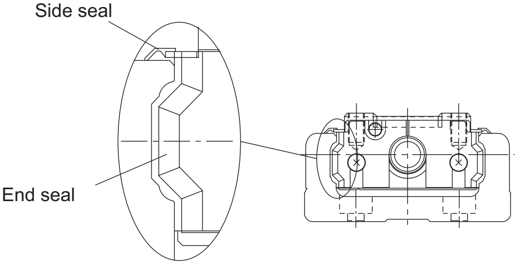


Table2 shows the rolling resistance and seal resistance per nut block (guide section).

Table2 Maximum Resistance Value Unit: N

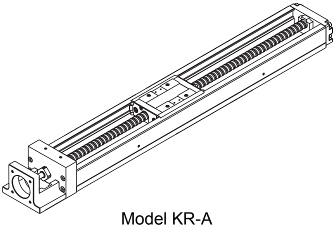
Model No.	Rolling resistance value	Seal resistance value	Total
KR15	0.2	0.7	0.9
KR20	0.5	0.7	1.2
KR26	0.6	0.8	1.4
KR30H	1.5	2.0	3.5
KR33	1.5	1.9	3.4
KR45H	2.5	2.6	5.1
KR46	2.5	2.5	5
KR55	5.0	3.8	8.8
KR65	6.0	4.1	10.1

Note) The rolling resistance represents the value when a lubricant is not used.

Types and Features

Model KR-A (with a Single Long Nut Block)

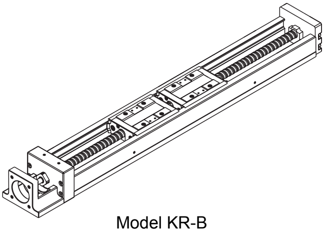
Representative model of KR.



Model KR-A

Model KR-B (with Two Long Nut Blocks)

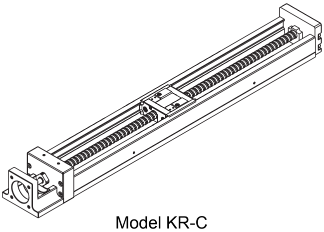
Equipped with two units of the nut block of model KR-A, this model achieves higher rigidity, higher load capacity and higher accuracy.



Model KR-B

Model KR-C (with a Single Short Nut Block)

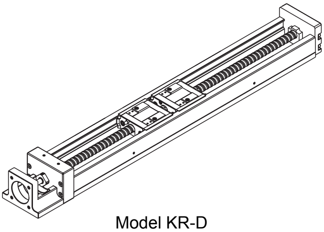
This model has a shorter overall length of the nut block and a longer stroke than model KR-A. (Supported models: model KR30H, 33, 45H, 46)



Model KR-C

Model KR-D (with Two Short Nut Blocks)

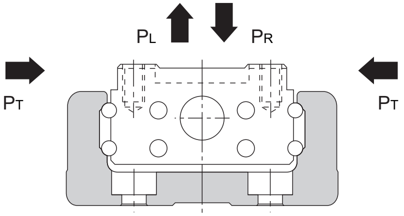
Equipped with two units of the nut block of model KR-C, this design allows a span between blocks that suits the equipment, thus to achieve high rigidity.
(Supported models: model KR30H, 33, 45H, 46)



Model KR-D

Load Ratings in All Directions and Static Permissible Moment

[Load Rating]



● LM Guide Unit

Model KR is capable of receiving loads in four directions: radial, reverse radial and lateral directions. Its basic load ratings are equal in all four directions (radial, reverse radial and lateral directions), and their values are indicated in Table3 on A-392 and A-393.

● Ball Screw Unit

Since the nut block is incorporated with a Ball Screw, model KR is capable of receiving an axial load. The basic load rating value is indicated in Table3 on A-392 and A-393.

● Bearing Unit (Fixed Side)

Since housing A contains an angular bearing, model KR is capable of receiving an axial load. The basic load rating value is indicated in Table3 on A-392 and A-393.

[Equivalent Load (LM Guide Unit)]

The equivalent load when the LM Guide unit of model KR simultaneously receives loads in all directions is obtained from the following equation.

$$P_E = P_R\ (P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral direction
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

Table3 Load Rating of Model KR

Model No.			KR15		KR20		KR26	
			KR1501	KR1502	KR2001	KR2006	KR2602	KR2606
LM guide unit	Basic dynamic load rating C (N)	Long nut block types A, B	1930		3590		7240	
		Short nut block types C, D	—		—		—	
	Basic static load rating C_0 (N)	Long nut block types A, B	3450		6300		12150	
		Short nut block types C, D	—		—		—	
	Radial clearance (mm)	Normal grade, high accuracy grade	−0.001 to +0.002		−0.003 to +0.002		−0.004 to +0.002	
		Precision grade	−0.005 to −0.002		−0.007 to −0.003		−0.01 to −0.004	
Ball screw unit	Basic dynamic load rating Ca (N)	Normal grade, high accuracy grade	340	230	660	860	2350	1950
		Precision grade	340	230	660	1060	2350	2390
	Basic static load rating C_0a (N)	Normal grade, high accuracy grade	660	410	1170	1450	4020	3510
		Precision grade	660	410	1170	1600	4020	3900
	Screw shaft diameter (mm)		5		6		8	
	Lead (mm)		1	2	1	6	2	6
	Thread minor diameter (mm)		4.5		5.3	5.0	6.6	6.7
	Ball center-to-center diameter (mm)		5.15		6.15	6.3	8.3	8.4
Bearing unit (Fixed side)	Axial direction	Basic dynamic load rating Ca (N)	590		1000		1380	
		Static permissible load P_0a (N)	290		1240		1760	

Note1) The load ratings in the LM Guide unit each indicate the load rating per LM block.

Note2) The Ball Screw of precision grade (grade P) for models KR30H, KR33, KR45H10 and KR4610 is incorporated with spacer balls in the proportion of one to one.

Note3) The Ball Screw of precision grade (grade P) for models KR45H20, KR4620, KR55 and KR65 is incorporated with spacer balls in the proportion of two to one.

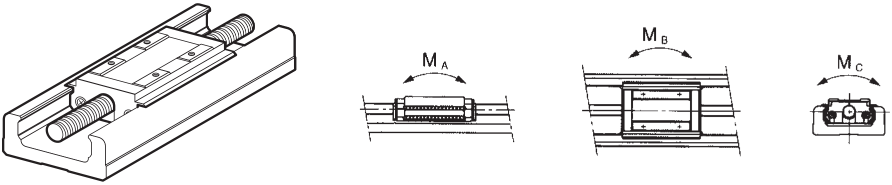
Symbols in the parentheses indicate units.

KR30H		KR33		KR45H		KR46		KR55	KR65
KR30H06	KR30H10	KR3306	KR3310	KR45H10	KR45H20	KR4610	KR4620		
11600		11600		23300		27400		38100	50900
4900		4900		11900		14000		—	—
20200		20200		39200		45500		61900	80900
10000		10000		19600		22700		—	—
−0.004 to +0.002		−0.004 to +0.002		−0.006 to +0.003		−0.006 to +0.003		−0.007 to +0.004	−0.008 to +0.004
−0.012 to −0.004		−0.012 to −0.004		−0.016 to −0.006		−0.016 to −0.006		−0.019 to −0.007	−0.022 to −0.008
2840	1760	2840	1760	3140	3040	3140	3040	3620	5680
2250	1370	2250	1370	2940	3430	2940	3430	3980	5950
4900	2840	4900	2840	6760	7150	6760	7150	9290	14500
2740	1570	2740	1570	3720	5290	3720	5290	6850	10700
10		10		15		15		20	25
6	10	6	10	10	20	10	20	20	25
7.8		7.8		12.5		12.5		17.5	22
10.5		10.5		15.75		15.75		20.75	26
1790		1790		6660		6660		7600	13700
2590		2590		3240		3240		3990	5830

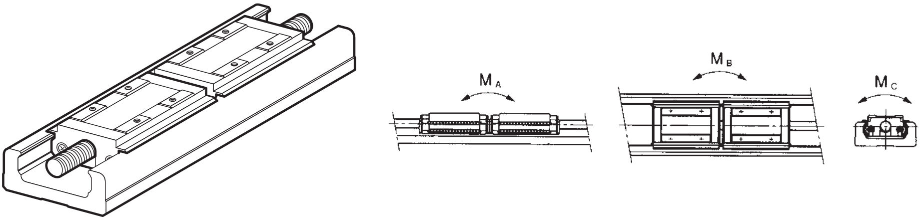
[Static Permissible Moment (LM Guide Unit)]

The LM Guide unit of model KR is capable of receiving moments in four directions only with a single nut block.

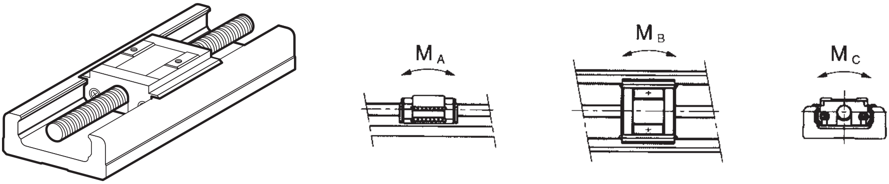
Table4 on A-395 shows static permissible moments in the M_A, M_B and M_C directions.



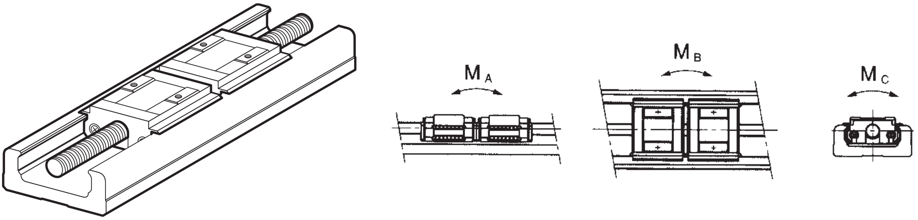
With a single long nut block (type A)



With double long nut blocks (type B)



With a single short nut block (type C)



With double short nut blocks (type D)

Table4 Static Permissible Moments of Model KR Unit: N-m

Model No.	Static permissible moment		
	M_A	M_B	M_C
KR15-A	12.1	12.1	38
KR15-B	70.3	70.3	76
KR20-A	31	31	83
KR20-B	176	176	165
KR26-A	84	84	208
KR26-B	480	480	416
KR30H-A	166	166	428
KR30H-B	908	908	857
KR30H-C	44	44	214
KR30H-D	319	319	427
KR33-A	166	166	428
KR33-B	908	908	857
KR33-C	44	44	214
KR33-D	319	319	427
KR45H-A	486	486	925
KR45H-B	2732	2732	1850
KR45H-C	130	130	463
KR45H-D	994	994	925
KR46-A	547	547	1400
KR46-B	2940	2940	2800
KR46-C	149	149	700
KR46-D	1010	1010	1400
KR55-A	870	870	2280
KR55-B	4890	4890	4570
KR65-A	1300	1300	3920
KR65-B	7230	7230	7840

Note1) Symbols A, B, C or D in the end of each model number indicates the nut block size and the number of nut blocks used.
A: With a single long nut block
B: With double long nut blocks
C: With a single short nut block
D: With double short nut blocks
Note2) The values for models KR - B/D indicate the values when double nut blocks are used in close contact with each other.

Maximum Travel Speed and the Maximum Length

The maximum travel speed of model KR is limited by the dangerous speed of the ball screw shaft and the DN value regardless of the maximum rotation speed of the motor. These factors must be taken into account especially when model KR operates at high speed.
The maximum lengths are indicated in terms of LM rail length.

Table5 Maximum Travel Speed and the Maximum Length

Model No.	Ball Screw lead (mm)	LM rail length (mm)	Maximum travel speed (mm/s)						Maximum length(mm)	
			Precision grade	High-accuracy grade	Normal grade	Precision grade	High-accuracy grade	Normal grade	Precision grade	High-accuracy grade, normal grade
			Long block			Short block				
KR15	01	—	160	160	—	—	—	—	250	250
	02	—	330	330		—	—	—		
KR20	01	—	190	190		—	—	—	250	250
	06	—	1100	790		—	—	—		
KR26	02	—	280	280		—	—	—	350	350
	06	—	830	590		—	—	—		
KR30H	06	150	660	470		660	470		600	700
		200	660	470		660	470			
		300	660	470		660	470			
		400	660	470		660	470			
		500	590	360		530	470			
		600	395	395		360	360			
	10	150	1100	790		1100	790			
		200	1100	790		1100	790			
		300	1100	790		1100	790			
		400	1100	790		1100	790			
		500	980	790		880	790			
		600	650	650		600	600			
KR33	06	150	660	470		660	470		600	700
		200	660	470		660	470			
		300	660	470		660	470			
		400	660	470		660	470			
		500	590	360		530	470			
		600	395	395		360	360			
	10	150	1100	790		1100	790			
		200	1100	790		1100	790			
		300	1100	790		1100	790			
		400	1100	790		1100	790			
		500	980	790		880	790			
		600	650	650		600	600			
KR45H	10	340	740	520		740	520		800	1200
		440	740	520		740	520			
		540	740	520		740	520			
		640	740	520		740	520			
		740	730	520		640	520			
		840	—	520		—	520			
		940	—	430		—	380			
	20	340	1480	1050		1480	1050			
		440	1480	1050		1480	1050			
		540	1480	1050		1480	1050			
		640	1480	1050		1480	1050			
		740	1430	1050		1280	1050			
		840	—	1050		—	1050			
		940	—	840		—	770			

Model No.	Ball Screw lead (mm)	LM rail length (mm)	Maximum travel speed (mm/s)						Maximum length(mm)	
			Precision grade	High-accuracy grade	Normal grade	Precision grade	High-accuracy grade	Normal grade	Precision grade	High-accuracy grade, normal grade
			Long block			Short block				
KR46	10	340	740	520		740	520		800	1200
		440	740	520		740	520			
		540	740	520		740	520			
		640	740	520		740	520			
		740	730	520		650	520			
		840	—	520		—	520			
		940	—	430		—	390			
	20	340	1480	1050		1480	1050			
		440	1480	1050		1480	1050			
		540	1480	1050		1480	1050			
		640	1480	1050		1480	1050			
		740	1440	1050		1300	1050			
		840	—	1050		—	1050			
		940	—	840		—	780			
KR55	20	980	1120	800		—	—	—	1180	2000
		1080	900	800		—	—	—		
		1180	740	740		—	—	—		
		1280	—	620		—	—	—		
		1380	—	530		—	—	—		
KR65	25	980	1120	800		—	—	—	1380	2000
		1180	1120	800		—	—	—		
		1380	840	800		—	—	—		
		1680	—	550		—	—	—		

* Any rail length greater than the standard rail length is limited by the dangerous speed. If desiring such a rail length, contact THK.

Lubrication

Table6 shows standard greases used in model KR and grease nipple types.

Table6

Model No.	Standard grease	Grease nipple
KR15	THK AFF Grease	—
KR20	THK AFA Grease	PB107
KR26	THK AFA Grease	PB107
KR30H	THK AFB-LF Grease	PB107
KR33	THK AFB-LF Grease	PB107
KR45H	THK AFB-LF Grease	A-M6F
KR46	THK AFB-LF Grease	A-M6F
KR55	THK AFB-LF Grease	A-M6F
KR65	THK AFB-LF Grease	A-M6F

Service Life

Model KR consists of an LM Guide, a Ball Screw and a support bearing. The nominal life of each component can be obtained using the basic dynamic load rating indicated in Table3 on A-392 and A-393 (Rated Load of Model KR).

[LM Guide Unit]

● Nominal Life

$$L = \left(\frac{f_C \cdot C}{f_W \cdot P_C}\right)^3 \times 50$$

L	: Nominal life	(km)
	(The total travel distance that 90% of a group of identical LM Guide units independently operating under the same conditions can achieve without showing flaking)	
C	: Basic dynamic load rating	(N)
P_C	: Calculated applied load	(N)
f_W	: Load factor	(see Table8 on A-401)
f_C	: Contact factor	(see Table7 on A-401)

- If a moment is applied to model KR-A/C or model KR-B/D using two nut blocks in close contact with each other, calculate the equivalent load by multiplying the applied moment by the equivalent factor indicated in Table9 on A-401.

$$P_m = K \cdot M$$

P_m : Equivalent load (per nut block) (N)
K : Equivalent moment factor(see Table9 on A-401)
M : Applied moment (N-mm)
(If planning to use three or more nut blocks, or use nut blocks with a wide span, contact THK.)

- If moment Mc is applied to model KR-B/D

$$P_m = \frac{K_C \cdot M_C}{2}$$

- If a radial load (P) and a moment are simultaneously applied to model KR

$$P_E = P_m + P$$

P_E : Total equivalent radial load (N)
Perform a nominal life calculation using the above data.

● Service Life Time

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations are constant, the service life time is obtained using the equation below.

$$L_h = \frac{L \times 10^6}{2 \cdot \ell_s \cdot n_1 \times 60}$$

L_h : Service life time (h)
ℓ_s : Stroke length (mm)
n_1 : Number of reciprocations per minute(min^{-1})

[Ball Screw Unit/Bearing Unit(Fixed Side)]

● Nominal Life

$$L = \left(\frac{Ca}{f_W \cdot Fa}\right)^3 \times 10^6$$

L : Nominal life (rev)
(The total number of revolutions that 90% of a group of identical Ball Screw units independently operating under the same conditions can achieve without showing flaking)
Ca : Basic dynamic load rating (N)
Fa : Applied axial load (N)
f_W : Load factor (see Table8 on A-401)

When the nominal life has been obtained from the equation above, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

● Service Life Time

$$L_h = \frac{L \cdot \ell}{2 \cdot \ell_s \cdot n_1 \times 60}$$

L_h : Service life time (h)
ℓ_s : Stroke length (mm)
n_1 : Number of reciprocations per minute(min^{-1})
ℓ : Ball Screw lead (mm)

■f_C: Contact Factor

If two nut blocks are used in close contact with each other with model KR-B/D, multiply the basic load rating by the corresponding contact factor indicated in Table7.

Table7 Contact Factor (f_C)

Block type	Contact factor f_C
A, C type	1
B, D type	0.81

■f_W: Load Factor

Table8 shows load factors.

Table8 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

■K: Moment Equivalent Factor (LM Guide Unit)

When model KR travels under a moment, the distribution of load applied to the LM Guide is locally large (see A-75). In such cases, calculate the load by multiplying the moment value by the corresponding moment equivalent factor indicated in Table9.

Symbols K_A, K_B and K_C indicate the moment equivalent loads in the M_A, M_B and M_C directions, respectively.

Table9 Equivalent moment factor(K)

Model No.	K_A	K_B	K_C
KR15-A	3.2×10^{-1}	3.2×10^{-1}	9.09×10^{-2}
KR15-B	5.96×10^{-2}	5.96×10^{-2}	9.09×10^{-2}
KR20-A	2.4×10^{-1}	2.4×10^{-1}	7.69×10^{-2}
KR20-B	4.26×10^{-2}	4.26×10^{-2}	7.69×10^{-2}
KR26-A	1.73×10^{-1}	1.73×10^{-1}	5.88×10^{-2}
KR26-B	3.06×10^{-2}	3.06×10^{-2}	5.88×10^{-2}
KR30H-A	1.51×10^{-1}	1.51×10^{-1}	4.78×10^{-2}
KR30H-B	2.76×10^{-2}	2.76×10^{-2}	4.78×10^{-2}
KR30H-C	2.77×10^{-1}	2.77×10^{-1}	4.78×10^{-2}
KR30H-D	3.99×10^{-2}	3.99×10^{-2}	4.78×10^{-2}
KR33-A	1.51×10^{-1}	1.51×10^{-1}	4.93×10^{-2}
KR33-B	2.57×10^{-2}	2.57×10^{-2}	4.93×10^{-2}
KR33-C	2.77×10^{-1}	2.77×10^{-1}	4.93×10^{-2}
KR33-D	3.55×10^{-2}	3.55×10^{-2}	4.93×10^{-2}
KR45H-A	9.83×10^{-2}	9.83×10^{-2}	3.45×10^{-2}
KR45H-B	1.87×10^{-2}	1.87×10^{-2}	3.45×10^{-2}
KR45H-C	1.83×10^{-1}	1.83×10^{-1}	3.45×10^{-2}
KR45H-D	2.81×10^{-2}	2.81×10^{-2}	3.45×10^{-2}
KR46-A	1.01×10^{-1}	1.01×10^{-1}	3.38×10^{-2}
KR46-B	1.78×10^{-2}	1.78×10^{-2}	3.38×10^{-2}
KR46-C	1.85×10^{-1}	1.85×10^{-1}	3.38×10^{-2}
KR46-D	2.5×10^{-2}	2.5×10^{-2}	3.38×10^{-2}
KR55-A	8.63×10^{-2}	8.63×10^{-2}	2.83×10^{-2}
KR55-B	1.53×10^{-2}	1.53×10^{-2}	2.83×10^{-2}
KR65-A	7.55×10^{-2}	7.55×10^{-2}	2.14×10^{-2}
KR65-B	1.35×10^{-2}	1.35×10^{-2}	2.14×10^{-2}

Note) The values for models KR-B/D indicate the values when double nut blocks are used in close contact with each other.

Static Safety Factor

[Calculating the Static Safety Factor]

● LM Guide Unit

To calculate a load applied to the LM Guide of model KR, the average load required for calculating the service life and the maximum load needed for calculating the static safety factor must be obtained first. In particular, if the system starts and stops frequently, or if a large moment caused by an overhung load is applied to the system, it may receive an unexpectedly large load.

When selecting a model number, make sure that the desired model is capable of receiving the required maximum load (whether stationary or in motion).

$$f_s = \frac{C_0}{P_{max}}$$

f_s : Static safety factor

C_0 : Basic static load rating (N)

P_{max} : Maximum applied load (N)

* The basic static load rating is a static load with a constant direction and magnitude whereby the sum of the permanent deformation of the rolling element and that of the raceway on the contact area under the maximum stress is 0.0001 times the rolling element diameter.

● Ball Screw Unit/Bearing Unit(Fixed Side)

If an unexpected external force is applied in the axial direction as a result of an inertia caused by an impact or start and stop while model KR is stationary or operating, it is necessary to take into account the static safety factor.

$$f_s = \frac{C_{0a}}{F_{max}}$$

f_s : Static safety factor

C_{0a} : Basic static load rating (N)

F_{max} : Maximum applied load (N)

[Standard Values for the Static Safety Factor (f_s)]

Machine using the LM system	Load conditions	Lower limit of f_s
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3

* The standard value of the static safety factor may vary according to the conditions such as environment, lubrication status, mounting section accuracy or rigidity.

Example of Calculating the Nominal Life

[Condition (Horizontal Installation)]

Assumed model number : KR 5520A
LM Guide unit (C=38100N, C_0=61900N)
Ball Screw unit (C_a=3620N, C_{0a}=9290N)
Bearing unit(Fixed Side) (C_a=7600N, P_{0a}=3990N)
Mass : m = 30kg
Speed : v = 500mm/s
Acceleration : α =2.4m/s^2
Stroke : ℓ_s = 1200mm
Gravitational acceleration : g = 9.807m/s^2
Velocity diagram : see Fig.7

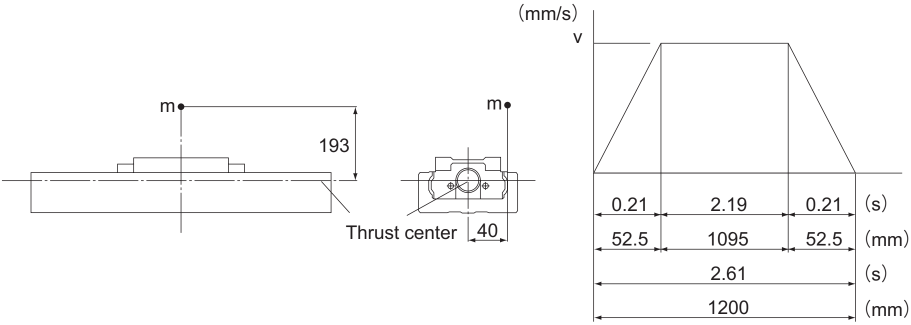


Fig.7

[Consideration]

● Studying the LM Guide Unit

■Load Applied to the Nut Block

* Assuming that a single nut block is used, convert applied moments M_A and M_B into applied load by multiplying them by the moment equivalent factor (K_A=K_B=8.63 × 10^{-2}).

* Assuming that a single shaft is used, convert applied moment M_C into applied load by multiplying it by the moment equivalent factor (K_C=2.83 × 10^{-2}).

- During uniform motion:

  $P_1 = mg + K_C \cdot mg \times 40 = 627\ \text{N}$
- During acceleration:

  $P_{1a} = P_1 + K_A \cdot m\alpha \times 193 = 1826\ \text{N}$

  $P_{1aT} = -\ K_B \cdot m\alpha \times 40 = -\ 249\ \text{N}$
- During deceleration:

  $P_{1d} = P_1 -\ K_A \cdot m\alpha \times 193 = -572\ \text{N}$

  $P_{1dT} = K_B \cdot m\alpha \times 40 = 249\ \text{N}$

* Since the groove under a load is different from the assumed groove, give "0" (zero) to P_{1aT} and P_{1d}.

■Combined Radial And Thrust Load

- During uniform motion:

  $P_{1E} = P_1 = 627\ \text{N}$
- During acceleration:

  $P_{1aE} = P_{1a} + P_{1aT} = 1826\ \text{N}$
- During deceleration:

  $P_{1dE} = P_{1d} + P_{1dT} = 249\ \text{N}$

■Static Safety Factor

$$f_s = \frac{C_0}{P_{max}} = \frac{C_0}{P_{1aE}} = 33.9$$

■Nominal Life

- Average load

$$P_m = \sqrt[3]{\frac{1}{\ell_S}\left(P_{1E}{}^3 \times 1095 + P_{1aE}{}^3 \times 52.5 + P_{1dE}{}^3 \times 52.5\right)} = 790\ \text{N}$$

- Nominal life

$$L = \left(\frac{C}{f_W \cdot P_m}\right)^3 \times 50 = 3.25 \times 10^6\ \text{km}$$

f_W : Load factor (1.2)

● Studying the Ball Screw Unit

■Axial load

- During forward uniform motion:

$Fa_1 = \mu \cdot mg + f = 11\ \mathrm{N}$

μ : Friction coefficient(0.005)
f : Rolling resistance of one KR block + seal resistance(10.0 N)

- During forward acceleration:

$Fa_2 = Fa_1 + m\alpha = 83\ \mathrm{N}$

- During forward deceleration:

$Fa_3 = Fa_1 - m\alpha = -61\ \mathrm{N}$

- During uniform backward motion

$Fa_4 = -Fa_1 = -11\ \mathrm{N}$

- During backward acceleration:

$Fa_5 = Fa_4 - m\alpha = -83\ \mathrm{N}$

- During backward deceleration:

$Fa_6 = Fa_4 + m\alpha = 61\ \mathrm{N}$

* Since the groove under a load is different from the assumed groove, give "0" (zero) to Fa_3, Fa_4 and Fa_5.

■Static Safety Factor

$$f_s = \frac{C_{0a}}{Fa_{max}} = \frac{C_{0a}}{Fa_2} = 111.9$$

■Buckling Load

$$P_1 = \frac{n \cdot \pi^2 \cdot E \cdot I}{\ell_a^{\,2}} \times 0.5 = 11000\ \mathrm{N}$$

P_1 : Buckling load (N)
ℓ_a : Distance between two mounting surfaces (1300 mm)
E : Young's modulus (2.06×10^5 N/mm²)
n : Factor for mounting method (fixed-fixed: 4.0, see A-694)
0.5 : Safety factor
I : Minimum geometrical moment of inertia of the shaft (mm⁴)

$$I = \frac{\pi}{64} \cdot d_1^{\,4}$$

d_1 : Screw-shaft thread minor diameter (17.5 mm)

■Permissible tensile Compressive Load

$$P_2 = \delta \cdot \frac{\pi}{4} \cdot d_1{}^2 = 35300\ \text{N}$$

P_2 : Permissible tensile compressive load (N)
δ : Permissible tensile compressive stress (147 N/mm^2)
d_1 : Screw-shaft thread minor diameter (17.5mm)

■Dangerous Speed

$$N_1 = \frac{60 \cdot \lambda^2}{2\pi \cdot \ell_b{}^2} \cdot \sqrt{\frac{E \times 10^3 \cdot I}{\gamma \cdot A}} \times 0.8 = 1560\ \text{min}^{-1}$$

N_1 : Dangerous speed (min^{-1})
ℓ_b : Distance between two mounting surfaces (1300mm)
γ : Density (7.85×10^{-6}kg/mm^3)
λ : Factor according to the mounting method (fixed-supported 3.927, see A-696)
0.8 : Safety factor

■DN Value

DN=31125(≦50000)

D : Ball center-to-center diameter (20.75mm)
N : Maximum working rotation speed (1500min^{-1})

■Nominal Life

- Average axial load

$$F_{am} = \sqrt[3]{\frac{1}{2 \cdot \ell_s}\left(F_{a1}{}^3 \times 1095 + F_{a2}{}^3 \times 52.5 + F_{a6}{}^3 \times 52.5\right)} = 26.2\ \text{N}$$

- Nominal life

$$L = \left(\frac{C_a}{f_w \cdot F_{am}}\right)^3 \cdot \ell = 3.05 \times 10^7\ \text{km}$$

f_w : Load factor (1.2)
ℓ : Ball Screw lead (20mm)

● Bearing Unit (Fixed Side)

■Axial Load (Same as the Ball Screw Unit)

$Fa_1 = 11$ N

$Fa_2 = 83$ N

$Fa_3 = 0$ N

$Fa_4 = 0$ N

$Fa_5 = 0$ N

$Fa_6 = 61$ N

■Static Safety Factor

$$f_s = \frac{P_{0a}}{Fa_{max}} = \frac{P_{0a}}{Fa_2} = 48.0$$

■Nominal Life

- Average axial load

$$Fa_m = \sqrt[3]{\frac{1}{2 \cdot \ell_s}(Fa_1{}^3 \times 1095 + Fa_2{}^3 \times 52.5 + Fa_6{}^3 \times 52.5)} = 26.2 \text{ N}$$

- Nominal life

$$L = \left(\frac{Ca}{f_w \cdot Fa_m}\right)^3 \times 10^6 = 1.41 \times 10^{13} \text{ rev}$$

f_w : Load factor (1.2)

* Convert the above nominal life into the service life in travel distance of the Ball Screw.

$L_s = L \cdot \ell \times 10^{-6} = 2.82 \times 10^8$ km

[Result]

The table below shows the result of the examination.

KR5520A	LM guide unit	Ball screw unit	Bearing unit (Fixed side)
Static safety factor	33.9	111.9	48.0
Buckling load(N)	—	11000	—
Permissible tensile compressive load(N)	—	35300	—
Dangerous speed(min^{-1})	—	1560	—
DN Value	—	31125	—
Nominal life(km)	3.25×10^6	3.05×10^7	2.82×10^8
Maximum axial load(N)	—	76	—
Maximum working rotation speed(min^{-1})	—	1500	—

Note1) From the static safety coefficient and other values above, it is judged that the assumed model can be used.

Note2) Of the rated lives of the three components, the shortest value (of LM Guide unit) is considered the nominal life of the assumed model KR 5520A.

[Condition (Vertical Installation)]

Assumed model number : KR 5520A
  LM Guide Unit (C = 38100 N, C_0 = 61900N)
  Ball Screw Unit (C_a=3620 N, C_{0a}=9290 N)
  Bearing Unit(Fixed Side) (C_a=7600 N, P_{0a}=3990 N)
Mass : m = 30 kg
Speed : v = 500mm/s
Acceleration : α =2.4 m/s^2
Stroke : ℓ_s = 1200 mm
Gravitational acceleration : g = 9.807 m/s^2
Velocity diagram see Fig.8

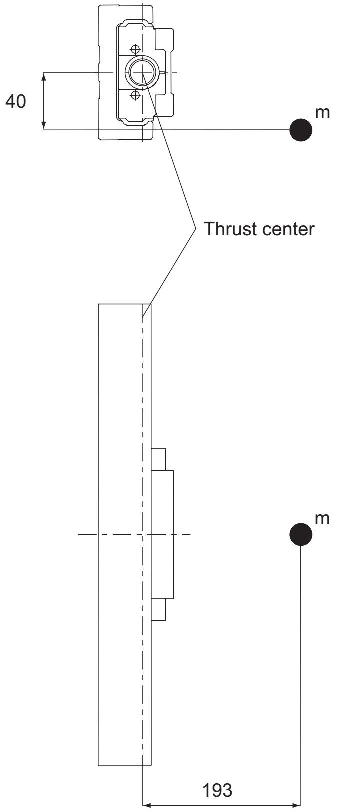


Fig.8

[Consideration]

● Studying the LM Guide Unit

■Load Applied to the Block

* Assuming that a single block is used, convert applied moments M_A and M_B into applied load by multiplying them by the moment equivalent factor ($K_A = K_B = 8.63 \times 10^{-2}$).

- During uniform motion:

$P_1 = K_A \cdot mg \times 193 = 4900$ N

$P_{1T} = K_B \cdot mg \times 40 = 1016$ N

- During acceleration:

$P_{1a} = P_1 + K_A \cdot m\alpha \times 193 = 6100$ N

$P_{1aT} = P_{1T} + K_B \cdot m\alpha \times 40 = 1264$ N

- During deceleration:

$P_{1d} = P_1 - K_A \cdot m\alpha \times 193 = 3701$ N

$P_{1dT} = P_{1d} - K_B \cdot m\alpha \times 40 = 767$ N

■Combined Radial And Thrust Load

- During uniform motion:

$P_{1E} = P_1 + P_{1T} = 5916$ N

- During acceleration:

$P_{1aE} = P_{1a} + P_{1aT} = 7364$ N

- During deceleration:

$P_{1dE} = P_{1d} + P_{1dT} = 4468$ N

■Static Safety Factor

$$f_s = \frac{C_0}{P_{max}} = \frac{C_0}{P_{1aE}} = 8.4$$

■Nominal Life

- Average load

$$P_m = \sqrt[3]{\frac{1}{\ell_S}\left(P_{1E}{}^3 \times 1095 + P_{1aE}{}^3 \times 52.5 + P_{1dE}{}^3 \times 52.5\right)} = 5947 \text{ N}$$

- Nominal life

$$L = \left(\frac{C}{f_W \cdot P_m}\right)^3 \times 50 = 7.61 \times 10^3 \text{ km}$$

f_W : Load factor (1.2)

● Studying the Ball Screw Unit

■Axial Load

- During upward uniform motion:

$Fa_1 = mg + \mu \cdot mg + f = 306\ \text{N}$

μ : Friction coefficient (0.005)

f : Sliding resistance per block (10.0 N)

- During upward acceleration:

$Fa_2 = Fa_1 + m\alpha = 378\ \text{N}$

- During upward deceleration:

$Fa_3 = Fa_1 - m\alpha = 234\ \text{N}$

- During downward uniform motion:

$Fa_4 = mg - \mu \cdot mg - f = 283\ \text{N}$

- During downward acceleration:

$Fa_5 = Fa_4 - m\alpha = 211\ \text{N}$

- During downward deceleration:

$Fa_6 = Fa_4 + m\alpha = 355\ \text{N}$

■Static Safety Factor

$$f_s = \frac{C_{0a}}{F_{max}} = \frac{C_{0a}}{Fa_2} = 24.5$$

■Buckling Load

Same as Horizontal Installation

■Permissible Tensile Compressive Load

Same as Horizontal Installation

■Dangerous Speed

Same as Horizontal Installation

■DN Value

Same as Horizontal Installation

■Nominal Life

- Average axial load

$$F_m = \sqrt[3]{\frac{1}{2 \cdot \ell_s}(Fa_1{}^3 \times 1095 + Fa_2{}^3 \times 525 + Fa_3{}^3 \times 525 + Fa_4{}^3 \times 1095 + Fa_5{}^3 \times 525 + Fa_6{}^3 \times 525)} = 296\ \text{N}$$

- Nominal life

$$L = \left(\frac{Ca}{f_w \cdot F_m}\right)^3 \times \ell = 2.12 \times 10^4\ \text{km}$$

f_w : Load factor (1.2)

ℓ : Lead (20mm)

● Bearing Unit (Fixed Side)

■Axial Load (Same as the Ball Screw Unit)

$Fa_1 = 306$ N
$Fa_2 = 378$ N
$Fa_3 = 234$ N
$Fa_4 = 283$ N
$Fa_5 = 211$ N
$Fa_6 = 355$ N

■Static Safety Factor

$$f_s = \frac{P_{0a}}{F_{max}} = \frac{P_{0a}}{Fa_2} = 10.5$$

■Nominal Life

● Average axial load

$$F_m = \sqrt[3]{\frac{1}{2\cdot \ell_s}\left(Fa_1^3 \times 1095 + Fa_2^3 \times 525 + Fa_3^3 \times 525 + Fa_4^3 \times 1095 + Fa_5^3 \times 525 + Fa_6^3 \times 525\right)} = 296\ \mathrm{N}$$

● Nominal life

$$L = \left(\frac{Ca}{f_w \cdot F_m}\right)^3 \times 10^6 = 9.80 \times 10^9\ \mathrm{rev}$$

f_W : Load factor (1.2)

* Convert the above nominal life into the service life in travel distance of the Ball Screw.

$L_S = L \cdot \ell \times 10^{-6} = 1.96 \times 10^5$ km

[Result]

The table below shows the result of the examination.

KR5520A	LM guide unit	Ball screw unit	Bearing unit (Fixed side)
Static safety factor	8.4	24.5	10.5
Buckling load(N)	—	11000	—
Permissible tensile compressive load(N)	—	35300	—
Dangerous speed(min^{-1})	—	1560	—
DN Value	—	31125	—
Nominal life(km)	7.61×10^3	2.12×10^4	1.96×10^5
Maximum axial load(N)	—	76	—
Maximum working rotation speed(min^{-1})	—	1500	—

Note1) From the static safety coefficient and other values above, it is judged that the assumed model can be used.
Note2) Of the rated lives of the three components, the shortest value (of LM Guide unit) is considered the nominal life of the assumed model KR 5520A.

Accuracy Standards

The accuracy of model KR is defined in positioning repeatability, positioning accuracy, backlash and running parallelism.

[Positioning Repeatability]

After repeating positioning to a given point in the same direction seven times, measure the halting point and obtain the value of half the maximum difference. Perform this measurement in the center and both ends of the travel distance, use the maximum value as the measurement value and express the value of half the maximum difference with symbol "±" as positioning repeatability.

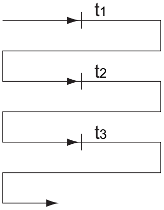


Fig.9 Positioning Repeatability

[Positioning Accuracy]

Using the maximum stroke as the reference length, express the maximum error between the actual distance traveled from the reference point and the command value in an absolute value as positioning accuracy.

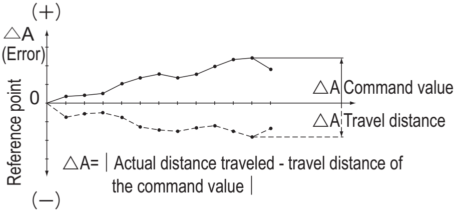


Fig.10 Positioning Accuracy

[Running of Parallelism]

Place a straightedge on the surface table where model KR is mounted, measure almost throughout the travel distance of the nut block using a test indicator. Use the maximum difference among the readings within the travel distance as the running parallelism measurement.

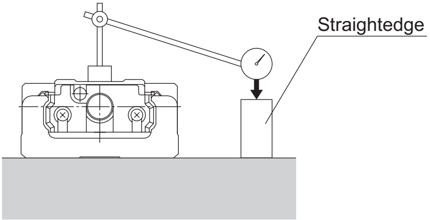


Fig.11 Running of Parallelism

[Backlash]

Feed and slightly move the nut block and read the measurement on the test indicator as the reference value. Subsequently, apply a load to the nut block from the same direction (table feed direction), and then release the nut block from the load. Use the difference between the reference value and the return as the backlash measurement.

Perform this measurement in the center and near both ends, and use the maximum value as the measurement value.

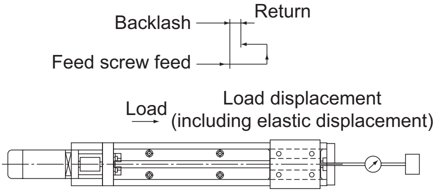


Fig.12 Backlash

The accuracies of model KR are classified into normal grade (no symbol), high accuracy grade (H) and precision grade (P). Tables below show standards for all the accuracies.

Table10 Normal Grade (No Symbol)

Unit: mm

Model No.	Rail length	Positioning Repeatability	Positioning Accuracy	Running of parallelism	Backlash	Starting torque (N・cm)
KR20	100	±0.01	No standard defined	No standard defined	0.02	0.5
	150					
	200					
KR26	150	±0.01	No standard defined	No standard defined	0.02	1.5
	200					
	250					
	300					
KR30H	150	±0.01	No standard defined	No standard defined	0.02	7
	200					
	300					
	400					
	500					
	600					
KR33	150	±0.01	No standard defined	No standard defined	0.02	7
	200					
	300					
	400					
	500					
	600					
KR45H	340	±0.01	No standard defined	No standard defined	0.02	10
	440					
	540					
	640					
	740					
	840					
	940					
KR46	340	±0.01	No standard defined	No standard defined	0.02	10
	440					
	540					
	640					
	740					
	940					
KR55	980	±0.01	No standard defined	No standard defined	0.05	12
	1080					
	1180					
	1280					
	1380					
KR65	980	±0.01	No standard defined	No standard defined	0.05	12
	1180					
	1380					
	1680	±0.012				15

Note1) The evaluation method complies with THK standards.
Note2) Measurement is performed using an inspection-use motor. For motor wrap types, measurement with motor wrap completion is not performed.
Note3) The starting torque represents the value when THK AFB-LF Grease is used.
However, that of models KR20 and KR26 represents the value when THK AFA Grease is used, and that of KR15 represents the value when THK AFF Grease is used.
Note4) If highly viscous grease such as vacuum grease and clean room grease is used, the actual starting torque may exceed the corresponding value in the table. Use much care in selecting a motor.
Note5) For accuracy with a rail length longer than the standard rail length, contact THK.

Table11 High Accuracy Grade (H)

Unit: mm

Model No.	Rail length	Positioning Repeatability	Positioning Accuracy	Running of parallelism	Backlash	Starting torque (N•cm)
KR15	75	±0.004	0.04	0.02	0.01	0.4
	100					
	125					
	150					
	175					
	200					
KR20	100	±0.005	0.06	0.025	0.01	0.5
	150					
	200					
KR26	150	±0.005	0.06	0.025	0.01	1.5
	200					
	250					
	300					
KR30H	150	±0.005	0.06	0.025	0.02	7
	200					
	300					
	400					
	500		0.1	0.035		
	600					
KR33	150	±0.005	0.06	0.025	0.02	7
	200					
	300					
	400					
	500		0.1	0.035		
	600					
KR45H	340	±0.005	0.1	0.035	0.02	10
	440					
	540					
	640					
	740		0.12	0.04		
	840		0.15	0.05		
	940					
KR46	340	±0.005	0.1	0.035	0.02	10
	440					
	540					
	640					
	740		0.12	0.04		
	940		0.15	0.05		
KR55	980	±0.005	0.18	0.05	0.05	12
	1080					
	1180		0.25			
	1280					
	1380					
KR65	980	±0.008	0.18	0.05	0.05	12
	1180		0.2			
	1380					
	1680		0.28	0.055		15

Table12 Precision Grade (P)

Unit: mm

Model No.	Rail length	Positioning Repeatability	Positioning Accuracy	Running of parallelism	Backlash	Starting torque (N･cm)
KR15	75	±0.003	0.02	0.01	0.002	0.8
	100					
	125					
	150					
	175					
	200					
KR20	100	±0.003	0.02	0.01	0.003	1.2
	150					
	200					
KR26	150	±0.003	0.02	0.01	0.003	4
	200					
	250					
	300					
KR30H	150	±0.003	0.02	0.01	0.003	15
	200					
	300					
	400					
	500		0.025	0.015		
	600					
KR33	150	±0.003	0.02	0.01	0.003	15
	200					
	300					
	400					
	500		0.025	0.015		
	600					
KR45H	340	±0.003	0.025	0.015	0.003	15
	440					
	540					
	640					17
	740		0.03	0.02		
KR46	340	±0.003	0.025	0.015	0.003	15
	440					
	540					
	640					17
	740		0.03	0.02		
KR55	980	±0.005	0.035	0.025	0.003	17
	1080					
	1180		0.04	0.03		20
KR65	980	±0.005	0.035	0.025	0.005	20
	1180					
	1380		0.04	0.03		22

Note1) The evaluation method complies with THK standards.
Note2) Measurement is performed using an inspection-use motor. For motor wrap types, measurement with motor wrap completion is not performed.
Note3) The starting torque represents the value when THK AFB-LF Grease is used.
However, that of models KR20 and KR26 represents the value when THK AFA Grease is used, and that of KR15 represents the value when THK AFF Grease is used.
Note4) If highly viscous grease such as vacuum grease and clean room grease is used, the actual starting torque may exceed the corresponding value in the table. Use much care in selecting a motor.
Note5) For accuracy with a rail length longer than the standard rail length, contact THK.

Caged Ball LM Guide Actuator

Model SKR

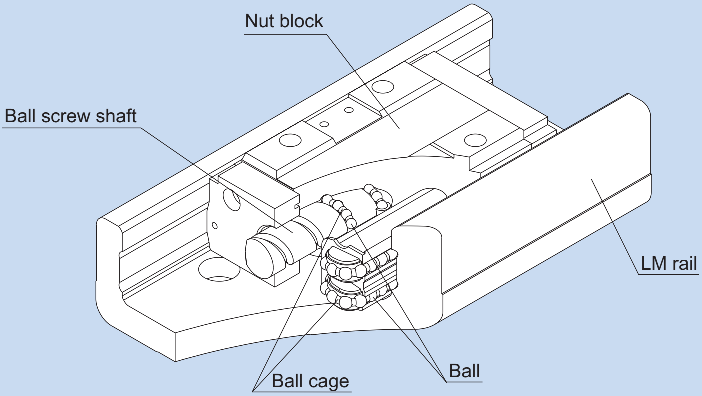


Fig.1 Structure of Caged Ball LM Guide Model SKR

Structure and Features

Caged Ball LM Guide Actuator model SKR is a compact actuator that has a nut block consisting of LM blocks and a ball screw nut integrated inside a U-shaped LM rail.
In addition, this model achieves high speed operation, lower noise and longer-term maintenance-free operation by using ball cages in the LM Guide units and the Ball Screw unit.

[4-way Equal Load]
Each train of balls is arranged at a contact angle of 45° so that the rated load on the nut block is uniform in the four directions (radial, reverse radial and lateral directions). As a result, model SKR can be used in any mounting orientation.

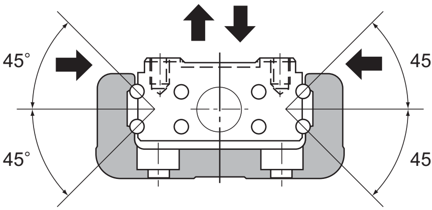


Fig.2 Load Capacity and Contact Angle of Model SKR

[High Rigidity]

Use of an LM rail with a U-shaped cross section increases the rigidity against a moment and torsion.

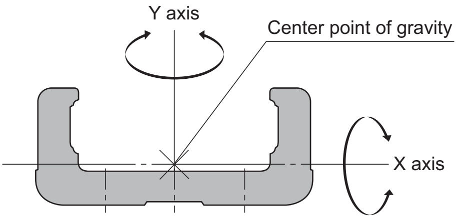


Fig.3 Cross Section of the LM Rail

Table1 Cross-sectional Characteristics of the LM Rail

Unit: mm^4

Model No.	I_X	I_Y	Mass (kg/100mm)
SKR33	5.35×10^{4}	3.52×10^{5}	0.61
SKR46	2.05×10^{5}	1.45×10^{6}	1.26

I_X=geometrical moment of inertia around X axis
I_Y=geometrical moment of inertia around Y axis

[High Accuracy]

Since the linear guide section consists of 4 rows of circular-arc grooves that enable balls to smoothly move even under a preload, a highly rigid guide with no clearance is achieved. Additionally, variation in frictional resistance caused by load fluctuation is minimized, allowing the system to follow highly accurate feed.

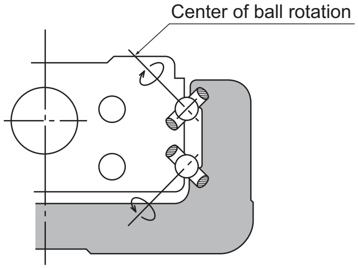


Fig.4 Contact Structure of SKR

[Space Saving]

Due to an integral structure where LM Guide units are placed on both side faces of the nut block and a Ball Screw unit is placed in the center of the nut block, a highly rigid and highly accurate actuator with a minimal space is achieved.

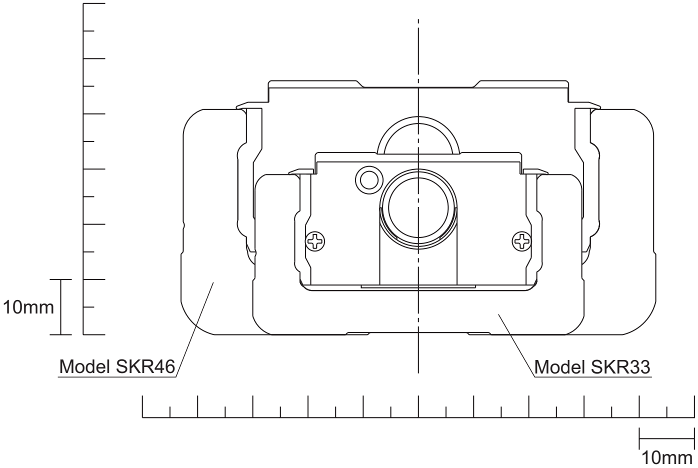


Fig.5 Cross Sectional Drawing

[High Speed]

Model SKR supports a latest high-rotation servomotor (6,000 min^{-1}) using a ball cage and is capable of operating at higher speed than the conventional model KR.

In addition, a new type with a 20 -mm lead is added to lineups of the new model SKR33 in order to achieve fast feed (formerly, only 6 mm and 10 mm ball screw leads were available for the conventional model KR33).

Table2 Maximum Travel Speed

Model No.	Ball Screw lead (mm)	LM rail length (mm)	Maximum travel speed (mm/s)		Maximum length(mm)
			Long block	Short block	
SKR33	6	150	600		700
		200	600		
		300	600		
		400	600		
		500	600		
		600	552	503	
		700	393	364	
	10	150	1000		
		200	1000		
		300	1000		
		400	1000		
		500	1000		
		600	920	839	
		700	656	607	
	20	150	2000	—	
		200	2000	—	
		300	2000	—	
		400	2000	—	
		500	2000	—	
		600	1780	—	
		700	1276	—	
SKR46	10	340	1000		940
		440	1000		
		540	1000		
		640	1026	914	
		740	736	667	
		940	431	400	
	20	340	2000		
		440	2000		
		540	2000		
		640	1988	1774	
		740	1433	1300	
		940	845	784	

The maximum travel speed of model SKR is limited by the dangerous speed of the ball screw shaft despite the maximum rotation speed of the motor (6,000 min^{-1}). Take much care when using the product at high speed.

When considering the use of this model at speed higher than the maximum speed indicated above, contact THK.

Caged Ball/Roller Technology

[High Lubricity]

Model SKR uses ball cages to eliminate friction between balls and significantly improve torque characteristics. As a result, the torque fluctuation is reduced and superb lubricity is achieved.

Item	Description
Shaft diameter/lead	ϕ13/10mm
Shaft rotation speed	60min^{-1}

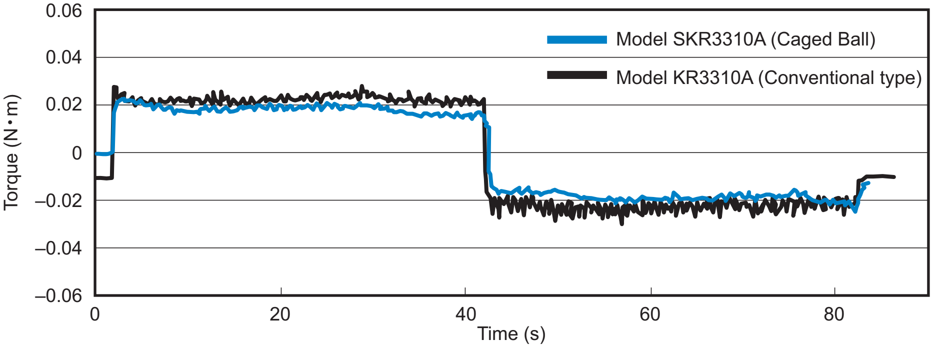


Fig.6 Comparison of Torque Fluctuation between Model SKR and Model KR

[Low Noise, Acceptable Running Sound]

Model SKR uses ball cages in the LM Guide unit and the Ball Screw unit. As a result, low noise and acceptable running sound are achieved.

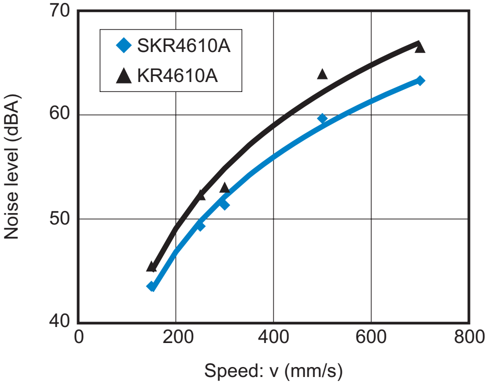


Fig.7 Comparison of Noise between Model SKR4610A and Model KR4610A

[Long-term Maintenance-free Operation]

With model SKR, the ball cage effect helps increase grease retention and achieve long-term maintenance-free operation.

[Long Service Life – 3 Times Longer (with Model *KR3310. Calculated from the Following Equation)]

With model SKR, both the LM Guide unit and the Ball Screw unit have larger basic dynamic load ratings, and therefore a longer service life is achieved.

The rated service life is calculated from the following equation.

LM guide unit

$$L=(C/P)^3 \times 50$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P : Applied load (N)

Ball screw unit

$$L=(Ca/Fa)^3 \times 10^6$$

L : Nominal life (rev)
Ca : Basic dynamic load rating (N)
Fa : Applied axial load (N)

As indicated in the equation above, the greater the basic dynamic load rating, the longer the service life of both the LM Guide unit and the Ball Screw unit.

Table3 Comparison of Basic Dynamic Load Rating between Model SKR and Model KR Unit: N

Basic dynamic load rating		SKR3310	KR3310	SKR4620	KR4620
LM guide unit	Long type block	17000	11600	39500	27400
	Short type block	11300	4900	28400	14000
Ball screw unit		2700	1760	4240	3040

[Seal]

Model SKR is equipped with end seals and side seals for contamination protection as standard.

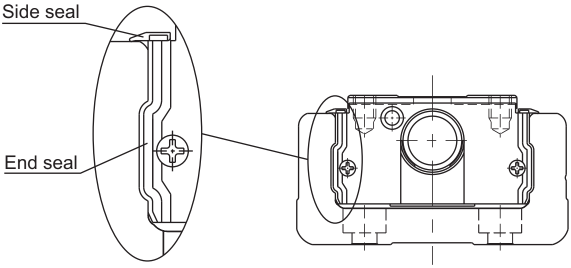


Table4 shows the rolling resistance and seal resistance per nut block (guide section).

Table4 Maximum Resistance Value Unit: N

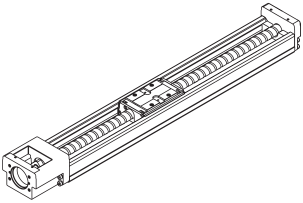
Model No.	Rolling resistance value	Seal resistance value	Total
SKR33	3.0	1.4	4.4
SKR46	2.5	1.8	4.3

Note) The rolling resistance represents the value when a lubricant is not used.

Types and Features

Model SKR-A

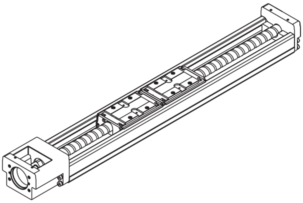
Representative model of SKR.



Model SKR-A

Model SKR-B

Equipped with two units of the nut block of model SKR-A, this model achieves higher rigidity, higher load capacity and higher accuracy.

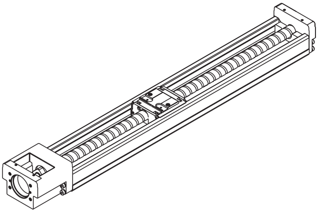


Model SKR-B

Model SKR-C

This model has a shorter overall length of the block and a longer stroke than model SKR-A.

* With model SKR3320, a short-block type is not available.

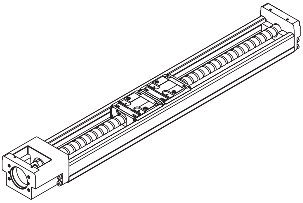


Model SKR-C

Model SKR-D

Equipped with two units of the nut block of model SKR-C, this design allows a span between blocks that suits the equipment, thus to achieve high rigidity.

* With model SKR3320, a short-block type is not available.

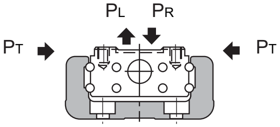


Model SKR-D

Load Ratings in All Directions and Permissible Moment

[Load Rating]

Caged Ball LM Guide Actuator Model SKR consists of an LM Guide, a Ball Screw and a support bearing.



● LM Guide Unit

Model SKR is capable of receiving loads in four directions: radial, reverse radial and lateral directions. Its basic load ratings are equal in all four directions (radial, reverse radial and lateral directions), and their values are indicated in Table5.

● Ball Screw Unit

Since the nut block is incorporated with a ball screw nut, model SKR is capable of receiving an axial load. The basic load rating value is indicated in Table5.

● Bearing Unit (Fixed Side)

Since housing A contains an angular bearing, model SKR is capable of receiving an axial load. The basic load rating value is indicated in Table5.

[Equivalent Load (LM Guide Unit)]

The equivalent load when the LM Guide unit of model SKR simultaneously receives loads in all directions is obtained from the following equation.

$$P_E = P_R\,(P_L) + P_T$$

P_E : Equivalent load (N)
: Radial direction
: Reverse radial direction
: Lateral directions
P_R : Radial load (N)
P_L : Reverse radial load (N)
P_T : Lateral load (N)

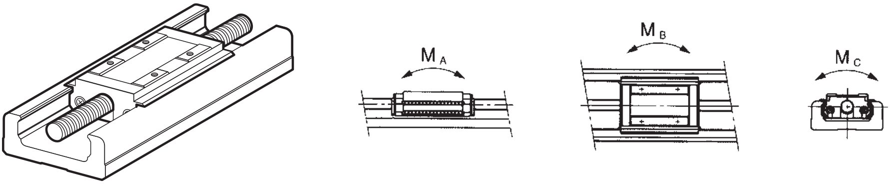
Table5 Load Rating of Model SKR Symbols in the parentheses indicate units.

Model No.			SKR33			SKR46	
			SKR3306	SKR3310	SKR3320	SKR4610	SKR4620
LM guide unit	Basic dynamic load rating C (N)	Long nut block types A, B	17000			39500	
		Short nut block types C, D	11300			28400	
	Basic static load rating C_0 (N)	Long nut block types A, B	20400			45900	
		Short nut block types C, D	11500			28700	
	Radial clearance (mm)	Normal grade, high accuracy grade	0 to −0.004			0 to −0.006	
		Precision grade	−0.004 to −0.012			−0.006 to −0.016	
Ball screw unit	Basic dynamic load rating Ca (N)		4400	2700	2620	4350	4240
	Basic static load rating C_{0a} (N)		6290	3780	3770	6990	7040
	Screw shaft out diameter (mm)		13			15	
	Lead (mm)		6	10	20	10	20
	Thread minor diameter (mm)		10.8			12.5	
	Ball center-to-center diameter (mm)		13.5			15.75	
Bearing unit (Fixed side)	Axial direction	Basic dynamic load rating Ca (N)	6250			6700	
		Static permissible load P_{0a} (N)	2700			3330	

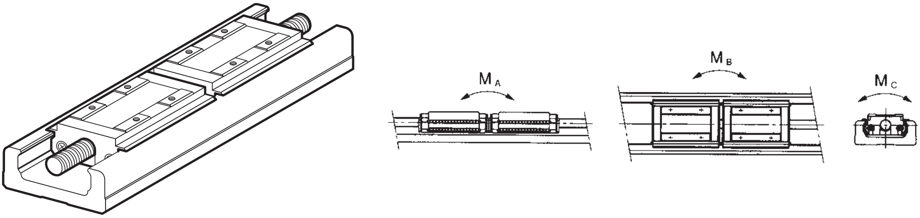
Note1) The load ratings in the LM Guide unit each indicate the load rating per LM block.
Note2) With model SKR3320, a short-block type is not available.

[Permissible Moment (LM Guide Unit)]

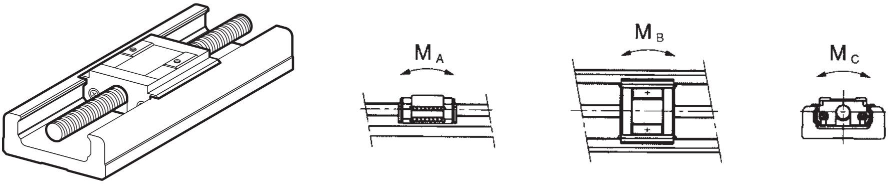
The LM Guide unit of model SKR is capable of receiving moments in four directions only with a single nut block. Table6 on A-425 shows static permissible moments in the M_A, M_B and M_C directions.



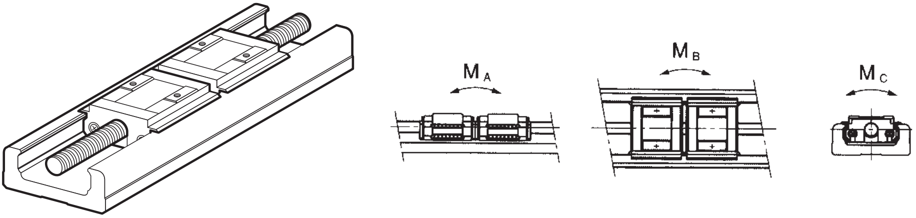
With a single long nut block (type A)



With double long nut blocks (type B)



With a single short nut block (type C)



With double short nut blocks (type D)

Table6 Static Permissible Moments of Model SKR Unit: N-m

Model No.	Static permissible moment		
	M_A	M_B	M_C
SKR33-A	173	173	424
SKR33-B	990	990	848
SKR33-C	58	58	240
SKR33-D	390	390	480
SKR46-A	579	579	1390
SKR46-B	3240	3240	2780
SKR46-C	236	236	870
SKR46-D	1460	1460	1740

Note1) Symbols A, B, C or D in the end of each model number indicates the nut block size and the number of nut blocks used.
A: With a single long nut block
B: With double long nut blocks
C: With a single short nut block
D: With double short nut blocks
Note2) The values for models SKR-B/D indicate the values when double nut blocks are used in close contact with each other.

Lubrication

Standard greases used in model SKR are indicated below. For model SKR, a grease nipple can be attached per your request.

Table7

Model No.	Standard grease	THK grease nipples that can be attached
SKR33	THK AFB-LF Grease	PB107
SKR46	THK AFB-LF Grease	A-M6F

Service Life

Caged Ball LM Guide Actuator Model SKR consists of an LM Guide, a Ball Screw and a support bearing. The service life of each component can be obtained using the basic dynamic load rating indicated in Table5 on A-423 (Rated Load of Model KR).

[LM Guide Unit]

● Nominal Life

The nominal life (L) means the total travel distance that 90% of a group of units of the same LM Guide model can achieve without flaking (scale-like pieces on the metal surface) after individually running under the same conditions.

The nominal life of the LM Guide is obtained using the following equation.

$$L = \left(\frac{f_C \cdot C}{f_W \cdot P_C}\right)^3 \times 50$$

L : Nominal life (km)

C : Basic dynamic load rating (N)

P_C : Calculated applied load (N)

f_W : Load factor (see Table8 on A-427)

f_C : Contact factor (see Table9 on A-427)

- If a moment is applied to model SKR-A/C or model SKR-B/D using two nut blocks in close contact with each other, calculate the equivalent load by multiplying the applied moment by the equivalent factor indicated in Table10 on A-427.

$$P_m = K \cdot M$$

P_m : Equivalent load (per nut block) (N)

K : Equivalent moment factor

M : Applied moment (N-mm)

(If planning to use three or more nut blocks, or use nut blocks with a wide span, contact THK.)

If moment Mc is applied to model SKR-B/D

$$P_m = \frac{K_C \cdot M_C}{2}$$

- If a radial load (P) and a moment are simultaneously applied to model SKR

$$P_E = P_m + P$$

P_E : Overall equivalent radial load (N)

Perform a nominal life calculation using the above data.

● Service Life Time

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations are constant, the service life time is obtained using the equation below.

$$L_h = \frac{L \times 10^6}{2 \cdot \ell_s \cdot n_1 \times 60}$$

L_h : Service life time (h)

ℓ_s : Stroke length (mm)

n_1 : Number of reciprocations per minute (min^{-1})

[Ball Screw Unit/Bearing Unit(Fixed Side)]

● Nominal Life

The nominal life (L) means the total travel distance that 90% of a group of units of the same Ball Screw (bearing) can achieve without flaking after individually running under the same conditions.

The nominal life of the Ball Screw unit/bearing unit (fixed side) is obtained using the following equation.

$$L = \left(\frac{Ca}{f_W \cdot Fa}\right)^3 \times 10^6$$

L : Nominal life (rev)
C_a : Basic dynamic load rating (N)
F_a : Axial load (N)
f_W : Load factor (see Table8)

Table8 Load Factor (f_W)

Vibrations/impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

● Service Life Time

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations are constant, the service life time is obtained using the equation below.

$$L_h = \frac{L \cdot \ell}{2 \cdot \ell_S \cdot n_1 \times 60}$$

L_h : Service life time (h)
ℓ_s : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})
ℓ : Ball Screw lead (mm)

■f_C: Contact Factor

If two nut blocks are used in close contact with each other with model SKR-B/D, multiply the basic load rating by the corresponding contact factor indicated in Table9.

Table9 Contact Factor (f_C)

Block type	Contact factor f_C
A, C type	1.0
B, D type	0.81

■f_W: Load Factor

Table8 shows load factors.

■K: Moment Equivalent Factor (LM Guide Unit)

When model SKR travels under a moment, the distribution of load applied to the LM Guide is locally large. In such cases, calculate the load by multiplying the moment value by the corresponding moment equivalent factor indicated in Table10.

Symbols K_A, K_B and K_C indicate the moment equivalent loads in the M_A, M_B and M_C directions, respectively.

Table10 Equivalent moment factor(K)

Model No.	K_A	K_B	K_C
SKR33-A	1.42×10^{-1}	1.42×10^{-1}	5.05×10^{-2}
SKR33-B	2.47×10^{-2}	2.47×10^{-2}	5.05×10^{-2}
SKR33-C	2.39×10^{-1}	2.39×10^{-1}	5.05×10^{-2}
SKR33-D	3.54×10^{-2}	3.54×10^{-2}	5.05×10^{-2}
SKR46-A	9.51×10^{-2}	9.51×10^{-2}	3.46×10^{-2}
SKR46-B	1.70×10^{-2}	1.70×10^{-2}	3.46×10^{-2}
SKR46-C	1.46×10^{-1}	1.46×10^{-1}	3.46×10^{-2}
SKR46-D	2.36×10^{-2}	2.36×10^{-2}	3.46×10^{-2}

K_A: Moment equivalent factor in the M_A direction.
K_B: Moment equivalent factor in the M_B direction.
K_C: Moment equivalent factor in the M_C direction.
Note) The values for models SKR-B/D indicate the values when double nut blocks are used in close contact with each other.

Accuracy Standards

The accuracy of model SKR is defined in positioning repeatability, positioning accuracy, backlash and running parallelism.

[Positioning Repeatability]

After repeating positioning to a given point in the same direction seven times, measure the halting point and obtain the value of half the maximum difference. Perform this measurement in the center and both ends of the travel distance, use the maximum value as the measurement value and express the value of half the maximum difference with symbol "±" as positioning repeatability.

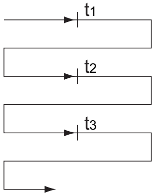


Fig.8 Positioning Repeatability

[Positioning Accuracy]

Using the maximum stroke as the reference length, express the maximum error between the actual distance traveled from the reference point and the command value in an absolute value as positioning accuracy.

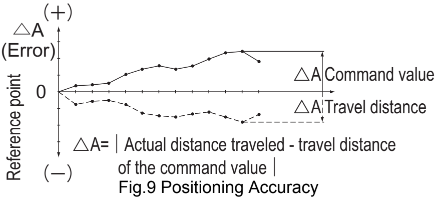


Fig.9 Positioning Accuracy

[Running of Parallelism]

Place a straightedge on the surface table where model SKR is mounted, measure almost throughout the travel distance of the nut block using a test indicator. Use the maximum difference among the readings within the travel distance as the running parallelism measurement.

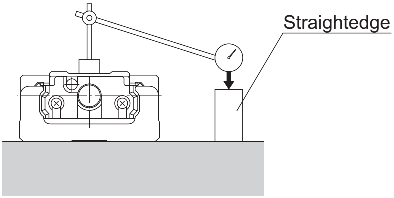


Fig.10 Running of Parallelism

[Backlash]

Feed and slightly move the nut block and read the measurement on the test indicator as the reference value. Subsequently, apply a load to the nut block from the same direction (table feed direction), and then release the nut block from the load. Use the difference between the reference value and the return as the backlash measurement.

Perform this measurement in the center and near both ends, and use the maximum value as the measurement value.

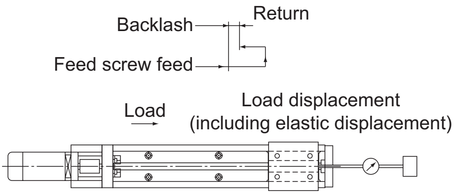


Fig.11 Backlash

The accuracies of model SKR are classified into normal grade (no symbol), high accuracy grade (H) and precision grade (P). Tables below show standards for all the accuracies.

Table11 Normal Grade (No Symbol)

Unit: mm

Model No.	Rail length	Positioning Repeatability	Positioning Accuracy	Running of parallelism	Backlash	Starting torque (N•cm)
SKR33	150	±0.010	No standard defined	No standard defined	0.020	7
	200					
	300					
	400					
	500					
	600					
	700					
SKR46	340	±0.010	No standard defined	No standard defined	0.020	10
	440					
	540					
	640					
	740					
	940					

Table12 High Accuracy Grade (H)

Unit: mm

Model No.	Rail length	Positioning Repeatability	Positioning Accuracy	Running of parallelism	Backlash	Starting torque (N•cm)
SKR33	150	±0.005	0.060	0.025	0.020	7
	200					
	300					
	400					
	500		0.100	0.035		
	600					
	700		0.120	0.040		
SKR46	340	±0.005	0.100	0.035	0.020	10
	440					
	540					
	640					
	740		0.120	0.040		
	940		0.150	0.050		

Table13 Precision Grade (P)

Unit: mm

Model No.	Rail length	Positioning Repeatability	Positioning Accuracy	Running of parallelism	Backlash	Starting torque (N•cm)
SKR33	150	±0.003	0.020	0.010	0.003	15
	200					
	300					
	400					
	500		0.025	0.015		
	600					
	700		0.030	0.020		
SKR46	340	±0.003	0.025	0.015	0.003	15
	440					
	540					
	640					17
	740		0.030	0.020		

Note1) The evaluation method complies with THK standards.
Note2) The starting torque represents the value when THK AFB-LF Grease is used.
Note3) If highly viscous grease such as vacuum grease and clean room grease is used, the actual starting torque may exceed the corresponding value in the table. Use much care in selecting a motor.
Note4) For accuracy with a rail length longer than the standard rail length, contact THK.

Various types of options are available for models KR and SKR. Select an appropriate model according to your application.

Name		Reference page	Overview
Cover	Cover	A-431	Serve as contamination protection accessories or the likes
	Bellows	B-302	
Sensor	Proximity sensor	B-309	Supporting manufacturer: Yamatake, SUNX
	Photo sensor	B-310	Supporting manufacturer: Omron
	Sensor rail	B-311	For mounting a sensor
Motor bracket	Housing	A-434	For standard type model KR without a motor If the customer manufactures a motor braket For motor wrap type
	Table of Motors Used in Model KR and Corresponding Motor Brackets	B-312	Supporting manufacturer: Yaskawa Electric, Mitsubishi Electric, Matsushita Electric,.Sanyo Electric, Omron, Fanuc and Oriental Motor
	Motor bracket dimensional table for model KR	B-314	—
	Table of Motors Used in Model SKR and Corresponding Motor Brackets	B-336	Supporting manufacturer: Yaskawa Electric, Mitsubishi Electric, Matsushita Electric,.Sanyo Electric, Omron, Fanuc and Oriental Motor
	Motor bracket dimensional table for model SKR	B-337	—

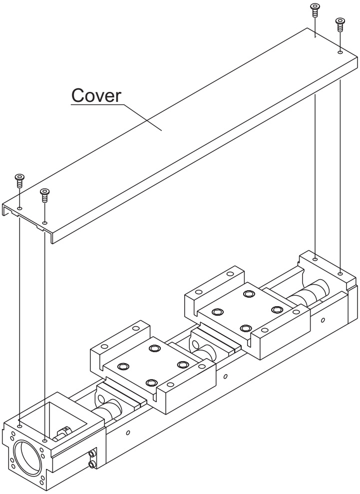
Table1 Table of Applicable Options

Model No.	Cover	Bellows	Proximity sensor	Photo sensor	Housing A for a Separate Motor	Turnaround Housing A	Intermediate Flange
KR15	○	○	○	—	—	—	○
KR20	○	○	○	○	—	—	○
KR26	○	○	○	○	—	—	○
KR30H	○	○	○	○	—	—	○
KR33	○	○	○	○	○	○	○
KR45H	○	○	○	○	—	—	○
KR46	○	○	○	○	○	○	○
KR55	○	○	○	○	—	○	○
KR65	○	○	○	○	—	○	○
SKR33	○	—	○	○	—	—	○
SKR46	○	—	○	○	—	—	○

Cover

For models KR and SKR, covers are available as an option.

[Example of Installation]



Model SKR33(with a Cover)

Bellows

●For dimensions of the bellows, see B-302 to B-307.

For model KR, a bellows is available for contamination protection in addition to a cover.

dammy

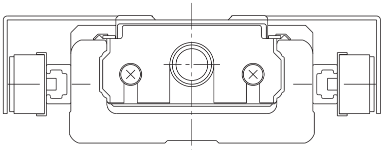
Sensor

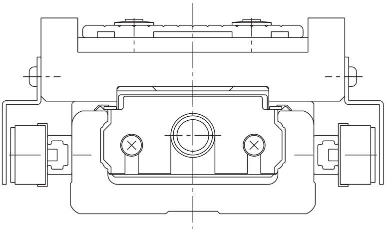
●For detailed dimensions, see B-308 to B-311.

Optional proximity sensors and photo sensors are available for models KR and SKR. Models equipped with a sensor are also provided with a dedicated sensor rail/sensor dog (detecting plate).

Some models with a short rail are attached with a sensor and sensor rail on both sides. See the table below.

[Example of Installation]





Model No.	Rail length
KR15A	75L
	100L
KR15B	125L
KR20A	75L
	100L
	125L
KR20B	125L
	150L
KR26A	100L
	125L
	150L
KR26B	175L
	200L

Motor Bracket

●For detailed dimensions, see B-312 to B-345.

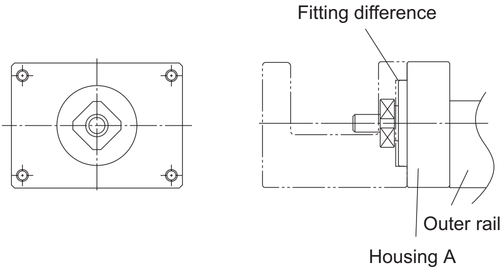
[Housing]

● Housing A

THK also offers Housing A for a separate motor and Turnaround Housing A as options in order to support a motor bracket or a turnaround section that the customer individually manufactures.

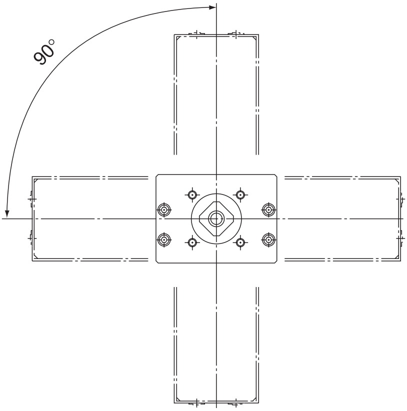
● Housing A for a Separate Motor

By using the fitting difference, the user can easily mount a separately manufactured motor bracket.



● Turnaround Housing A

Since the mounting holes are drilled in constant pitches, the user can select how to mount the motor bracket.



Motor Wrap Type (for Reference)

Motor wrap types are available that allow the motor to be turned around in order to minimize the dimension in the longitudinal direction. Contact THK for details. (Pulley ratio: 1:1)

XY Bracket (for Reference)

Brackets for installing models KR33 and 46 only are available as standard. The brackets use aluminum to reduce the weights and keep the inertia as low as possible.

Precautions on Using Models KR/SKR

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Dropping or hitting the product may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.
(2) Do not mix lubricants of different physical properties.
(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(4) When planning to use a special lubricant, contact THK before using it.
(5) When adopting oil lubrication, contact THK in advance.
(6) To maximize the performance, lubrication is required. Using the product without lubrication may increase wear of the rolling elements or shorten the service life. In normal use, the lubricant must be replenished every 100 km as a guide. However, the greasing interval varies according to the conditions. We recommend determining the greasing interval based on the result of the initial inspection. For clean room applications, low dust generative AFF Grease is available. Contact THK for details.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
(2) When planning to use the product in an environment where the coolant penetrates the nut block, contact THK in advance.
(3) The service temperature range of this product is 0 to 40℃ (no freezing or condensation). If you consider using this product outside the service temperature range, contact THK.
(4) Exceeding the dangerous speed may lead the components to be damaged or cause an accident. Be sure to use the product within the specification range designated by THK.
(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

[Safety precautions]

(1) If the product is operating or in the ready state, never touch a moving part. In addition, do not enter the operating area of the actuator.
(2) If two or more people are involved in the operation, confirm the procedures such as a sequence, signs and anomalies in advance, and appoint another person for monitoring the operation.

[Storage]

When storing the product, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

LM Actuator

THK General Catalog

A Technical Descriptions of the Products

Model GL

B Product Specifications (Separate)

Dimensional Drawing, Dimensional Table

* Please see the separate "B Product Specifications".

Feature of the LM Actuator Model GL

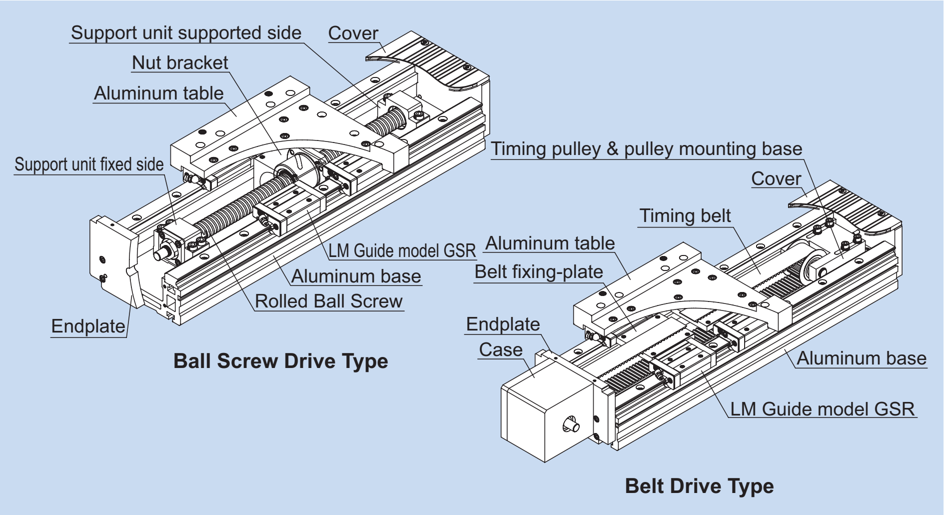


Fig.1 Structures of the Ball Screw Drive Type of Model GL and the Belt Drive Type of Model GL

Structure and Features

Model GL is a single-axis actuator that allows a ball screw drive or a belt drive to be integrated with an aluminum base on which the LM Guide model GSR is mounted. For the ball screw drive type of model GL, several ball screw leads are available to select from. The belt drive type of model GL supports a long stroke.

Model GL is used mainly in conveyance-related applications.

[Drive Methods are Selectable]

With model GL, two drive types are available to select from: a ball screw drive type and a belt drive type

- Ball screw specifications
  Different ball screw leads are selectable for each model number.

Table1 Ball Screw Leads by Model Numbers

	Ball Screw lead (mm)
GL 15	5, 16, 30
GL 20	5, 20, 40

- Belt drive type
  Since it uses a highly rigid belt (wire woven), this type excels in high speed operation, and is not subject to restriction by dangerous speed as opposed to ball screw type. Therefore , it supports a longer stroke (up to 2720 mm for model GL20) than ball screw type. In addition, this type uses a timing pulley with different pitch circle diameter according to the model number.

Table2 Pitch Circle Diameter of the Timing Pulley

	Pitch circle diameter (P.C.D) (mm)
GL 15	35.01
GL 20	38.20

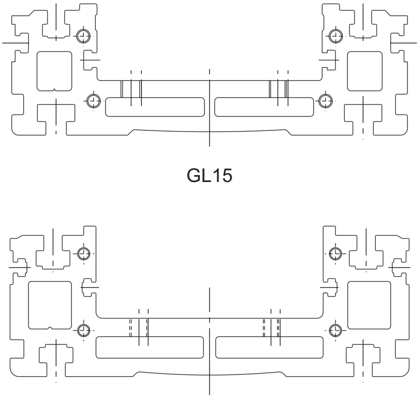
Note) When using AC servomotor drive, we recommend also using a reducer. For details, contact THK.

[Lightweight, High Rigidity]

The base using an extruded aluminum material has a hollow sectional shape, thus achieving lightweight and high rigidity.

Table3 Geometrical Moment of Inertia and Mass of the Aluminum Base

	Geometrical moment of inertia		Mass (kg/1000mm)
	I_X (mm^4)	I_Y (mm^4)	
GL15	2.0×10^5	2.7×10^6	5.1
GL20	4.62×10^5	4.62×10^6	6.8



GL15

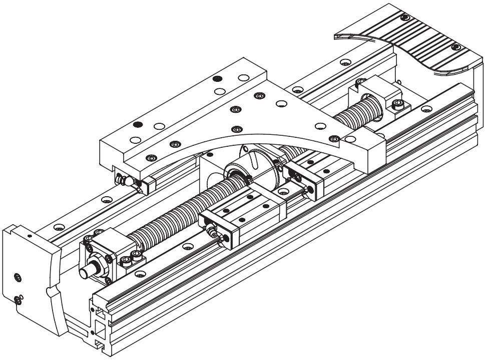
GL20

Fig.2 Cross Section of the Aluminum Base

Types of the LM Actuator Model GL

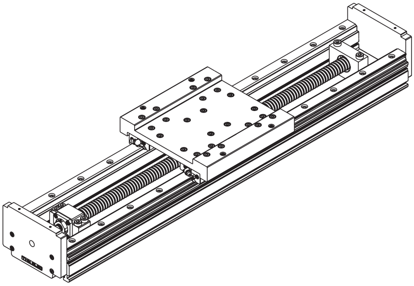
Types and Features

[Ball Screw Drive Type]



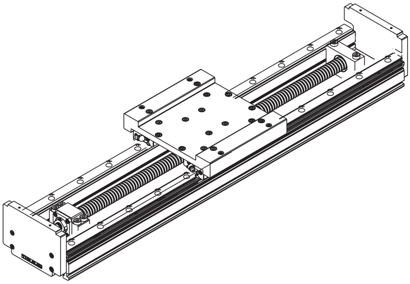
Long Table

This type has 4 units of LM Guide model GSR --- T (long type) attached with a dedicated table.

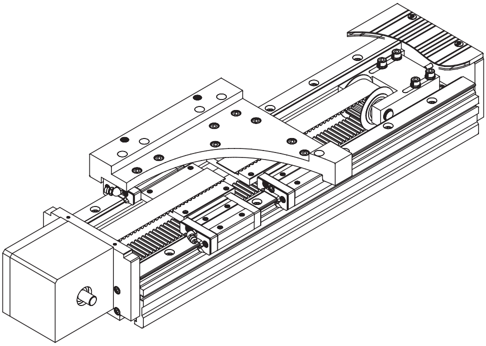


Short Table

This type has 4 units of LM Guide model GSR --- V (short type) attached with a dedicated table.

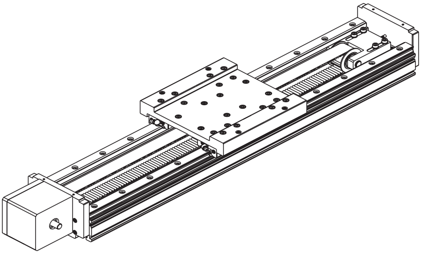


[Belt Drive Type]



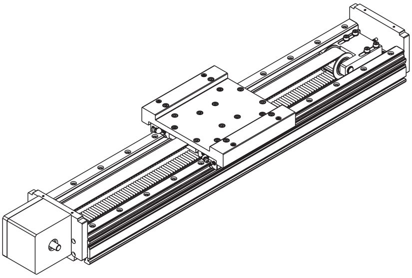
Long Table

This type has 4 units of LM Guide model GSR --- T (long type) attached with a dedicated table.



Short Table

This type has 4 units of LM Guide model GSR --- V (short type) attached with a dedicated table.



Load Rating

The following table shows the load ratings of the LM Guide, the Ball Screw and the support bearing used in model GL, which will help select a specific GL model.

[LM Guide Unit]

Model GL uses LM Guide model GSR for its guide unit.

Table1 shows the load ratings of the LM Guide model GSR used in model GL.

Table1 Load Rating of an LM Guide

	Model No.	Basic dynamic load rating C (kN)	Basic static load rating C0 (kN)
GL 15	GSR 15V	4.31	5.59
	GSR 15T	5.69	8.43
GL 20	GSR 20V	7.01	8.82
	GSR 20T	9.22	13.2

[Ball Screw Unit]

The ball screw drive type of model GL uses a THK Ball Screw for its ball screw unit.

Table2 shows the load ratings of the ball screw used in the ball screw drive type of model GL.

Table2 Load Ratings of the Ball Screw Unit

	Model No.	Basic dynamic load rating Ca (kN)	Basic static load rating C0a (kN)
GL 15	BTK1605-2.6ZZ	5.4	13.3
	BLK1616-3.6ZZ	10.5	25.9
	WTF1530-2ZZ	5.6	12.4
GL 20	BTK2005-2.6ZZ	6	16.5
	BLK2020-3.6ZZ	7.7	22.3
	WTF2040-2ZZ	5.4	13.6

[Support Bearing Unit]

The ball screw drive type of model GL uses a THK Ball Screw for its ball screw unit.

Table3 shows the load ratings of the ball screw used in the ball screw drive type of model GL.

Table3 Load Ratings of and the Static Permissible Load of the Support Bearing Unit

	Model No.	Basic dynamic load rating Ca (N)	Static permissible load P_0a (N)
GL 15	GK 10	6080	2100
GL 20	GK 12	6660	2200

Maximum Travel Speed

The maximum travel speed of the ball screw drive type of model GL is limited by the DN value of and the dangerous speed of the ball screw regardless of the maximum rotation speed of the motor.

Table4 Maximum Travel Speed Unit: mm/sec

Base length (mm)	GL 15			GL 20		
	Lead (mm)			Lead (mm)		
	5	16	30	5	20	40
340	248	1120	2220	—	—	—
460	248	1120	2220	203	740	2247
580	248	1120	2220	203	740	2247
700	248	1120	2220	203	740	2247
820	248	1120	2120	203	707	2247
1060	203	667	1145	203	382	2127
1240	141	464	795	180	265	1480
1420	104	341	585	133	195	1087
1600	—	—	—	102	150	833
1780	—	—	—	81	118	660

Accuracy Standards

The accuracy of model GL is defined in terms of positioning repeatability.

[Positioning Repeatability]

After repeating positioning to a given point in the same direction seven times, measure the halting point and obtain the value of half the maximum difference. Perform this measurement in the center and both ends of the travel distance, use the maximum value as the measurement value and express the value of half the maximum difference with symbol "±" as positioning repeatability.

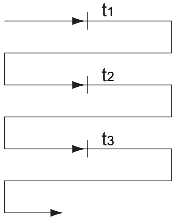


Fig.1 Positioning Repeatability

Table5 Accuracy of Each Model Unit: mm

Drive method	Model No.	
	GL 15	GL 20
Ball screw	±0.02	±0.02
Belt	±0.08	±0.08

Various types of options are available for model GL. Select an appropriate model according to your application.

Name	Reference page	Overview
Cover	A-444	Serve as contamination protection accessories or the likes
Bellows	A-445	
Endplate	A-445	For ball screw drive type
Sensor	A-445	Proximity sensor, photo sensor
Plate nut for mounting the base	A-445	Used for securing the base mounting bolt

Cover

For model GL, a cover is available for contamination protection from entering the top face.

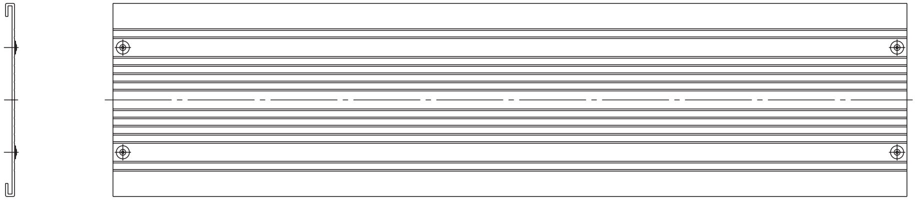
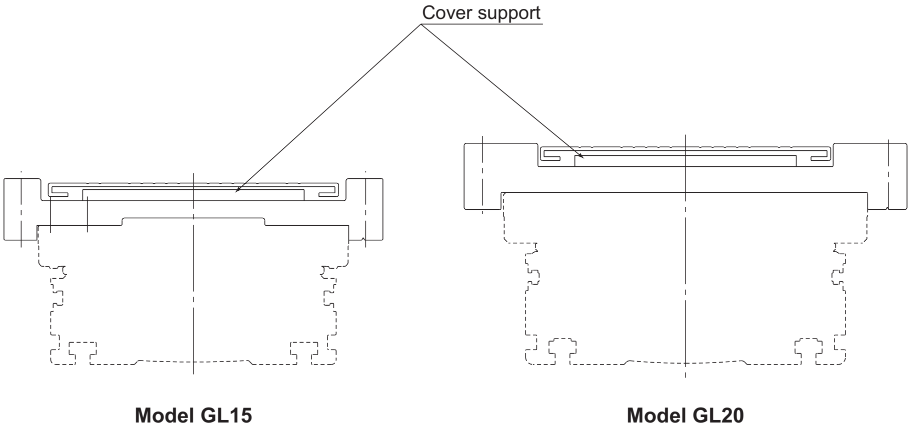


Fig.1 Outline Drawing of the Cover

* Greater the base length, the greater the defection of the cover. To prevent the cover from deflecting, attach a cover support on the table (see figure below). The cover is attached as standard for models with a base length of 1060 mm or longer.



Cross section of the cover support

Bellows

●For dimensions of the bellows, see B-358 to B-361.

For model GL, a bellows is available for contamination protection in addition to a cover.

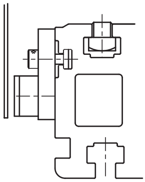
Endplate

●For detailed dimensions, see B-362.

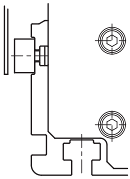
With the ball screw drive type of model GL, the end plate on the motor mounting side is machined according to the motor used. Indicate the motor to be used when placing an order to THK.

Sensor

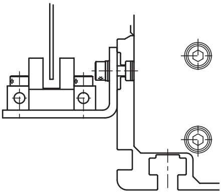
Various types of sensors can be mounted for model GL. Contact THK for details.



GXL-N12F



TL-W3MC1



EE-SX671

Proximity sensor	GXL-N12F (SUNX) TL-W3MC1 (Omron)
Photo micro sensor	EE-SX671 (Omron)

Plate Nut for Mounting the Base

●For detailed dimensions, see B-362.

For model GL, a plate nut for mounting the base is available. It is attached as standard when mode GL is delivered.

[Handling]

(1) Disassembling parts may cause foreign material to enter the system or deteriorate the accuracy. Do not disassemble the product.

(2) Dropping or hitting the LM Actuator model GL may damage it. Giving an impact to the Slide Rail could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.

(2) Do not mix lubricants of different physical properties.

(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details. For clean room applications, low dust-generative grease is available. Contact THK for details.

(4) When planning to use a special lubricant, contact THK before using it.

(5) To maximize the performance of the LM Actuator model GL, lubrication is required. Using the product without lubrication may increase wear of the rolling elements or shorten the service life.

(6) In normal use, the lubricant must be replenished every 100 km as a guide. However, the greasing interval varies according to the conditions. We recommend determining the greasing interval based on the result of the initial inspection.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.

(2) When planning to use the LM system in an environment where the coolant penetrates the LM Actuator model GL, it may cause trouble to product functions depending on the type of the coolant. Contact THK for details.

(3) The service temperature range of this product is 0 to 40℃ (no freezing or condensation). If you consider using this product outside the service temperature range, contact THK.

(4) When using the LM system in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

(5) Exceeding the permissible rotational speed may lead the components to be damaged or cause an accident. Be sure to use the product within the specification range designated by THK.

[Safety precautions]

(1) If the product is operating or in the ready state, never touch a moving part. In addition, do not enter the operating area of the actuator.

(2) If two or more people are involved in the operation, confirm the procedures such as a sequence, signs and anomalies in advance, and appoint another person for monitoring the operation.

[Storage]

When storing the LM Actuator model GL, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity.

Ball Spline

THK General Catalog

Ball Spline

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

Dimensional Drawing, Dimensional Table

High Torque Type Ball Spline

Medium Torque Type Ball Spline

Rotary Ball Spline With Geared type

Rotary Ball Spline With Support Bearing type

* Please see the separate "B Product Specifications".

Features of the Ball Spline

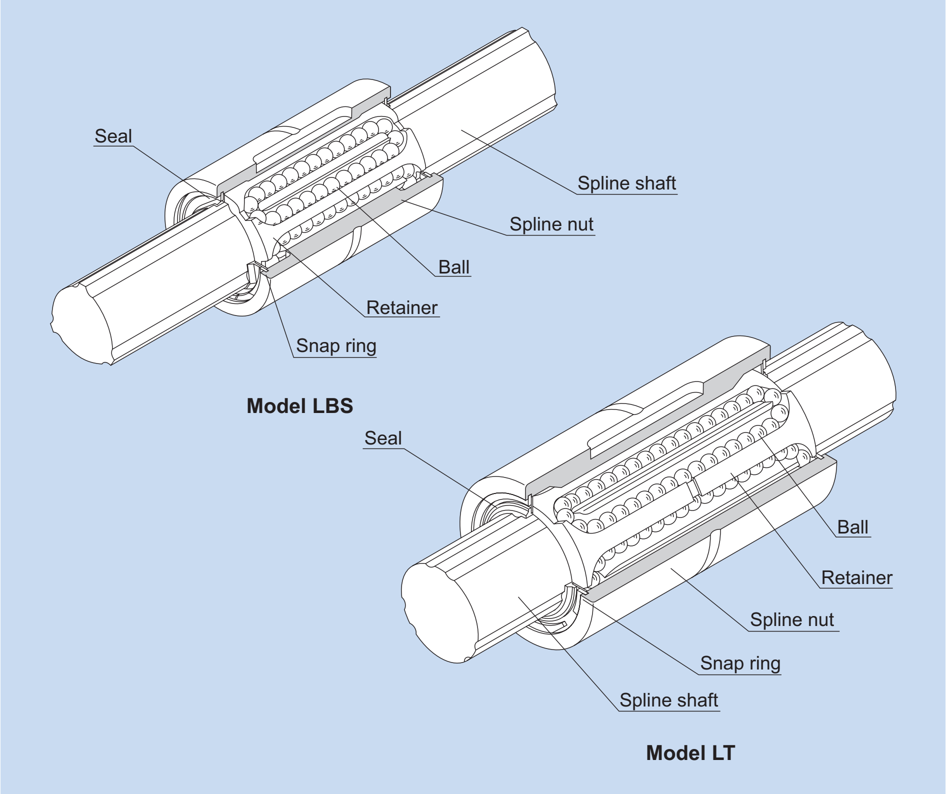
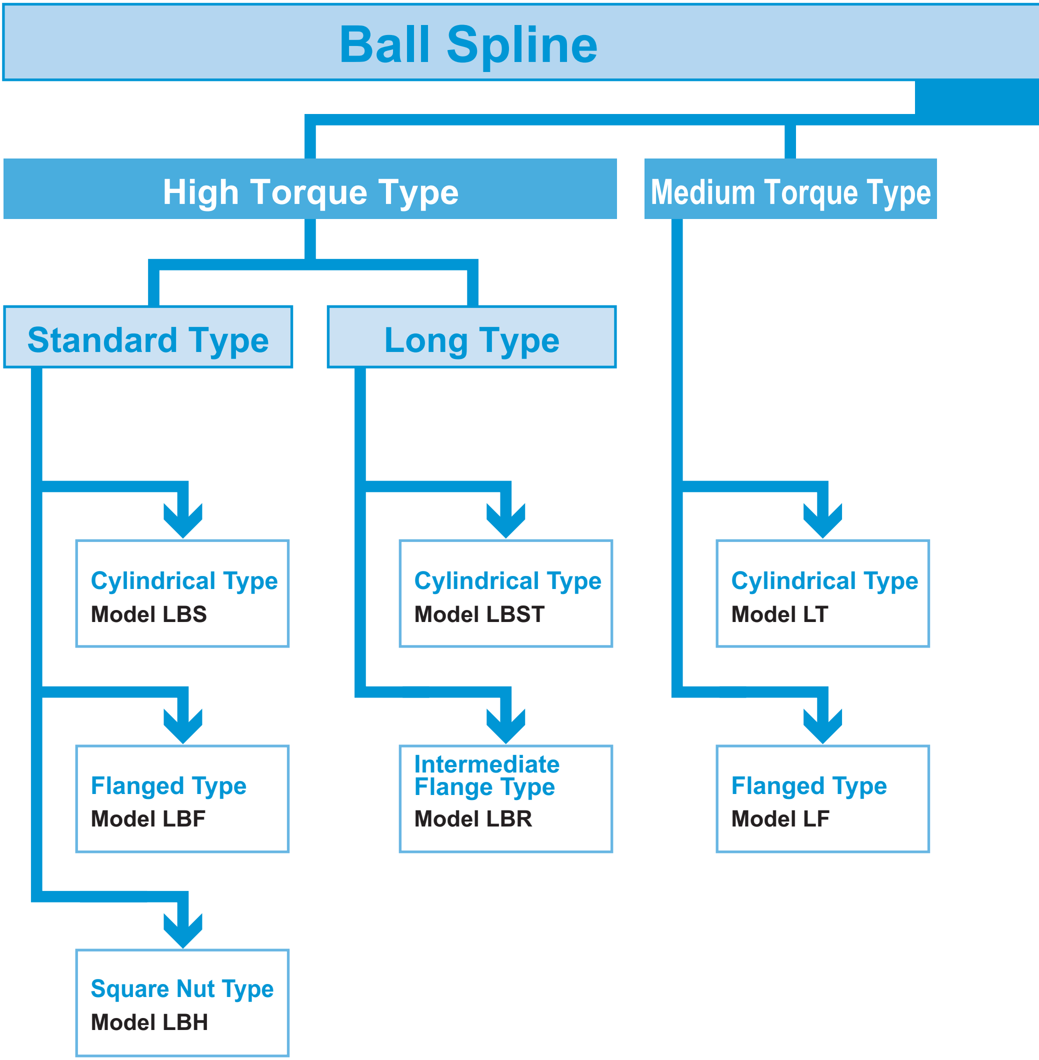


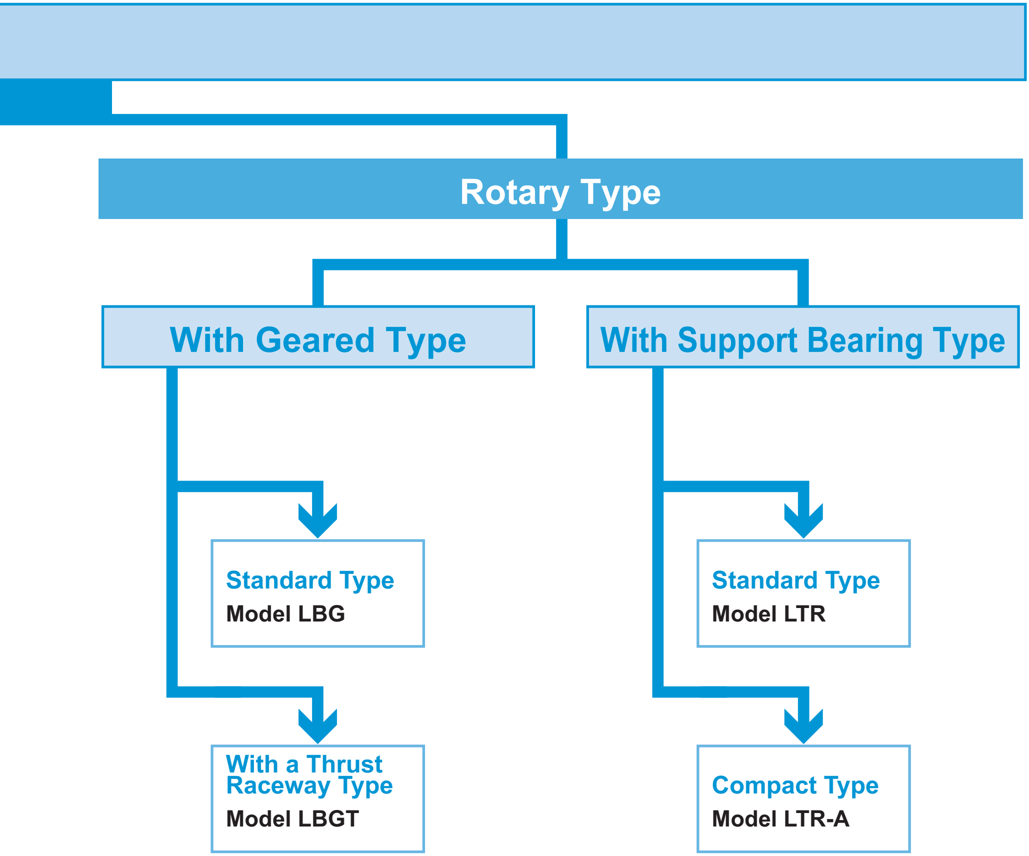
Fig.1 Structure of Ball Spline Models LBS and LT

Structure and Features

The Ball Spline is an innovative linear motion system in which balls accommodated in the spline nut transmit torque while linearly moving on precision-ground raceways on the spline shaft.
Unlike the conventional structure, a single spline nut can provide a preload with THK's Ball Spline. As a result, the Ball Spline demonstrates high performance in environments subject to vibrations and impact loads, locations where a high level of positioning accuracy is required or areas where high-speed kinetic performance is required.
In addition, even when used as an alternative to a linear bushing, the Ball Spline achieves a rated load more than 10 times greater than the linear bushing with the same shaft diameter, allowing it to compactly be designed and used in locations where an overhung load or a moment load is applied. Thus, the Ball Spline provides a high degree of safety and long service life.

Classification of Ball Splines



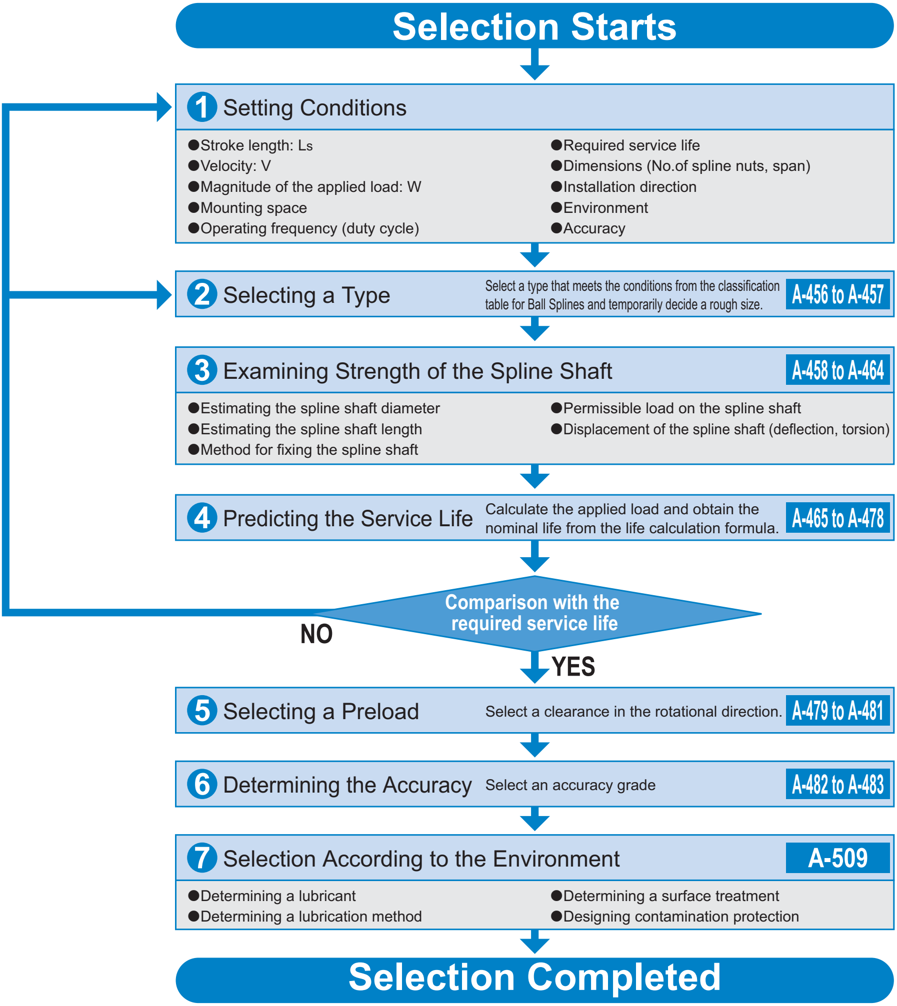


- Rotary Type
  - With Geared Type
    - Standard Type Model LBG
    - With a Thrust Raceway Type Model LBGT
  - With Support Bearing Type
    - Standard Type Model LTR
    - Compact Type Model LTR-A

Flowchart for Selecting a Ball Spline

Steps for Selecting a Ball Spline

The following is a flowchart as a measuring stick for selecting a Ball Spline.



Selection Starts

1 Setting Conditions

- Stroke length: Ls
- Velocity: V
- Magnitude of the applied load: W
- Mounting space
- Operating frequency (duty cycle)
- Required service life
- Dimensions (No.of spline nuts, span)
- Installation direction
- Environment
- Accuracy

2 Selecting a Type Select a type that meets the conditions from the classification table for Ball Splines and temporarily decide a rough size. A-456 to A-457

3 Examining Strength of the Spline Shaft A-458 to A-464

- Estimating the spline shaft diameter
- Estimating the spline shaft length
- Method for fixing the spline shaft
- Permissible load on the spline shaft
- Displacement of the spline shaft (deflection, torsion)

4 Predicting the Service Life Calculate the applied load and obtain the nominal life from the life calculation formula. A-465 to A-478

5 Selecting a Preload Select a clearance in the rotational direction. A-479 to A-481

6 Determining the Accuracy Select an accuracy grade A-482 to A-483

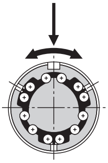
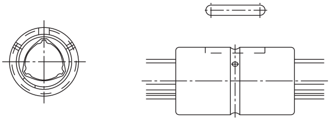
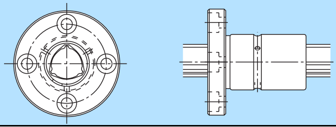
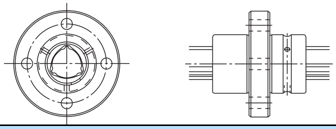
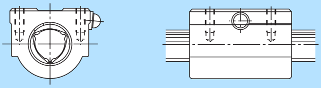
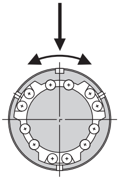
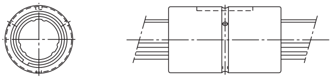
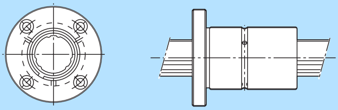
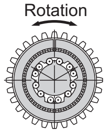
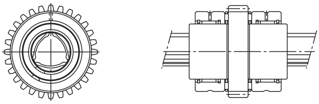
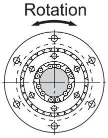
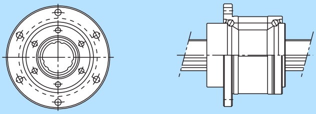
7 Selection According to the Environment A-509

- Determining a lubricant
- Determining a lubrication method
- Determining a surface treatment
- Designing contamination protection

Selection Completed

Selecting a Type

There are three types of the Ball Spline: high torque type, medium torque type and rotary type. You can choose a type according to the intended use. In addition, wide arrays of spline nut shapes are available for each type, enabling the user to choose a desired shape according to the mounting or service requirements.

Classification		Type	Shape	Shaft diameter
High torque type		Type LBS Type LBST		Nominal shaft diameter 6 to 150mm
		Type LBF		Nominal shaft diameter 15 to 100mm
		Type LBR		Nominal shaft diameter 15 to 100mm
		Type LBH		Nominal shaft diameter 15 to 50mm
Medium torque type		Type LT		Nominal shaft diameter 4 to 100mm
		Type LF		Nominal shaft diameter 6 to 50mm
Rotary type		Type LBG Type LBGT		Nominal shaft diameter 20 to 85mm
		Type LTR-A Type LTR		Nominal shaft diameter 8 to 60mm

*For specification tables for each model, please see the separate "B Product Specifications".

Specification Table	Structure and features	Major application	
B-368	● The spline shaft has three crests equidistantly formed at angles of 120°. On both sides of each crest, two rows (six rows in total) of balls are arranged to hold the crest from both sides. The angular-contact design of the ball contact areas allows an appropriate preload to be evenly applied. ● Since the balls circulate inside the spline nut, the outer dimensions of the spline nut are compactly designed. ● Even under a large preload, smooth straight motion is achieved. ● Since the contact angle is large (45°) and the displacement is minimal, high rigidity is achieved. ● No angular backlash occurs. ● Capable of transmitting a large torque.	● Column and arm of industrial robot ● Automatic loader ● Transfer machine ● Automatic conveyance system ● Tire molding machine ● Spindle of spot-welding machine ● Guide shaft of high-speed automatic coating machine ● Riveting machine ● Wire winder ● Work head of electric discharge machine ● Spindle drive shaft of grinding machine ● Speed gears ● Precision indexing machine	
B-374			
B-376			
B-378			
B-386	● The spline shaft has two to three crests. On both sides of each crest, two rows (four to six rows in total) of balls are arranged to hold the crest from both sides. This design allows an appropriate preload to be evenly applied. ● The contact angle of 20° and an appropriate preload level eliminate angular backlash, providing high-torque moment rigidity.	● Die-set shaft and similar applications requiring straight motion under a heavy load ● Loading system and similar applications requiring rotation to a given angle at a fixed position ● Automatic gas-welding machine spindle and similar applications requiring a whirl-stop on one shaft	● Column and arm of industrial robot ● Spot-welding machine ● Riveting machine ● Book-binding machine ● Automatic filler ● XY recorders ● Automatic spinner ● Optical measuring instrument
B-388			
B-396	● A unit type that has the same contact structure as model LBS. The flange circumference on the spline nut is machined to have gear teeth, and radial and thrust needle bearings are compactly combined on the circumference of the spline nut.	● Speed gears for high torque transmission	
B-404	● A lightweight and compact type based on model LT, but has a spline nut circumference machined to have angular-contact type ball raceways to accommodate support bearings.	● Z axis of scalar robot ● Wire winder	

Studying the Spline Shaft Strength

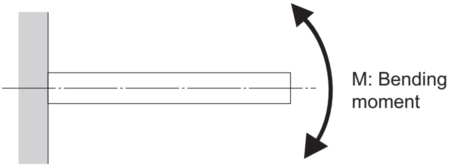
The spline shaft of the Ball Spline is a compound shaft capable of receiving a radial load and torque. When the load and torque are large, the spline shaft strength must be taken into account.

[Spline Shaft Receiving a Bending Load]

When a bending load is applied to the spline shaft of a Ball Spline, obtain the spline shaft diameter using the equation (1) below.

$$M = \sigma \cdot Z \quad \text{and} \quad Z = \frac{M}{\sigma} \quad \cdots\cdots\cdots\cdots(1)$$

M : Maximum bending moment acting on the spline shaft (N-mm)
σ : Permissible bending stress of the spline shaft ($98N/mm^2$)
Z : Modulus section factor of the spline shaft (mm^3) (see Table3 on A-463 and Table4 on A-464)

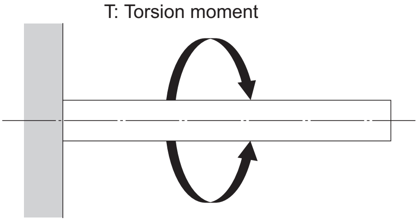


[Spline Shaft Receiving a Torsion Load]

When a torsion load is applied on the spline shaft of a Ball Spline, obtain the spline shaft diameter using the equation (2) below.

$$T = \tau_a \cdot Z_P \quad \text{and} \quad Z_P = \frac{T}{\tau_a} \quad \cdots\cdots\cdots\cdots(2)$$

T : Maximum torsion moment (N-mm)
τ_a : Permissible torsion stress of the spline shaft ($49N/mm^2$)
Z_p : Polar modulus of section of the spline nut (mm^3) (see Table3 on A-463 and Table4 on A-464)



[When the Spline Shaft Simultaneously Receives a Bending Load and a Torsion Load]

When the spline shaft of a Ball Spline receives a bending load and a torsion load simultaneously, calculate two separate spline shaft diameters: one for the equivalent bending moment (M_e) and the other for the equivalent torsion moment (T_e). Then, use the greater value as the spline shaft diameter.

Equivalent bending moment

$$M_e = \frac{M+\sqrt{M^2+T^2}}{2} = \frac{M}{2}\left\{1+\sqrt{1+\left(\frac{T}{M}\right)^2}\right\} \cdots\cdots\cdots\cdots(3)$$

$M_e = \sigma \cdot Z$

Equivalent torsion moment

$$T_e = \sqrt{M^2+T^2} = M\cdot\sqrt{1+\left(\frac{T}{M}\right)^2} \cdots\cdots\cdots\cdots(4)$$

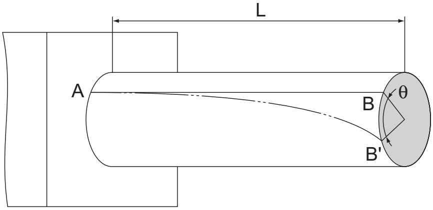
$T_e = \tau_a \cdot Z_p$

[Rigidity of the Spline Shaft]

The rigidity of the spline shaft is expressed as a torsion angle per meter of shaft length. Its value should be limited within 1°/4.

$$\theta = 57.3 \times \frac{T \cdot L}{G \cdot I_P} \cdots\cdots\cdots\cdots(5)$$

$$\text{Rigidity of the shaft} = \frac{\text{Torsion angle}}{\text{Unit length}} = \frac{\theta\cdot\ell}{L} < \frac{1^\circ}{4}$$



θ : Torsion angle (°)
L : Spline shaft length (mm)
G : Transverse elastic modulus (7.9×10^4N/mm^2)
ℓ : Unit length (1000mm)
I_p : Polar moment of inertia (mm^4) (see Table3 on A-463 and Table4 on A-464)

[Deflection and Deflection Angle of the Spline Shaft]

The deflection and deflection angle of the Ball Spline shaft need to be calculated using equations that meet the relevant conditions. Table1 and Table2 represent these conditions and the corresponding equations.

Table3 and Table4 (A-463 and A-464) show the modulus section (Z) and the geometrical moments of inertia (I) of the spline shaft. Using Z and I values in the tables, the strength and displacement (deflection) of a typical Ball Spline model can be obtained.

Table1 Deflection and Deflection Angle Equations

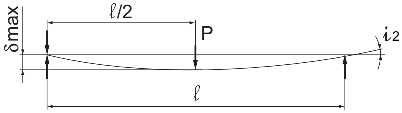
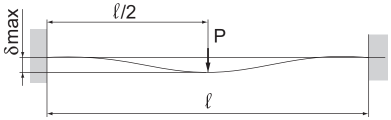
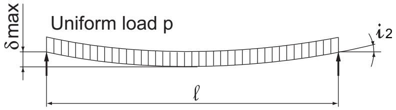
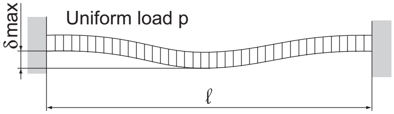
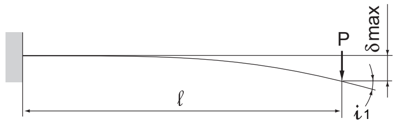
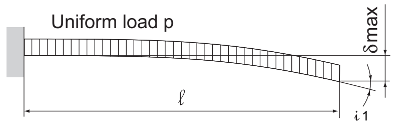
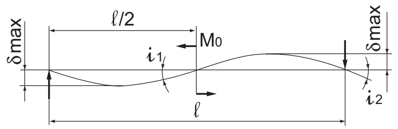
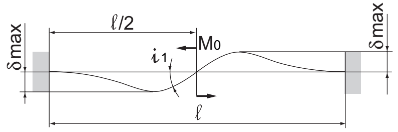
Support method	Condition	Deflection equation	Deflection angle equation
Both ends free		$\delta_{max} = \frac{P\ell^3}{48EI}$	$i_1 = 0$ $i_2 = \frac{P\ell^2}{16EI}$
Both ends fas-tened		$\delta_{max} = \frac{P\ell^3}{192EI}$	$i_1 = 0$ $i_2 = 0$
Both ends free		$\delta_{max} = \frac{5p\ell^4}{384EI}$	$i_2 = \frac{p\ell^3}{24EI}$
Both ends fas-tened		$\delta_{max} = \frac{p\ell^4}{384EI}$	$i_2 = 0$

Table2 Deflection and Deflection Angle Equations

Support method	Condition	Deflection equation	Deflection angle equation
One end fastened		$\delta_{max} = \frac{P\ell^3}{3EI}$	$i_1 = \frac{P\ell^2}{2EI}$ $i_2 = 0$
One end fastened		$\delta_{max} = \frac{P\ell^4}{8EI}$	$i_1 = \frac{P\ell^3}{6EI}$ $i_2 = 0$
Both ends free		$\delta_{max} = \frac{\sqrt{3}M_0\ell^2}{216EI}$	$i_1 = \frac{M_0\ell}{12EI}$ $i_2 = \frac{M_0\ell}{24EI}$
Both ends fastened		$\delta_{max} = \frac{M_0\ell^2}{216EI}$	$i_1 = \frac{M_0\ell}{16EI}$ $i_2 = 0$

δ_{max}: Maximum deflection(mm)

M_0: Moment(N-mm)

ℓ: Span (mm)

I: Geometrical moment of inertia(mm^4)

i_1: Deflection angle at loading point

i_2: Deflection angle at supporting point

P: Concentrated load(N)

p: Uniform load(N/mm)

E: Modulus of longitudinal elasticity 2.06×10^5 (N/mm^2)

[Dangerous Speed of the Spline Shaft]

When a Ball Spline shaft is used to transmit power while rotating, as the rotational speed of the shaft increases, the rotation cycle nears the natural frequency of the spline shaft. It may cause resonance and eventually result in inability to move. Therefore, the maximum shaft speed must be limited to a level that does not cause resonance. If the shaft's rotation cycle exceeds or nears the resonance point during operation, it is necessary to reconsider the spline shaft diameter. The critical speed of the spline shaft is obtained using the equation (6) below, in which the value is multiplied by a safety factor of 0.8.

● Critical Speed

$$N_c = \frac{60\lambda^2}{2\pi \cdot \ell_b^{\,2}} \cdot \sqrt{\frac{E \times 10^3 \cdot I}{\gamma \cdot A}} \times 0.8 \quad \cdots(6)$$

N_c : Dangerous speed (min^{-1})

ℓ_b : Distance between two mounting surfaces (mm)

E : Young's modulus (2.06×10^5 $\mathrm{N/mm^2}$)

I : Minimum geometrical moment of inertia of the shaft (mm^4)

$$I = \frac{\pi}{64} d^4$$ d:Minor diameter (mm)

(see Table7 and Table8 on A-468)

γ : Density (specific gravity) ($7.85\times10^{-6}\mathrm{kg/mm^3}$)

$$A = \frac{\pi}{4} d^2$$ d: Minor diameter (mm)

(see Table7 and Table8 on A-468)

A : Spline shaft cross-sectional area (mm^2)

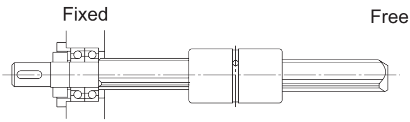
λ : Factor according to the mounting method

(1)Fixed - free λ=1.875

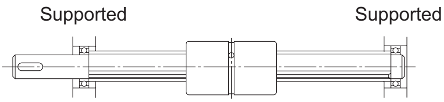
(2)Supported - supported λ=3.142

(3)Fixed - supported λ=3.927

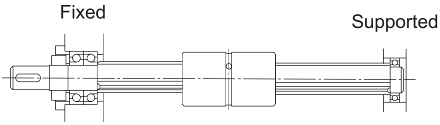
(4)Fixed - fixed λ=4.73



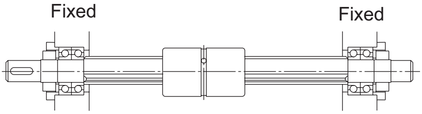
Fixed - free



Supported - supported



Fixed - supported



Fixed - fixed

[Cross-sectional Characteristics of the Spline Shaft]

● Cross-sectional Characteristics of the Spline Shaft for Ball Spline Models LBS, LBST, LBF, LBR, LBH, LBG and LBGT

Table3 Cross-sectional Characteristics of the Spline Shaft for Models LBS, LBST, LBF, LBR, LBH, LBG and LBGT

Nominal shaft diameter		I: Geometrical moment of inertia mm⁴	Z: Modulus section mm³	I_P: Polar momentof inertia mm⁴	Z_P: Section modulus mm³
6	Solid shaft	50.6	17.8	1.03×10^{2}	36.2
8	Solid shaft	1.64×10^{2}	42.9	3.35×10^{2}	87.8
10	Solid shaft	3.32×10^{2}	73.0	6.80×10^{2}	1.50×10^{2}
15	Solid shaft	1.27×10^{3}	2.00×10^{2}	2.55×10^{3}	4.03×10^{2}
20	Solid shaft	3.82×10^{3}	4.58×10^{2}	7.72×10^{3}	9.26×10^{2}
	Hollow shaft	3.79×10^{3}	4.56×10^{2}	7.59×10^{3}	9.11×10^{2}
25	Solid shaft	9.62×10^{3}	9.14×10^{2}	1.94×10^{4}	1.85×10^{3}
	Hollow shaft	9.50×10^{3}	9.05×10^{2}	1.90×10^{4}	1.81×10^{3}
30	Solid shaft	1.87×10^{4}	1.50×10^{3}	3.77×10^{4}	3.04×10^{3}
	Hollow shaft	1.78×10^{4}	1.44×10^{3}	3.57×10^{4}	2.88×10^{3}
40	Solid shaft	6.17×10^{4}	3.69×10^{3}	1.25×10^{5}	7.46×10^{3}
	Hollow shaft	5.71×10^{4}	3.42×10^{3}	1.14×10^{5}	6.84×10^{3}
50	Solid shaft	1.49×10^{5}	7.15×10^{3}	3.01×10^{5}	1.45×10^{4}
	Hollow shaft	1.34×10^{5}	6.46×10^{3}	2.69×10^{5}	1.29×10^{4}
60	Solid shaft	3.17×10^{5}	1.26×10^{4}	6.33×10^{5}	2.53×10^{4}
	Hollow shaft	2.77×10^{5}	1.11×10^{4}	5.54×10^{5}	2.21×10^{4}
70	Solid shaft	5.77×10^{5}	1.97×10^{4}	1.16×10^{6}	3.99×10^{4}
	Hollow shaft	5.07×10^{5}	1.74×10^{4}	1.01×10^{6}	3.49×10^{4}
85	Solid shaft	1.33×10^{6}	3.69×10^{4}	2.62×10^{6}	7.32×10^{4}
	Hollow shaft	1.11×10^{6}	3.10×10^{4}	2.22×10^{6}	6.20×10^{4}
100	Solid shaft	2.69×10^{6}	6.25×10^{4}	5.33×10^{6}	1.25×10^{5}
	Hollow shaft	2.18×10^{6}	5.10×10^{4}	4.37×10^{6}	1.02×10^{5}
120	Solid shaft	5.95×10^{6}	1.13×10^{5}	1.18×10^{7}	2.26×10^{5}
	Hollow shaft	5.28×10^{6}	1.01×10^{5}	1.06×10^{7}	2.02×10^{5}
150	Solid shaft	1.61×10^{7}	2.40×10^{5}	3.20×10^{7}	4.76×10^{5}
	Hollow shaft	1.40×10^{7}	2.08×10^{5}	2.79×10^{7}	4.16×10^{5}

Note) For the hole-shape of the hollow spline shaft, see B-381 and B-400.

● Cross-sectional Characteristics of the Spline Shaft for Ball Spline Models LT, LF, LTR and LTR-A

Table4 Cross-sectional Characteristics of the Spline Shaft for Models LT, LF, LTR and LTR-A

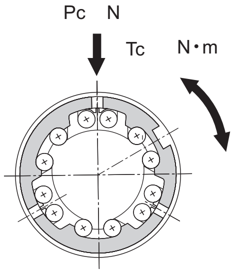
Nominal shaft diameter			I: Geometrical moment of inertia mm^4	Z: Modulus section mm^3	I_P: Polar moment of inertia mm^4	Z_P: Section modulus mm^3
4	Solid shaft		11.39	5.84	22.78	11.68
5	Solid shaft		27.88	11.43	55.76	22.85
6	Solid shaft		57.80	19.7	1.19×10^2	40.50
	Hollow shaft	Type K	55.87	18.9	1.16×10^2	39.20
8	Solid shaft		1.86×10^2	47.4	3.81×10^2	96.60
	Hollow shaft	Type K	1.81×10^2	46.0	3.74×10^2	94.60
10	Solid shaft		4.54×10^2	92.6	9.32×10^2	1.89×10^2
	Hollow shaft	Type K	4.41×10^2	89.5	9.09×10^2	1.84×10^2
13	Solid shaft		1.32×10^3	2.09×10^2	2.70×10^3	4.19×10^2
	Hollow shaft	Type K	1.29×10^3	2.00×10^2	2.63×10^3	4.09×10^2
16	Solid shaft		3.09×10^3	3.90×10^2	6.18×10^3	7.80×10^2
	Hollow shaft	Type K	2.97×10^3	3.75×10^2	5.95×10^3	7.51×10^2
		Type N	2.37×10^3	2.99×10^2	4.74×10^3	5.99×10^2
20	Solid shaft		7.61×10^3	7.67×10^2	1.52×10^4	1.53×10^3
	Hollow shaft	Type K	7.12×10^3	7.18×10^2	1.42×10^4	1.43×10^3
		Type N	5.72×10^3	5.77×10^2	1.14×10^4	1.15×10^3
25	Solid shaft		1.86×10^4	1.50×10^3	3.71×10^4	2.99×10^3
	Hollow shaft	Type K	1.75×10^4	1.41×10^3	3.51×10^4	2.83×10^3
		Type N	1.34×10^4	1.08×10^3	2.68×10^4	2.16×10^3
30	Solid shaft		3.86×10^4	2.59×10^3	7.71×10^4	5.18×10^3
	Hollow shaft	Type K	3.53×10^4	2.37×10^3	7.07×10^4	4.74×10^3
		Type N	2.90×10^4	1.95×10^3	5.80×10^4	3.89×10^3
32	Solid shaft		5.01×10^4	3.15×10^3	9.90×10^4	6.27×10^3
	Hollow shaft	Type K	4.50×10^4	2.83×10^3	8.87×10^4	5.61×10^3
		Type N	3.64×10^4	2.29×10^3	7.15×10^4	4.53×10^3
40	Solid shaft		1.22×10^5	6.14×10^3	2.40×10^5	1.21×10^4
	Hollow shaft	Type K	1.10×10^5	5.55×10^3	2.17×10^5	1.10×10^4
		Type N	8.70×10^4	4.39×10^3	1.71×10^5	8.64×10^3
50	Solid shaft		2.97×10^5	1.20×10^4	5.94×10^5	2.40×10^4
	Hollow shaft	Type K	2.78×10^5	1.12×10^4	5.56×10^5	2.24×10^4
		Type N	2.14×10^5	8.63×10^3	4.29×10^5	1.73×10^4
60	Solid shaft		6.16×10^5	2.07×10^4	1.23×10^6	4.14×10^4
	Hollow shaft	Type K	5.56×10^5	1.90×10^4	1.13×10^6	3.79×10^4
80	Solid shaft		1.95×10^6	4.91×10^4	3.90×10^6	9.82×10^4
	Hollow shaft	Type K	1.58×10^6	3.97×10^4	3.15×10^6	7.95×10^4
100	Solid shaft		4.78×10^6	9.62×10^4	9.56×10^6	1.92×10^5
	Hollow shaft	Type K	3.76×10^6	7.57×10^4	7.52×10^6	1.51×10^5

Note) For the hole-shape of the hollow spline shaft.
For type K: see B-391 and B-408.
For type N: see B-391 and B-408.

Predicting the Service Life

[Nominal Life]

The service life of a Ball Spline varies from unit to unit even if they are manufactured through the same process and used in the same operating conditions. Therefore, the nominal life defined below is normally used as a guidepost for obtaining the service life of a Ball Spline.
Nominal life is the total travel distance that 90% of a group of identical ball splines independently operating under the same conditions can achieve without showing flaking (scale-like pieces on a metal surface).



[Calculating the Nominal Life]

The nominal life of a Ball Spline varies with types of loads applied during operation: torque load, radial load and moment load. The corresponding nominal life values are obtained using the equations (7) to (10) below. (The basic load ratings in these loading directions are indicated in the specification table for the corresponding model number.)

- **When a Torque Load is Applied**

$$L = \left(\frac{f_T \cdot f_C}{f_W} \cdot \frac{C_T}{T_C}\right)^3 \times 50 \quad \cdots\cdots\cdots(7)$$

- **When a Radial Load is Applied**

$$L = \left(\frac{f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C}\right)^3 \times 50 \quad \cdots\cdots\cdots(8)$$

L : Nominal life (km)
C_T : Basic dynamic torque rating (N-m)
T_C : Calculated torque applied (N-m)
C : Basic dynamic load rating (N)
P_C : Calculated radial load (N)
f_T : Temperature factor (see Fig.1 on A-467)
f_C : Contact factor (see Table5 on A-467)
f_W : Load factor (see Table6 on A-467)

● When a Torque Load and a Radial Load are Simultaneously Applied

When a torque load and a radial load are simultaneously applied, calculate the nominal life by obtaining the equivalent radial load using the equation (9) below.

$$P_E = P_C + \frac{4 \cdot T_C \times 10^3}{i \cdot dp \cdot \cos\alpha} \quad \cdots\cdots\cdots (9)$$

P_E : Equivalent radial load (N)

$\cos\alpha$: Contact angle i=Number of rows of balls under a load

Type LBS	$\alpha=45°$	i=2(LBS10 or smaller) i=3(LBS15 or greater)
Type LT	$\alpha=70°$	i=2(LT13 or smaller) i=3(LT16 or greater)

dp : Ball center-to-center diameter (mm)
(see Table7 and Table8 on A-468)

● When a Moment Load is Applied to a Single Nut or Two Nuts in Close Contact with Each Other

Obtain the equivalent radial load using the equation (10) below.

$$P_u = K \cdot M \quad \cdots\cdots\cdots (10)$$

P_u : Equivalent radial load (N)
(with a moment applied)

K : Equivalent Factors (see Table9 on A-471, Table10 on A-472)

M : Applied moment (N-mm)

However, M should be within the range of the static permissible moment.

● When a Moment Load and a Radial Load are Simultaneously Applied

Calculated the nominal life from the sum of the radial load and the equivalent radial load.

● Calculating the Service Life Time

When the nominal life (L) has been obtained in the equation above, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the equation (11) below.

$$L_h = \frac{L \times 10^3}{2 \times \ell_S \times n_1 \times 60} \quad \cdots\cdots\cdots (11)$$

L_h : Service life time (h)

ℓ_S : Stroke length (m)

n_1 : Number of reciprocations per minute (opm)

■f_T:Temperature Factor

If the temperature of the environment surrounding the operating Ball Spline exceeds 100 ℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.1.
In addition, the Ball Spline must be of a high temperature type.

Note) If the environment temperature exceeds 80 ℃, high-tem-perature types of seal and retainer are required. ContactTHK for details.

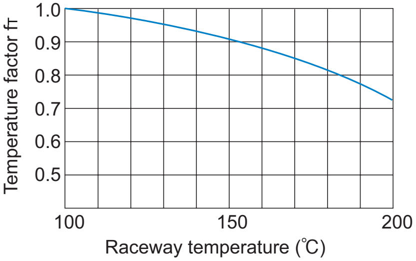


Fig.1 Temperature Factor (f_T)

■f_C: Contact Factor

When multiple spline nuts are used in close contact with each other, their linear motion is affected by moments and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C_0) by the corresponding contact factor in Table5.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in Table5.

Table5 Contact Factor (f_C)

Number of spline nuts in close contact with each other	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
Normal use	1

■f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. When loads applied on a Ball Spline cannot be measured, or when speed and impact have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in the table of empirically obtained data on Table6.

Table6 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low V≦0.25m/s	1 to 1.2
Weak	Slow 0.25<V≦1m/s	1.2 to 1.5
Medium	Medium 1<V≦2m/s	1.5 to 2
Strong	High V>2m/s	2 to 3.5

Table7 Sectional Shape of the Spline Shaft for Models LBS, LBST, LBF, LBR, LBH, LBG and LBGT

Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
Minor diameter ϕd	11.7	15.3	19.5	22.5	31	39	46.5	54.5	67	81	101	130
Outer diameter ϕD_0	14.5	19.7	24.5	29.6	39.8	49.5	60	70	84	99	117	147
Ball center-to-center diameter ϕ dp	15	20	25	30	40	50	60	70	85	100	120	150

* The minor diameter ϕd must be a value at which no groove is left after machining.

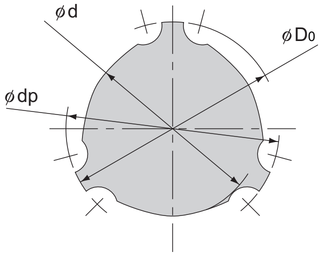
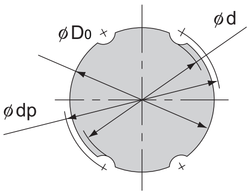


Table8 Sectional Shape of the Spline Shaft for Models LT, LF, LTR and LTR-A

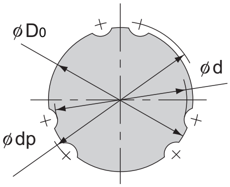
Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30	32	40	50	60	80	100
Minor diameter ϕd	3.5	4.5	5	7	8.5	11.5	14.5	18.5	23	28	30	37.5	46.5	56.5	75.5	95
Outer diameter ϕD_0	4	5	6	8	10	13	16	20	25	30	32	40	50	60	80	100
Ball center-to-center diameter ϕ dp	4.6	5.7	7	9.3	11.5	14.8	17.8	22.1	27.6	33.2	35.2	44.2	55.2	66.3	87.9	109.5
Outer diameter tolerance	$^{0}_{-0.012}$			$^{0}_{-0.015}$		$^{0}_{-0.018}$		$^{0}_{-0.021}$				$^{0}_{-0.025}$		$^{0}_{-0.03}$		$^{0}_{-0.035}$

* The minor diameter ϕd must be a value at which no groove is left after machining.



Nominal shaft diameter: 13 mm or less



Nominal shaft diameter: 16 mm or more

[Calculating the Average Load]

When the load applied on the spline shaft fluctuates according to varying conditions, such as an industrial robot arm traveling forward while holding a workpiece and traveling backward with empty weight, and a machine tool handling various workpieces, this varying load condition must be taken into account in service life calculation.

The average load (P_m) is a constant load under which the service life of an operating Ball Spline with its spline nut receiving a fluctuation load in varying conditions is equivalent to the service life under this varying load condition.

The following is the basic equation.

$$P_m = \sqrt[3]{\frac{1}{L} \cdot \sum_{n=1}^{n} (P_n{}^3 \cdot L_n)}$$

P_m : Average Load (N)
P_n : Varying load (N)
L : Total travel distance (mm)
L_n : Distance traveled under P_n (mm)

- **When the Load Fluctuates Stepwise**

$$P_m = \sqrt[3]{\frac{1}{L} (P_1{}^3 \cdot L_1 + P_2{}^3 \cdot L_2 \cdots\cdots + P_n{}^3 \cdot L_n)} \quad \cdots\cdots\cdots\cdots(1)$$

P_m : Average Load (N)
P_n : Varying load (N)
L : Total travel distance (m)
L_n : Distance traveled under load P_n (m)

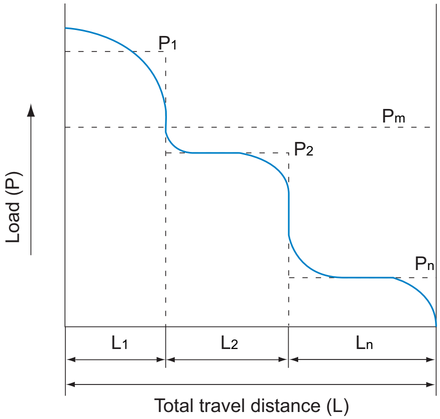


Fig.2

- **When the Load Fluctuates Monotonically**

$$P_m \fallingdotseq \frac{1}{3}(P_{min} + 2 \cdot P_{max}) \cdots\cdots\cdots\cdots(2)$$

P_{min} : Minimum load (N)
P_{max} : Maximum load (N)

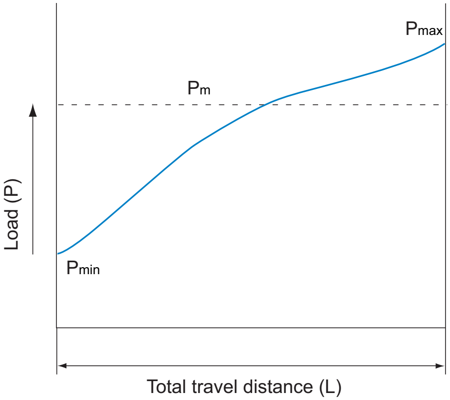


Fig.3

- **When the Load Fluctuates Sinusoidally**

(a) $P_m \fallingdotseq 0.65P_{max} \cdots\cdots\cdots\cdots(3)$ (b) $P_m \fallingdotseq 0.75P_{max} \cdots\cdots\cdots\cdots(4)$

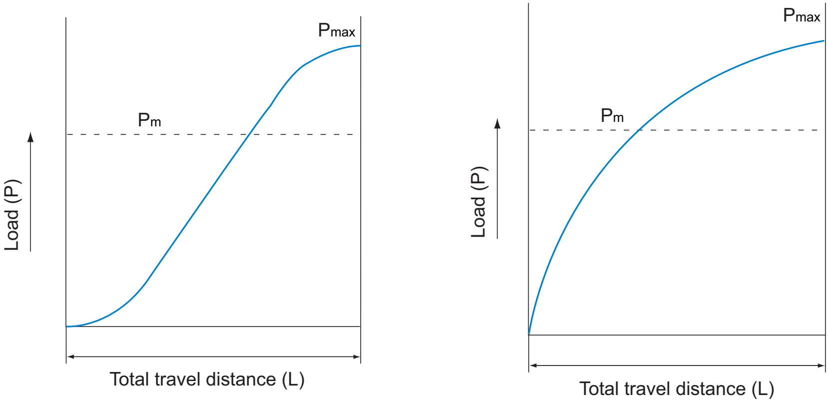
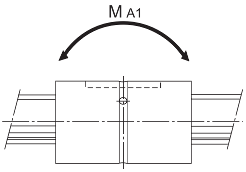


Fig.4

[Equivalent Factor]

Table9 below and Table10 on A-472 show equivalent radial load factors calculated under a moment load.

● Table of Equivalent Factors for Ball Spline Model LBS



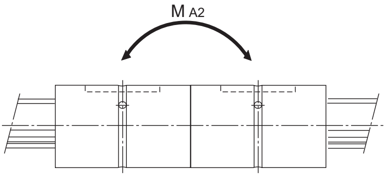


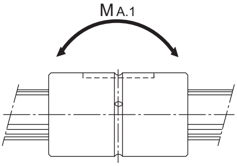
Table9

Model No.	Equivalent factor: K	
	Single spline nut	Two spline nuts in close contact with each other
LBS 6	0.61	0.074
LBS 8	0.46	0.060
LBS 10	0.54	0.049
LBS 15	0.22	0.022
LBS 20	0.24	0.03
LBST 20	0.17	0.027
LBS 25	0.19	0.026
LBST 25	0.14	0.023
LBS 30	0.16	0.022
LBST 30	0.12	0.02
LBS 40	0.12	0.017
LBST 40	0.1	0.016
LBS 50	0.11	0.015
LBST 50	0.09	0.014
LBS 60	0.08	0.013
LBS 70	0.1	0.013
LBST 70	0.08	0.012
LBS 85	0.08	0.011
LBST 85	0.07	0.01
LBS 100	0.08	0.009
LBST 100	0.06	0.009
LBST 120	0.05	0.008
LBST 150	0.045	0.006

Note1) Values of equivalent factor K for model LBF are the same as that for model LBS.

Note2) Values of equivalent factor K for models LBR, LBG, LBGT and LBH are the same as that for model LBST.
However the values of model LBF60 are the same as that for model LBST60.
The values of model LBH15 are the same as that for model LBS15.

● Table of Equivalent Factors for Ball Spline Model LT



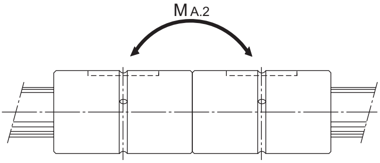


Table10

Model No.	Equivalent factor: K	
	Single spline nut	Two spline nuts in close contact with each other
LT 4	0.65	0.096
LT 5	0.55	0.076
LT 6	0.47	0.06
LT 8	0.47	0.058
LT 10	0.31	0.045
LT 13	0.3	0.042
LT 16	0.19	0.032
LT 20	0.16	0.026
LT 25	0.13	0.023
LT 30	0.12	0.02
LT 40	0.088	0.016
LT 50	0.071	0.013
LT 60	0.07	0.011
LT 80	0.062	0.009
LT100	0.057	0.008

Note) Values of equivalent factor K for model LF are the same as that for model LT.

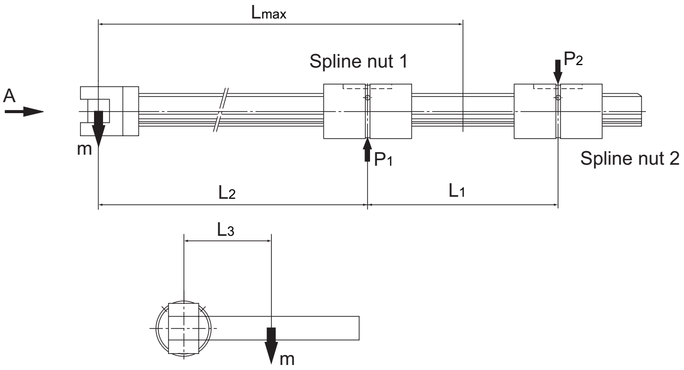
[Example of Calculating the Service Life]

● Example of Calculation - 1

An industrial robot arm (horizontal)

[Conditions]

Mass applied to the arm end	$m=50kg$	Arm length at maximum stroke	$L_{max}=400mm$
Stroke	$\ell_S=200mm$		$L_2=325mm$
Spline nut mounting span (estimate)	$L_1=150mm$		$L_3=50mm$



(The Ball Spline type is LBS in this example.)

Fig.5

■Shaft Strength Calculation

Calculate the bending moment (M) and the torsion moment (T) applied on the shaft.

$M=m\times9.8\times L_{max}=196000N\text{-}mm$

$T=m\times9.8\times L_3=24500N\text{-}mm$

Since the bending and torsion moments are applied simultaneously, obtain the corresponding bending moment (M_e) and torsion moment (T_e), and then determine the shaft diameter based on the greater value. From equations (3) and (4) on A-459,

$$M_e=\frac{M+\sqrt{M^2+T^2}}{2}\fallingdotseq 196762.7N\cdot mm$$

$$T_e=\sqrt{M^2+T^2}\fallingdotseq 197525.3N\cdot mm$$

$$M_e < T_e$$

$$\therefore T_e=\tau_a\times Z_P \quad \text{Hence,}$$

$$Z_P=\frac{T_e}{\tau_a}\fallingdotseq 4031mm^3$$

Thus, judging from Table3 on A-463, the nominal shaft diameter that meets Z_p is at least 40 mm.

■Average Load P_m

Obtain an applied load value when the arm is extended to the maximum length (P_{max}), and another when the arm is contracted (P_{min}). Based on the values obtained, calculate the average load on the spline shaft nut.

$$P_{1max} = \frac{m \times 9.8(L_1+L_2)}{L_1} \fallingdotseq 1551.7N$$

$$P_{2max} = \frac{m \times 9.8 \times L_2}{L_1} \fallingdotseq 1061.7N$$

When the arm is contracted

$$P_{1min} = \frac{m \times 9.8 \times [(L_2-\ell_S) + L_1]}{L_1} \fallingdotseq 898.3N$$

$$P_{2min} = \frac{m \times 9.8 \times (L_2-\ell_S)}{L_1} \fallingdotseq 408.3N$$

As this load is monotonically varying as shown in the Fig.3 on A-470, calculate the average load using the equation (2) on A-470.

The average load (P_{1m}) on spline nut 1

$$P_{1m} \fallingdotseq \frac{1}{3}(P_{1min} + 2P_{1max}) = 1333.9N$$

The average load (P_{2m}) on spline nut 2

$$P_{2m} \fallingdotseq \frac{1}{3}(P_{2min} + 2P_{2max}) = 843.9N$$

Obtain the torque applied on one spline nut.

$$T = \frac{m \times 9.8 \times L_3}{2} = 12250N \cdot mm$$

Since the radial load and the torque are simultaneously applied, calculate the equivalent radial load using equation (9) on A-466.

$$P_{1E} = P_{1m} + \frac{4 \times T}{3 \times dp \times \cos\alpha} = 1911.4N$$

$$P_{2E} = P_{2m} + \frac{4 \times T}{3 \times dp \times \cos\alpha} = 1421.4N$$

■Nominal Life L_n

Based on the nominal life equation (8) on A-465, each nominal life is obtained as follows.

$$\text{Nominal life of the spline nut } L_1 = \left(\frac{f_T \times f_C}{f_W} \times \frac{C}{P_{1E}}\right)^3 \times 50 = 68867.4km$$

$$\text{Nominal life of the spline nut } L_2 = \left(\frac{f_T \times f_C}{f_W} \times \frac{C}{P_{2E}}\right)^3 \times 50 = 167463.2km$$

f_T: Temperature factor = 1 (from Fig.1 on A-467)
f_C: Contact factor = 1 (from Table5 on A-467)
f_W: Load factor = 1.5 (from Table6 on A-467)
C: Basic dynamic load rating = 31.9 kN (model LBS40)

Given the nominal life obtained for each spline nut above, the nominal life of the Ball Spline unit is equal to that of spline nut 1, which is 68867.4km.

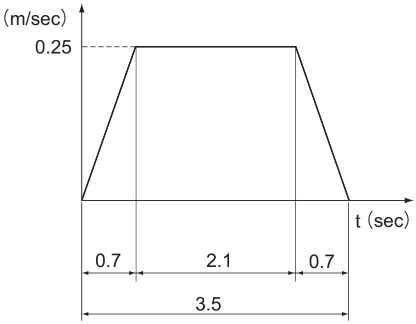
● Example of Calculation - 2

[Conditions]

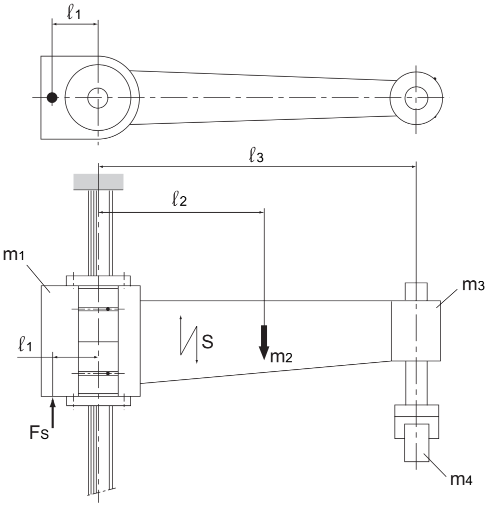
Thrust position: F_S
Stroke velocity: V_{max} = 0.25m/sec
Acceleration: a=0.36m/sec^2 (from the respective velocity diagram)
Stroke: S=700mm
Housing mass: m_1=30kg
Arm mass : m_2=20kg
Head mass: m_3=15kg
Work mass: m_4=12kg

Distance from the thrust position to each mass
ℓ_1=200mm ℓ_2=500mm
ℓ_3=1276mm

Cycle (1 cycle: 30 sec)
1. Descent (3.5sec) 2.Dwell (1sec): with a work
3. Ascend (3.5sec) 4.Dwell (7sec)
5. Descent (3.5sec) 6.Dwell (1sec): without a work
7. Ascend (3.5sec) 8.Dwell (7sec)



Velocity diagram



(The Ball Spline type is LBF in this example.)

Fig.6

■Shaft Strength Calculation

Calculate the shaft strength while assuming the shaft diameter to be 60 mm. (with double spline nut in contact with each other)

■Calculating the Moment (M_n) Applying on the Spline Nut during Acceleration, Uniform Motion and Deceleration with Different Masses (m_n)

Applied moment during deceleration: M_1

$$M_1 = m_n \times 9.8 \left(1 \pm \frac{a}{g}\right) \times \ell_n \qquad \cdots\cdots\cdots(a)$$

Applied moment during uniform motion: M_2

$$M_2 = m_n \times 9.8 \times \ell_n \qquad \cdots\cdots\cdots(b)$$

Applied moment during deceleration: M_3

$$M_3 = m_n \times 9.8 \left(1 \pm \frac{a}{g}\right) \times \ell_n \qquad \cdots\cdots\cdots(c)$$

m_n: Mass (kg)
a : Acceleration (m/sec^2)
g : Gravitational acceleration(m/sec^2)
ℓ_n : Offset from each loading point to the trust center(mm)
Assume:

$$A = \left(1 + \frac{a}{g}\right), \quad B = \left(1 - \frac{a}{g}\right)$$

- During descent

From equation (c), during acceleration

M_{m1} $=m_1 \times 9.8 \times B \times \ell_1 + m_2 \times 9.8 \times B \times (\ell_1+\ell_2) + m_3 \times 9.8 \times B \times (\ell_1+\ell_3)$
=398105.01N-mm

From equation (b), during uniform motion

M_{m2} $=m_1 \times 9.8 \times \ell_1 + m_2 \times 9.8 \times (\ell_1+\ell_2) + m_3 \times 9.8 \times (\ell_1+\ell_3)$
=412972N-mm

From equation (a), during deceleration

M_{m3} $=m_1 \times 9.8 \times A \times \ell_1 + m_2 \times 9.8 \times A \times (\ell_1+\ell_2) + m_3 \times 9.8 \times A \times (\ell_1+\ell_3)$
=427838.99N-mm

- During ascent

From equation (a), during acceleration

M_{m1}' $=m_1 \times 9.8 \times A \times \ell_1 + m_2 \times 9.8 \times A \times (\ell_1+\ell_2) + m_3 \times 9.8 \times A \times (\ell_1+\ell_3)$
=427838.99N-mm

From equation (b), during uniform motion

M_{m2}' $=m_1 \times 9.8 \times \ell_1 + m_2 \times 9.8 \times (\ell_1+\ell_2) + m_3 \times (\ell_1+\ell_3)$
=412972N-mm

From equation (c), during deceleration

$M_{m3}' = m_1 \times 9.8 \times B \times \ell_1 + m_2 \times 9.8 \times B \times (\ell_1 + \ell_2) + m_3 \times 9.8 \times B \times (\ell_1 + \ell_3)$

$= 398105.01$N-mm

- During descent (with a work loaded)

From equation (c), during acceleration

$M_{m1}'' = M_{m1} + m_4 \times 9.8 \times B \times (\ell_1 + \ell_3)$

$= 565433.83$N-mm

From equation (b), during uniform motion

$M_{m2}'' = M_{m2} + m_4 \times 9.8 \times (\ell_1 + \ell_3)$

$= 586549.6$N-mm

From equation (a), during deceleration

$M_{m3}'' = M_{m3} + m_4 \times 9.8 \times A \times (\ell_1 + \ell_3)$

$= 607665.37$N-mm

- During ascent (with a work loaded)

From equation (a), during acceleration

$M_{m1}''' = M_{m1}' + m_4 \times 9.8 \times A \times (\ell_1 + \ell_3)$

$= 607665.37$N・mm

From equation (b), during uniform motion

$M_{m2}''' = M_{m2}' + m_4 \times 9.8 \times (\ell_1 + \ell_3)$

$= 586549.6$N-mm

From equation (c), during deceleration

$M_{m3}''' = M_{m3}' + m_4 \times 9.8 \times B \times (\ell_1 + \ell_3)$

$= 565433.83$N-mm

$\therefore M_1 = M_{m1} = M_{m3}' = 398105.01$N-mm

$M_2 = M_{m2} = M_{m2}' = 412972$N-mm

$M_3 = M_{m3} = M_{m1}' = 427838.99$N-mm

$M_1' = M_{m1}'' = M_{m3}''' = 565433.83$N-mm

$M_2' = M_{m2}'' = M_{m2}''' = 586549.6$N-mm

$M_3' = M_{m3}'' = M_{m1}''' = 607665.37$N-mm

■Calculating the Equivalent Radial Load Considered to be Applied to the Spline Nut with Different Moments

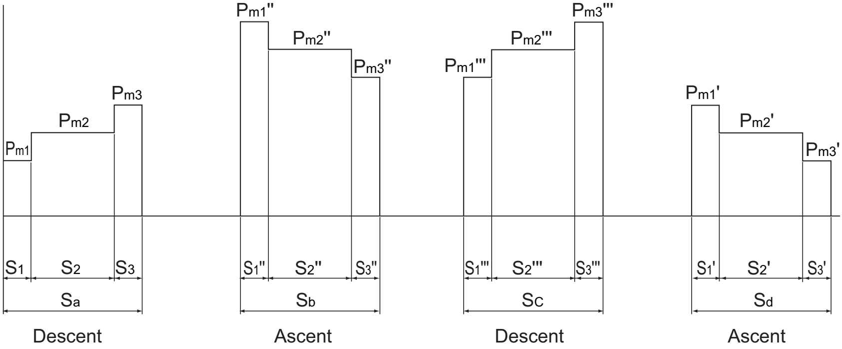
Relational expression between moment M_n and P_n

$$\mathbf{P_n = M_n \times K} \quad \cdots\cdots\cdots(d)$$

P_n : Equivalent radial load (N)
M_n : Applied moment (N-mm)
K : Equivalent factor (from Table9 to A-471)
(If two spline nuts of LBF60 contact with each other, K = 0.013)

Calculate the equivalent radial load with different applied moments using equation (d).

$P_{m1} = P_{m3}' = M_1 \times 0.013 \fallingdotseq 5175.4\text{N}$
$P_{m2} = P_{m2}' = M_2 \times 0.013 \fallingdotseq 5368.6\text{N}$
$P_{m3} = P_{m1}' = M_3 \times 0.013 \fallingdotseq 5561.9\text{N}$
$P_{m1}'' = P_{m3}''' = M_1' \times 0.013 \fallingdotseq 7350.7\text{N}$
$P_{m2}'' = P_{m2}''' = M_2' \times 0.013 \fallingdotseq 7625.2\text{N}$
$P_{m3}'' = P_{m1}''' = M_3' \times 0.013 \fallingdotseq 7899.7\text{N}$



$$\begin{cases} P_1 = P_{m1} = P_{m3}' \fallingdotseq 5175.4\text{N} \\ P_2 = P_{m2} = P_{m2}' \fallingdotseq 5368.6\text{N} \\ P_3 = P_{m3} = P_{m1}' \fallingdotseq 5561.9\text{N} \end{cases}$$

$$\begin{cases} P_4 = P_{m1}'' = P_{m3}''' \fallingdotseq 7350.7\text{N} \\ P_5 = P_{m2}'' = P_{m2}''' \fallingdotseq 7625.2\text{N} \\ P_6 = P_{m3}'' = P_{m1}''' \fallingdotseq 7899.7\text{N} \end{cases}$$

$$\begin{cases} S = S_a = S_b = S_c = S_d = 700\text{mm} \\ S_1 = S_1 = S_1' = S_1'' = S_1''' = 87.5\text{mm} \\ S_2 = S_2 = S_2' = S_2'' = S_2''' = 525\text{mm} \\ S_3 = S_3 = S_3' = S_3'' = S_3''' = 87.5\text{mm} \end{cases}$$

■Calculating the Average Load P_m

Using equation (1) on A-469,

$$P_m = \sqrt[3]{\frac{1}{4\times S}\left[2\{(P_1^3\times S_1)+(P_2^3\times S_2)+(P_3^3\times S_3)\}+2\{(P_4^3\times S_3)+(P_5^3\times S_2)+(P_6^3\times S_1)\}\right]}$$

$$\fallingdotseq 6689.5\text{N}$$

■Calculating the Rated Life L from the Average Load

Using equation (8) on A-465,

$$L = \left(\frac{f_T\cdot f_C}{f_W}\cdot\frac{C}{P_m}\right)^3 \times 50$$

$$= 7630\text{km}$$

f_T : Temperature factor = 1 (from Fig.1 on A-467)
f_C : Contact factor=0.81 (from Table5 on A-467)
f_W : Load factor=1.5 (from Table6 on A-467)
C : Basic dynamic load rating = 66.2 kN (model LBF60)

Given the result above, the nominal life of model LBF60 with double spline nuts used in close contact with each other is 7,630 km.

Selecting a Preload

A preload on the Ball Spline significantly affects its accuracy, load resistance and rigidity. Therefore, it is necessary to select the most appropriate clearance according to the intended use.
Specific clearance values are standardized for each model, allowing you to select a clearance that meets the conditions.

Clearance in the Rotation Direction

With the Ball Spline, the sum of clearances in the circumferential direction is standardized as the clearance in the rotational direction. For models LBS and LT, which are especially suitable for transmission of rotational torque, clearances in the rotational directions are defined.

Clearance in the rotational direction (BCD)

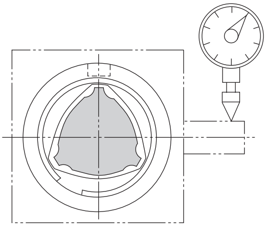
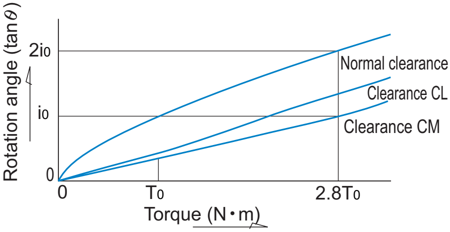


Fig.7 Measurement of Clearance in the Rotational Direction

Preload and Rigidity

Preload is defined as the load preliminarily applied to the ball in order to eliminate angular backlash (clearance in the rotational direction) and increase rigidity. When given a preload, the Ball Spline is capable of increasing its rigidity by eliminating the angular backlash according to the magnitude of the preload. Fig.8 shows the displacement in the rotational direction when a rotational torque is applied.
Thus, the effect of a preload can be obtained up to 2.8 times that of the applied preload. When given the same rotational torque, the displacement when a preload is applied is 0.5 or less of that without a preload. The rigidity with a preload is at least twice greater than that without a preload.



T0: Applied preload

Fig.8

Conditions and Guidelines for Selecting of a Preload

Table11 provides guidelines for selecting a clearance in the rotational direction with given conditions of the Ball Spline.
The rotational clearance of the Ball Spline significantly affects the accuracy and rigidity of the spline nut. Therefore, it is essential to select a correct clearance according to the intended use. Generally, the Ball Spline is provided with a preload. When it is used in repeated circular motion or reciprocating straight motion, the Ball Spline is subject to a large vibration impact, and therefore, its service life and accuracy are significantly increased with a preload.

Table11 Guidelines for Selecting a Clearance in the Rotational Direction for the Ball Spline

Clearance in the rotation direction	Condition	Examples of applications
Normal grade (No symbol)	● Smooth motion with a small force is desired. ● A torque is always applied in the same direction.	• Measuring instruments • Automatic drafting machine • Geometrical measuring equipment • Dynamometer • Wire winder • Automatic welding machine • Main shaft of horning machine • Automatic packing machine
Light preload (CL)	● An overhang load or moment load is present. ● High positioning accuracy is required. ● Alternating load is applied.	• Industrial robot arm • Automatic loaders • Guide shaft of automatic coating machine • Main shaft of electric discharge machine • Guide shaft for press die setting • Main shaft of drilling machine
Medium preload (CM)	● High rigidity is required and vibrations and impact are applied. ● Receives a moment load with a single spline nut.	• Steering shaft of construction vehicle • Shaft of spot-welding machine • Indexing shaft of automatic lathe tool rest

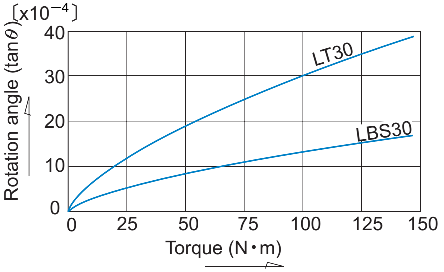


Fig.9 Comparison between LBS and LT for Zero Clearance

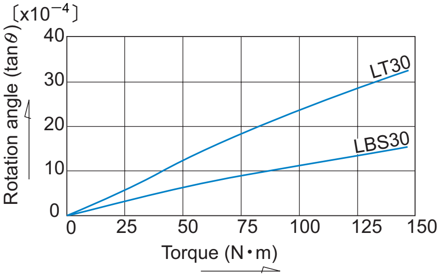


Fig.10 Comparison between LBS and LT for Clearance CL

Table12 Clearance in the Rotational Direction for Models LBS, LBF, LBST, LBR and LBH Unit: µm

Symbol	Normal	Light preload	Medium preload
Nominal shaft diameter	No Symbol	CL	CM
6 8	−2 to +1	−6 to −2	—
10 15	−3 to +2	−9 to −3	−15 to −9
20 25 30	−4 to +2	−12 to −4	−20 to −12
40 50 60	−6 to +3	−18 to −6	−30 to −18
70 85	−8 to +4	−24 to −8	−40 to −24
100 120	−10 to +5	−30 to −10	−50 to −30
150	−15 to +7	−40 to −15	−70 to −40

Table13 Clearance in the Rotational Direction for Models LT and LF Unit: µm

Symbol	Normal	Light preload	Medium preload
Nominal shaft diameter	No Symbol	CL	CM
4 5 6 8 10 13	−2 to +1	−6 to −2	—
16 20	−2 to +1	−6 to −2	−9 to −5
25 30	−3 to +2	−10 to −4	−14 to −8
40 50	−4 to +2	−16 to −8	−22 to −14
60 80	−5 to +2	−22 to −12	−30 to −20
100	−6 to +3	−26 to −14	−36 to −24

Table14 Clearance in the Rotational Direction for Models LBG and LBGT Unit: µm

Symbol	Normal	Light preload	Medium preload
Nominal shaft diameter	No Symbol	CL	CM
20 25 30	−4 to +2	−12 to −4	−20 to −12
40 50 60	−6 to +3	−18 to −6	−30 to −18
70 85	−8 to +4	−24 to −8	−40 to −24

Table15 Clearance in the Rotational Direction for Model LTR Unit: µm

Symbol	Normal	Light preload	Medium preload
Nominal shaft diameter	No Symbol	CL	CM
8 10	−2 to +1	−6 to −2	—
16 20	−2 to +1	−6 to −2	−9 to −5
25 32	−3 to +2	−10 to −4	−14 to −8
40 50	−4 to +2	−16 to −8	−22 to −14
60	−5 to +2	−22 to −12	−30 to −20

Determining the Accuracy

Accuracy Grades

The accuracy of the Ball Spline is classified into three grades: normal grade (no symbol), high accuracy grade (H) and precision grade (P), according to the runout of spline nut circumference in relation to the support of the spline shaft. Fig.11 shows measurement items.

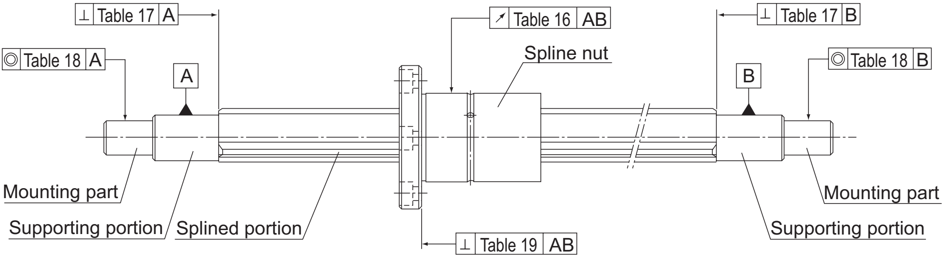


Fig.11 Accuracy Measurement Items of the Ball Spline

Accuracy Standards

Table16 to Table19 show measurement items of the Ball Spline.

Table16 Runout of the Spline Nut Circumference in Relation to the Support of the Spline Shaft Unit: µm

Accuracy		Runout(max)																							
Nominal shaft diameter Overall spline shaft length (mm)		4 to 8 Note			10			13 to 20			25 to 32			40, 50			60 to 80			85 to 120			150		
Above	Or less	Normal	Upper	Precision	Normal	Upper	Precision	Normal	Upper	Precision	Normal	Upper	Precision	Normal	Upper	Precision	Normal	Upper	Precision	Normal	Upper	Precision	Normal	Upper	Precision
—	200	72	46	26	59	36	20	56	34	18	53	32	18	53	32	16	51	30	16	51	30	16	—	—	—
200	315	133	(89)	—	83	54	32	71	45	25	58	39	21	58	36	19	55	34	17	53	32	17	—	—	—
315	400	—	—	—	103	68	—	83	53	31	70	44	25	63	39	21	58	36	19	55	34	17	—	—	—
400	500	—	—	—	123	—	—	95	62	38	78	50	29	68	43	24	61	38	21	57	35	19	46	36	19
500	630	—	—	—	—	—	—	112	—	—	88	57	34	74	47	27	65	41	23	60	37	20	49	39	21
630	800	—	—	—	—	—	—	—	—	—	103	68	42	84	54	32	71	45	26	64	40	22	53	43	24
800	1000	—	—	—	—	—	—	—	—	—	124	83	—	97	63	38	79	51	30	69	43	24	58	48	27
1000	1250	—	—	—	—	—	—	—	—	—	—	—	—	114	76	47	90	59	35	76	48	28	63	55	32
1250	1600	—	—	—	—	—	—	—	—	—	—	—	—	139	93	—	106	70	43	86	55	33	80	65	40
1600	2000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	128	86	54	99	65	40	100	80	50
2000	2500	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	156	—	—	117	78	49	125	100	68
2500	3000	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	143	96	61	150	129	84

Note) Dimensions in parentheses do not apply to nominal shaft diameter of 4.
Note) Applicable to models LBS, LBST, LBF, LBR, LT and LF.

Table17 Perpendicularity of the Spline Shaft End Face in Relation to the Support of the Spline Shaft Unit: μm

Accuracy	Perpendicularity (max)		
Nominal shaft diameter	Normal grade (No symbol)	High accuracy grade (H)	Precision Grade (P)
4 5 6 8 10	22	9	6
13 15 16 20	27	11	8
25 30 32	33	13	9
40 50	39	16	11
60 70 80	46	19	13
85 100 120	54	22	15
150	63	25	18

Table18 Concentricity of the Part-mounting in Relation to the Support of the Spline Shaft Unit: μm

Accuracy	Concentricity (max)		
Nominal shaft diameter	Normal grade (No symbol)	High accuracy grade (H)	Precision Grade (P)
4 5 6 8	33	14	8
10	41	17	10
13 15 16 20	46	19	12
25 30 32	53	22	13
40 50	62	25	15
60 70 80	73	29	17
85 100 120	86	34	20
150	100	40	23

Table19 Straightness of the Flange-mounting Surface of the Spline Nut in Relation to the Support of the Spline Shaft
Unit: μm

Accuracy	Perpendicularity (max)		
Nominal shaft diameter	Normal grade (No symbol)	High accuracy grade (H)	Precision Grade (P)
6 8	27	11	8
10 13	33	13	9
15 16 20 25 30	39	16	11
40 50	46	19	13
60 70 80 85	54	22	15
100	63	25	18

Note) This table does not apply to models LBG, LBGT, LTR and LTR-A.

High Torque Type Ball Spline

Models LBS, LBF, LBH, LBST and LBR

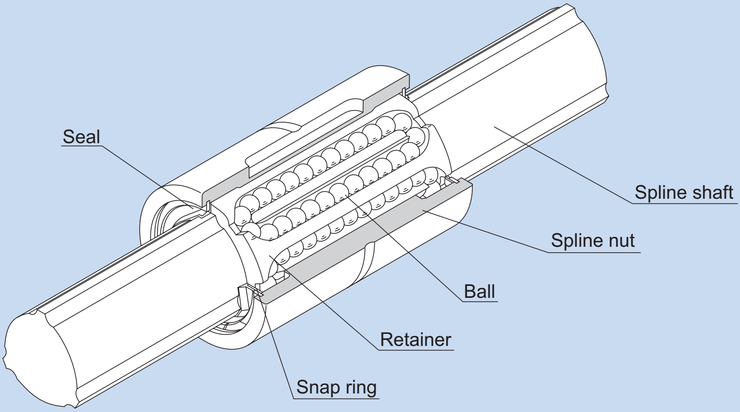


Fig.1 Structure of High Torque Type Ball Spline Model LBS

Structure and Features

With the high torque type Ball Spline, the spline shaft has three crests positioned equidistantly at 120°, and along both sides of each crest, two rows of balls (six rows in total) are arranged so as to hold the crest, as shown in Fig.1.

The raceways are precision ground into R-shaped grooves whose diameters are approximate to the ball diameter. When a torque is generated from the spline shaft or the spline nut, the three rows of balls on the load-bearing side evenly receive the torque, and the center of rotation is automatically determined. When the rotation reverses, the remaining three rows of balls on the unloaded side receive the torque.

The rows of balls are held in a retainer incorporated in the spline nut so that they smoothly roll and circulate. With this design, balls will not fall even if the spline shaft is removed from the nut.

[No Angular Backlash]

With the high torque type Ball Spline, a single spline nut provides a preload to eliminate angular backlash and increase the rigidity.

Unlike conventional ball splines with circular-arc groove or Gothic-arch groove, the high torque type Ball Spline eliminates the need for twisting two spline nuts to provide a preload, thus allowing compact design to be achieved easily.

[High Rigidity and Accurate Positioning]

Since this model has a large contact angle and provides a preload from a single spline nut, the initial displacement is minimal and high rigidity and high positioning accuracy are achieved.

[High-speed Motion, High-speed Rotation]

Adoption of a structure with high grease retention and a rigid retainer enables the ball spline to operate over a long period with grease lubrication even in high-speed straight motion. Since the distance in the radius direction is almost uniform between the loaded balls and the unloaded balls, the balls are little affected by the centrifugal force and smooth straight motion is achieved even during high-speed rotation.

[Compact Design]

Unlike conventional ball splines, unloaded balls do not circulate on the outer surface of the spline nut with this model. As a result, the outer diameter of the spline nut is reduced and a space-saving and compact design is achieved.

[Ball Retaining Type]

Use of a retainer prevents the balls from falling even if the spline shaft is pulled out of the spline nut.

[Can be Used as a Linear Bushing for Heavy Loads]

Since the raceways are machined into R grooves whose diameter is almost equal to the ball diameter, the contact area of the ball is large and the load capacity is large also in the radial direction.

[Double, Parallel Shafts can be Replaced with a Single Shaft]

Since a single shaft is capable of receiving a load in the torque direction and the radial direction, double shafts in parallel configuration can be replaced with a single-shaft configuration. This allows easy installation and achieves space-saving design.

Applications

The high torque type Ball Spline is a reliable straight motion system used in a wide array of applications such as the columns and arms of industrial robot, automatic loader, transfer machine, automatic conveyance system, tire forming machine, spindle of spot welding machine, guide shaft of high-speed automatic coating machine, riveting machine, wire winder, work head of electric discharge machine, spindle drive shaft of grinding machine, speed gears and precision indexing shaft.

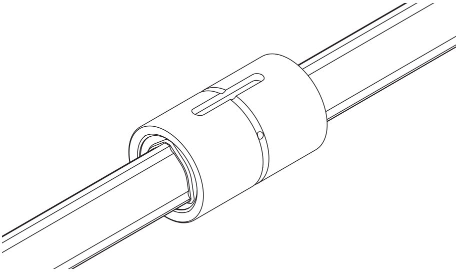
Types and Features

[Types of Spline Nuts]

Cylindrical Type Ball Spline Model LBS (Medium Load Type)

Specification Table⇒B-368

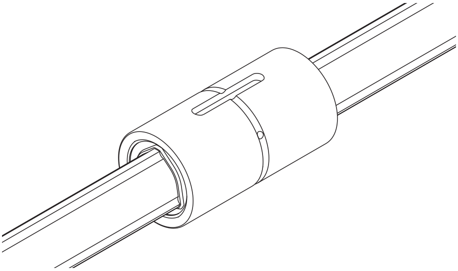
The most compact type with a straight cylindrical spline nut. When transmitting a torque, a key is driven into the body. The outer surface of the spline nut is provided with anti-carbonation treatment.



Cylindrical Type Ball Spline Model LBST (Heavy Load Type)

Specification Table⇒B-372

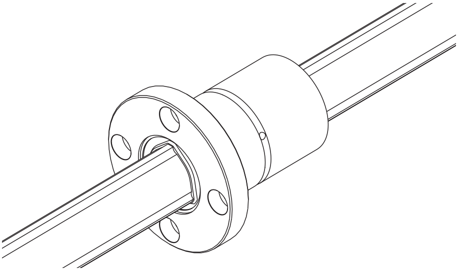
A heavy load type that has the same spline nut diameter as model LBS, but has a longer spline nut length. It is optimal for locations where the space is small, a large torque is applied, and an overhang load or moment load is applied.



Flanged Type Ball Spline Model LBF

Specification Table⇒B-374

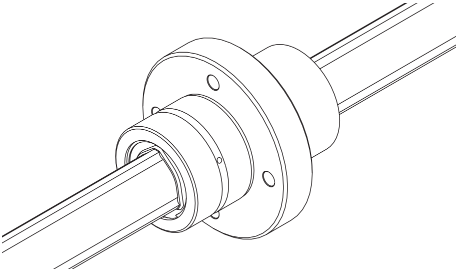
The spline nut can be attached to the housing via the flange, making assembly simple. It is optimal for locations where the housing may be deformed if a keyway is machined on its surface, and where the housing width is small.
Since it allows a dowel pin to be driven into the flange, angular backlash occurring in the fitting can completely be eliminated.



Flanged Type Ball Spline Model LBR

Specification Table⇒B-376

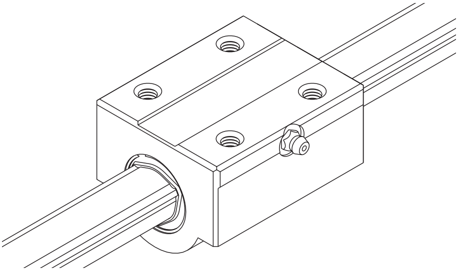
Based on the heavy load type model LBST, this model has a flange in the central area, making itself optimal for locations under a moment load such as arms of industrial robots.



Rectangular Type Ball Spline Model LBH

Specification Table⇒B-378

Its rigid rectangular spline nut does not require a housing and can be directly mounted on the machine body. Thus, a compact, highly rigid linear guide system is achieved.



[Types of Spline Shafts]

Precision Solid Spline Shaft (Standard Type)

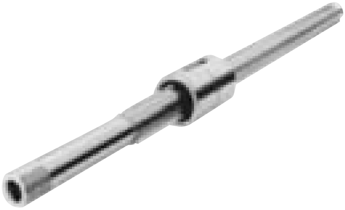
The spline shaft is cold-drawn and its raceway is precision ground. It is used in combination with a spline nut.

Special Spline Shaft

THK manufactures a spline shaft with thicker ends or thicker middle area through special processing at your request.

Hollow Spline Shaft (Type K)

A drawn, hollow spline shaft is available for requirements such as piping, wiring, air-vent and weight reduction.



Service Life

For details,see A-465.

Clearance in the Rotation Direction

For details,see A-481.

Accuracy Standards

For details,see A-482.

Housing Inner-diameter Tolerance

When fitting the Ball Spline with the housing, tight fitting is normally recommended. If the accuracy of the Ball Spline does not need to be very high, clearance fitting is also acceptable.

Table1 Housing Inner-diameter Tolerance

Housing Inner-diameter Tolerance	General conditions	H7
	When clearance needs to be small	J6

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (type K), as described on A-488.
For details, see B-381 to B-383.

Accessories

Ball Spline models LBS and LBST are provided with a standard key.
For detailed dimensions, see B-384.

Medium Torque Type Ball Spline

Models LT and LF

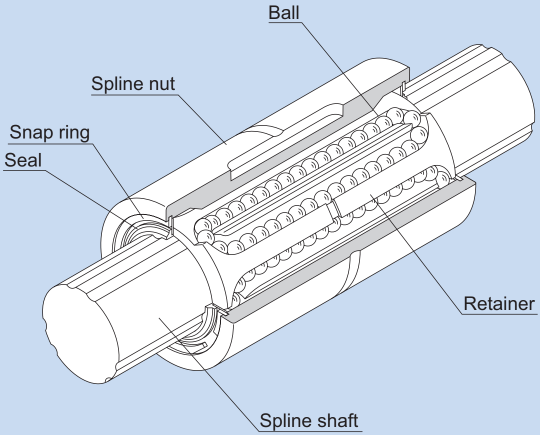


Fig.1 Structure of Medium Torque Type Ball Spline Model LT

Structure and Features

With the medium torque type Ball Spline, the spline shaft has two to three crests on the circumference, and along both sides of each crest, two rows of balls (four or six rows in total) are arranged to hold the crest so that a reasonable preload is applied.
The rows of balls are held in a special resin retainer incorporated in the spline nut so that they smoothly roll and circulate. With this design, balls will not fall even if the nut is removed from the spline shaft.

[Large Load Capacity]
The raceways are formed into circular-arc grooves approximate to the ball curvature and ensure angular contact. Thus, this model has a large load capacity in the radial and torque directions.

[No Angular Backlash]
Two rows of balls facing one another hold a crest, formed on the circumference of the spline nut, at a contact angle of 20° to provide a preload in an angular-contact structure. This eliminates an angular backlash in the rotational direction and increases the rigidity.

[High Rigidity]

Since the contact angle is large and an appropriate preload is given, high rigidity against torque and moment is achieved.

[Ball Retaining Type]

Use of a retainer prevents the balls from falling even if the spline shaft is pulled out of the spline nut. (except for models LT4 and 5)

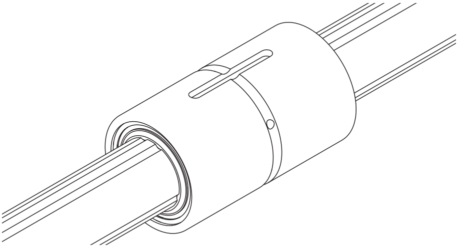
Types and Features

[Types of Spline Nuts]

Cylindrical Type Ball Spline Model LT

Specification Table⇒B-386

The most compact type with a straight cylindrical spline nut. When transmitting a torque, a key is driven into the body.



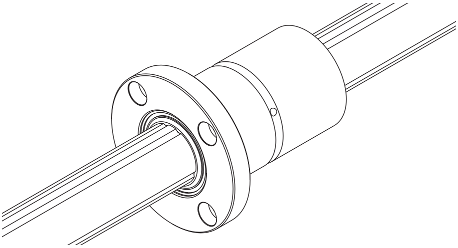
Flanged Type Ball Spline Model LF

Specification Table⇒B-388

The spline nut can be attached to the housing via the flange, making assembly simple.

It is optimal for locations where the housing may be deformed if a keyway is machined on its surface, and where the housing width is small.

Since it allows a dowel pin to be driven into the flange, angular backlash occurring in the fitting can completely be eliminated.



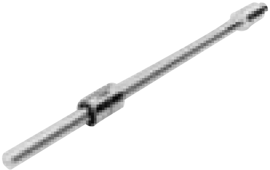
[Types of Spline Shafts]

Precision Solid Spline Shaft (Standard Type)

The raceway of the spline shaft is precision ground. It is used in combination with a spline nut.

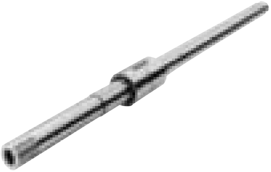
Special Spline Shaft

THK manufactures a spline shaft with thicker ends or thicker middle area through special processing at your request.



Hollow Spline Shaft (Type K)

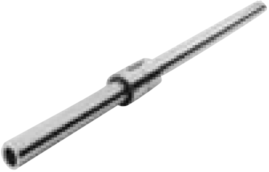
A drawn, hollow spline shaft is available for requirements such as piping, wiring, air-vent and weight reduction.



Thick

Hollow Spline Shaft (Type N)

A drawn, hollow spline shaft is available for requirements such as piping, wiring, air-vent and weight reduction.



Thin

Service Life

For details,see A-465.

Clearance in the Rotation Direction

For details,see A-481.

Accuracy Standards

For details,see A-482.

Housing Inner-diameter Tolerance

When fitting the Ball Spline with the housing, tight fitting is normally recommended. If the accuracy of the Ball Spline does not need to be very high, clearance fitting is also acceptable.

Table1 Housing Inner-diameter Tolerance

Housing Inner-diameter Tolerance	General conditions	H7
	When clearance needs to be small	J6

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (types K and N), as described on A-493.
For details, see B-391 to B-392.

Accessories

Ball Spline model LT is provided with a standard key.
For detailed dimensions, see B-393.

Rotary Ball Spline
With Geared type

Models LBG and LBGT

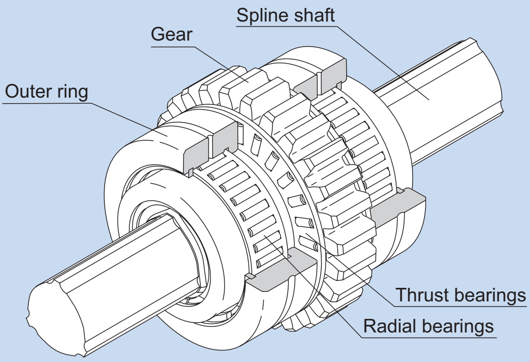


Fig.1 Structure of Rotary Ball Spline Model LBG

Structure and Features

With the Rotary Ball Spline, the spline shaft has three crests, and along both sides of each crest, two rows of balls (six rows in total) are arranged to hold the crest so that a reasonable preload is applied. These models are unit types based on model LBR, but have gear teeth on the flange circumference and radial and thrust bearings on the spline nut, all compactly integrated.
The rows of balls are held in a special resin retainer so that they smoothly roll and circulate. With this design, balls will not fall even if the spline shaft is removed.

[No Angular Backlash]
The spline shaft has three crests positioned equidistantly at 120° and along both sides of each crest, two rows of balls (six rows in total) are arranged so as to hold the crest at a contact angle of 45° and provide a preload. As a result, backlash in the rotational direction is eliminated and the rigidity is increased.

[Compact Design]
The spline nut is compactly integrated with radial and thrust bearings, allowing compact design to be achieved.

[High Rigidity]

Since the contact angle is large and an appropriate preload is given, high rigidity against torque and moment is achieved.

Use of needle bearings in the support unit achieves a rigid nut support strong against a radial load.

[Optimal for Torque Transmission with Spline Nut Drive]

Since the support bearings allow a rigid nut support, these models are optimal for torque transmission with spline nut drive.

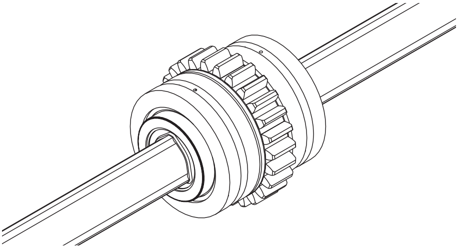
Types and Features

[Types of Spline Nuts]

Ball Spline with Gears Model LBG

Specification Table⇒B-396

These models are unit types based on model LBR, but have gear teeth on the flange circumference and radial and thrust bearings on the spline nut, all compactly integrated. It is optimal for a torque transmission mechanism with spline nut drive.

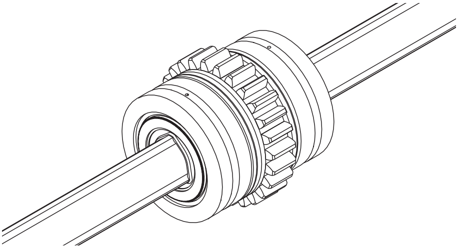


Without a thrust raceway

Ball Spline with Gears Model LBGT

Specification Table⇒B-398

These models are unit types based on model LBR, but have gear teeth on the flange circumference and radial and thrust bearings on the spline nut, all compactly integrated. It is optimal for a torque transmission mechanism with spline nut drive.



With a thrust raceway

[Types of Spline Shafts]

For details,see A-488.

Service Life

For details,see A-465.

Clearance in the Rotation Direction

For details,see A-481.

Accuracy Standards

For details,see A-482.

Housing Inner-diameter Tolerance

Table1 shows housing inner-diameter tolerance for models LBG and LBGT.

Table1 Housing Inner-diameter Tolerance

Housing Inner-diameter Tolerance	General conditions	H7
	When clearance needs to be small	J6

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (type K), as described on A-488.
For details, see B-400 to B-401.

Rotary Ball Spline

With Support Bearing Type

Models LTR and LTR-A

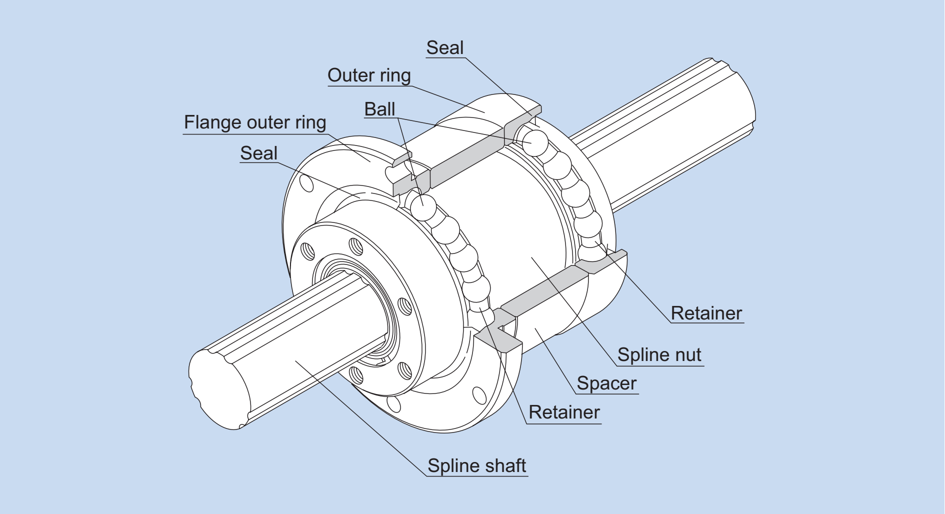


Fig.1 Structure of Rotary Ball Spline Model LTR

Structure and Features

With the Rotary Ball Spline model LTR, the spline shaft has three crests on the circumference, and along both sides of each crest, two rows of balls (six rows in total) are arranged to hold the crest so that a reasonable preload is applied.
Angular-contact ball raceways are machined on the outer surface of the spline nut to constitute support bearings, allowing the whole body to be compactly and lightly designed.
The rows of balls are held in a special resin retainer so that they smoothly roll and circulate. With this design, balls will not fall even if the spline shaft is removed.
In addition, a dedicated seal for preventing foreign material from entering the support bearings is available.

[No Angular Backlash]
Two rows of balls facing one another hold a crest, formed on the circumference of the spline nut, at a contact angle of 20° to provide a preload in an angular-contact structure. This eliminates an angular backlash in the rotational direction and increases the rigidity.

[Compact Design]
The spline nut is integrated with the support bearings, allowing highly accurate, compact design to be achieved.

[Easy Installation]

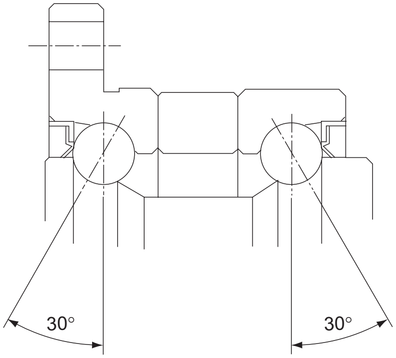
This ball spline can easily be installed by simply securing it to the housing using bolts.

[High Rigidity]

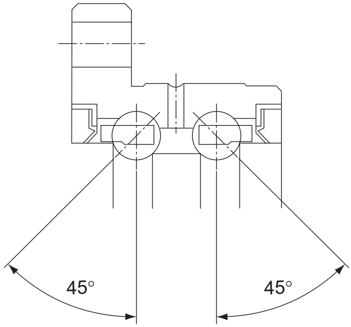
Since the contact angle is large and an appropriate preload is given, high rigidity against torque and moment is achieved.

The support bearing has a contact angle of 30° to secure high rigidity against a moment load, thus to achieve a rigid shaft support.

Model LTR-A, a compact type of LTR, has a contact angle of 45° .



Model LTR



Model LTR-A

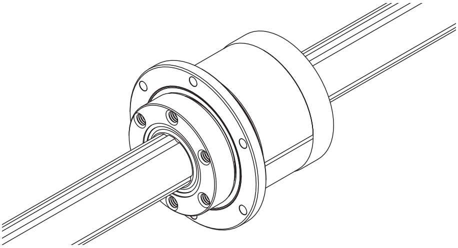
Types and Features

[Types of Spline Nuts]

Ball Spline Model LTR

Specification Table⇒B-406

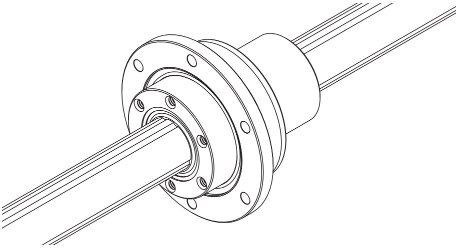
A compact unit type whose support bearings are directly integrated with the outer surface of the spline nut.



Ball Spline Model LTR-A

Specification Table⇒B-404

A compact type even smaller than LTR.



[Types of Spline Shafts]

For details,see A-493.

Service Life

For details,see A-465.

Clearance in the Rotation Direction

For details,see A-481.

Accuracy Standards

For details,see A-482.

Housing Inner-diameter Tolerance

For the housing inner-diameter tolerance for model LTR, class H7 is recommended.

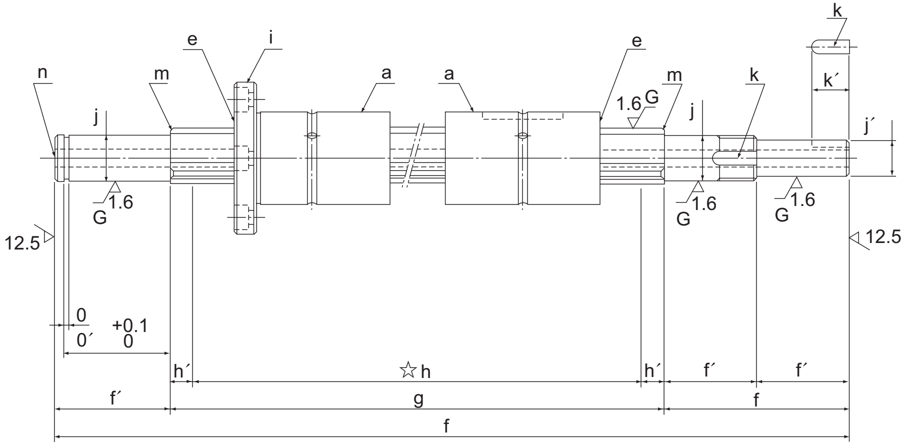
Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (types K and N), as described on A-493.
For details, see B-408 to B-409.

Checking List for Spline Shaft End Shape

If desiring a ball spline type with its end specially machined, check the following items when placing an order.

The diagram below shows a basic configuration of the Ball Spline.



[Check Items]

a. Type of the spline nut to be fit
b. Number of spline nuts
c. Clearance in the rotation direction
d. Accuracy
e. With/without a seal (for a single seal, check its orientation)
f. Overall length (including all dimensions? Total value correct?)
g. Effective spline length
h. Hardened area (mark the location with symbol ☆ and indicate the purpose of hardening)
i. Orientation of the flange (for flanged type)
j. Spline shaft end shape (thicker than the minimum spline diameter?) (black, mill scale)
k. Positional relationship between the spline nut and the spline shaft end shape (keyway of the spline nut, flange mounting hole)
l. Indication of chamfering for each part
m. Shape of chamfer on the spline shaft end (see B-382)
n. Intended purpose of the though hole in the spline shaft if any
o. o'. Snap ring groove
p. Maximum length
q. Precedented or not

Housing Inner-diameter Tolerance

When fitting the spline nut with the housing, tight fitting is normally recommended. If the accuracy of the Ball Spline does not need to be very high, clearance fitting is also acceptable.

Table1 Housing Inner-diameter Tolerance

Housing Inner-diameter Tolerance	General conditions	H7
	When clearance needs to be small	J6

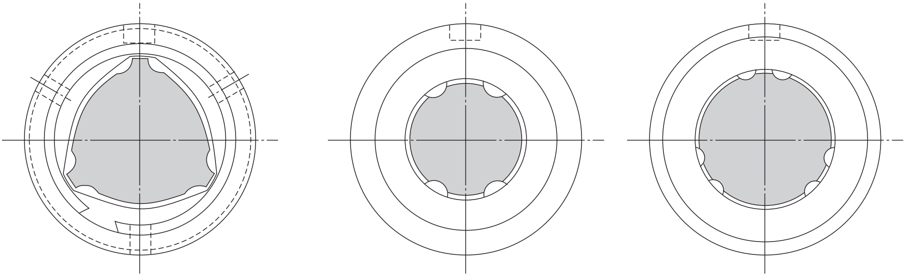
Note) For the housing inner-diameter tolerance of Rotary Ball Spline model LTR, H7 is recommended.

Positions of the Spline-nut Keyway and Mounting Holes

The keyways formed on the outer surface of straight nuts for Ball Spline models are positioned where balls under a load are placed as shown in Fig.1.

The flange-mounting holes of the flange types are positioned as shown in Fig.2.

When placing an order, indicate their positions in relation to the keyway or the like to be formed on the spline shaft.



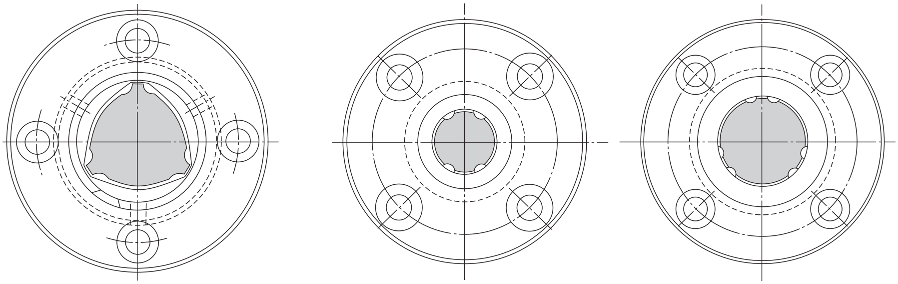
Model LT13 or smaller

Model LT16 or greater

Model LBS

Model LT

Fig.1 Positions of Keyways



Model LF13 or smaller

Model LF16 or greater

Model LBF

Model LF

Fig.2 Positions of Flange Mounting Holes

Assembling the Ball Spline

Mounting the Spline

Fig.1 and Fig.2 shows examples of mounting the spline nut. Although the Ball Spline does not require a large strength for securing it in the spline shaft direction, do not support the spline only with driving fitting.

Straight nut type

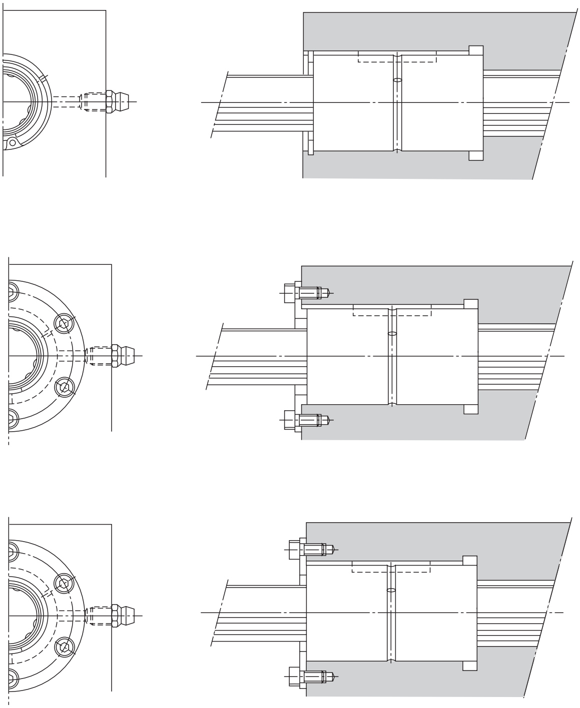
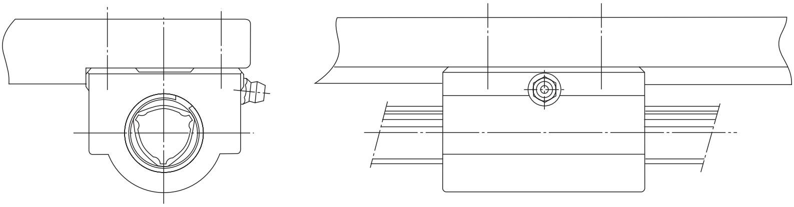
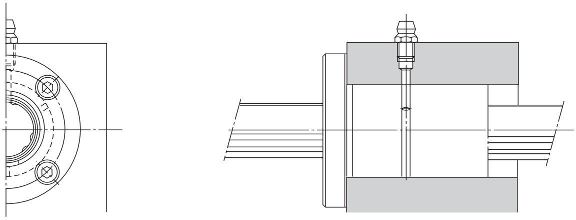


Fig.1 Examples of Fitting the Spline Nut

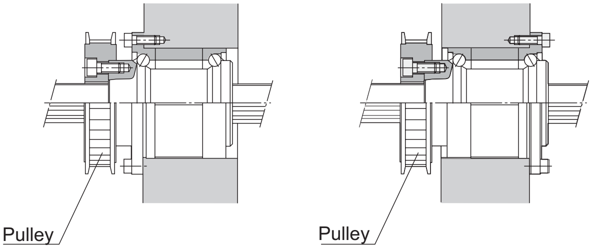
Model LBH



Flanged type



Model LTR



Model LBG

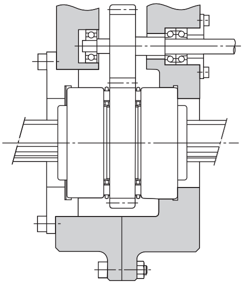


Fig.2 Examples of Fitting the Spline Nut

Installing the Spline Nut

When installing the spline nut into the housing, do not hit the side plate or the seal, but gently insert it using a jig (Fig.3).

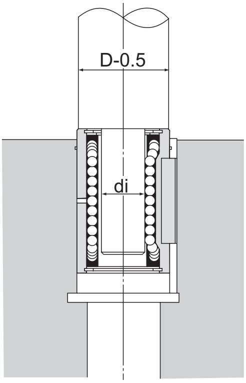


Fig.3

Table1 Dimensions of the Jig for Model LBS

Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
di	12.5	16.1	20.3	24.4	32.4	40.1	47.8	55.9	69.3	83.8	103.8	131.8

Table2 Dimensions of the Jig for Model LT

Unit: mm

Nominal shaft diameter	6	8	10	13	16	20	25	30	40	50	60	80	100
di	5.0	7	8.5	11.5	14.5	18.5	23	28	37.5	46.5	56	75.5	94.5

Installation of the Spline Shaft

When installing the spline shaft into the spline nut, identify the matching marks (Fig.4) on the spline shaft and the spline nut, and then insert the shaft straightforward while checking their relative positions.

Note that forcibly inserting the shaft may cause balls to fall off.

If the spline nut is attached with a seal or given a preload, apply a lubricant to the outer surface of the spline shaft.

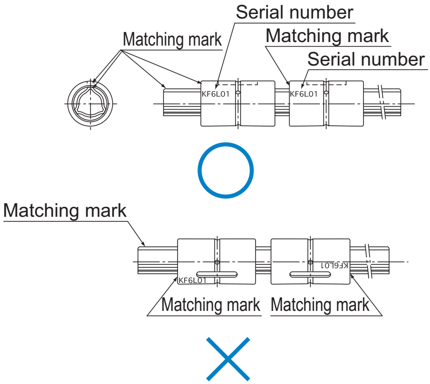


Fig.4

Lubrication

To prevent foreign material from entering the spline nut and the lubricant from leaking, special synthetic resin seals with high wear resistance are available for the Ball Spline.

Spline nuts with seals (seal for both ends type UU, and seal for one end) contain high-quality lithium-soap group grease No. 2. However, if using them at high speed or with a long stroke, replenish grease of the same type through the greasing hole on the spline nut after running in.

Afterward, replenish grease of the same type as necessary according to the service conditions.

The greasing interval differs depending on the conditions. Normally, replenish the lubricant (or replace the product) roughly every 100 km of travel distance (six months to one year) as a rule of thumb.

For a Ball Spline model type without a seal, apply grease to the interior of the spline nut or to the raceways of the spline shaft.

Material and Surface Treatment

Depending on the service environment, the Ball Spline requires anticorrosive treatment or a different material. For details of anticorrosive treatment and material change, contact THK.

Contamination Protection

Entrance of dust or other foreign material into the spline nut will cause abnormal wear or shorten the service life. Therefore, it is necessary to prevent detrimental foreign material from entering the Ball Spline. When entrance of dust or other foreign material is predicted, it is important to select an effective sealing device or dust-control device that meets the environment conditions.

For the Ball Spline, a special synthetic rubber seal that is highly resistant to wear is available as a contamination protection accessory. If desiring a higher contamination protection effect, a felt seal is also available for some types. For details about the felt seal, contact THK.

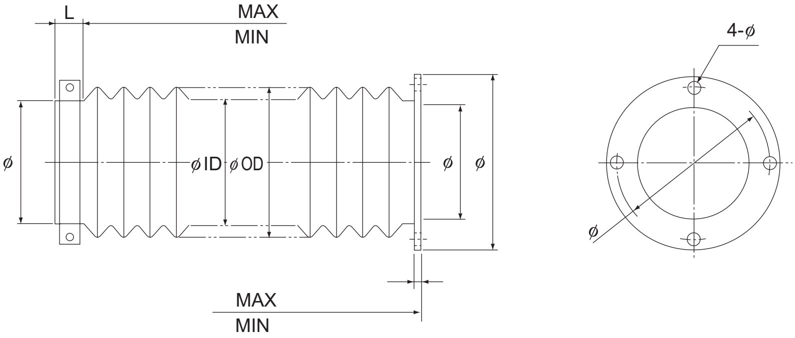
In addition, THK produces round bellows. Contact us for details.

Table1 Contamination protection accessory symbol

Symbol	Contamination protection accessory
No Symbol	Without seal
UU	Rubber seal attached on both ends of spline nut
U	Rubber seal attached on either end of spline nut
DD	Felt seal attached on both ends of spline nut
D	Felt seal attached on either end of spline nut
ZZ	Rubber seal attached on both ends of support bearings
Z	Rubber seal attached on either end of support bearings

Specifications of the Bellows

Bellows are available as a contamination protection accessory. Use this specification sheet.



(Band type) (Flange type)

Specifications of the Bellows

Supported Ball Screw models:

Dimensions of the Bellows

Stroke:( ) mm MAX:( ) mm MIN:( ) mm

Permissible outer diameter:(ϕOD) Desired inner diameter:(ϕID)

How It Is Used

Installation direction:(horizontal, vertical, slant) Speed: ( )mm/sec. min.

Motion:(reciprocation, vibration)

Conditions

Resistance to oil and water: (necessary, unnecessary) Oil name ( )

Chemical resistance: Name ( ) × ( ) %

Location: (indoor, outdoor)

Remarks:

Number of Units To Be Manufactured:

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Tilting a spline nut or spline shaft may cause them to fall by their own weight.
(3) Dropping or hitting the Ball Spline may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.
(2) Do not mix lubricants of different physical properties.
(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(4) When planning to use a special lubricant, contact THK before using it.
(5) When adopting oil lubrication, the lubricant may not be distributed throughout the product depending on the mounting orientation of the system. Contact THK for details.
(6) Lubrication interval varies according to the conditions. Contact THK for details.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
(2) Contact THK if you desire to use the product at a temperature of 80℃ or higher.
(3) When planning to use the product in an environment where the coolant penetrates the spline nut, it may cause trouble to product functions depending on the type of the coolant. Contact THK for details.
(4) If foreign material adheres to the product, replenish the lubricant after cleaning the product.
(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
(6) Do not remove the spline nut from the spline shaft unnecessarily. If you inevitably reassemble the product, check the relative positions of the spline nut and the spline shaft by identifying the matching marks on them. Be sure not to twist the spline nut and the spline shaft when inserting the shaft into the nut. Forcibly inserting it may cause balls to fall. For a type equipped with seals, apply a lubricant to the circumference of the shaft.
(7) When installing the spline shaft into the housing, do not hit the seal section or the stop ring section. Doing so may cause malfunction.
(8) Giving a shock to the product may cause a functional loss. Do not drop the product or hit it with a tool.
(9) Take care not to let the spline nut run on the incomplete spline section. Doing so may cause malfunction.

[Storage]

When storing the Ball Spline, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding high temperature, low temperature and high humidity. If the product is stored in an inappropriate position, the spline shaft could bend.

[Other]

If you have any trouble or question when handling the product, contact THK.

Spline Nut

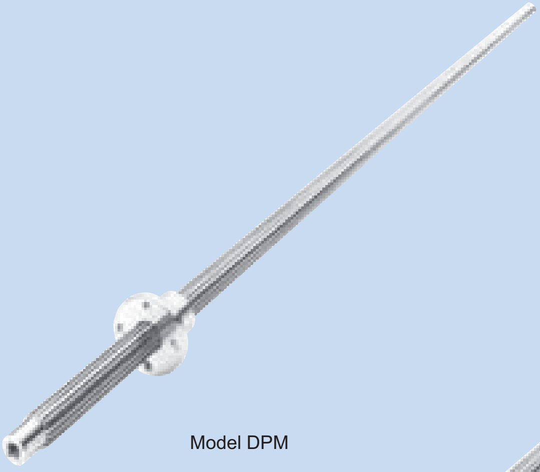
THK General Catalog

A Technical Descriptions of the Products

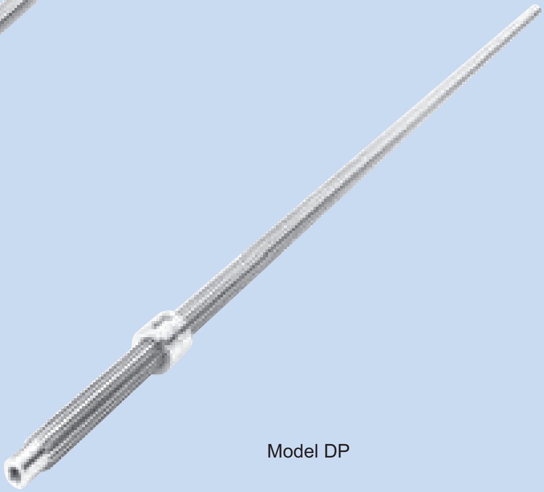
B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Spline Nut



Model DPM



Model DP

Structure and Features

Spline Nut models DPM and DP are low price bearings that are made of a special alloy (see A-515) formed by die casting and use highly accurate spline shafts as the core. Unlike conventional machined spline nuts, the sliding surface of these models maintains a chill layer formed in the rolling process, thus achieving high wear resistance.

The surface of the spline shafts to be used in combination with the nuts is hardened through rolling and is mirror-finished. Accordingly, smooth sliding motion is achieved.

The specially designed teeth of the spline have large contact areas, as well as concentricity, which enable the shaft to automatically establish the center as a torque is applied. Therefore, the teeth demonstrate stable performance in transmitting a torque.

Features of the Special Rolled Shafts

Dedicated rolled shafts with standardized lengths are available for the Spline Nut.

[Increased Wear Resistance]
The shaft teeth are formed by cold gear rolling, and the surface of the tooth surface is hardened to over 250 HV and mirror-finished. As a result, the shafts are highly wear resistant and achieve significantly smooth motion when used in combination with nuts.

[Improved Mechanical Properties]
Inside the teeth of the rolled shaft, a fiber flow occurs along the contour of the tooth surface of the shaft, making the structure around the teeth roots dense. As a result, the fatigue strength is increased.

[Additional Machining of the Shaft End Support]
Since each shaft is rolled, additional machining of the support bearing of the shaft end can easily be performed by lathing or milling.

High Strength Zinc Alloy

The high strength zinc alloy used in the spline nuts is a material that is highly resistant to seizure and wear and has a high load carrying capacity. Its composition, mechanical properties, physical properties and wear resistance are given below.

[Composition]

Table1 Composition of the High Strength Zinc Alloy

Unit: %

Item	Description
Aℓ	3 to 4
Cu	3 to 4
Mg	0.03 to 0.06
Be	0.02 to 0.06
Ti	0.04 to 0.12
Zn	Remaining portion

[Mechanical Properties]

Item	Description
Tensile strength	275 to 314 N/mm^2
Tensile yield strength (0.2%)	216 to 245 N/mm^2
Compressive strength	539 to 686 N/mm^2
Compressive yield strength (0.2%)	294 to 343 N/mm^2
Fatigue strength	132 $N/mm^2 \times 10^7$ (Schenk bending test)
Charpy impact	0.098 to 0.49 $N\text{-}m/mm^2$
Elongation	1 to 5 %
Hardness	120 to 145 HV

[Physical Properties]

Item	Description
Specific gravity	6.8
Specific heat	460 J/ (kg･K)
Melting point	390 ℃
Thermal expansion coefficient	24×10^{-6}

[Wear Resistance]

[Test conditions: Amsler wear-tester]

Item	Description
Test piece rotational speed	185 min^{-1}
Load	392 N
Lubricant	Dynamo oil

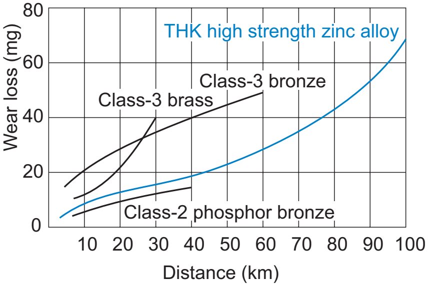


Fig.1 Wear Resistance of the High Strength Zinc Alloy

Clearance in the Rotation Direction

Clearance in the rotational direction: $\alpha \leqq 20'$ MAX

Selecting a Spline Nut

[Dynamic Permissible Torque T and Dynamic Permissible Thrust F]

The dynamic permissible torque (T) and the dynamic permissible thrust (F) are the torque and the thrust at which the contact surface pressure on the tooth surface of the bearing is 9.8 N/mm^2. These values are used as a measuring stick for the strength of the spline nut.

[pV Value]

With a sliding bearing, a pV value, which is the product of the contact surface pressure (p) and the sliding speed (V), is used as a measuring stick to judge whether the assumed model can be used. Use the corresponding pV value indicated in Fig.1 as a guide for selecting a spline nut. The pV value also varies according to the lubrication conditions.

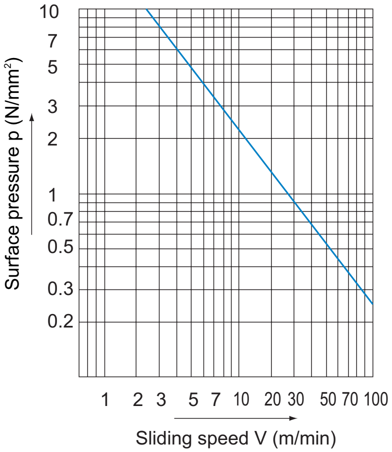


Fig.1 pV Value

● f_S: Safety Factor

To calculate a load applied to the spline nut, it is necessary to accurately obtain the effect of the inertia that changes with the weight and dynamic speed of an object. In general, with reciprocating or rotating machines, it is not easy to accurately obtain all the factors such as the effect of the start and stop, which are always repeated. Therefore, if the actual load cannot be obtained, it is necessary to select a bearing while taking into account the empirically obtained safety factors (f_S) shown in Table1.

Table1 Safety Factor (f_S)

Type of load	Lower limit of f_S
For a static load less frequently used	1 to 2
For an ordinary single-directional load	2 to 3
For a load accompanied by vibrations/impact	4 or greater

● f_T:Temperature Factor

If the temperature of the spline nut exceeds the normal temperature range, the seizure resistance of the nut and the strength of the material will decrease. Therefore, it is necessary to multiply the dynamic permissible torque (T) and the dynamic permissible thrust (F) by the corresponding temperature factor indicated in Fig.2.

Accordingly, when selecting a spline nut, the following equations need to be met in terms of its strength.

Dynamic permissible torque (T)

$$f_S \leqq \frac{f_T \cdot T}{P_T}$$

Static permissible thrust (F)

$$f_S \leqq \frac{f_T \cdot F}{P_F}$$

f_S : Static safety factor (see Table1 on A-517)
f_T : Temperature factor (see Fig.2)
T : Dynamic permissible torque (N-m)
P_T : Applied torque (N-m)
F : Dynamic permissible thrust (N)
P_F : Axial load (N)

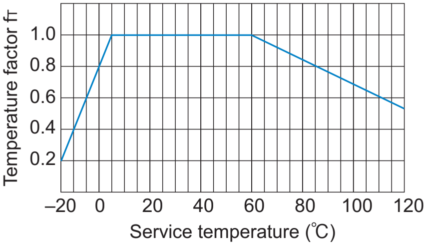


Fig.2 Temperature factor

● Hardness of the Surface and Wear Resistance

The hardness of the shaft significantly affects the wear resistance of the spline nut. If the hardness is equal to or less than 250 HV, the abrasion loss increases as indicated in Fig.3. The roughness of the surface should preferably be 0.80a or less.

A specially rolled shaft achieves surface hardness of 250 HV or greater, through hardening as a result of rolling, and a surface roughness of 0.20a or less. Thus, the dedicated rolled shaft is highly wear resistant.

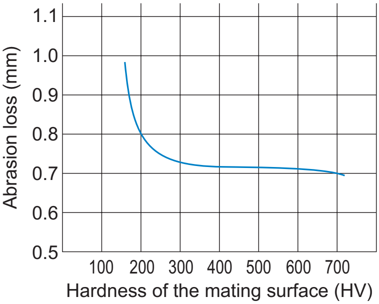


Fig.3 Hardness of the Surface and Wear Resistance

[Calculating the Contact Surface Pressure p]

$$p = \frac{P_T}{T} \times 9.8$$

p : Contact surface pressure on the tooth under a load torque (P_T) (N/mm^2)
T : Dynamic permissible torque (N-m)
P_T : Applied torque (N-m)

[Calculating the Sliding Speed]

With splines, the sliding speed of the tooth surface is equal to the feeding speed.

V : Sliding speed of the tooth (m/min)

[Example of calculation]

Use Spline Nut DPM and reciprocate it at a speed in the axial direction of 5 m/min while transmitting a load torque of 78 N-m. Since the applied torque is not consistent in direction, it is important to select a spline nut that can be used in locations accompanied by vibrations and impact.
First, select a nut that has a dynamic permissible torque (T) at which it can be used.

$$T \geqq \frac{f_S \cdot P_T}{f_T} = \frac{4 \times 78}{1} = 312\text{N} \cdot \text{m}$$

Safety factor (f_S) =4
Temperature factor (f_T) = 1
Applied torque (P_T) =78 N-m

Select Spline Nut model DPM3560 (dynamic permissible torque T = 443 N-m), which satisfies the dynamic permissible torque (T) above.
Obtain the pV value.
Obtain the contact surface pressure (p).

$$p = \frac{P_T}{T} \times 9.8 = \frac{78}{443} \times 9.8 \fallingdotseq 1.73\ \text{N/mm}^2$$

Obtain the sliding speed (V).

$$V = 5\text{m/min}$$

From the diagram of pV values (see Fig.1 on A-517), it is judged that there will be no abnormal wear if the sliding speed (V) is 13.5 m/min or below against the "p" value of 1.73 N/mm². Therefore, it is appropriate to select model DPM3560.

Fit

For the fitting between the spline nut circumference and the housing, we recommend loose fitting or tight fitting.

Housing inner-diameter tolerance: H8 or J8

Installation

[About Chamfer of the Housing's Mouth]

To increase the strength of the root of the flange of the spline nut, the corner is machined to have an R shape. Therefore, it is necessary to chamfer the inner edge of the housing's mouth.

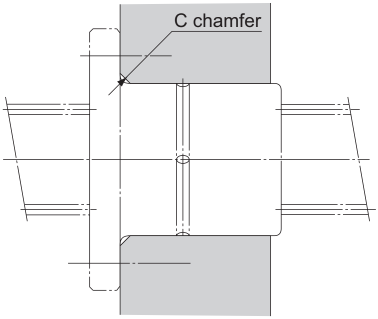


Fig.1

Table1 Chamfer of the Housing's Mouth

Unit: mm

Model No.	Chamfer of the mouth C (Min.)
DPM	
12	2
15	
17	
20	
25	2.5
30	
35	3
40	
45	
50	

Lubrication

Select a lubrication method according to the conditions of the spline nut.

[Oil Lubrication]

For the lubrication of the spline nut, oil lubrication is recommended. Specifically, oil-bath lubrication or drop lubrication is particularly effective. Oil-bath lubrication is the most appropriate method since it meets harsh conditions such as high speed, heavy load or external heat transmission, and it cools the spline nut. Drop lubrication suits low to medium speed and a light to medium load. Select a lubricant according to the conditions as indicated in Table2.

Table2 Selection of a Lubricant

Condition	Types of Lubricants
Low speed, high load, high temperature	High-viscosity sliding surface oil or turbine oil
Low speed, light load, low temperature	Low-viscosity sliding surface oil or turbine oil

[Grease Lubrication]

In low-speed feed, which occurs less frequently, the user can lubricate the slide system by manually applying grease to the shaft on a regular basis or using the greasing hole on the spline nut. We recommend using lithium-soap group grease No. 2.

Linear Bushing

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Linear Bushing

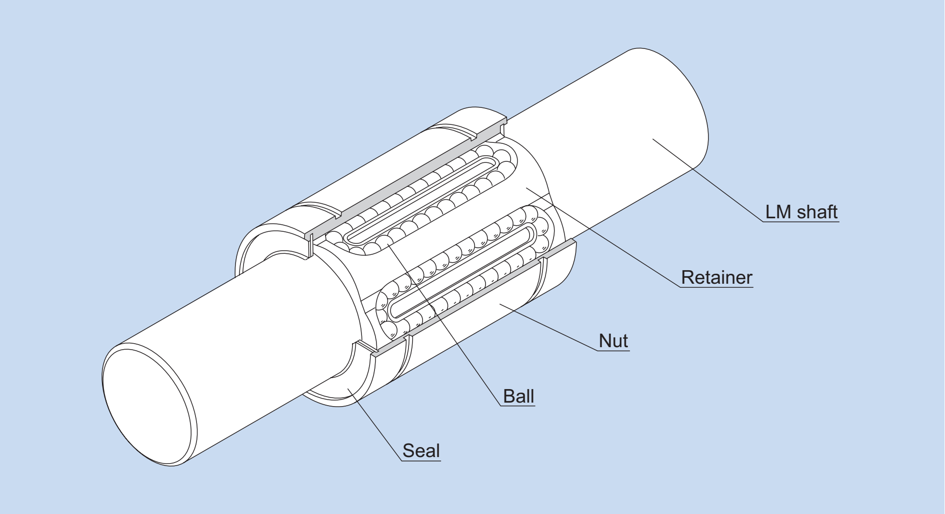


Fig.1 Structure of Linear Bushing Model LM···UU

Structure and Features

Linear Bushing model LM is a linear motion system used in combination with a cylindrical LM shaft to perform infinite straight motion. The balls in the loaded area of the nut are in point contact with the LM shaft. This allows straight motion with minimal friction resistance and achieves highly accurate and smooth motion despite the small permissible load.

The nut uses high-carbon chromium bearing steel and its outer and inner surfaces are ground after being heat-treated.

The Linear Bushing is used in a broad array of applications, such as slide units of precision equipment including OA equipment and peripherals, measuring instruments, automatic recorders and digital 3D measuring instruments, industrial machines including multi-spindle drilling machine, punching press, tool grinder, automatic gas cutting apparatus, printing machine, card selector and food packing machine.

[Interchangeability]
Since the dimensional tolerances of the Linear Bush's components are standardized, they are interchangeable. The LM shaft is machined through cylindrical grinding, which can easily be performed, and it allows highly accurate fitting clearance to be achieved.

[Highly Accurate Retainer Plate]
Since the retainer, which guides three to eight rows of balls, is integrally molded, it is capable of accurately guiding the balls in the traveling direction and achieving stable running accuracy.
Small-diameter types use integrally molded retainers made of synthetic resin. It reduces noise generated during operation and allows for superb lubrication.

[Wide Array of Types]
A wide array of types are available, such as standard type, clearance-adjustable type, open type, long type and flanged linear bushing, allowing the user to select a type that meets the intended use.

Dedicated Shafts for Model LM

The LM shaft of the Linear Bushing needs to be manufactured with much consideration for hardness, surface roughness and dimensional accuracy of the shaft since balls roll directly on it.
THK manufactures dedicated LM shafts for the Linear Bushing.

Standard LM Shafts

THK manufactures high quality, dedicated LM shafts for Linear Bushing model LM series.

Specially Machined Types

THK also supports special machining processes such as tapping, milling, threading, through hole and joggling, as shown in the Fig.2, at your request.

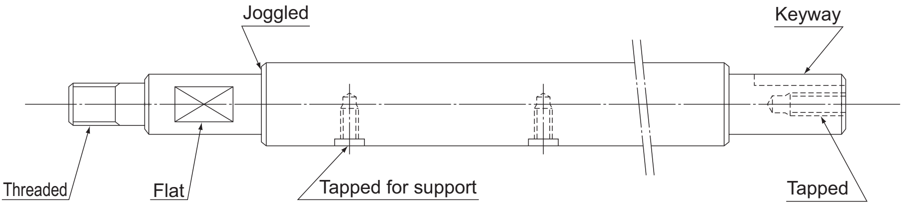


Fig.2

Table of Rows of Balls and Masses for Clearance-adjustable Types and Open Types of the Linear Bushing

Shaft diameter	Clearance-adjustable type			Open type		
	Model No.	Rows of balls	Mass g	Model No.	Rows of balls	Mass g
6	LM 6-AJ	4	7.8	—	—	—
8	LM 8S-AJ	4	10	—	—	—
	LM 8-AJ	4	14.7	—	—	—
10	LM 10-AJ	4	29	—	—	—
12	LM 12-AJ	4	31	LM 12-OP	3	25
13	LM 13-AJ	4	42	LM 13-OP	3	34
16	LM 16-AJ	5(4)	68	LM 16-OP	4(3)	52
20	LM 20-AJ	5	85	LM 20-OP	4	69
25	LM 25-AJ	6(5)	216	LM 25-OP	5(4)	188
30	LM 30-AJ	6	245	LM 30-OP	5	210
35	LM 35-AJ	6	384	LM 35-OP	5	350
38	LM 38-AJ	6	475	LM 38-OP	5	400
40	LM 40-AJ	6	579	LM 40-OP	5	500
50	LM 50-AJ	6	1560	LM 50-OP	5	1340
60	LM 60-AJ	6	1820	LM 60-OP	5	1650
80	LM 80-AJ	6	4320	LM 80-OP	5	3750
100	LM 100-AJ	6	8540	LM 100-OP	5	7200
120	LM 120-AJ	8	14900	LM 120-OP	6	11600

Note) The numbers of ball rows in the table apply to types using a resin retainer. Those of types using a metal retainer are indicated in parentheses.

Linear Bushing Types

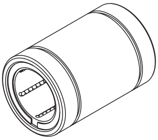
Types and Features

Standard Type

With the Linear Bushing nut having the most accurate cylindrical shape, this type is widely used.

There are two series of the Linear Bushing in dimensional group.

- Model LM
  Metric units series used most widely in Japan
- Model LM-MG
  Stainless steel version of type LM
- Model LME
  Metric units series commonly used in Europe



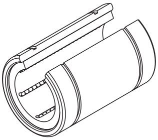
Standard Type

Open Type

The nut is partially cut open by one row of balls (50° to 80°). This enables the Linear Bushing to be used even in locations where the LM shaft is supported by a column or fulcrum. In addition, a clearance can easily be adjusted.

Models LM-OP/LME-OP

Model LM-MG-OP

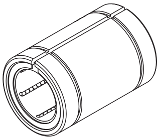


Open Type

Clearance-adjustable Type

This type has the same dimensions as the standard type, but the nut has a slit in the direction of the LM shaft. This allows the linear bushing to be installed in a housing whose inner diameter is adjustable, and enables the clearance between the LM shaft and the housing to easily be adjusted.

Models LM-AJ/LME-AJ
Model LM-MG-AJ

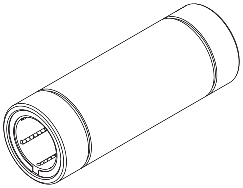


Clearance-adjustable Type

Long Type

Containing two units of the standard retainer plate, this type is optimal for locations where a moment load is present and reduces man-hours in installation.

Model LM-L············Standard type

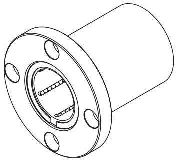


Long Type

Flanged Type (Round)

The nut of the standard type Linear Bushing is integrated with a flange. This enables the Linear Bushing to be directly mounted onto the housing with bolts, thus achieving easy installation.

Model LMF···············Standard type
Model LMF-M···········Made of stainless steel

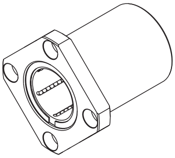


Flanged Type (Round)

Flanged Type (Square)

Like model LMF, this type also has a flange, but the flange is cut to a square shape. Since the height is lower than the circular flange type, compact design is allowed.

Model LMK··············Standard type
Model LMK-M···········Made of stainless steel

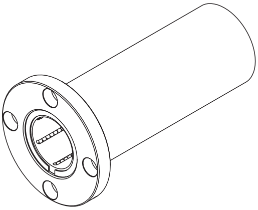


Flanged Type (Square)

Flanged Type (Round) - Long

The nut of the long type Linear Bushing is integrated with a flange. This enables the Linear Bushing to be directly mounted onto the housing with bolts, thus achieving easy installation. Containing two units of the standard retainer plate, this type is optimal for locations where a moment load is present.

Model LMF-L···········Standard type
Model LMF-ML·········Made of stainless steel

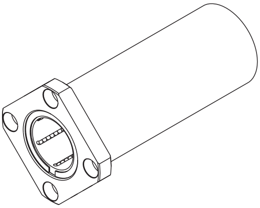


Flanged Type (Round) - Long

Flanged Type (Square) - Long

Like model LMF-L, this type also has a flange, but the flange is cut to a square shape. Since the height is lower than the circular flange type, compact design is allowed.

Model LMK-L···········Standard type
Model LMK-ML·········Made of stainless steel

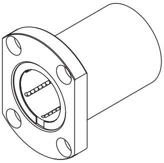


Flanged Type (Square) - Long

Flanged Type (Cut Flange)

The nut is integrated with a cut flange. Since the height is lower than model LMK, compact design is allowed. Since the rows of balls in the Linear Bushing are arranged so that two rows receive the load from the flat side, a long service life can be achieved.

Model LMH··············Standard type

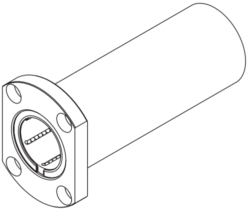


Flanged Type (Cut Flange)

Flanged Type (Cut Flange) - Long

The flange is a cut flange and lower than model LMK-L, allowing compact design. Containing two units of the standard retainer plate, this type is optimal for locations where a moment load is present. Since the rows of balls in the Linear Bushing are arranged so that two rows receive the load from the flat side, a long service life can be achieved.

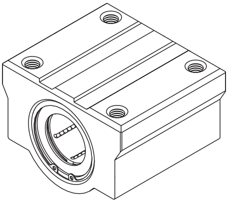
Model LMH-L············Standard type



Flanged Type (Cut Flange) - Long

Linear Bushing Model SC

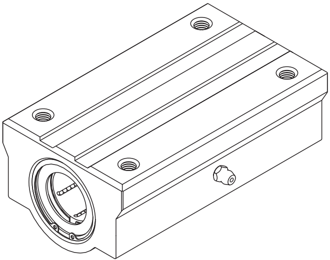
It is a case unit where the standard type of Linear Bushing is incorporated into a small, lightweight aluminum casing. This model can easily be mounted simply by securing it to the table with bolts.



Linear Bushing Model SC

Linear Bushing (Long) Model SL

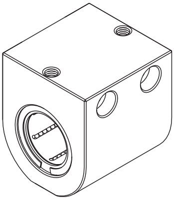
A long version of model SC, this model contains two units of the standard type Linear Bushing in an aluminum casing.



Linear Bushing (Long) Model SL

Linear Bushing Model SH

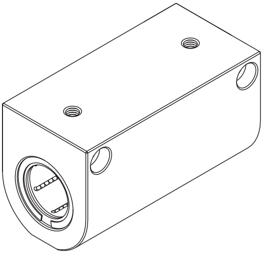
It is a case unit where the standard type of Linear Bushing is incorporated into a smaller and lighter aluminum casing than model SC. This model allows even more compact design than model SC. It also has flexibility in mounting orientation. Additionally, it is structured so that two rows of balls receive the load from the top of the casing, allowing a long service life to be achieved.



Linear Bushing Model SH

Linear Bushing (Long) Model SH-L

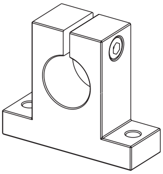
A long version of model SH, this model is a case unit that contains two units of the standard type Linear Bushing in an aluminum casing.



Linear Bushing (Long) Model SH-L

LM Shaft End Support Model SK

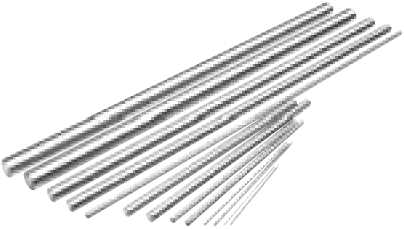
An aluminum-made light fulcrum for securing an LM shaft. The LM shaft mounting section has a slit, enabling the linear bushing to firmly secure an LM shaft using bolts.



LM Shaft End Support Model SK

Standard LM Shafts

THK manufactures high quality, dedicated LM shafts for Linear Bushing model LM series.



Standard LM Shafts

Build-to-order LM Shafts

THK also manufactures hollow LM shafts and specially machined shafts at your request.

Build-to-order LM Shafts

Classification Table

Linear Bushing

Flange Type

- **Circular Flange**
  - **Standard Type**
    - **Model LMF**
      - SUJ2
      - Resin
    - **Model LMF-M**
      - SUS
      - Resin
  - **Long Type**
    - **Model LMF-L**
      - SUJ2
      - Resin
    - **Model LMF-ML**
      - SUS
      - Resin
- **Square Flange**
  - **Standard Type**
    - **Model LMK**
      - SUJ2
      - Resin
    - **Model LMK-M**
      - SUS
      - Resin
  - **Long Type**
    - **Model LMK-L**
      - SUJ2
      - Resin
    - **Model LMK-ML**
      - SUS
      - Resin
- **Cut Flange**
  - **Standard Type**
    - **Model LMH**
      - SUJ2
      - Resin
  - **Long Type**
    - **Model LMH-L**
      - SUJ2
      - Resin

LM Shaft

- **Standard LM Shafts**
  - **Model SF**
- **Build-to-order LM Shafts**
- **LM Shaft End Support**
  - **Model SK**
    - SUJ2
    - Resin

Flange-less Type

Standard Type

Model LM
SUJ2
Resin

Model LME
SUJ2
Resin

Model LM-GA
SUJ2
Metal

Model LM-MG
SUS
Resin

Open Type

Model LM-OP
SUJ2
Resin

Model LME-OP
SUJ2
Resin

Model LM-MG-OP
SUS
Resin

Long Type

Model LM-L
SUJ2
Resin

Clearance-adjustable Type

Model LM-AJ
SUJ2
Resin

Model LME-AJ
SUJ2
Resin

Model LM-MG-AJ
SUS
Resin

Encased Type

Standard Type

Model SC
SUJ2
Resin

Model SH
SUJ2
Resin

Long Type

Model SL
SUJ2
Resin

Model SH-L
SUJ2
Resin

Type of Material

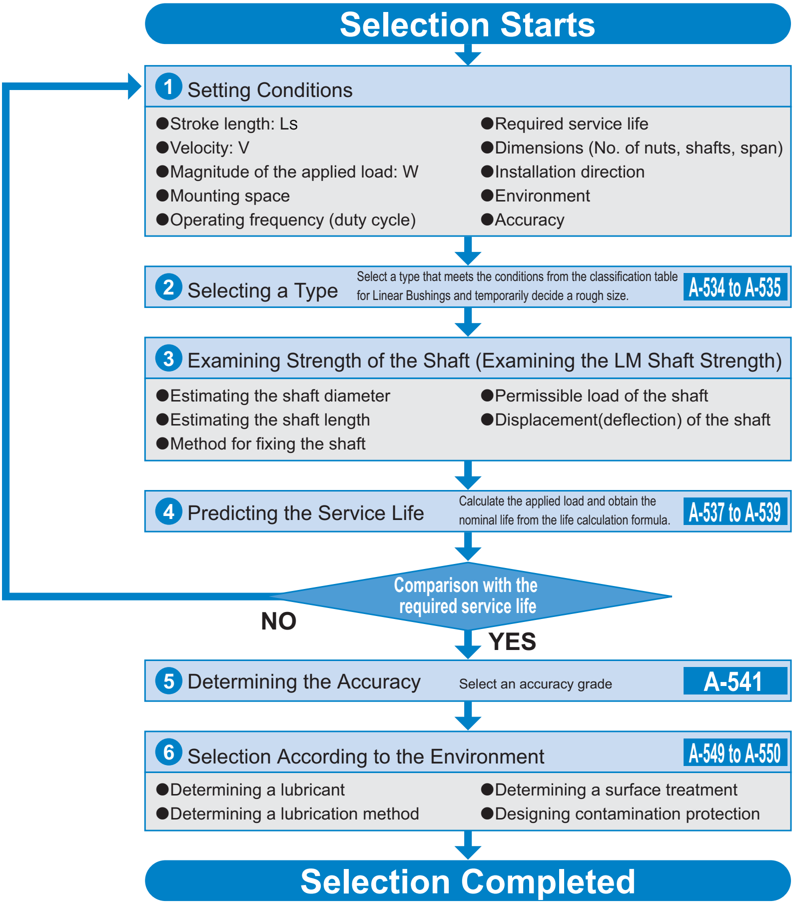
Model No.
Nut Material
Retainer Material

SUJ2 (High-carbon Chromium Bearing Steel)
SUS (Stainless Steel)

Flowchart for Selecting a Linear Bushing

Steps for Selecting a Linear Bushing

The following flowchart should be used as a guide for selecting a Linear Bushing.



Selection Starts

① Setting Conditions

- Stroke length: Ls
- Velocity: V
- Magnitude of the applied load: W
- Mounting space
- Operating frequency (duty cycle)
- Required service life
- Dimensions (No. of nuts, shafts, span)
- Installation direction
- Environment
- Accuracy

② Selecting a Type — Select a type that meets the conditions from the classification table for Linear Bushings and temporarily decide a rough size. **A-534 to A-535**

③ Examining Strength of the Shaft (Examining the LM Shaft Strength)

- Estimating the shaft diameter
- Estimating the shaft length
- Method for fixing the shaft
- Permissible load of the shaft
- Displacement(deflection) of the shaft

④ Predicting the Service Life — Calculate the applied load and obtain the nominal life from the life calculation formula. **A-537 to A-539**

Comparison with the required service life — NO (back to ①) / YES

⑤ Determining the Accuracy — Select an accuracy grade **A-541**

⑥ Selection According to the Environment **A-549 to A-550**

- Determining a lubricant
- Determining a lubrication method
- Determining a surface treatment
- Designging contamination protection

Selection Completed

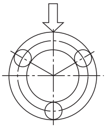
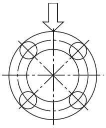
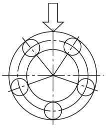
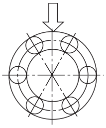
Rated Load and Nominal Life

[Load Rating]

The rated load of the Linear Bushing varies according to the position of balls in relation to the load direction. The basic load ratings indicated in the specification tables each indicate the value when one row of balls receiving a load are directly under the load.

If the Linear Bushing is mounted so that two rows of balls evenly receive the load in the load direction, the rated load changes as shown in table 1.

Table1

Rows of balls	Ball position	Load Rating
3 rows		1×C
4 rows		1.41×C
5 rows		1.46×C
6 rows		1.28×C

For specific values for "C" above, see the respective specification table.

[Calculating the Nominal Life]

The nominal life of the Linear Bushing is obtained using the following equation.

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C}\right)^3 \times 50$$

L : Nominal life (km)
C : Basic dynamic load rating (N)
P_C : Calculated load (N)
f_T : Temperature factor (see Fig.2 on A-539)
f_C : Contact factor (see Table2 on A-539)
f_W : Load factor (see Table3 on A-539)
f_H : Hardness factor (see Fig.1)

● When a Moment Load is Applied to a Single Nut or Two Nuts in Close Contact with Each Other

When a moment load is applied to a single nut or two nuts in close contact with each other, calculate the equivalent radial load at the time the moment is applied.

$$P_u = K \cdot M$$

P_u : Equivalent radial load (N)
(with a moment applied)
K : Equivalent factors
(see Table4 to Table6 on A-540)
M : Applied moment (N-mm)

However, "P_u" is assumed to be within the basic static load rating (C_0).

● When a Moment Load and a Radial Load are Simultaneously Applied

When a moment and a radial load are applied simultaneously, calculate the service life based on the sum of the radial load and the equivalent radial load.

■f_H: Hardness Factor

To maximize the load capacity of the Linear Bushing, the hardness of the raceways needs to be between 58 to 64 HRC.

If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).

Normally, f_H=1.0 since the Linear Bushing has sufficient hardness.

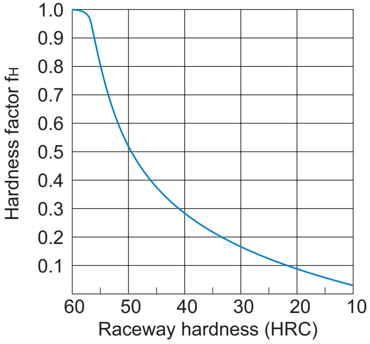


Fig.1 Hardness Factor (f_H)

■f_T:Temperature Factor

If the temperature of the environment surrounding the operating Linear Bushing exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.2.
Also note that the Linear Bushing itself must be of high temperature type.

Note) If the environment temperature exceeds 80 ℃, use a Linear Bushing type equipped with metal retainer plates.

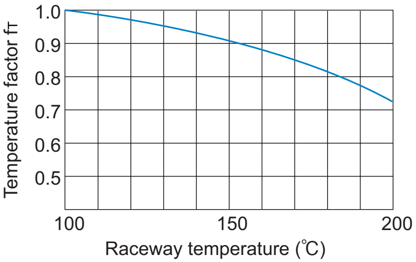


Fig.2 Temperature Factor (f_T)

■f_C: Contact Factor

When multiple nuts are used in close contact with each other, their linear motion is affected by moments and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C_0) by the corresponding contact factor in Table2.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in Table2.

Table2 Contact Factor (f_C)

Number of nuts in close contact with each other	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
Normal use	1

■f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop motion. Therefore, when loads applied on a Linear Bushing cannot be measured, or when speed and impact have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in Table3.

Table3 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^3}{2 \times \ell_s \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_s : Stroke length (m)
n_1 : Number of reciprocations per minute (min^{-1})

Table of Equivalent Factors

Table4 Equivalent Factors of Model LM

Model No.	Equivalent factor: K	
	Single nut	Double blocks
LM 3	1.566	0.26
LM 4	1.566	0.21
LM 5	1.253	0.178
LM 6	0.553	0.162
LM 8S	0.708	0.166
LM 8	0.442	0.128
LM 10	0.389	0.101
LM 12	0.389	0.097
LM 13	0.343	0.093
LM 16	0.279	0.084
LM 20	0.257	0.071
LM 25	0.163	0.054
LM 30	0.153	0.049
LM 35	0.143	0.045
LM 38	0.127	0.042
LM 40	0.117	0.04
LM 50	0.096	0.032
LM 60	0.093	0.028
LM 80	0.077	0.022
LM 100	0.065	0.017
LM 120	0.051	0.015

Note) Equivalent factors for models LMF, LMK, LMH and SC are the same as that for model LM.

Table5 Equivalent Factors of Model LM-L

Model No.	Equivalent factor: K
	Single nut
LM 3L	0.654
LM 4L	0.578
LM 5L	0.446
LM 6L	0.402
LM 8L	0.302
LM 10L	0.236
LM 12L	0.226
LM 13L	0.214
LM 16L	0.192
LM 20L	0.164
LM 25L	0.12
LM 30L	0.106
LM 35L	0.1
LM 40L	0.086
LM 50L	0.068
LM 60L	0.062

Note) Equivalent factors for models LMF-L, LMK-L and LMH-L are the same as that for model LM-L.

Table6 Equivalent Factors of Model LME

Model No.	Equivalent factor: K	
	Single nut	Double blocks
LME 5	0.669	0.123
LME 8	0.514	0.116
LME 12	0.389	0.09
LME 16	0.343	0.081
LME 20	0.291	0.063
LME 25	0.209	0.052
LME 30	0.167	0.045
LME 40	0.127	0.039
LME 50	0.105	0.031
LME 60	0.093	0.024
LME 80	0.077	0.018

Accuracy Standards

The accuracy of the Linear Bushing in inscribed bore diameter, outer diameter, width and eccentricity is described in the corresponding specification table. The accuracy of mode LM in inscribed bore diameter and eccentricity is classified into high accuracy grade (no symbol) and precision grade (P). (Accuracy symbol is expressed at the end of the model number.)

The accuracy of clearance-adjustable types (-AJ) and open types (-OP) in inscribed bore diameter and outer diameter indicates the value before division.

Assembling the Linear Bushing

[Inner Diameter of the Housing]

Table1 shows recommended housing inner-diameter tolerance for the Linear Bushing. When fitting the Linear Bushing with the housing, loose fit is normally recommended. If the clearance needs to be smaller, provide transition fit.

Table1 Housing Inner-diameter Tolerance

Type		Housing	
Model No.	Accuracy	Loose fit	Transition fit
LM	High accuracy grade (no symbol)	H7	J7
	Precision Grade (P)	H6	J6
LME	—	H7	K6, J6
LMF	High accuracy grade (no symbol)	H7	J7
LMK			
LMH			
LM-L			
LMF-L			
LMK-L			
LMH-L			

[Clearance between the Nut and the LM Shaft]

When using the Linear Bushing in combination with an LM shaft, use normal clearance in ordinary use and small gap if the clearance is to be minimized.

Note1) If the clearance after installation is to be negative, it is preferable not to exceed the radial clearance tolerance indicated in the specification table.
Note2) The shaft tolerance for Linear Bushing models SC, SL SH and SH-L falls under high accuracy grade (no symbol).

Table2 Shaft Outer-diameter Tolerance

Type		LM Shaft	
Model No.	Accuracy	Normal clearance	Small gap
LM	High accuracy grade (no symbol)	f6, g6	h6
	Precision Grade (P)	f5, g5	h5
LME	—	h7	k6
LMF	High accuracy grade (no symbol)	f6, g6	h6
LMK			
LMH			
LM-L			
LMF-L			
LMK-L			
LMH-L			

[Mounting the Nut]

Although the Linear Bushing does not require a large amount of strength for securing it in the axial direction, do not rely only on a press fit to support the nut. For the housing inner-diameter tolerance, see Table1 on A-542.

● Installing the Standard Type

Fig.1 and Fig.2 show examples of installing the standard type Linear Bushing.
When securing the Linear Bushing, use snap rings or stopper plates.

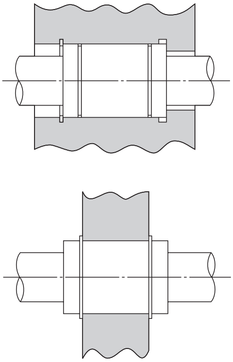


Fig.1 Snap Ring

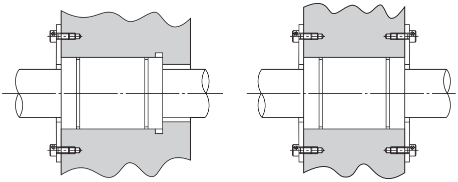


Fig.2 Stopper Plate

■Snap Ring for Installation

To secure Linear Bushing model LM, snap rings indicated in Table3 are available.

Note1) For models indicated with parentheses, use C-shape concentric snap rings.
Note2) The Table3 commonly applies to models LM, LM-GA, LM-MG and LM-L.

Table3 Types of Snap Rings

Model No.	Snap ring			
	For outer surface		For inner surface	
	Needle snap ring	C-shape snap ring	Needle snap ring	C-shape snap ring
LM 3	—	—	AR 7	—
LM 4	—	—	8	—
LM 5	WR 10	10	10	10
LM 6	12	12	12	12
LM 8	—	15	15	15
LM 8S	—	15	15	15
LM 10	19	19	19	19
LM 12	21	21	21	21
LM 13	23	22	23	—
LM 16	28	—	28	28
LM 20	32	—	32	32
LM 25	40	40	40	40
LM 30	45	45	45	45
LM 35	52	52	52	52
LM 38	—	56・58	57	—
LM 40	—	60	60	60
LM 50	—	80	80	80
LM 60	—	90	90	90
LM 80A	—	120	120	120
LM 100A	—	(150)	150	—
LM 120A	—	(180)	180	—

■Set Screws Not Allowed

Securing the nut by pressing the outer surface with one set screw as shown in Fig.3 will cause the nut to be deformed.

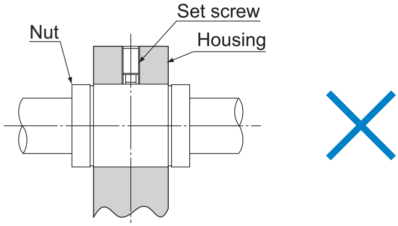
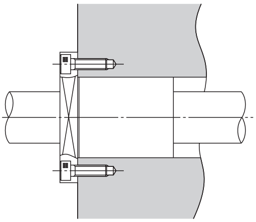


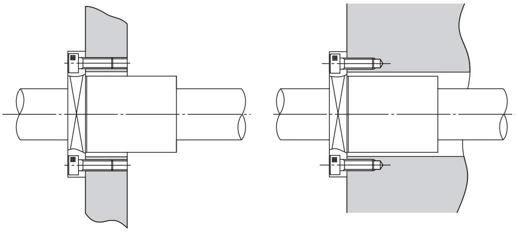
Fig.3

● Installing a Flanged Type

With models LMF, LMK and LMH, the nut is integrated with a flange. Therefore, the Linear Bushing can be mounted only via the flange.



Nut mounted via socket and spigot joint



Mounted via a flange only

● Installing a Clearance-adjustable Type

To adjust the clearance of a clearance-adjustable type (-AJ), use a housing that allows adjustment of the nut outer diameter so as to facilitate the adjustment of the clearance between the Linear Bushing and the LM shaft. Positioning the slit of the Linear Bushing at an angle of 90° with the housing's slit will provide uniform deformation in the circumferential direction. (See Fig.4.)

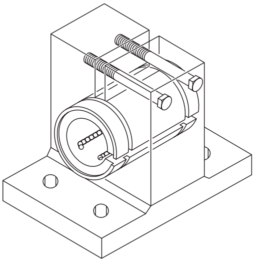


Fig.4

● Mounting an Open Type

For an open type (-OP), also use a housing that allows adjustment of the nut outer diameter as shown in Fig.5.

Open types are normally used with a light preload. Be sure not to give an excessive preload.

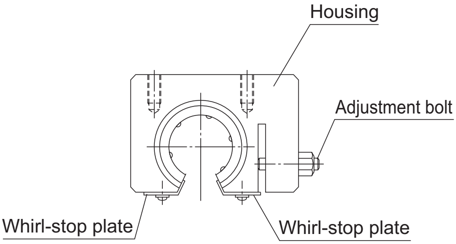
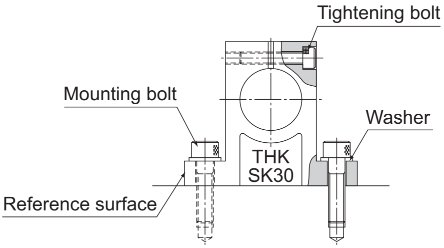


Fig.5

[Mounting the Shaft End Support]

Shaft end support model SK can easily be secured to the table using mounting bolts. Model SK enables the LM shaft to firmly be secured using tightening bolts.



[Installing an LM Case Unit]

● Attaching Model SC (SL)

Since models SC and SL can be attached from the top or bottom by simply tightening it using bolts, the installation time can be shortened. (See Fig.6.)

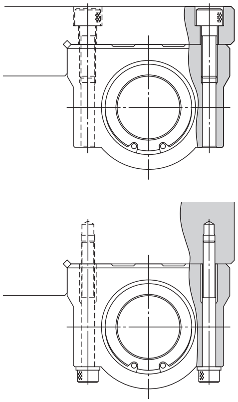
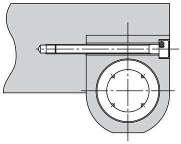


Fig.6

● Attaching Model SH (SH-L)

Since models SH and SH-L can be attached from the top or bottom by simply tightening it using bolts, the installation time can be shortened.(See Fig.7.)

Basic installation



Alternative installation

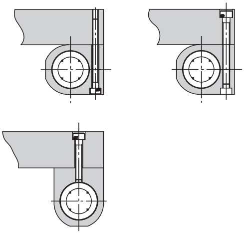
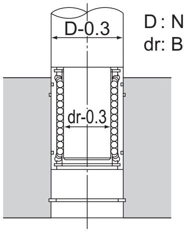


Fig.7

[Incorporating the Nut]

When incorporating the standard Linear Bushing into a housing, use a jig and drive in the nut, or use a flatter plate and gently hit the nut, instead of directly hitting the side plate or the seal. (See Fig.8.)



D : Nut outer diameter
dr: Bore diameter

Fig.8

[Inserting the LM Shaft]

When inserting the LM shaft into the Linear Bushing, align the center of the shaft with that of the nut and gently insert the shaft straightforward into the nut. If the shaft is slanted while it is inserted, balls may fall off or the retainer may be deformed. (See Fig.9.)

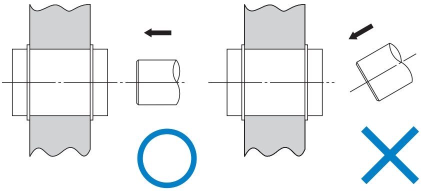


Fig.9

[When Under a Moment Load]

When using the Linear Bushing, make sure the load is evenly distributed on the whole ball raceway. In particular, if a moment load is applied, use two or more Linear Bushing units on the same LM shaft and secure an adequately large distance between the units.

If using the Linear Bushing under a moment load, also calculate the equivalent radial load and identify the correct model number. (See A-538.)

[Rotational Use Not Allowed]

The Linear Bushing is not suitable for rotational use for a structural reason. (See Fig.10.)

Forcibly rotating it may cause an unexpected accident.

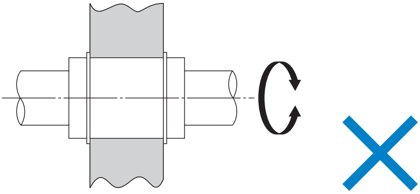


Fig.10

[Precautions on Installing an Open Three-ball-row Type Linear Bushing]

When installing an open three-ball-row type Linear Bushing, mount it while taking into account the load distribution as indicated in Fig.11.

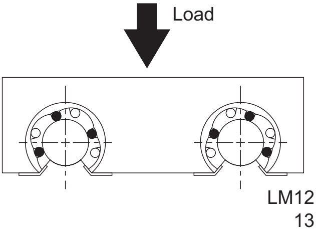


Fig.11

[Attaching Felt Seal Model FLM]

The felt seal can be press-fit into a housing finished to H7, but cannot be used as a stopper for preventing the Linear Bushing from coming off. Be sure to use the felt seal by attaching it as indicated in the Fig.12.

Also make sure to impregnate the felt with sufficient lubricant before attaching it.

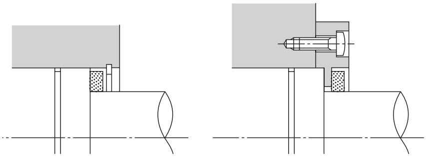


Fig.12

Lubrication

The Linear Bushing requires grease or oil as a lubricant for its operation.

[Grease Lubrication]

When installing a type attached with seals on both sides (···UU) to the LM shaft, apply grease to rows of balls in the Linear Bushing.

When installing standard types (without seal), perform the same as above or apply grease to the LM shaft.

Afterward, replenish grease of the same type as necessary according to the service conditions.

We recommend using high-quality lithium-soap group grease No. 2.

[Oil Lubrication]

Turbine oil, machine oil and spindle oil are commonly used as a lubricant.

When oiling the Linear Bushing, drop oil on the LM shaft, or infuse it from the greasing hole on the housing as shown in Fig.1.

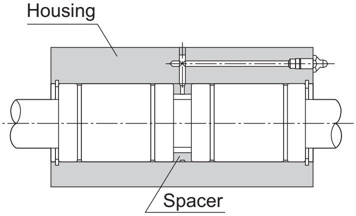


Fig.1

Material and Surface Treatment

For the Linear Bushing and the LM shaft, highly corrosion-resistant stainless steel types are available for some models.

Although the LM shaft can be surface treated, some types may not be suitable for the treatment. Contact THK for details.

Contamination Protection

Entrance of dust or other foreign material into the Linear Bushing will cause abnormal wear or shorten the service life. When nut contamination is expected, it is important to select an effective sealing device or dust-control device that meets the environment conditions.
For the Linear Bushing, a special synthetic rubber seal that is highly resistant to wear and a felt seal (highly dust preventive with low seal resistance) are available as contamination protection accessories.
In addition, THK produces round bellows. Contact us for details.

Felt Seal Model FLM

●For detailed dimensions, see B-461.

Linear Bushing model LM series include types equipped with a special synthetic rubber seal (LM⋯UU, U). If desiring to have an additional contamination protection measure, or desiring to lower the seal resistance, use the felt seal model FLM.

Precautions on Use

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Dropping or hitting the Linear Bushing may damage it. Giving an impact force to the bushing could also cause damage even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.

(2) Do not mix lubricants of different physical properties.

(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.

(4) When planning to use a special lubricant, contact THK before using it.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.

(2) Do not use the product at temperature of 80 ℃ or higher. Contact THK if you desire to use the product at a temperature of 80℃ or higher.

(3) Please be careful when using the product in an environment with excessive coolant. The coolant may cause premature failure if it penetrates the bushing nut. Contact THK for further details.

(4) If foreign material adheres to the product, replenish the lubricant after cleaning the product.

(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

[Storage]

When storing the Linear Bushing, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

LM Stroke

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

LM Stroke

Models ST, ST-B and STI

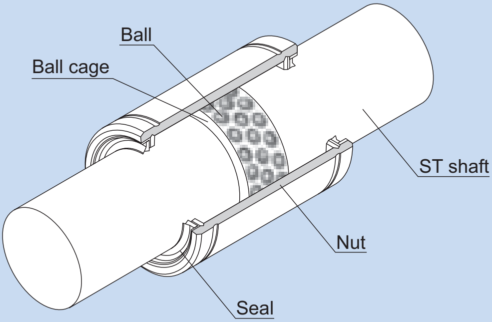


Fig.1 Structure of LM Stroke Model ST

Structure and Features

Model ST has a ball cage and balls both incorporated into a precision-ground cylindrical nut as shown in Fig.1. The balls are arranged in zigzags so as to evenly receive a load. The ball cage is a drilled cage made of a light alloy with high rigidity, and is capable of high-speed motion. A thrust ring and a snap ring are installed on both sides of the inner surface of the nut to prevent the ball cage from overshooting.

This structure allows rotational motion, reciprocal motion and complex motion with a small friction coefficient. Model ST has a stroke length up to twice the range within which the ball cage can travel.

Since high accuracy can be obtained at a low price, this model is used in a broad array of applications such as press die setting, ink roll unit of printing machine, workpiece chuck unit of punching press, press feeder, work head of electric discharge machine, wound roll corrector, spinning and weaving machine, distortion measuring equipment, spindle of optical measuring instrument, and photocopiers.

[Minimal Friction Coefficient]
The balls and the ball raceway are in point contact, which causes the smallest rolling loss, and the balls are individually retained in the ball cage. This allows the LM stroke to perform rolling motion at a minimal friction coefficient (μ=0.0006 to 0.0012).

[Compact Design]
Since it consists only of a thin nut and balls, the outer diameter of the bearing is minimized and a light, space-saving, compact design is achieved.

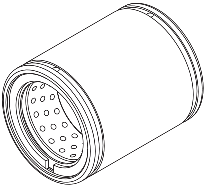
[High Accuracy at a Low Price]
A highly accurate slide unit can be produced at a low price.

Types and Features

Light Load Type Model ST

Specification Table⇒B-464

Model ST is a light load type that allows for a long stroke.
Shaft diameter:ϕ6 to ϕ100
In addition, a type attached with seal is available. Model ST-UU

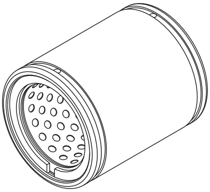


Model ST

Medium Load Type Model ST-B

Specification Table⇒B-464

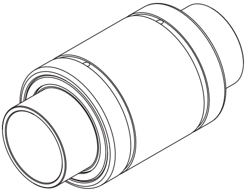
It has the same dimensions as model ST, but has a shorter stroke and achieves a rated load twice that of ST.
Shaft diameter:ϕ8 to ϕ100
In addition, a type attached with seal is available. Model ST-UUB



Model ST-B

Inner Ring Type Model STI

If the LM shaft cannot be hard quenched, STI allows an inner ring to be incorporated. The inner ring is available build-to-order.



Model STI

Rated Load and Nominal Life

[Load Rating]

The basic load ratings for model ST are indicated in the respective specification tables.

[Nominal Life]

The nominal life of model ST is obtained using the following equation.

$$L = \left(\frac{f_H \cdot f_T \cdot f_C}{f_W} \cdot \frac{C}{P_C} \right)^3$$

L : Nominal life (rotating 10^6 times)
(The total number of revolutions that 90% of a group of identical LM strokes independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (kN)
P_C : Calculated radial load (kN)
f_H : Hardness factor (see Fig.2 on A-557)
f_T : Temperature factor (see Fig.3 on A-557)
f_C : Contact factor (see Table1 on A-558)
f_W : Load factor (see Table2 on A-558)

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the number of revolutions per minute and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

- **For Rotating Motion or Complex Motion**

$$L_h = \frac{10^6 \times L}{60 \sqrt{(dm \cdot n)^2 + (10 \times \alpha \cdot \ell_s \cdot n_1)^2 / dm}}$$

- **For Reciprocating Motion**

$$L_h = \frac{10^6 \times L}{60 \times 10 \times \alpha \cdot \ell_s \cdot n_1 / (\pi \cdot dm)}$$

L_h : Service life time (h)
n : Revolutions per minute (min^{-1})
n_1 : Number of reciprocations per minute (min^{-1})
ℓ_s : Stroke length (mm)
dm : Pitch circle diameter (mm)
(dm≒1.15×dr)
dr : Ball inscribed bore diameter (mm)
α : Factor for cage material
(α=0.7)

[Tolerance Value in Rotation and Reciprocating Speed]

The permissible speed limit of model ST is obtained using the following equation.

$$DN \geqq dm \cdot n + 10 \times \ell_s \cdot n_1$$

For the DN value above, the following value applies as a standard value.

For oil lubrication	DN=600000
For grease lubrication	DN=300000

However, the following points must be taken into account.

$n_1 \leqq 5000$

$\ell_s \cdot n_1 \leqq 50000$

● f_H: Hardness Factor

To maximize the load capacity of model ST, the hardness of the raceways needs to be between 58 to 64 HRC.

If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).

Normally, f_H=1.0 since model ST has sufficient hardness.

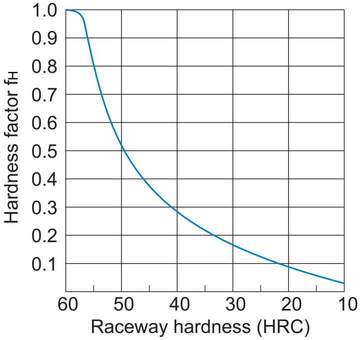


Fig.2 Hardness Factor (f_H)

● f_T: Temperature Factor

If the temperature of the environment surrounding the operating model ST exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.3.

Note) If the environment temperature exceeds 80℃, contact THK.

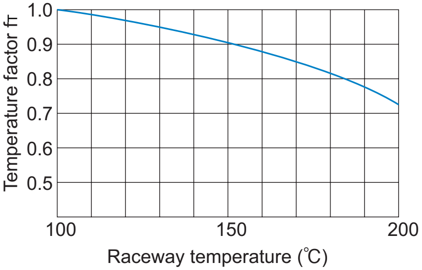


Fig.3 Temperature Factor (f_T)

- **f_c: Contact Factor**

When multiple nuts of model ST are used in close contact with each other, their linear motion is affected by moments and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C_0) by the corresponding contact factor in Table1.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in table 1.

Table1 Contact Factor (f_c)

Number of nuts in close contact with each other	Contact factor f_c
2	0.81
3	0.72
4	0.66
5	0.61
Normal use	1

- **f_w: Load Factor**

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when speed and vibrations have a significant influence, divide the basic dynamic load rating (C or C_0), by the corresponding load factor in Table2 of empirically obtained data.

Table2 Load Factor (f_w)

Vibrations/ impact	Speed(V)	f_w
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

Accuracy Standards

The tolerance value in inscribed bore diameter (dr), nut outer diameter (D) and nut length (L) is indicated in the corresponding specification table.

The end of the nut may be deformed due to tension of the snap ring. Therefore, when measuring the nut outer diameter, it is necessary to calculate the measurement range using the following equation, and obtain the average diameter value within the range.

The tolerance value in the nut outer diameter is equal to the calculated average value of the maximum diameter and the minimum diameter obtained through two-point measurement of the outer diameter.

$$W = 4 + \frac{L}{8}$$

W : Length out of the measurement range (mm)

L : Nut length (mm)

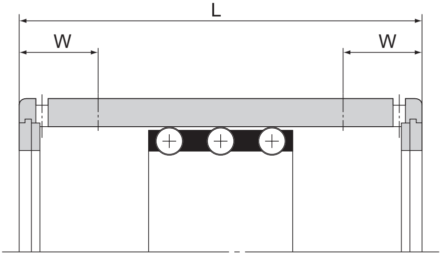


Fig.4 Measurement Range of the Nut

Fit

In theory, the ball cage of model ST moves in the same direction as the ST shaft by 1/2 of the shaft (or nut). However, to minimize the travel distance error caused by uneven load distribution or vibrations, it is necessary to reduce the clearance. If high accuracy is required or if the LM Stroke is used on a vertical shaft, we recommend setting the radial clearance between 0 and 10 µm.

Item	Normal conditions	Vertical shaft or high accuracy
ST shaft	k5, m5	n5, p5
Housing	H6, H7	J6, J7

ST Shaft

With the ST shaft, used in model ST, balls roll directly on the shaft surface. Therefore, it is necessary to pay much attention to the hardness, surface roughness and dimensional accuracy when manufacturing it.
Since the hardness of the ST shaft has especially large impact on the service life, use much care in selecting a material and heat treatment method.
THK also manufactures high-quality ST shafts. Contact us for details.

[Material]

Generally, the following materials are used as suitable for surface hardening through induction-hardening.

- SUJ2 (JIS G 4805: high-carbon chromium bearing steel)
- SK3 to 6 (JIS G 4401: carbon tool steel)
- S55C (JIS G 4051: carbon steel for machine structural use)

[Hardness]

We recommend surface hardness of 58 HRC (≒653 HV) or higher. The depth of the hardened layer is determined by the shaft diameter; we recommend approximately 2 mm for general use.
The ST shaft can have a hardened inner ring attached on the shaft raceway.

[Surface Roughness]

To achieve smooth motion, the surface is normally finished to 0.40a or less. If higher wear resistance is required, finish the surface to 0.20a or less.

Installation of the ST Shaft

To install the ST shaft, drive it in to the designated depth. If the clearance is negative, a large driving force is required. However, do not forcibly hammer the shaft. Instead, apply a lubricant on the ST shaft first, and then gradually drive it in with a slight back action.

Miniature Stroke

Model MST

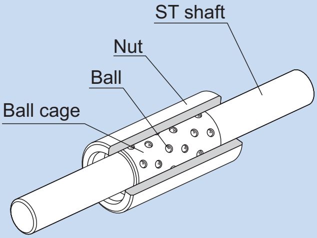


Fig.1 Structure of Miniature Stroke Model MST

Structure and Features

Model MST consists of an ST shaft, ball cage and nut. These components can freely be combined according to the application. The sectional shape is small, the clearance is minimal and the motion is extremely light and smooth. Accordingly, model MST can be used in a variety of small, precision measuring equipment such as optic measuring instrument's spindle, pen plotter, OA equipment, computer terminals, automatic scale, digital length measuring machine and solenoid valve.

[Highly Accurate Bearing]

Precision steel balls (sphericity in mutual difference: 0.0003 mm) compliant with JIS B 1501 are incorporated in a copper alloy ball cage to ensure high accuracy. The ball cage serves to prevent the balls from falling off with a unique ball-retaining design.

[Highly Durable Bearing]

The nut of the ST shaft uses a selected material, and is heat-treated and ground. In addition, the raceways are finished with ultra fine finish. The rows of balls are densely arranged in the ball cage, and the balls are placed so that the ball raceways do not overlap with each other. It enables this model to be used over a long period without wear and to demonstrate high durability.

[Compact Bearing]

Use of a combination of balls with a 1 mm diameter and a thin nut allows a small sectional shape and space-saving design.

[Bearing with Extremely Low Frictional Resistance]

Since the balls are in point-contact with the raceways, rolling loss is minimal and rolling motion with low-friction is achieved.

Fit

The inner surface of the housing must be finished to H6 to H7, and secured with an adhesive after the nut is inserted.

When press fitting is required, mounting the nut to the hole will reduce the inner diameter. Therefore, be sure to check the inner diameter after press fitting the nut and adjust the shaft diameter so that a correct preload is achieved. Also make sure that the preload must not exceed -2μm.

Travel Distance of the Ball Cage

The ball cage can travel up to 1/2 of the stroke length (ℓ_s) of the nut or the ST shaft in the same direction.

Die-setting Ball Cage

Models KS and BS

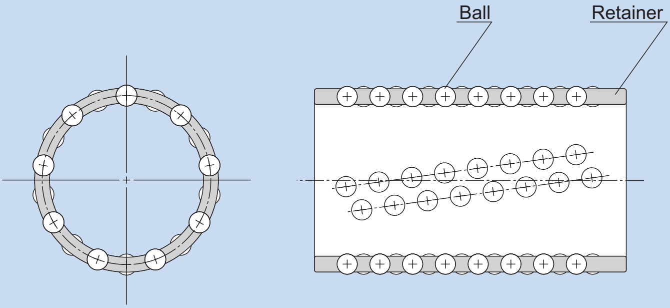


Fig.1 Structure of Die-setting Ball Cage Model KS

Structure and Features

With models KS and BS, a large number of precision steel balls (sphericity in mutual difference: 0.0005 mm) compliant with JIS B 1501 are incorporated in a lightweight, highly rigid ball cage. The balls are arranged along the circumference of the ball cage in spirals so that the ball raceways do not overlap with each other. It enables these models to be used over a long period without wear and to demonstrate high durability.

In addition, the ball pockets, which hold the balls, are finished with precision and continuously caulked with a unique process, enabling them to prevent the balls from falling. It allows the system to travel smoothly even if the ball cage is longer than the housing.

These ball cages are used in precision press die set, spinning and weaving machine, precision measuring instrument, automatic recorder, medical equipment and various machine tools.

Rated Load and Service Life

The rated loads of models KS and BS are indicated in the respective specification tables. Their service lives are obtained using the service life equation for LM Stroke model ST on A-556.

Fit

When using the Die-setting Ball Cage in the guide unit of the guide post of a precision press die set, normally select a negative clearance in order to increase the accuracy and the ball cage rigidity. Table1 shows typical fitting between the hole and the shaft. Select a combination of a hole and a shaft so that the clearance does not exceed the tolerance value of the radial clearance indicated in the specification table.

Table1 Fitting between Holes and Shaft

Tolerance in hole dimensions: D	K5
Dimensional tolerance of the shaft: d	h5

Installation of the Ball Cage

Fig.2 shows examples of mounting the Die-setting Ball Cage.

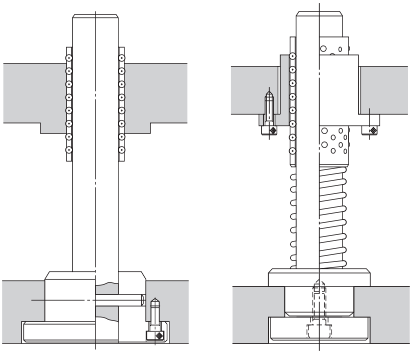


Fig.2 Example of Installation

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Dropping or hitting the LM Stroke may damage it. Giving an impact force to the product could also cause damage even if the product looks intact.

[Lubrication]

(1) LM Stroke model ST can use either oil or grease as a lubricant. Select either lubricant according to the DN value. When using grease, we recommend high-quality lithium-soap group grease No. 2.
(2) Thoroughly remove anti-rust oil and feed lubricant before using the product.
(3) Do not mix lubricants of different physical properties.
(4) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(5) When planning to use a special lubricant, contact THK before using it.

[Precautions on Use]

(1) Entrance of foreign material into LM Stroke model ST may cause abnormal wear or shorten the service life. When entrance of foreign material is predicted, it is important to select an effective sealing device or dust-control device that meets the environment conditions. For LM Stroke model ST, a special synthetic rubber seal (ST···UU) that is highly resistant to wear and a felt seal with high contamination protection effect and low seal resistance (ST···DD) are available for some types as contamination protection accessories.
(2) If foreign material adheres to the product, replenish the lubricant after cleaning the product.
(3) Contact THK if you desire to use the product at a temperature of 80℃ or higher.
(4) Please be careful when using the product in an environment with excessive coolant. The coolant may cause premature failure if it penetrates the bushing nut. Contact THK for further details.
(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

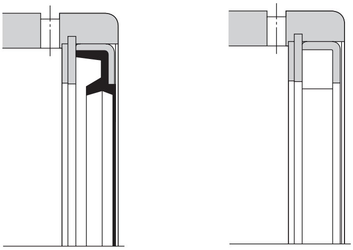

Rubber seal (standard)
Felt seal (designated)

Fig.1 Types of the Seal for the LM Stroke

[Storage]

When storing the LM Stroke, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Precision Linear Pack

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Precision Linear Pack

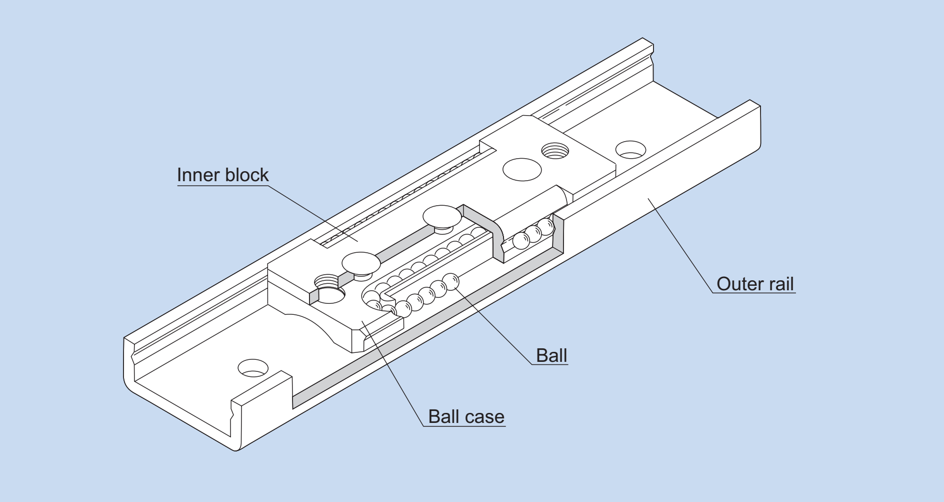


Fig.1 Structure of Precision Linear Pack Model ER

Structure and Features

Model ER is a slide unit using a stainless steel plate that is precision formed, heat-treated and then ground. It has a structure where balls roll between the V-shaped grooves machined on the outer rail and the inner block to allow the system to slide. It is an ultra-thin, lightweight unit in which the balls circulate in a ball case incorporated in the inner block to perform infinite straight motion.
This model is used in extensive applications such as magnetic disc devices, electronic equipment, semiconductor manufacturing equipment, medical equipment, measuring equipment, plotting machines and photocopiers.

[Reduced Design and Assembly Costs]

It provides a highly accurate linear guide system with lower design cost and fewer assembly man-hours than the conventional miniature ball bearings used in precision machines and other equipment.

[Maintains Long-term Stability]

It is a ball-circulating type slide unit with an extremely small friction coefficient. This slide unit maintains stable performance over a long period of time.

[Lightweight, Compact Design and High-speed Response]

The outer rail and the inner block are composed of very thin stainless steel plates.
Since the linear pack is light, it has a small inertial moment and demonstrates superb high-speed response.

Rated Load and Nominal Life

[Rated Loads in All Directions]

The basic load rating in the specification table indicates the rated load in the radial direction as shown in Fig.2. The rated loads in the reverse radial and lateral directions are obtained from Table1 below.

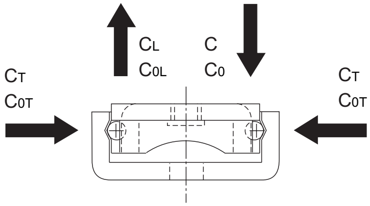


Fig.2 Rated Loads in All Directions

Table1 Rated Loads in All Directions

	Basic dynamic load rating	Basic static load rating
Radial direction	C (indicated in the specification table)	C_0 (indicated in the specification table)
Reverse radial direction	$C_L=C$	$C_{0L}=C_0$
Lateral directions	$C_T=1.47C$	$C_{0T}=1.73C_0$

[Static Safety Factor f_S]

Model ER may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{f_C \cdot C_0}{P_C}$$

f_S : Static safety factor (see Table2)
f_C : Contact factor (see Table3 on A-568)
C_0 : Basic static load rating (N)
P_C : Calculated load (N)

● Reference Value of Static Safety Factor

The static safety factors indicated in Table2 are the lower limits of reference values in the respective conditions.

Table2 Reference Value of Static Safety Factors (f_S)

Machine using the LM system	Condition	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 7

[Nominal Life]

The nominal life of model ER is obtained using the following equation.

$$L = \left(\frac{f_C}{f_W} \cdot \frac{C}{P_C}\right)^3 \times 50$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical ER units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (N)
P_C : Calculated load (N)
f_C : Contact factor (see Table3)
f_W : Load factor (see Table4 on A-569)

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

● f_C: Contact Factor

When multiple inner blocks are used in close contact with each other, their linear motion is affected by a moment load and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C_0) by the corresponding contact factor in Table3.

Table3 Contact Factor (f_C)

Number of inner blocks in close contact with each other	Contact factor f_C
2	0.81
3	0.72
Normal use 1	1

- **f_w: Load Factor**

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when the actual load applied on model ER cannot be obtained, or when speed and vibrations have a significant influence, divide the basic dynamic load rating (C) by the corresponding load factor in Table4 of empirically obtained data.

Table4 Load Factor (f_w)

Vibrations/ impact	Speed(V)	f_w
Faint	Very low V≦0.25m/s	1 to 1.2
Weak	Slow 0.25<V≦1m/s	1.2 to 1.5

Accuracy Standards

The running straightness of model ER is indicated in Table5. (See Fig.3.)

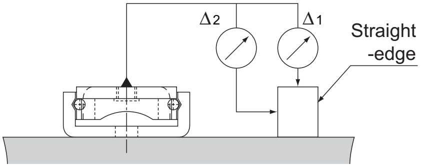


Fig.3 Method for Measuring Running Straightness

Table5 Running Straightness Unit: mm

Stroke length		Running straightness of inner block in vertical directions Δ1	Running straightness of inner block in horizontal directions Δ2
Above	Or less		
—	20	0.002	0.004
20	40	0.003	0.006
40	60	0.004	0.008
60	80	0.005	0.010
80	100	0.006	0.012
100	120	0.008	0.016

Radial Clearance

The radial clearance of model ER means the value for the motion of the central part of the inner block when the inner block is slightly moved with a vertically constant force in the middle of the outer rail in the longitudinal direction. The negative values in table 6 indicate that the respective models are provided with a preload when assembled and have no clearance between their inner blocks and the outer rails.

Table6 Radial Clearance Unit: µm

Model No.	Radial clearance	
	Normal	C1
ER 513	±2	−2 to 0
ER 616	±2	−3 to 0
ER 920	±2	−4 to 0
ER 1025	±3	−6 to 0

Note) When desiring normal clearance, add no symbol; when desiring C1 clearance, indicate "C1" in the model number.
(see "Model number coding" on B-476)

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Dropping or hitting the Precision Linear Pack may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

(3) Removing the inner block of the Precision Linear Pack from the outer rail or letting it overshoot will cause balls to fall off.

[Lubrication]

(1) Thoroughly remove anti-rust oil with a cleaning detergent and apply lubricant before using the product. As the most suitable grease, we recommend THK AFC Grease, which maintains lubricity over a long period of time. For lubrication in a clean room, low dust generation THK AFE-CA Grease and THK AFF Grease are recommended.

(2) Do not mix lubricants of different physical properties.

(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.

(4) When planning to use a special lubricant, contact THK before using it.

[Installation]

The mounting surface of Precision Linear Pack model ER must be finished to the maximum accuracy.

For securing the outer rail of models ER513 and ER613, also purchase and use No. 0 screws for precision equipment (see Table1). (If using ordinary screws, the inner block may hit the screw head.)

Table1 Outer Rail Fixing Screws for Models ER513 and ER616

Model No.	Type	Nominal name of screw × pitch
ER 513	No. 0 pan-head screw (class 1)	M2×0.4
ER 616		M2.6×0.45

Japan Camera Industry Association Standard JCIS 10-70
Cross-recessed screw for precision equipment (No. 0 screw)

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.

(2) If foreign material such as dust of cutting chips adheres to the product, replenish the lubricant after cleaning the product with pure white kerosene.

(3) Contact THK if you desire to use the product at a temperature of 80℃ or higher.

(4) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

[Storage]

When storing the Precision Linear Pack, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Cross Roller Guide/Ball Guide

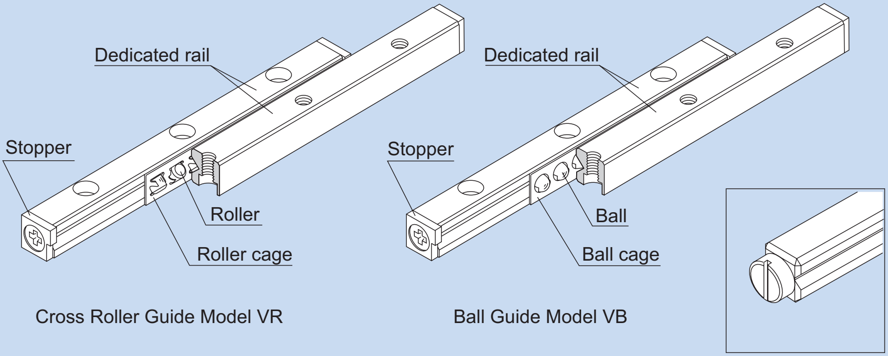
THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Cross Roller Guide/Ball Guide



Cross Roller Guide Model VR

Ball Guide Model VB

Stoppers of models V1 to V4 have round shapes.

Fig.1 Structure of Cross Roller Guide Model VR and Ball Guide Model VB

Structure and Features

In model VR, precision rollers are orthogonally aligned one after another in a roller cage that is combined with a dedicated rail having a raceway cut into a V-shape groove. When two units of the Cross Roller Guide are mounted in parallel, the guide system is capable of receiving loads in the four directions. In addition, since the Cross Roller Guide can be given a preload, a clearance-free, highly rigid and smooth slide mechanism is achieved.

Model VB is a low-friction, high-accuracy, finite LM system consisting of precision steel balls, arranged in short pitches in a ball cage model B, and a dedicated rail model V.

The Cross Roller Guide and the Ball Guide are used in the slide unit of various devices such as OA equipment and its peripherals, measuring instruments, precision equipment including a printed circuit board drilling machine, optic measuring machines, optic stages, handling mechanisms and X-Ray machines.

[Long Service Life, High Rigidity]

With a unique roller retaining mechanism, the effective contact length of the rollers is 1.7 times greater than the conventional type. Furthermore, the roller pitch interval is short and a sufficient number of rollers are installed, thus increasing the rigidity by two and the service life by six times greater than the conventional type. As a result, a safety-oriented design against vibrations and impact, which commonly occur in ordinary straight motion mechanisms, can be achieved.

[Smooth Motion]

With model VR, the rollers are individually held in a cage and roller pockets formed on the cage are in surface contact with the rollers to increase grease retention. Thus, smooth motion with little wear and friction is achieved.

[Highly Corrosion Resistant]

Model VR series and model VB series both include types made of stainless steel, which is highly corrosion resistant.

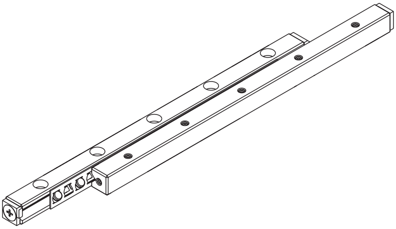
Types of the Cross Roller Guide/Ball Guide

Types and Features

Cross Roller Guide Model VR

Specification Table⇒B-480

A compact, highly rigid LM system whose roller cage holding precision rollers orthogonally aligned one after another travels by half the stroke on a V-shaped groove formed on a rail.

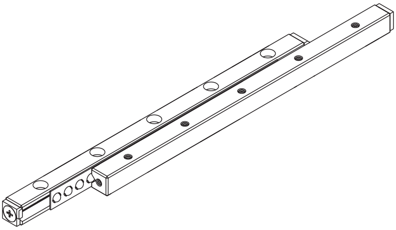


Model VR

Ball Guide Model VB

Specification Table⇒B-498

A low-friction, highly accurate LM system whose ball cage holding precision balls in short pitches travels by half the stroke on a V-shaped groove formed on a rail.



Model VB

Rated Load and Nominal Life

[Rated Loads in All Directions]

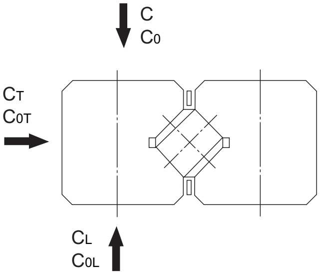
The basic load ratings (C_z and C_{0z}) in the specification table indicate the values per rolling element in the directions shown in Fig.1. When obtaining the nominal life, calculate the basic load ratings (C and C_0) of the actually used rolling elements from the equation below.

- **For Model VR**

$$C = C_L = \left(\frac{Z}{2}\right)^{\frac{3}{4}} \times C_z, \quad C_T = 2C$$

$$C_0 = C_{0L} = \frac{Z}{2} \times C_{0z}, \quad C_{0T} = 2C_0$$

(For $\frac{Z}{2}$, truncate the decimals.)

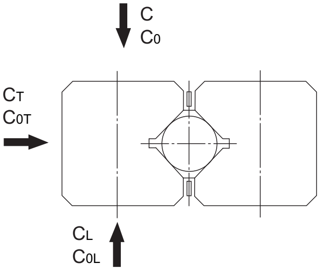


Model VR

- **For Model VB**

$$C = C_L = Z^{\frac{2}{3}} \times C_z, \quad C_T = 2C$$

$$C_0 = C_{0L} = Z \times C_{0z}, \quad C_{0T} = 2C_0$$



Model VB

Fig.1

C : Basic dynamic load rating (kN)
C_0 : Basic static load rating (kN)
C_z : Basic dynamic load rating in the specification table (kN)
C_{0z} : Basic static load rating in the specification table (kN)
Z : Number of rolling elements used (number of rolling elements within the effective load range)

[Static Safety Factor f_S]

Models VR and VB may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{C_0}{P_C}$$

f_S : Static safety factor (see Table1)
C_0 : Basic static load rating (kN)
P_C : Calculated load (kN)

Table1 Reference Values of Static Safety Factor (f_S)

Machine using the LM system	Basic dynamic load rating	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3

[Nominal Life]

When the basic dynamic load ratings have been obtained, the rated lives of model VR and model VB are obtained using the following equations.

- **For Model VR**

$$L = \left(\frac{f_T}{f_W} \cdot \frac{C}{P_C}\right)^{\frac{10}{3}} \times 100$$

- **For Model VB**

$$L = \left(\frac{f_T}{f_W} \cdot \frac{C}{P_C}\right)^{3} \times 50$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical VR (VB) units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (kN)
P_C : Calculated load (kN)
f_T : Temperature factor (see Fig.2 on A-577)
f_W : Load factor (see Table2 on A-577)

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

● f_T: Temperature Factor

If the temperature of the environment surrounding the operating model VR or VB exceeds 100 ℃ , take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.2.

Note) If the environment temperature exceeds 100 ℃ , contact THK.

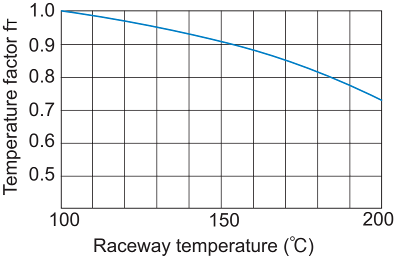


Fig.2 Temperature Factor (f_T)

● f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when the actual load applied on model VR or VB cannot be obtained, or when speed and vibrations have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in Table2 of empirically obtained data.

Table2 Load Factor (f_w)

Vibrations/ impact	Speed(V)	f_w
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5

Accuracy Standards

The accuracy of the dedicated rail for the Cross Roller Guide is classified into high accuracy grade (H) and precision grade (P) as shown in Table3.

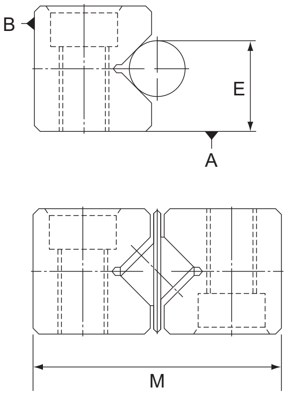


Fig.3

Table3 Accuracy Standards for Dedicated Rail Model V

Unit: mm

Accuracy grades	High-accuracy grade	Precision grade
Symbol	H	P
Item		
Parallelism of the raceway against surfaces A and B	As per Fig.4	
Dimensional tolerance in height E	±0.02	±0.01
Difference in height E (note)	0.01	0.005
Dimensional tolerance in width M	$^{0}_{-0.2}$	$^{0}_{-0.1}$

Note) The difference in height E applies to four rails used on the same plane.

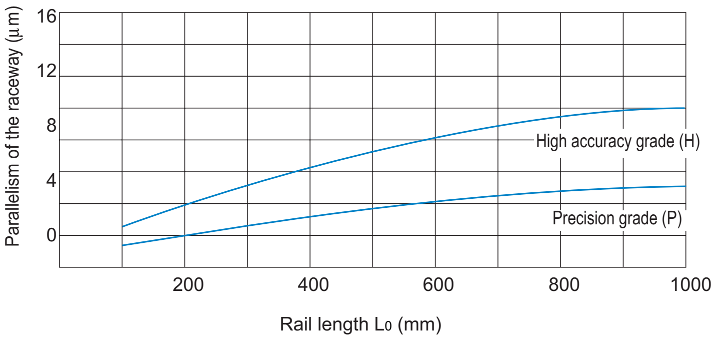


Fig.4 Rail Length and Parallelism of the Raceway

Installation Procedure

When using clearance adjustment bolts:

(1) Closely contact rails 2 and 3 onto the base, and rail 1 onto the table, and then firmly tighten the rail mounting bolts.

(2) Temporarily fasten rail 4 to the table.

Note) The rail mounting bolts must be designed so that they can be fully fastened while maintaining the rail installed.

(3) Place the base and the tables as shown in Fig.1, and then insert the roller cage from the end. If the cage does not enter because there is no clearance, slide rail 4 toward the adjustment bolt first, and then insert the cage again.

(4) Place a dial gauge as shown in Fig.1. Then, lightly screw all adjustment bolts evenly until the clearance is almost eliminated while gently pressing the table sideways.

(5) Attach the stopper to the rail end.

(6) Slide the table and adjust the cage position so as to achieve the required stroke.

(7) Position the roller cage in the center of the rail as shown in Fig.2-1. Then, evenly tighten the adjustment bolts (b, c and d) that are within the area where the roller is present until the dial gauge indicates the required displacement. Fully fasten the mounting bolts where adjustment was performed.

Note) The displacement indicated on the gauge represents the preload per roller cage.

(8) Slide the table as shown in Fig.2-2, and adjust the remaining adjustment bolts (a and e) in the same manner.

Note) When installing two or more units, first measure the tightening torque of the adjustment bolts for the first unit or the sliding resistance of the fist unit. Then, install the second (and later) unit so that its/their tightening torque(s) or sliding resistance(s) equal(s) that of the first unit. In this way, almost uniform preloads can be provided.

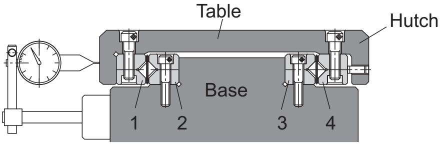


Fig.1 Installation of the Cross Roller Guide

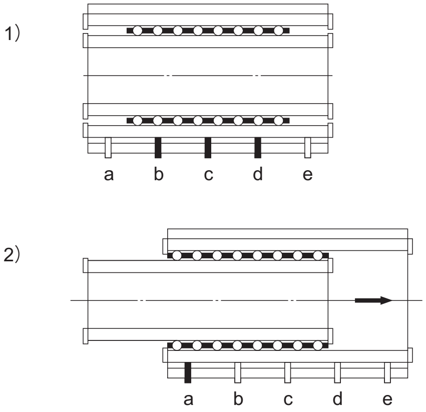
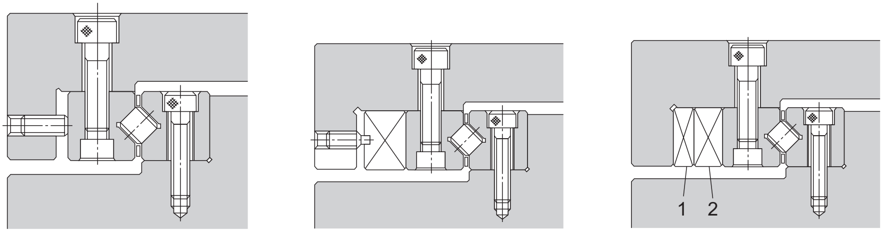


Fig.2 Sequence of Tightening the Adjustment Bolts

Example of Clearance Adjustment

Design the adjustment bolt so that it presses the rail on the same level as the roller.



Normally, press the rail with the adjustment bolt.

When a certain level of accuracy and rigidity is required, use a presser plate.

When high accuracy and high rigidity are required, use tapered gibs 1 and 2.

Fig.3 Example of Clearance Adjustment

Preload

An excessive preload may cause indentation, shorten the service life or cause trouble. The permissible preload per roller cage is indicated in the specification table. Tighten the adjustment bolts while monitoring the displacement of the roller contact area.

Accuracy of the Mounting Surface

To achieve a high level of running accuracy, it is also necessary to establish a certain level of accuracy in parallelism and straightness. Preferably, the parallelism and the flatness of the rail-mounting surface should be finished by grinding or similar machining to at least the same degree as the parallelism of the rail (see A-578). Also, mount the rail so that it closely contacts the mounting surface.

Dedicated Mounting Bolt

To mount the rail where normal clearance is to be adjusted, use the screw hole drilled on the rail as shown in Fig.1. The holes of the bolt (d_1 and D_1) must be machined so that they are greater by the adjustment allowance.

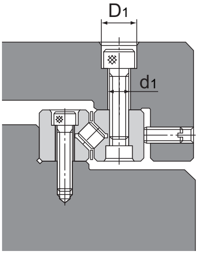


Fig.1

If it is inevitable to adopt a mounting method like the one shown in Fig.2 for a structural reason, use the dedicated mounting bolt (S) indicated in Fig.3.

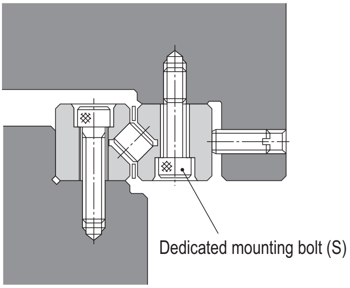


Fig.2

Table1 Dedicated Mounting Bolt

Unit: mm

Model No.	S	d	D	H	L	B	Supported rail
S 3	M3	2.3	5	3	12	2.5	V3
S 4	M4	3.1	5.8	4	15	3	V4
S 6	M5	3.9	8	5	20	4	V6
S 9	M6	4.6	8.5	6	30	5	V9
S 12	M8	6.25	11.3	8	40	6	V12
S 15	M10	7.9	13.9	10	45	8	V15
S 18	M12	9.6	15.8	12	50	10	V18

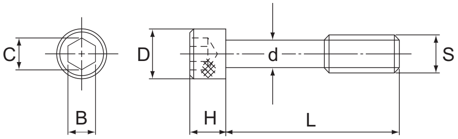


Fig.3 Dedicated Mounting Bolt

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Dropping or hitting the Cross Roller Guide/Ball Guide may damage it. Giving an impact to it could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.

(2) Do not mix lubricants of different physical properties.

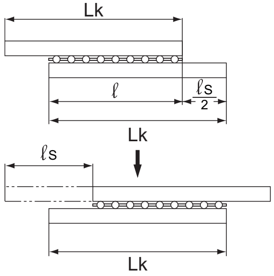
(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.

(4) When planning to use a special lubricant, contact THK before using it.

[Rail Length]

The roller cage and the ball cage move half the travel distance of the table in the same direction. To prevent the cage from overhanging from the raceway base when the cage length is "ℓ" and the stroke length is "ℓ_s", the rail length (Lk) must be at least the following.

$$Lk \geqq \ell + \frac{\ell_s}{2}$$



[Offset of the Cage]

The cage, which retains rollers (or balls), demonstrates extremely accurate motion. However, it may be offset as affected by driving vibrations, inertia or impact.

If using the Cross Roller Guide or Ball Guide in the following conditions, contact THK.

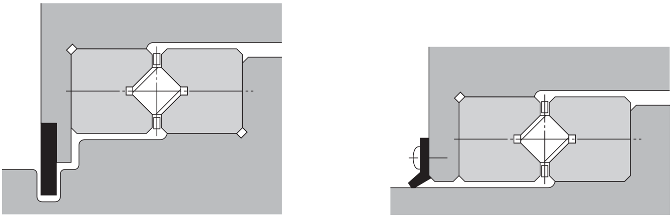
- Vertical use
- Pneumatic cylinder drive
- Cam drive
- High speed crank drive
- Under a large moment load
- Butting the guide's external stopper with the table

[Stopper]

Stoppers are attached to the rail ends in order to prevent the cage from falling off. Note, however, that frequently colliding the cage with the stopper may cause wear of the stopper and loosening of the stopper fastening screws, and may cause the cage to fall off.

[Contamination Protection]

As a means to prevent foreign material from entering the Cross Roller Guide or the Ball Guide, contamination protection accessories for the side faces as shown in Fig.1 are available. For contamination protection in the front and rear directions, consider using a bellows or a telescopic cover.



Labyrinth cover

Wiper seal

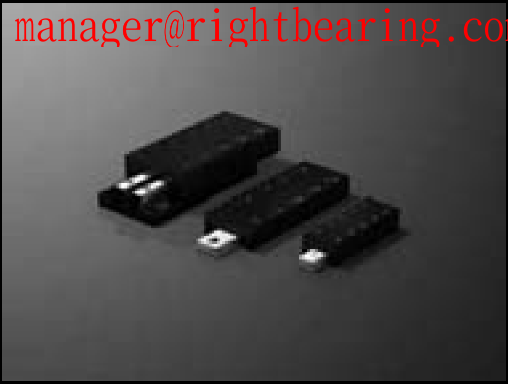
Fig.1 Contamination Protection Methods

[Precautions on Use]

(1) If foreign material adheres to the product, replenish the lubricant after cleaning the product.
(2) Contact THK if you desire to use the product at a temperature of 100℃ or higher.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

[Storage]

When storing the Cross Roller Guide/Ball Guide, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.



Cross Roller Table

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Cross Roller Table

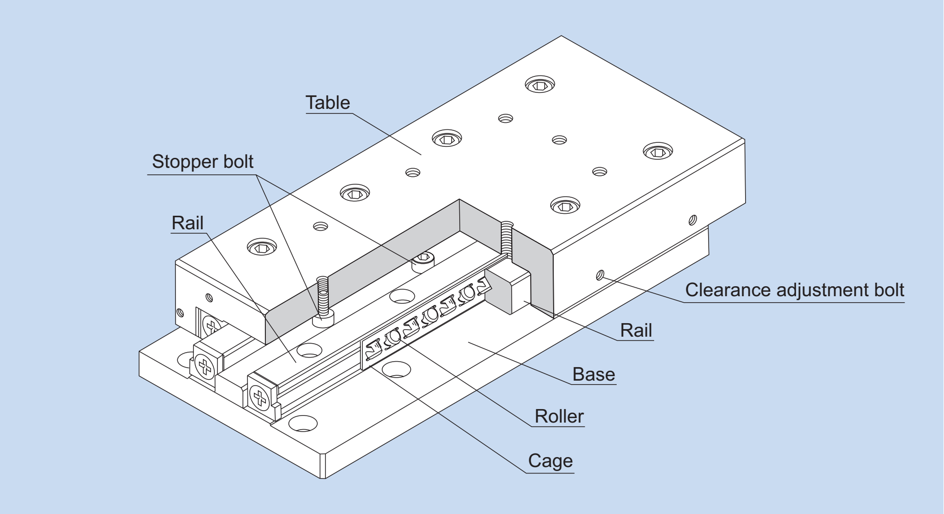


Fig.1 Structure of the Cross Roller Table

Structure and Features

The Cross Roller Table is a compact, highly rigid finite linear guide unit that has the Cross Roller Guide(s) between the precision-machined table and base.
There are two types of the Cross Roller Table: model VRU, and a miniature type model VRT. The Cross Roller Table is used in extensive applications such as OA equipment and peripherals, measuring instruments and printed circuit board drilling machines.

[Easy Installation]

Since the Cross Roller Guide(s) is installed between the precision-machined table and base, a highly accurate linear guide mechanism is achieved simply by mounting the product with bolts.

[Large Permissible Load]

Since rollers with large rated loads are installed in short pitches, the cross roller guide is capable of bearing a heavy load, achieving a highly rigid linear guide mechanism and gaining a long service life.

[Diversified Usage]

Since the rollers are orthogonally arranged one after another, the guide system is capable of evenly receiving loads in the four directions applied on the table. (See Fig.2.)

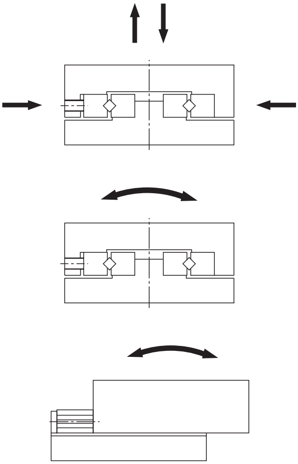
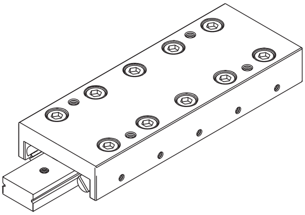


Fig.2 Load Directions

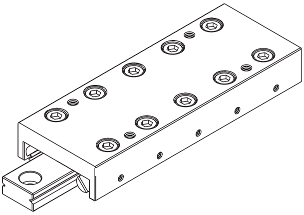
[Highly Corrosion Resistant]

The base and the table of models VRT-M and VRT-AM use stainless steel. Their rails, rollers, roller cages and screws are also made of stainless steel. As a result, these guide systems have significantly high corrosion resistance.

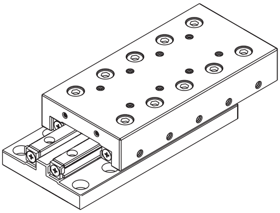
The base and the table of model VRU-M are made of aluminum.



Model VRT



Model VRT-A



Model VRU

Rated Load and Nominal Life

[Rated Loads in All Directions]

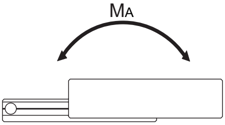
The rated loads of models VRT, VRT-A and VRU are equal in four directions (radial, reverse radial and lateral directions), and their values are expressed as C and C_0 in the corresponding specification tables.

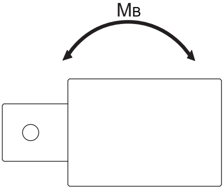
[Static Safety Factor f_S]

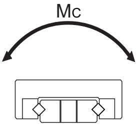
The Cross Roller Table may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{C_0}{P_C} \quad \text{or} \quad f_S = \frac{M_0}{M}$$

f_S : Static safety factor
C_0 : Basic static load rating (kN)
M_0 : Static permissible moment (M_A, M_B and M_C)
P_C : Calculated load (kN)
M : Calculated moment (kN)







● Reference value of static safety factor

The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Values of Static Safety Factor (f_S)

Machine using the LM system	Basic dynamic load rating	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3

[Nominal Life]

The nominal life of the Cross Roller Table is obtained using the following equation.

$$L = \left(\frac{f_T}{f_W} \cdot \frac{C}{P_C}\right)^{\frac{10}{3}} \times 100$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical VRT, VRT-A or VRU units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (kN)
P_C : Calculated radial load (kN)
f_T : Temperature factor (see Fig.1 on A-590)
f_W : Load factor (see Table2 on A-590)

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

● f_T: Temperature Factor

If the temperature of the environment surrounding the operating model VRT, VRT-A or VRU exceeds 100 ℃ , take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.1.

Note) If the environment temperature exceeds 100 ℃ , contact THK.

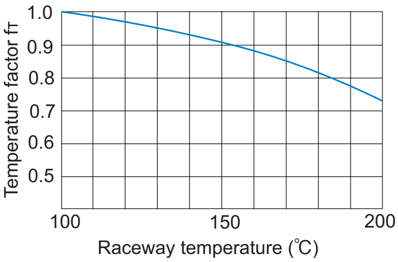


Fig.1 Temperature Factor (f_T)

● f_W: Load Factor

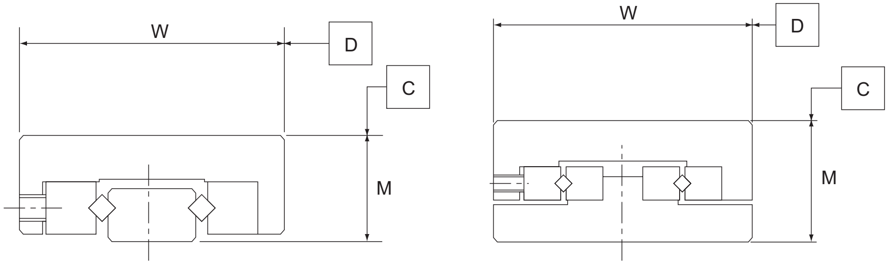
In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when the actual load applied on model VRT, VRT-A or VRU cannot be obtained, or when speed and vibrations have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in Table2 of empirically obtained data.

Table2 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5

Accuracy Standards

The dimensional tolerances of Cross Roller Table models VRT, VRT-A and VRU in height (M) and width (W), and the running accuracy of the base against the mounting surfaces C and D are indicated in the corresponding specification tables.



Models VRT and VRT-A

Model VRU

Fig.2 Accuracy Standards

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Dropping or hitting the Cross Roller Table may damage it. Giving an impact to it could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) For lubrication of the Cross Roller Table, use lithium-soap group grease or oil when it is necessary as with ordinary bearings.
(2) Thoroughly remove anti-rust oil and feed lubricant before using the product.
(3) Do not mix lubricants of different physical properties.
(4) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(5) When planning to use a special lubricant, contact THK before using it.

[Additional Machining of the Table and the Base]

When additionally machining the table and the base of the Cross Roller Table according to the conditions such as drilling mounting holes, adhere to the following precautions.

(1) Do not let cutting chips enter the Cross Roller Guide unit.
(2) Machine the mounting holes as blind holes, not though holes.
THK can perform additional machining such as mounting holes as requested.

The clearance of the Cross Roller Table is adjusted to the appropriate preload. Do not touch the clearance adjustment screw.

[Offset of the Cage]

The cage, which retains rollers (or balls), demonstrates extremely accurate motion. However, it may be offset as affected by driving vibrations, inertia or impact.

If using the Cross Roller Guide or Ball Guide in the following conditions, contact THK.

- Vertical use
- Pneumatic cylinder drive
- Cam drive
- High speed crank drive
- Under a large moment load
- Butting the guide's external stopper with the table

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
(2) If foreign material adheres to the product, replenish the lubricant after cleaning the product.
(3) Contact THK if you desire to use the product at a temperature of 100℃ or higher.
(4) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

[Storage]

When storing the Cross Roller Table, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Linear Ball Slide

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Linear Ball Slide

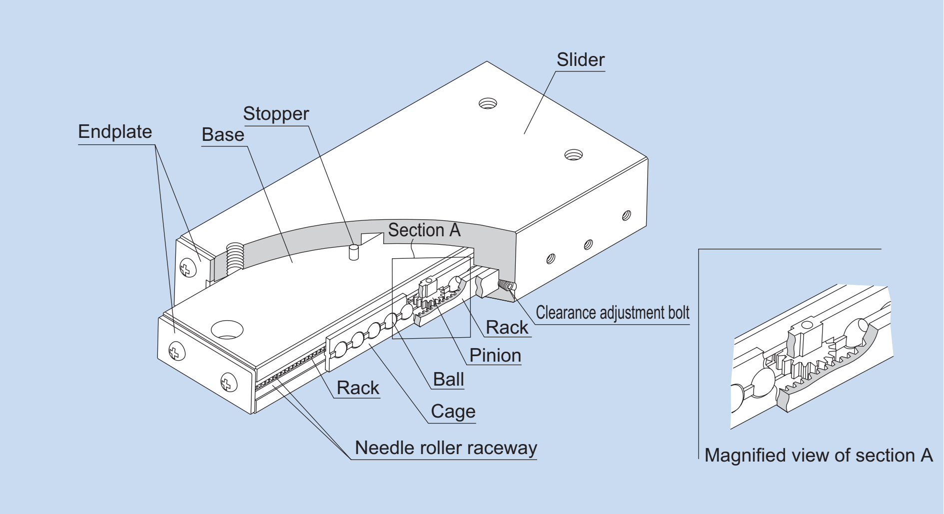


Fig.1 Structure of Linear Ball Slide Model LSP

Structure and Features

The Linear Ball Slide is a highly corrosion resistant slide unit that has an extremely low friction coefficient because stainless steel balls roll on four stainless steel needle roller raceways that are hardened and ground.

In addition, model LSP has a pinion gear in the center and a rack on the base to prevent the cage from slipping.

A ball slide equipped with a cylinder model LSC has a cylinder for drive in the base to downsize the system and reduce the space and the weight.

Its components are all made of stainless steel, which is highly corrosion resistant. Furthermore, since its inertia is small, the slide system is highly responsive to high speed. By simply securing the Linear Ball Slide on the mounting surface, the user can easily achieve a linear guide mechanism. Thus, this slide system is optimal for locations requiring high accuracy, such as optic measuring machines, automatic recorders, small electronic-parts assembling machines, OA equipment and its peripherals.

[A Unit Type That Allows Easy Installation]

The clearance and motion of the slider is adjusted to the best state. Therefore, a highly accurate slide mechanism can be gained by simply mounting the unit on the flat-finished mounting surface.

[Lightweight and Compact]

A light aluminum alloy is used in the base and the slider to reduce the weight.

[Smooth Motion]

The balls and the raceway (needle roller raceway) are in point contact, which causes the smallest rolling loss, and the balls are evenly retained in the ball cage. This allows the slide system to perform rolling motion at a minimal coefficient of friction (μ = 0.0006 to 0.0012).

[Highly Corrosion Resistant]

The base and the slider are made of an aluminum alloy and their surfaces are treated with alumite (anodization processing), which is highly resistant to corrosion and wear.

The balls, needle roller raceways and screws are made of stainless steel, making the system highly corrosion resistant.

Types of the Linear Ball Slide

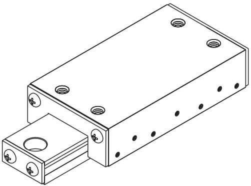
Types and Features

Linear Ball Slide with a Rack Model LSP

Specification Table⇒B-514

With model LSP, the cage has a rack and pinion mechanism, thus to prevent the cage from slipping.
Also, since the cage does not slip even in vertical mount, this model is used in an even broader range of applications.

Note) Do not use the stopper as a mechanical stopper.



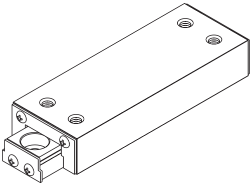
Model LSP

Linear Ball Slide Model LS

Specification Table⇒B-516

Model LS is a unit-type linear system for finite motion that has a structure where balls are arranged between the base and the slider via a needle roller raceway.
It is incorporated with a stopper mechanism, thus to prevent damage deformation caused by collision between the cage and the endplate.

Note) Do not use the stopper as a mechanical stopper.



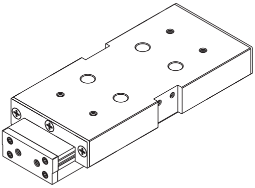
Model LS

Linear Ball Slide with a Cylinder Model LSC

Specification Table⇒B-518

Model LSC contains an air cylinder for drive inside the base. Feeding air from the two ports on the side face of the base allows the slide to perform reciprocating motion. Since the cylinder is of double-acting type, horizontal traveling speed can be adjusted using the speed controller. The cylinder and the piston are made of a corrosion resistant aluminum alloy, and their surfaces are specially treated to increase wear resistance and durability. Additionally, the cage has a rack and pinion mechanism, thus enabling the cage to operate without slipping.
Air-feeding ports for piping are provided on one side face, ensuring a certain degree of operability and easy assembly even if the installation site has a limited space and is complex.
The table on the right shows the specifications of the air cylinder incorporated in model LSC.

Note) Do not use the stopper as a mechanical stopper.



Model LSC

<Cylinder specifications>

Type of action	Double-acting
Fluid used	air (no lubrication)
Working pressure	100 kPa to 700 kPa (1 kgf/cm^2 to 7 kgf/cm^2)
Stroke velocity	50 to 300mm/s

[Speed Controller]

Fig.2 shows the shape of the speed controller.

Note) The speed controller is optional.
(control method: meter out)

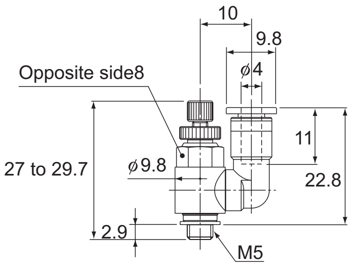


Fig.2 Shape of the Speed Controller (common to all model numbers)

[Dedicated Unit Base Model B]

With Linear Ball Slide model LSC, a limit switch for detecting the stroke end can be mounted using a dedicated unit base (Fig.3). When fine positioning is required, a dedicated stopper can be mounted on the unit base to adjust the position. (excluding model LSC1015)

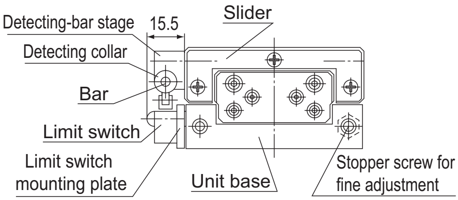
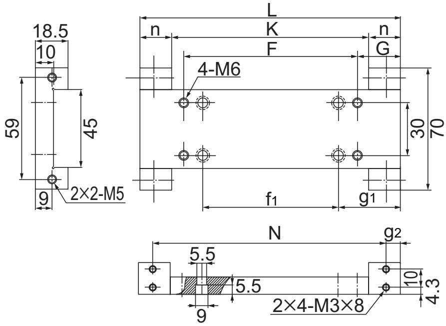
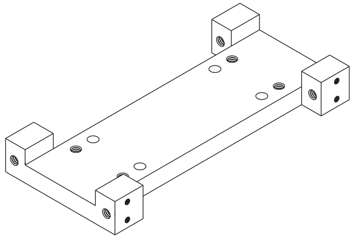


Fig.3 Unit Base and Limit Switch Installation





Unit: mm

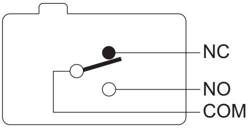
Unit base Model B	Unit base dimensions									Mass
	Length L	F	G	f_1	g_1	K	n	N	g_2	kg
LSC1515	80	40	21	23	29.5	56	12	68	6	0.12
LSC1530	110	60	25	40	35	74	18	94	8	0.16
LSC1550	150	100	25	78	36	114	18	134	8	0.21

[Limit Switch]

The specifications of the limit switch are as follows.

<Limit switch specifications>

Type	D2VW-5L2A-1 (Omron)
Contact type	contact (1C contact)



<Rated Specifications>

Type	Rated voltage (V)		Non-inductive load (A)				Inductive load (A)	
			Resistance load		Ramp load		Inductive load	
			Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open
D2VW-5	AC	125	5		0.5		4	
		250	5		0.5		4	
	DC	30	5		3		4	
		125	0.4		0.1		0.4	

Note1) The above figures indicate the constant current.
Note2) Inductive load refers to power factor of 0.7 or greater (alternate current) and time constant of 7 ms or less (direct current).
Note3) Ramp load implies a rush current 10 times greater.
Note4) The above rated values apply when a test is conducted with the following conditions in accordance with JIS C 4505.
(1) Ambient temperature: 20℃± 2℃
(2) Ambient humidity: 65% ± 5% RH
(3) Operating frequency: 30 times/min

Note) For applications under a minute load (5 to 24 VDC), a minute-load type is available. Contact THK for details.

Rated Load and Nominal Life

[Rated Loads in All Directions]

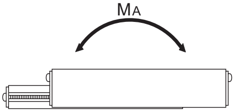
The rated loads of models LS, LSP and LSC are identical in the vertical and horizontal directions.

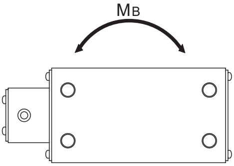
[Static Safety Factor f_S]

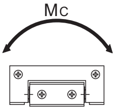
Linear Ball Slide models LS, LSP or LSC may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{C_0}{P_C} \quad \text{or} \quad f_S = \frac{M_0}{M}$$

f_S : Static safety factor
C_0 : Basic static load rating (N)
M_0 : Static permissible moment (M_A, M_B and M_C) (N-m)
P_C : Calculated load (N)
M : Calculated moment (N-m)







● Reference Value of Static Safety Factor

The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Value of Static Safety Factors (f_S)

Machine using the LM system	Load conditions	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 7

[Nominal Life]

The service life of the Linear Ball Slide is obtained using the following equation.

$$L = \left(\frac{1}{f_W} \cdot \frac{C}{P_C}\right)^3 \times 50$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical Linear Ball Slide units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (N)
P_C : Calculated load (N)
f_W : Load factor (see Table2)

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

● f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when the actual load applied on model VR or VB cannot be obtained, or when speed and vibrations have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in Table2 of empirically obtained data.

Table2 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5

Accuracy Standards

The accuracies of Linear Ball Slide models LS, LSP and LSC are defined as follows.

Running parallelism of the top face of the slide
: 0.010mm MAX/10mm
Positioning repeatability of the top face of the slide
: 0.0015mm MAX

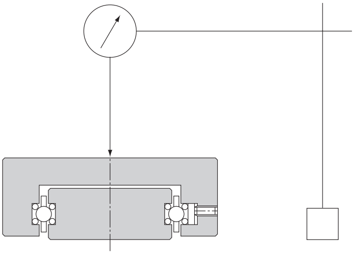


Fig.1 Accuracy Standards

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Dropping or hitting the Linear Ball Slide may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Apply lubricant before using the product.
(2) Do not mix lubricants of different physical properties.
(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.
(4) When planning to use a special lubricant, contact THK before using it.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.
(2) If foreign material such as dust of cutting chips adheres to the product, replenish the lubricant after cleaning the product with pure white kerosene.
(3) Contact THK if you desire to use the product at a temperature of 80℃ or higher.
(4) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.
(5) The Linear Ball Slide is incorporated with a stopper mechanism that prevents the slider from coming off. If impact is given, the stopper may be damaged. Do not use this stopper as a mechanical stopper.

[Storage]

When storing the Linear Ball Slide, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

LM Roller

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the LM Roller

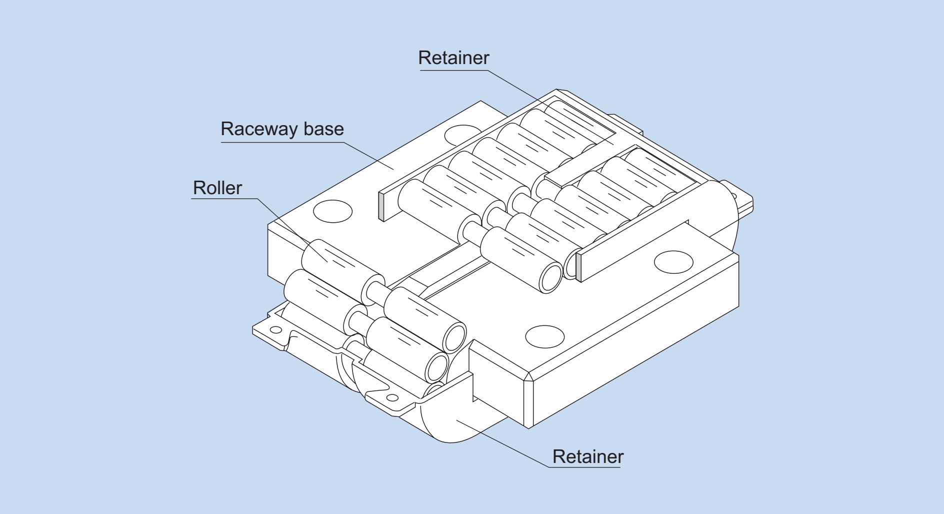


Fig.1 Structure of LM Roller Model LR

Structure and Features

In the LM Roller, dual rollers assembled on the circumference of the precision-ground, rigid raceway base travel in infinite circulation while being held by a retainer. A center guide integrated with the raceway base is formed in the central part of the loaded area of the raceway base to constantly correct skewing of the rollers. This unique structure ensures smooth rolling motion. The LM Roller is used in applications such as the XYZ guide of NC machine tools, precision press ram guides, press dies changers and heavy-load conveyance systems.

[Supports an Ultra Heavy Load and Ensures Smooth Motion]

The LM Roller is compact and capable of carrying a heavy load, and one unit of model LR50130 (length: 130 mm; width: 82 mm; height: 42 mm) is capable of receiving a 255 kN load. Moreover, because of rolling motion, this model has a low friction coefficient (μ = 0.005 to 0.01) and is free from stick-slip, thus achieving highly accurate straight motion.

[High Combined Accuracy]

In general, when supporting a single plane with LM rollers, multiple units of LM rollers are combined on the same plane, and therefore, the height difference between the rollers significantly affects the machine accuracy and service life. With THK LM Roller, the user can select a combination of models with a height difference of up to 2 μm.

[Rational Skewing-preventing Structure]

With an LM system using rollers, once the rollers skew, it increases friction resistance or decreases running accuracy.

To prevent skewing, the LM Roller has roller guides on the center of the retainer full circle, and in the center of the loaded area on the raceway base. This structure enables the LM Roller to automatically correct skewing caused by a mounting accuracy error and the rollers to travel in an orderly manner. It also allows the LM Roller to be installed with slant mount or wall mount while demonstrating high performance.

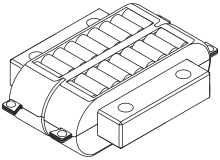
Types of the LM Roller

Types and Features

Model LR

Specification Table⇒B-524

This model is designed to be fit into a groove machined on the mounting surface. By screwing bolts into four holes on the raceway base, it is secured on the mounting surface. (Fixture models SM and SE are also available.)

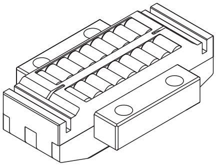


Model LR

Model LR-Z

Specification Table⇒B-524

A lighter type that uses a resin retainer and is designed to be mounted in the same manner as model LR. Since it has a groove for installing a seal, a special rubber seal with a high contamination protection effect can easily be attached. In addition, this model is capable of high-speed traveling at 1 m/s.

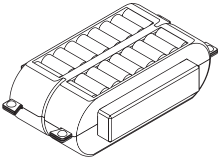


Model LR-Z

Model LRA

Specification Table⇒B-525

Just like model LR, this model is also designed to be fit into a groove. It is a compact type that can be mounted using fixture model SM or SE and bolts.

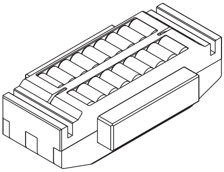


Model LRA

Model LRA-Z

Specification Table⇒B-525

A lighter type that uses a resin retainer and is designed to be mounted in the same manner as model LRA. Since it has a groove for installing a seal, a special rubber seal with a high contamination protection effect can easily be attached. In addition, this model is capable of high-speed traveling at 1 m/s.

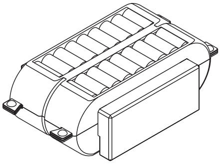


Model LRA-Z

Model LRB

Specification Table⇒B-526

Since this model does not require a groove on the mounting surface, man-hours for machining can be reduced. It can be mounted using fixture model SMB or SE and bolts.

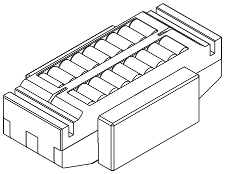


Model LRB

Model LRB-Z

Specification Table⇒B-526

A lighter type that uses a resin retainer and is designed to be mounted in the same manner as model LRB. Since it has a groove for installing a seal, a special rubber seal with a high contamination protection effect can easily be attached. In addition, this model is capable of high-speed traveling at 1 m/s.

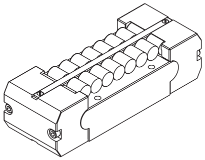


Model LRB-Z

Model LRU

Specification Table⇒B-527

Since this model does not require a groove on the mounting surface, man-hours for machining can be reduced. By screwing bolts into four holes on the raceway base, it is secured on the mounting surface.



Model LRU

Nominal Life

[Static Safety Factor f_S]

The LM Roller may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{f_C \cdot C_0}{P_C}$$

f_S : Static safety factor
f_C : Contact factor (see Table2 on A-610)
C_0 : Basic static load rating (kN)
P_C : Calculated load (kN)

● Reference Value of Static Safety Factor

The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Value of Static Safety Factors (f_S)

Machine using the LM system	Basic dynamic load rating	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3
Machine tool	Without vibration or impact	1 to 1.5
	With vibration or impact	2.5 to 7

[Nominal Life]

The nominal life of the LM Roller is obtained using the basic dynamic load rating (C) indicated in the corresponding specification table, and the following equation.

$$L = \left(\frac{f_H \cdot f_C \cdot f_T}{f_W} \cdot \frac{C}{P_C}\right)^{\frac{10}{3}} \times 100$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical LM Roller units independently operating under the same conditions can achieve without showing flaking)
C : Basic dynamic load rating (kN)
P_C : Calculated radial load (kN)
f_H : Hardness factor (see Fig.1)
f_T : Temperature factor (see Fig.2 on A-610)
f_C : Contact factor (see Table2 on A-610)
f_W : Load factor (see Table3 on A-610)

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

- **f_H: Hardness Factor**

To maximize the load capacity of the LM system, the hardness of the raceways needs to be between 58 to 64 HRC. If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).

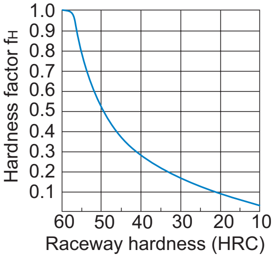


Fig.1 Hardness Factor (f_H)

● f_T: Temperature Factor

If the temperature of the environment surrounding the operating LM Roller exceeds 100℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.2.

Note) The normal service temperature of the LM Roller is 80℃ at a maximum. If the ambient temperature exceeds 80℃, contact THK.

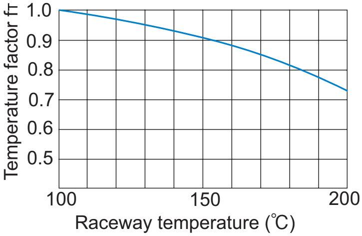


Fig.2 Temperature Factor (f_T)

● f_C: Contact Factor

When multiple LM Roller units are used in near close contact with each other, their linear motion is affected by moments and mounting accuracy, making it difficult to achieve uniform load distribution. In such applications, multiply the basic load rating (C) and (C_0) by the corresponding contact factor in Table2.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in Table2.

Table2 Contact Factor (f_C)

Number of LM Roller units in close contact with each other	Contact factor f_C
2	0.81
3	0.72
4	0.66
5	0.61
Normal use	1

● f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when the actual load applied to the LM Roller cannot be obtained, or when speed and impact have a significant influence, divide the basic load rating (C or C_0) by the corresponding load factor in Table3 of empirically obtained data.

Table3 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

Accuracy Standards

When multiple LM Roller units are arranged on the same plane, the mounting heights of the LM Roller units must be identical in order to achieve uniform load distribution. The dimensional tolerance of the LM Roller in height (A) is defined as indicated in Table4. When ordering LM Roller units to be used on the same plane, specify their tolerances with the same classification symbol.

Each classification symbol is marked on the package box and on the side face of the LM Roller's raceway base as indicated in Fig.4. (except for normal grade)

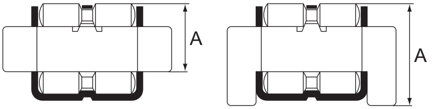


Fig.3 Mounting Height (A) of the LM Roller

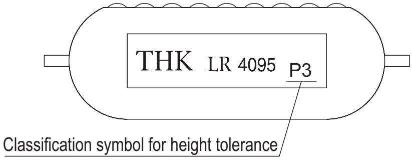


Fig.4

Table4 Classification of Dimensional Tolerances in Height (A)

Unit: μm

Accuracy Grades	Dimensional tolerance for A	Classification symbol
Normal grade	0 to −10	No Symbol
High grade	0 to −5	H5
	−5 to −10	H10
Precision grade	0 to −3	P3
	−3 to −6	P6
	−6 to −9	P9
	−9 to −12	P12
Ultra-precision grade	0 to −2	SP2
	−2 to −4	SP4
	−4 to −6	SP6
	−6 to −8	SP8
	−8 to −10	SP10

Raceway

To maximize the performance of the LM Roller, it is necessary to take into account the hardness, surface roughness and accuracy of the raceway, on which the rollers directly roll, when manufacturing the product. In particular, the hardness significantly affects the service life. Therefore, it is important to take much care in selecting a material and heat treatment method.

[Hardness]

We recommend surface hardness of 58 HRC (≒ 653 HV) or higher. The depth of the hardened layer is determined by the size of the LM Roller; we recommend approximately 2 mm for general use. If the hardness of the raceway is lower or the raceway cannot be hardened, multiply the load rating by the corresponding hardness factor (see Fig.1 on A-609).

[Material]

The following materials are generally used as suitable for surface hardening through induction-hardening and flame quenching.

- SUJ2 (JIS G 4805: high-carbon chromium bearing steel)
- SK3 to 6 (JIS G 4401: carbon tool steel)
- S55C (JIS G 4051: carbon steel for machine structural use)

If the machine body is a mold, depending on the conditions, a hardened steel plate may not be used and instead, the surface of mold itself may be hardened.

[Surface Roughness]

To achieve smooth motion, the surface should preferably be finished to 0.40a or less. If slight wear is allowed in the initial stage, the surface may be finished to approximately 0.80a.

[Accuracy]

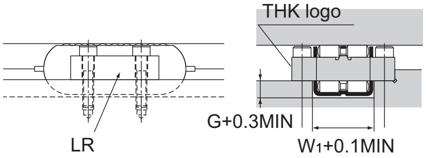
When high accuracy is required, securing a hardened steel plate to the machine body may cause undulation on the raceway. To avoid this, secure the LM Roller with bolts before grinding the hardened steel plate as with when mounting the product, or tightening it to the machine body before grinding and finishing the raceway, to produce a good result.

Installing the LM Roller

Fig.1 shows examples of installing the LM Roller. To minimize the gradient of the LM Roller in the traveling direction, provide a reference surface on the mounting surface and press the LM Roller toward it. The mounting reference surface of the LM Roller is opposite of the THK logo marked on the raceway base.

(a) Installing models LR, LRU and LR-Z

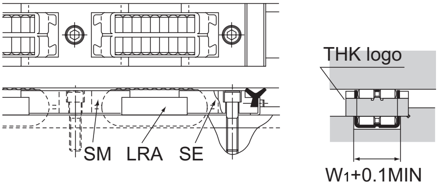
Use the four mounting bolt holes on the raceway base to mount the LM Roller.



For G and W1, see the specification table.

(b) Installing models LRA and LRA-Z

The LM Roller can easily be secured using fixture model SM or SE. SE is provided with a wiper to increase contamination protection effect.



For W1, see the specification table.

(c) Installing models LRB and LRB-Z

The LM Roller can easily be secured using fixture model SMB or SEB. SEB is provided with a wiper to increase contamination protection effect.

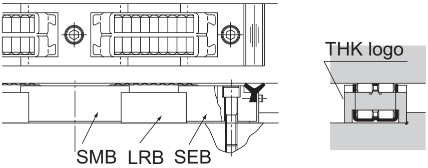


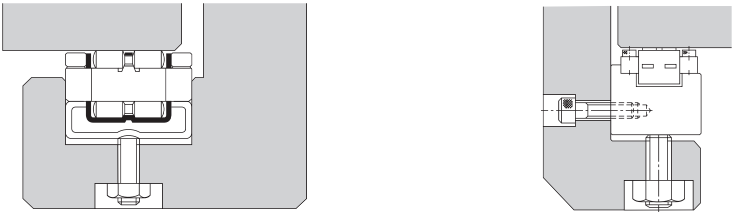
Fig.1 Installing the LM Roller

Guidance for Adjusting the Clearance

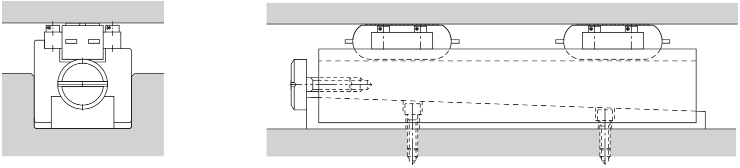
To secure stable accuracy during operation, the LM Roller is provided with a light preload. Provision of a preload is especially effective also in increasing the service life for applications where a vibration impact load or overhang load is applied.

Fig.2 shows clearance adjusting methods that are commonly practiced.

Normally, it is preferable to provide a preload that is approximately 3% of the basic dynamic load rating (C). Providing a preload to the LM Roller will stabilize the accuracy.



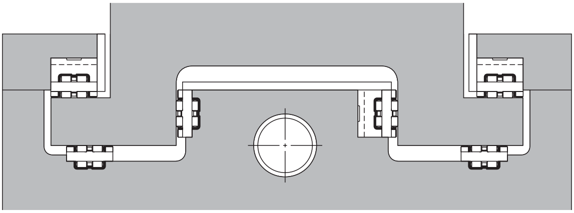
(a) Using a dedicated stopper (b) Using a set screw

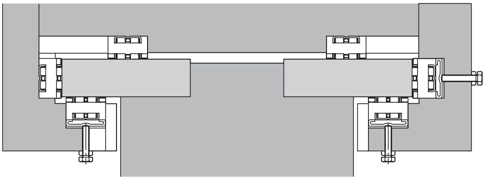


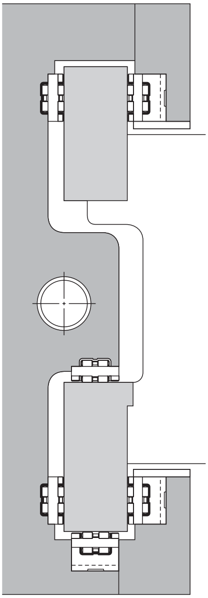
(c) Adjusting a tapered gib

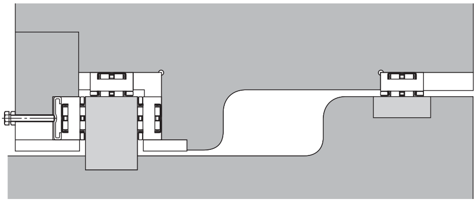
Fig.2 Methods for Adjusting the Clearance of the LM Roller

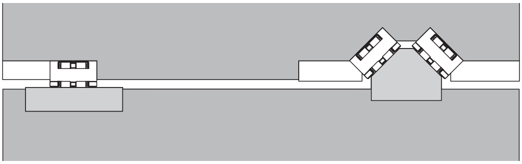
Examples of Arranging LM Roller Units





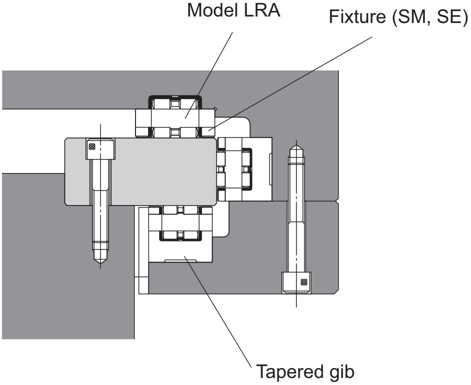




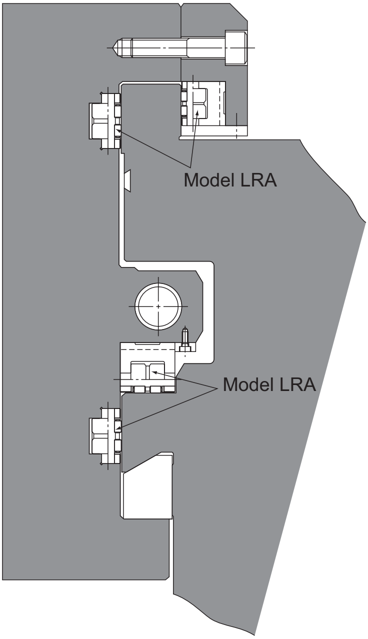


Examples of Installing the LM Roller

Assembling the slide section



Using the cross rail of a vertical lathe



Spring Pad Model PA

●For detailed dimensions, see B-528.

Item name	Schematic diagram / mounting location	Purpose/location of use
Spring Pad Model PA		By attaching this spring pad to the back of the LM Roller as shown in Fig.2 (a) on A-614 . Turning the adjustment bolt, adjustment of a clearance and a preload can easily be done.

[Guidance for Using the Spring Pad]

Spring pad model PA is a low price item that enables easy adjustment and achieves self-aligning. A preload can easily be adjusted by installing the spring pad to the machine and externally tightening the adjustment bolt using a torque wrench. As a result, the need for troublesome shim adjustment and machining for matching is eliminated.

● Example of Using the Spring Pad

(1) When using the spring pad in the opposite position to provide a preload
To prevent the table from lifting or guiding it horizontally, using the spring pad on one side as shown in Fig.1 will easily provide a preload and eliminate vibrations and play of the machine.

(2) When applying both sliding and rolling on the same plane
When desiring to increase friction resistance because the table inertia is large, or desiring to increase rigidity under a heavy load, the spring pad can be used in combination with the sliding surface. To do so, install the LM Roller and the spring pad to several locations on the table as shown in Fig.2, and then tighten the adjustment bolt by the load to be allocated to the LM Roller.

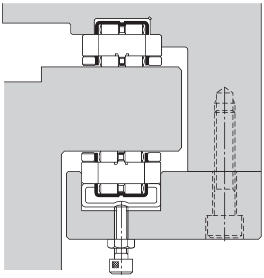


Fig.1

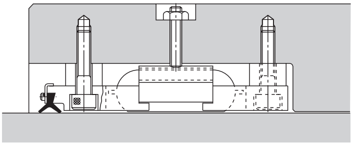


Fig.2

● Guidance for Installing the Spring Pad

Fig.3 shows examples of installing the spring pad model PA to the bottom of the LM Roller and adjusting the clearance and providing a preload.

The dimensions in this example are indicated in the specification table for the spring pad model PA.

The following is the procedure for the installation.

(1) Secure the fixture and the spacer. Adjust them so that the LM Roller can move vertically.
(2) Turn the adjustment bolt until the LM Roller hits the raceway.
(3) Turn the adjustment bolt using a torque wrench and tighten it until the desired torque is reached. A preload is provided via the spring pad model PA.

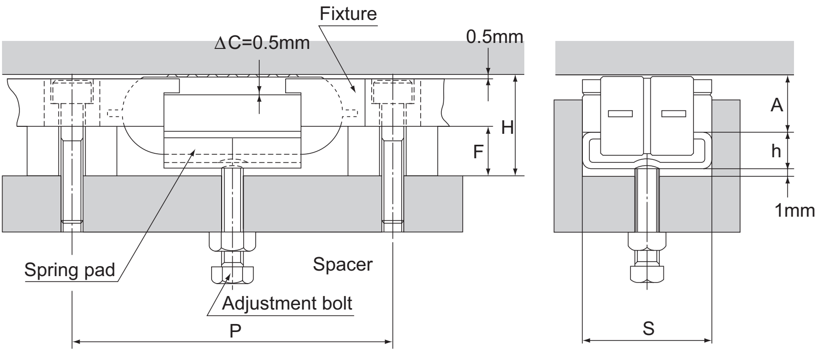
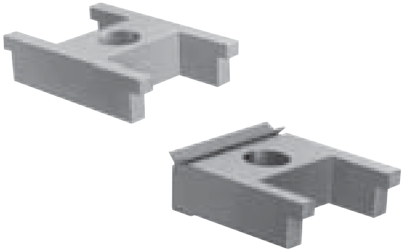


Fig.3

Fixture Models SM/SMB and SE/SEB

●For detailed dimensions, see B-529.

Item name	Schematic diagram / mounting location	Purpose/location of use
Fixture Models SM/SMB and SE/SEB		Use of fixture model SM or SE eliminates the need to machine thin tapped holes for mounting the LM Roller, and allows the roller to firmly be secured. Models SE and SEB each have a special rubber wiper with double lips to achieve a high contamination protection effect.

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Dropping or hitting the LM Roller may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Contamination Protection and Lubrication]

With the LM Roller, once foreign material enters the raceway due to poor contamination protection, it cannot be removed easily and tends to severely damage the raceway or the LM rollers. Therefore, use much care in contamination protection.

Fixture for the LM Roller models SE and SEB each have a special rubber wiper with double lips to achieve a high contamination protection effect. Feeding grease between the double lips when attaching the fixture, as shown in Fig.1, will further increase the effect.

For locations subject to cutting chips or welding spatter, it is necessary to use a contamination protection cover such as a bellows and a telescopic cover, or a wiper reinforced with a metal plate as indicated in Fig.2.

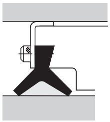


Fig.1 Wiper of Fixture Models SE and SEB

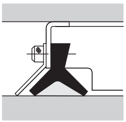


Fig.2 Reinforced Wiper

For contamination protection of the side faces, items as shown in Fig.3 are available.

The required quantity of lubricant is much smaller than sliding guides, making the lubrication control easy.

As for the lubricant, the same type of grease or lubricant as that of ordinary bearings will be adequately effective. To achieve a high level of grease retention, it is preferable to use lithium-soap group grease No. 1 or 2, or slightly viscous sliding surface oil or turbine oil.

To replenish the lubricant to the LM Roller, drop the lubricant from the greasing hole provided on the back of the retainer as necessary, or directly drop it to the raceway. If the LM Roller is not used frequently, it is also possible to apply grease to the rollers of the product.

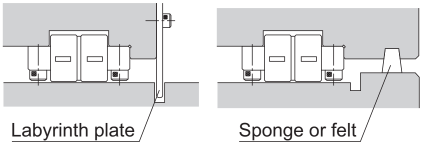


Fig.3

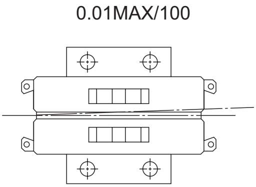
[Mounting Reference Surface]

To help correctly mount the LM Roller in the traveling direction, it has a mounting reference surface on the side face of the raceway base. The reference surface is on the opposite side of the THK logo.

[Mounting Precision]

To maximize the performance of the LM Roller, it is necessary to distribute the load as evenly as possible when mounting the product. For the parallelism between the roller and the raceway indicated in Fig.4, we recommend 0.015 mm or less against 100 mm. For the allowable tilt of the roller in the longitudinal direction, 0.01 mm or less against 100 mm is recommended.

(a) Parallelism between the LM Roller and the raceway (b) Allowable tilt of the roller in the longitudinal direction



(c) Parallelism between the LM Roller and the raceway in the horizontal direction

Fig.4 LM Roller and Mounting Precision

[Precautions on Use]

(1) If foreign material adheres to the product, replenish the lubricant after cleaning the product.
(2) Do not use the resin retainer for LM Roller model LR (A, B)-Z and seals (including SE and SEB) in an environment at temperature of 80℃ or higher.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

[Storage]

When storing the LM Roller, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Flat Roller

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Flat Roller

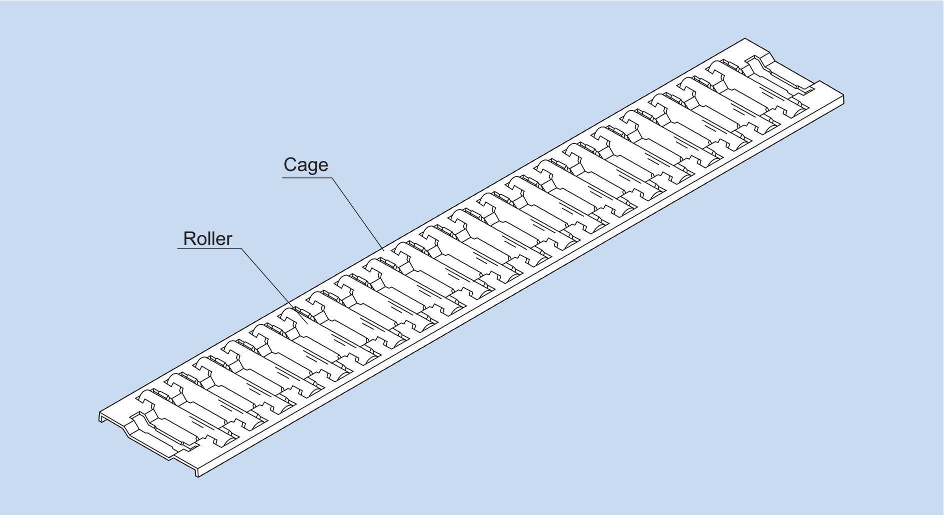


Fig.1 Structure of LM Flat Roller Model FT

Structure and Features

With the Flat Roller, precision rollers compliant with JIS B 1506 are installed in pockets of a cage made of a thin steel plate pressed into M shape (in cross section) to increase its rigidity. Thanks to its structural design, the rollers do not fall off because they are held in cage pockets. Since the cage, which is incorporated with rollers having a diameter of 5 mm or larger, is of roller-lifter type, smooth motion is achieved without damaging the raceway even if the hardness of the raceway is low. The Flat Roller is sandwiched between the two raceways. As the table moves, the Flat Roller travels by half the distance of the table in the same direction. For example, if the table moves 500 mm, the Flat Roller travels 250 mm in the same direction.

The Flat Roller is optimal for large machine tools such as planer, horizontal milling machines and cylindrical grinding machines, and for locations requiring high accuracy such as surface grinding machines, cylindrical grinder and optic measuring machines.

[Large Load Capacity]

Sine rollers are installed in short pitches, the Flat Roller has a large load capacity, and depending on the conditions, it can be used on the raceway of a mold that is little hardened. In addition, the deflection rigidity of the table is almost the same as that of a sliding surface.

[Combined Accuracy of 90° V Surface and Flat Surface Supported as Standard]

The Flat Roller is designed so that it can be mounted on the 90° V-flat sliding surface, which is the most common configuration among narrow guide types of tables and saddles of machinery. It allows the product to be used without major design change.

[Lowest Friction among Roller Type LM Systems]

Since the rollers are evenly held in a light, rigid cage, friction between rollers is eliminated and skewing of the rollers is minimized. As a result, a small friction coefficient (μ = 0.001 to 0.0025) is achieved, and stick-slip, which is problematic with sliding surfaces, does not occur.

[Instant Connection of the Cage]

When installing the Flat Roller in a large machine, it can easily be connected on the bed. This allows the Flat Roller to be installed even with the longest type.

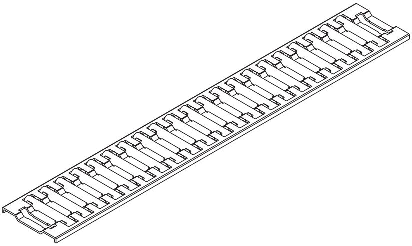
Types of the Flat Roller

Types and Features

Model FT/FT-V

Specification Table⇒B-532

These models have a single row of rollers and are mainly used on the flat surface.

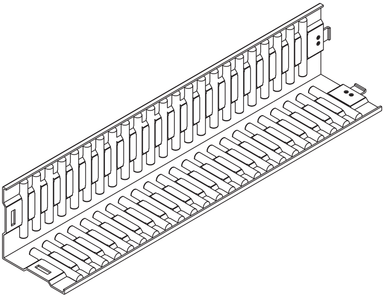


Models FT/FT-V

Model FTW/FTW-V

Specification Table⇒B-533

These models have two or more rows of rollers, and their cages are shaped to bend at 90°. Each model uses rollers with a diameter 0.7071 times greater than that of the rollers on the flat surface so that model FT or FT-V can be mounted on the 90° V surface at the same height if model FT or FT-V is used on the flat surface.



Models FTW/FTW-V

Rated Load and Nominal Life

[Static Safety Factor f_S]

The Flat Roller may receive an unexpected external force while it is stationary or operative due to the generation of an inertia caused by vibrations and impact or start and stop. It is necessary to consider a static safety factor against such a working load.

$$f_S = \frac{f_C \cdot C_0}{P_C}$$

f_S : Static safety factor
f_C : Contact factor
(see [Load Rating] and [Nominal Life] on A-626)
C_0 : Basic static load rating (kN)
P_C : Calculated radial load (kN)

● Reference Value of Static Safety Factor

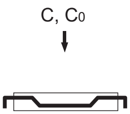
The static safety factors indicated in Table1 are the lower limits of reference values in the respective conditions.

Table1 Reference Value of Static Safety Factors (f_S)

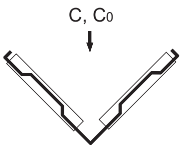
Machine using the LM system	Basic dynamic load rating	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3
Machine tool	Without vibration or impact	1 to 1.5
	With vibration or impact	2.5 to 7

[Load Rating]

The rated loads shown in the specification tables represent the rated loads with a unit length (ℓ) in the directions indicated in the figure below.



Model FT or FT-V



Model FTW or FTW-V

If the length of the Flat Roller in the effective load range differs from the unit length (ℓ), approximate rated loads (C_ℓ and $C_{0\ell}$) can be obtained using the following equation.

$$C_\ell = \left(\frac{\ell_0}{\ell}\right)^{\frac{3}{4}} \times C$$

$$C_{0\ell} = \frac{\ell_0}{\ell} \cdot C_0$$

C_ℓ : Basic dynamic load rating in the effective load range (kN)
ℓ_0 : Length in effective load range (mm)
ℓ : Unit length (see the specification table) (mm)
$C_{0\ell}$: Basic static load rating in the effective load range (kN)
C : Basic dynamic load rating (kN)
C_0 : Basic static load rating (kN)

Note) Note that if the hardness of the raceway is lower than 58 HRC, the rated loads will be decreased. (See Fig.2 on A-627.)

[Nominal Life]

When the basic dynamic load rating (C_ℓ) of the Flat Roller in the effective load range has been obtained from the equation above, the nominal life is obtained using the following equation.

$$L = \left(\frac{f_H \cdot f_C \cdot f_T}{f_W} \cdot \frac{C_\ell}{P_C}\right)^{\frac{10}{3}} \times 100$$

L : Nominal life (km)
(The total number of revolutions that 90% of a group of identical Flat Roller units independently operating under the same conditions can achieve without showing flaking)
C_ℓ : Basic dynamic load rating (kN)
P_C : Calculated radial load (kN)
f_H : Hardness factor (see Fig.2 on A-627)
f_T : Temperature factor (see Fig.1 on A-627)
f_W : Load factor (see Table2 on A-627)
f_C : Contact factor^Note)

Note) Contact factor is determined according to the contact state of the two planes between which the rollers travel. If the contact ratio between the two planes is 50%, set the contact factor as f_C = 0.5 for safety's sake.

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^6}{2 \times \ell_S \times n_1 \times 60}$$

L_h : Service life time (h)
ℓ_S : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

● f_T: Temperature Factor

If the temperature of the environment surrounding the operating Flat Roller exceeds 100 ℃, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in Fig.1.

Note) If the environment temperature exceeds 100 ℃, contact THK.

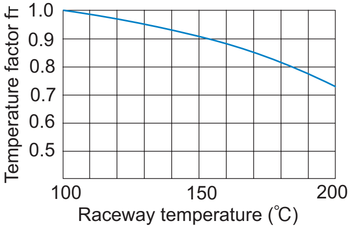


Fig.1 Temperature Factor (f_T)

● f_H: Hardness Factor

To maximize the load capacity of the LM system, the hardness of the raceways needs to be between 58 to 64 HRC. If the hardness is lower than this range, the basic dynamic load rating and the basic static load rating decrease. Therefore, it is necessary to multiply each rating by the respective hardness factor (f_H).

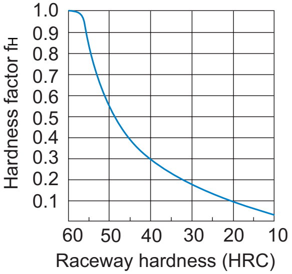


Fig.2 Hardness Factor (f_H)

● f_W: Load Factor

In general, reciprocating machines tend to involve vibrations or impact during operation. It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, when the actual load applied cannot be obtained, or when speed and impact have a significant influence, divide the basic load rating (C or C_0), by the corresponding load factor in Table2 of empirically obtained data.

Table2 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low V≦0.25m/s	1 to 1.2
Weak	Slow 0.25<V≦1m/s	1.2 to 1.5
Medium	Medium 1<V≦2m/s	1.5 to 2
Strong	High V>2m/s	2 to 3.5

Accuracy Standards

The accuracy of the Flat Roller is classified into normal grade, high accuracy grade and precision grade according to the difference in diameter between the rollers incorporated in a single cage. When it is necessary to specify the dimensional tolerance in the roller diameter for reasons related to the required accuracy or combination, select the desired accuracy from Table3 and specify the corresponding accuracy symbol.

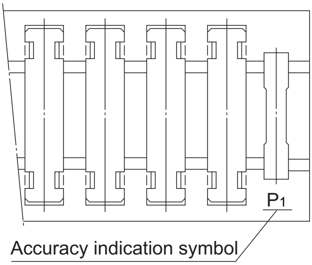


Fig.3

Table3 Classification of Roller Diameters for Selection

Unit: µm

Accuracy grades	Diameter difference	Dimensional tolerance in diameter	Accuracy indication symbol
Normal grade	3	0 to −3	No Symbol
High grade	2	0 to −2	H2
		−2 to −4	H4
		−4 to −6	H6
Precision grade	1	0 to −1	P1

Note) The accuracy indication symbol is marked on the end of the cage as shown in Fig.3.

Raceway

To maximize the performance of the Flat Roller, it is necessary to take into account the hardness, surface roughness and accuracy of the raceway, on which the rollers directly roll, when manufacturing the product. In particular, the hardness significantly affects the service life. Therefore, it is important to take much care in selecting a material and heat treatment method.

[Hardness]

We recommend surface hardness of 58 HRC (≒ 653 HV) or higher. The depth of the hardened layer is determined by the size of the Flat Roller; we recommend approximately 2 mm for general use. If the hardness of the raceway is lower or the raceway cannot be hardened, multiply the load rating by the corresponding hardness factor indicated in Fig.2 on A-627.

[Material]

The following materials are generally used as suitable for surface hardening through induction-hardening and flame quenching.

- SUJ2 (JIS G 4805: high-carbon chromium bearing steel)
- SK3 to 6 (JIS G 4401: carbon tool steel)
- S55C (JIS G 4051: carbon steel for machine structural use)

If the machine body is a mold, depending on the conditions, a hardened steel plate may not be used and instead, the surface of mold itself may be hardened.

[Surface Roughness]

To achieve smooth motion, the surface should preferably be finished to 0.40a or less. If slight wear is allowed in the initial stage, the surface may be finished to approximately 0.80a.

[Accuracy]

When high accuracy is required, securing a hardened steel plate to the machine body may cause undulation on the raceway. To avoid this, secure the Flat Roller with bolts before grinding the hardened steel plate as with when mounting the product, or tightening it to the machine body before grinding and finishing the raceway, to produce a good result.

Installing the Flat Roller

[Combination of 90° V Surface and Flat Surface]

The Flat Roller can be mounted directly onto the guide surface on the 90° V surface and flat surface. Table1 shows examples of their combinations.

Note) The roller diameter (Da) for model numbers containing symbol V at the end represents the value $\frac{1}{\sqrt{2}}$ times that of types for the same model number with no symbol.
The diameter of the roller to be combined with 90°V surface will be $\frac{1}{\sqrt{2}}$ times that of the roller on the flat surface.
For example, when using model FT4035 (roller diameter: ϕ 4) on the flat surface, use model FTW4030V (roller diameter: ϕ 2.828) on the V surface. Performance of the Flat Roller is significantly affected by the contact state of the upper and lower raceways. You can check the fit before installing the Flat Roller by designing the raceways as indicated in Fig. 1.

Table1 Example of Combinations

90°V surface		Flat surface	
Model No.	Roller diameter Da	Model No.	Roller diameter Da
FTW 4030V	2.828	FT 4030	4
FTW 4030V	2.828	FT 4035	4
FTW 5035V	3.535	FT 5038	5
FTW 5035V	3.535	FT 5043	5
FTW 5045	5	FT 10060V	7.071
FTW 5050	5	FT 10060V	7.071
FTW 10070V	7.071	FT 10080	10

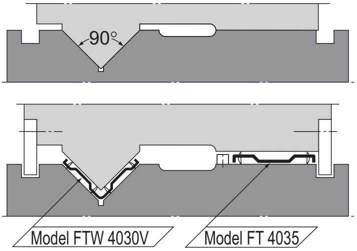


Fig.1 Example of Combinations

[Other Example of Installation]

In locations where a lifting load or an overhang load is applied, the Flat Roller can be installed as shown in Fig.2.
For details on clearance adjustment from the side face, see Example of Clearance Adjustment for the Cross Roller Guide on A-580.

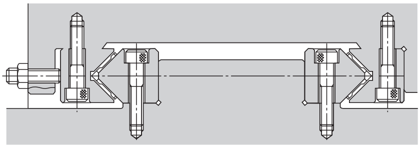


Fig.2 Location where a Lifting Load is Applied

[Determining the Flat Roller Length]

The Flat Roller travels 1/2 of the travel distance of the table in the same direction. Therefore, it is necessary to calculate the stroke length and the Flat Roller length as indicated below.

To keep the Flat Roller under the table, obtain Flat Roller length ℓ_S as follows.

$$\ell_S \leqq L_B - L_T$$

The Flat Roller length:

$$\ell = L_T + \frac{\ell_S}{2} = 0.5(L_B + L_T)$$

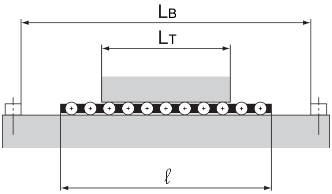


Fig.3

[Connecting Flat Roller Units]

When it is necessary to joint two or more Flat Roller units, use a joint plate as shown in Fig.4 to join them on the base. When placing an order, indicate the overall length for actual use. Note, however, that model FT2010 units cannot be joined together.

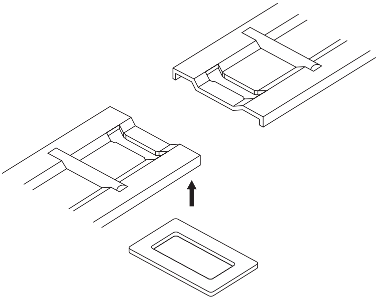
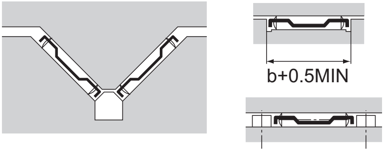


Fig.4 Connection of Model FT Units

[Guiding the Flat Roller]

To guide model FT or FT-V, follow the instruction as shown in Fig.5.



For "b", see the specification table.

Fig.5 Guiding the Flat Roller

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

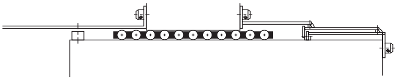
(2) Dropping or hitting the Flat Roller may damage it. Giving an impact to the product could also cause damage to its function even if the product looks intact.

[Contamination Protection and Lubrication]

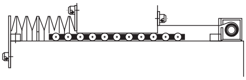
With the Flat Roller, once foreign material enters the raceway due to poor contamination protection, it cannot be removed easily and tends to severely damage the raceway or the Flat rollers. Therefore, use much care in contamination protection. Normally, for contamination protection of the Flat Roller, a bellows or a telescopic cover that covers the whole sliding surface, as shown in Fig.1, is effective.

The required quantity of lubricant is much smaller than sliding metals, making the lubrication control easy.

Since the Flat Roller has high lubricant retention, it is suitable for grease lubrication. It is preferable to use lithium-soap group grease No. 1 or 2, or slightly viscous sliding surface oil or turbine oil.



(a) Copper cover or telescopic cover



(b) Bellows or roller blind

Fig.1 Contamination Protection Methods

[Attaching the Stopper]

Although the Flat Roller performs extremely accurate motion, it may cause a traveling error due to uneven load distribution or non-uniform stop. Therefore, we recommend attaching a stopper on the end of the base or the table.

[Chamfering the End Face of the Table]

If the Flat Roller is longer than the overall table length, finely chamfer the end face of the table so that the rollers are easily fed to the table.

[Mounting Precision]

To maximize the performance of the Flat Roller, it is necessary to distribute the load as evenly as possible when mounting the product. For the allowable tilt as shown in Fig.2, we recommend 0.1 mm or less against 1,000 mm.

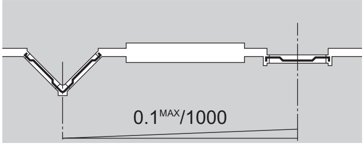


Fig.2 Mounting Precision

[Precautions on Use]

(1) If foreign material adheres to the product, replenish the lubricant after cleaning the product.

(2) Contact THK if you desire to use the product at a temperature of 100℃ or higher.

(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

(4) The Flat Roller cannot be used as a roller conveyor.

(5) A moment, vertical mount, uneven contact and machine vibrations may cause the cage to slip. If slippage of the cage is inevitable, we recommend using an LM Guide system designed for infinite motion.

[Storage]

When storing the Flat Roller, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Slide Pack

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

Dimensional Drawing, Dimensional Table

* Please see the separate "B Product Specifications".

Features of the Slide Pack

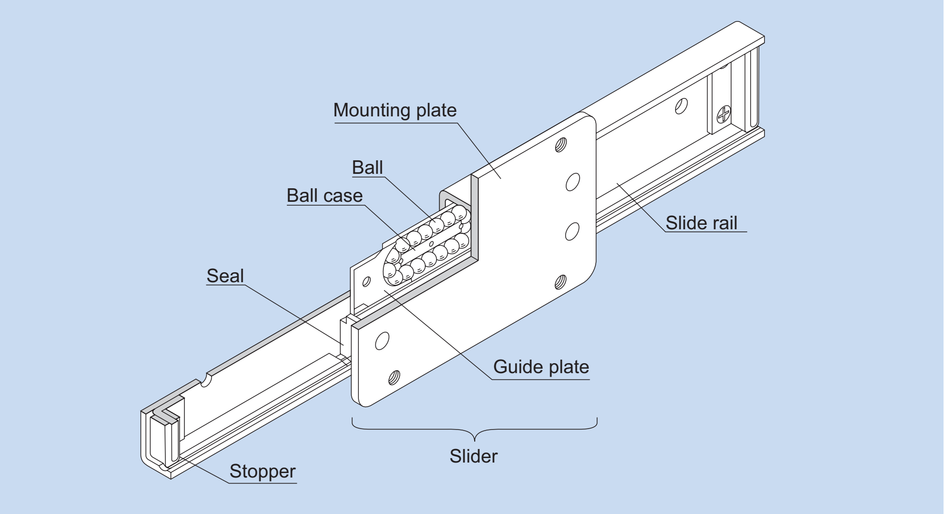


Fig.1 Structure of Slide Pack Model FBW-RUU

Structure and Features

Slide Pack model FBW is an LM system in which a precision press molded slider that contains balls performs infinite straight motion. Used in combination with a slide rail, the Slide Pack achieves light-weight and compact design and smooth straight motion at a low price.
The ball case and the slide rail are nitrided to ensure high wear resistance. (The slide rail of model FBW 2560R is made of stainless steel.)
The Slide Pack is optimal for slide units of photocopiers, tool cabinets, electronic equipment cabinets, moving seats, automatic vending machines, machine tool slide covers, cash registers, heavy doors and curtain walls.

[Low Cost, Interchangeable]

Since it is press molded with precision, this LM system achieves stable quality and interchangeability at low cost.

[Infinite Stroke Length]

Unlike the conventional finite stroke type, the slider is capable of performing infinite motion. When connected with a slide rail, it can be used in long-stroke applications.

[Easy Installation and Handling]

Because of the structure that prevents balls from falling off even if the slider is removed from the slide rail, this model is easy to handle and can be used in a complex construction where it is impossible to install an LM system unless it is disassembled.

[A Type Equipped with a Contamination Protection Seal Also Standardized]

A type equipped with a contamination protection seal is standardized for locations where cutting chips or dust may enter the system.

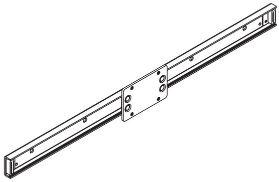
Types of the Slide Pack

Type

Model FBW 2560R

Specification Table⇒B-536

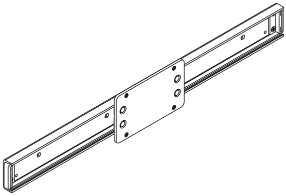
This model is a compact type.



Model FBW 3590R

Specification Table⇒B-536

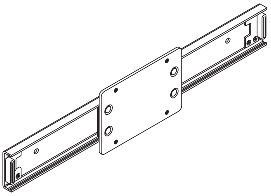
This model is a standard type.



Model FBW 50110R

Specification Table⇒B-537

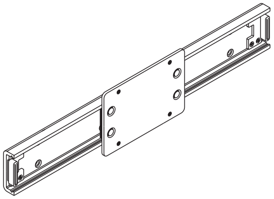
This model is a heavy load type.



Model FBW 50110H

Specification Table⇒B-537

This model is a high rigidity type.



Clearance

Model FBW is manufactured to the following accuracies.
Vertical clearance: 0.03 mm or less
Horizontal clearance: 0.1 mm or less
These specifications are values when the slide rail is attached to a rigid base.

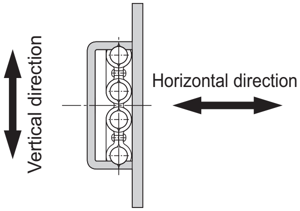


Fig.2

Contamination Protection

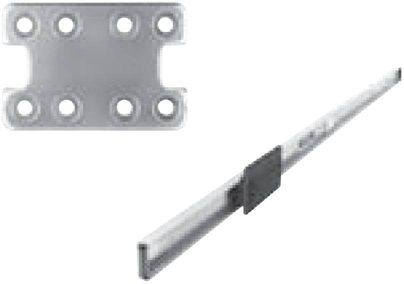
For Slide Pack model FBW-R (H), a special synthetic rubber seal with high contamination protection characteristics, capable of preventing foreign material from entering the slider and the lubricant from leaking, is available. The seal increases the contamination protection effect by contacting both the slide rail raceway where balls roll and the slide rail itself.

Metal Dustproof Cover

For Slide Pack model FBW, steel covers that cover the whole slide rail to prevent foreign material from entering the slide are available.
For detailed dimensions, see B-538.

Jointed Slide Rails

If the required specifications exceed the standard stroke, two or more slide rails can be connected. When placing an order, indicate the overall length.

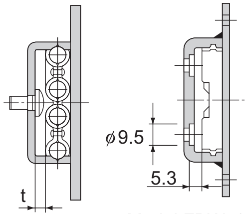


Installation

[Mounting Screws of the Slide Rail]

Since the space for securing the mounting screws of the slide rail is small as shown in Fig.1, we recommend using button-head bolt or binding-head bolt (JIS B 1111 annex).

Note) The slide rail of model FBW 50110H is countersunk. We recommend mounting the slide rail using hexagonal-socket-head type bolts (M5).



Model FBW50110H

Fig.1

Unit: mm

Model No.	t
FBW 2560R	3.2
FBW 3590R	3.4
FBW 50110R	3.4
FBW 50110H	—

[Attaching the Stopper]

If the slider may overshoot and come off of the slide rail, attach the dedicated stopper to the slide rail end as shown in Fig.2.

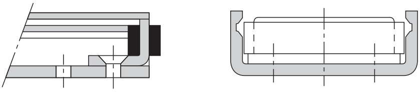


Fig.2

[Installing the Slider]

With model FBW-R (H), balls will not fall off even if the slider is removed from the slide rail. However, they could fall if the slider is twisted when reattaching it to the slide rail. Whenever possible, do not remove the slider from the slide rail when installing the Slide Pack.

[Groove Dimensions]

Fig.3 shows the dimensions of grooves for applications where model FBW-R (H) is installed in a groove.

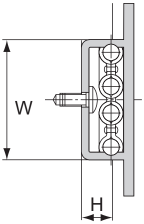


Fig.3

Unit: mm

Model No.	W	H
FBW 2560R	$24.8^{+0.15}_{+0.1}$	7.4
FBW 3590R	$37^{+0.15}_{+0.1}$	10
FBW 50110R	$50^{+0.15}_{+0.1}$	10
FBW 50110H	$54.4^{+0.15}_{+0.1}$	13

Lubrication

Apply high-quality lithium soap group grease to the raceway of the slide rail before using the product.

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Tilting the slider or slide rail may cause them to fall by their own weight.

(3) Dropping or hitting the Slide Pack may damage it. Giving an impact to the Slide Pack could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Apply high-quality lithium soap group grease to the raceway of the slide rail before using the product.

(2) Do not mix lubricants of different physical properties.

[Precautions on Use]

(1) The static permissible load of the Slide Pack varies according to the direction.

(2) Entrance of foreign material may cause damage to the ball circulating component or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.

(3) If foreign material such as dust or cutting chips adheres to the product, replenish the lubricant after cleaning the product with pure white kerosene.

(4) Avoid using the product at other than normal temperature, or using it in harsh conditions such as intensive reciprocations that generate frictional heat and environments with water or dust.

(5) When using the Slide Pack with inverted mount, breakage of the slider due to an accident or the like may cause balls to fall and the slider to come off from the slide rail and fall. In these cases, take preventive measures such as adding a safety mechanism for preventing such falls.

(6) When you remove the slider from the slide rail and then reassemble them, inserting the slide rail into the slider while twisting them may cause balls to fall or damage the slider. Be sure to gently insert the rail straight into the slider while checking the position of the slider balls and that of the rail raceway.

[Storage]

When storing the Slide Pack, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Slide Rail

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

Features and Types

Dimensional Drawing, Dimensional Table

* Please see the separate "B Product Specifications".

Features of the Slide Rail

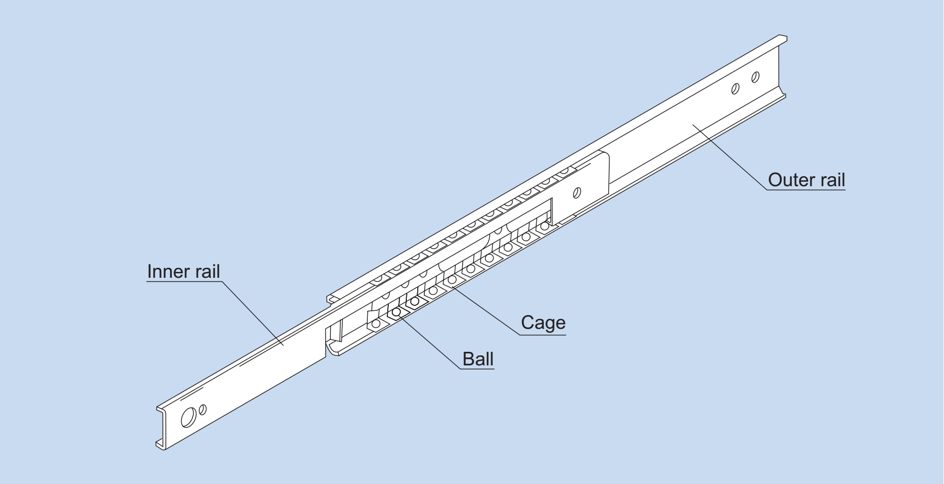


Fig.1 Structure of Slide Rail Model FBL

Structure and Features

Slide Rail model FBL is a thin, compact, lightweight and ultra-low price slide unit for finite motion. It has two rows of balls placed between an inner rail (made of a steel sheet roll-formed with precision) and an outer rail. The balls are evenly spaced by a cage press-molded with precision, thus eliminating friction between balls and achieving a smooth slide mechanism.
Since model FBL achieves smooth straight motion with easy installation, it can be used in a wide range of applications such as photocopiers, measuring instruments, telecommunication equipment, medical equipment, automatic vending machines and various types of office equipment.

[Unit Type That Allows Easy Installation]

Since the clearance and the motion of the slide unit are optimally adjusted, simply mounting the unit onto the base or the table using screws will achieve a slide mechanism with virtually no running noise.

[Thin and Compact]

Since the sectional shape is thin designed, this slide pack only requires a small side space for installation. In addition, a desired number of slide pack units can be installed in parallel according to the load conditions.

[Maintenance-free Operation]

Since the slide rail is treated with zinc plating, it is highly corrosion resistant. In addition, the slide unit contains lithium soap-based grease, which is highly stable against oxidation.

Types of the Slide Rail

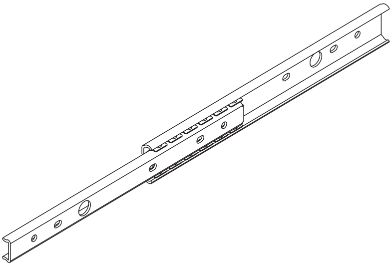
Types and Features

[Single Slides for Light Load]

Model FBL 27S

Specification Table⇒B-542

The most compact slide rail from THK.

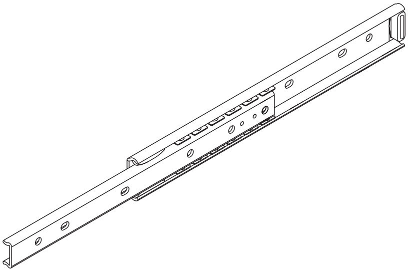


Model FBL 27S

Model FBL 27S-P14

Specification Table⇒B-543

An inner rail pulling type of model FBL 27S. Releasing the automatic free disconnection spring attached on the inner rail allows the slide rail to be pulled out. When stored, the spring is automatically released unidirectionally under a certain pressure.

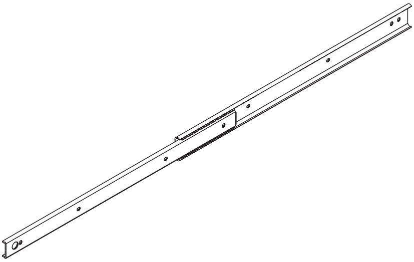


Model FBL 27S-P14

Model FBL 35S

Specification Table⇒B-544

A single slide type of Slide Rail with the most fundamental shape.

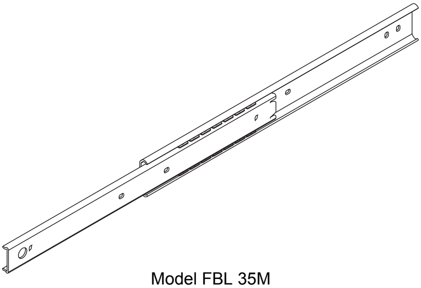


Model FBL 35S

Model FBL 35M

Specification Table⇒B-545

An inner rail pulling type of model FBL 35S. It stops by frictional resistance when the slide rail is fully opened, and is pulled out when being pulled further with force.
(brake-stop type)

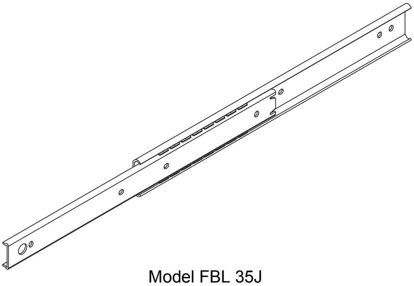


Model FBL 35M

Model FBL 35J

Specification Table⇒B-546

Based on model FBL 35M, this model has a lead ball that serves as a guide when the inner rail is inserted.

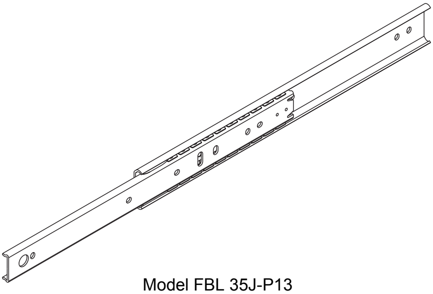


Model FBL 35J

Model FBL 35J-P13

Specification Table⇒B-547

An inner rail pulling type of model FBL 35S. Releasing the disconnection spring attached on the inner rail allows the slide rail to be pulled out. When folded, the locked state with the disconnect spring is manually released.

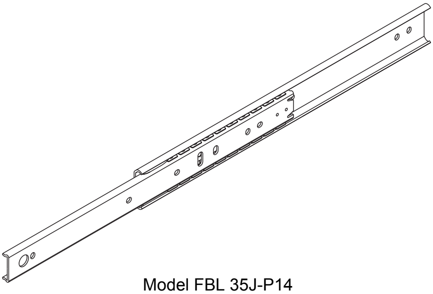


Model FBL 35J-P13

Model FBL 35J-P14

Specification Table⇒B-548

An inner rail pulling type of model FBL 35S. Releasing the automatic free disconnection spring attached on the inner rail allows the slide rail to be pulled out. When stored, the spring is automatically released unidirectionally under a certain pressure.

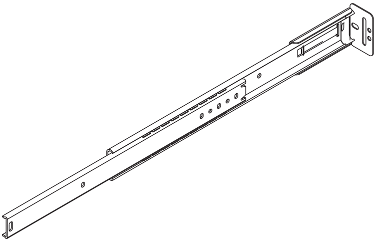


Model FBL 35J-P14

Model FBL 35B

Specification Table⇒B-549

A brake-stop type of model FBL 35M. It can be mounted on the bottom face of a moving object when used.



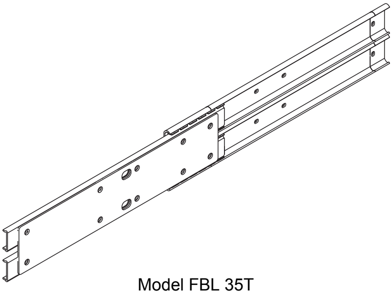
Model FBL 35B

[Single Slides for Medium Load]

Model FBL 35T

Specification Table⇒B-550

A single slide combining two units of model FBL 35S. When folded, the locked state with the disconnect spring is manually released.



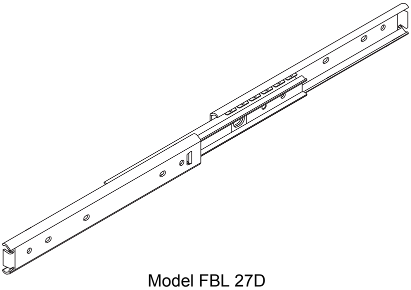
Model FBL 35T

[Double Slides for Light Load]

Model FBL 27D

Specification Table⇒B-551

A double-slide type that combines two units of model FBL 27S back-to-back. It is widely used in various types of OA equipment.

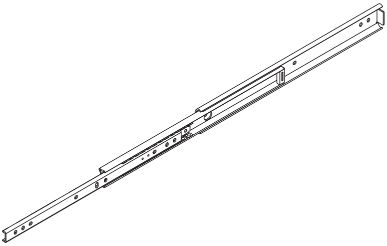


Model FBL 27D

Model FBL 35E-P14

Specification Table⇒B-552

A three-rail, double-slide type that allows a long stroke in a small space. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the locked state is automatically released under a certain pressure in the folding direction.



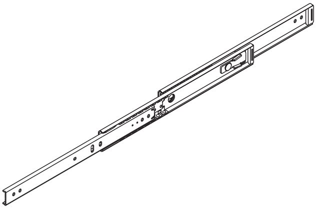
Model FBL 35E-P14

[Double Slides for Medium Load]

Model FBL 35G-P13

Specification Table⇒B-553

A double-slide type that combines two units of model FBL 35S front-to-front. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the locked state with the disconnect spring is manually released. It is also equipped with a pull-lock mechanism that functions when the slide rail is fully opened.

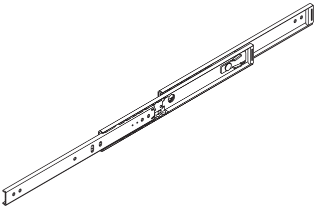


Model FBL 35G-P13

Model FBL 35G-P14

Specification Table⇒B-554

A double-slide type that combines two units of model FBL 35S front-to-front. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the lock state with the disconnect spring can automatically be released under a certain pressure in the folding direction. It is also equipped with a pull-lock mechanism that functions when the slide rail is fully opened.

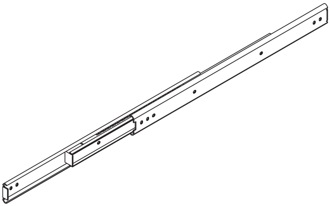


Model FBL 35G-P14

Model FBL 35D

Specification Table⇒B-555

A double-slide type that combines two units of model FBL 35S back-to-back. It is extensively used regardless of the industry.

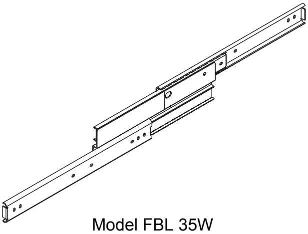


Model FBL 35D

Model FBL 35W

Specification Table⇒B-556

A double-slide type based on model FBL 35S that achieves a thickness of one single-slide unit.

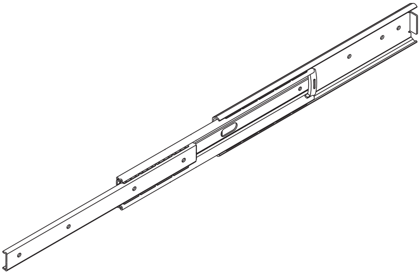


Model FBL 35W

Model FBL 51H

Specification Table⇒B-557

A three-rail, double-slide type that allows for a long stroke. With the smallest thickness, this model can be used in a space-saving location even under a large load.

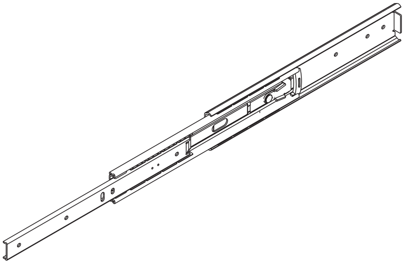


Model FBL 51H

Model FBL 51H-P13

Specification Table⇒B-558

A three-rail, double-slide type that allows a long stroke. With the smallest thickness, this model can be used in a space-saving location even under a large load. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the locked state with the disconnect spring is manually released. It is also equipped with a lock mechanism that functions when the slide rail is fully opened.

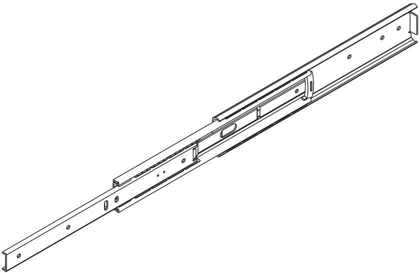


Model FBL 51H-P13

Model FBL 51H-P14

Specification Table⇒B-559

A three-rail, double-slide type that allows a long stroke. With the smallest thickness, this model can be used in a space-saving location even under a large load. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the locked state is automatically released under a certain pressure in the folding direction.



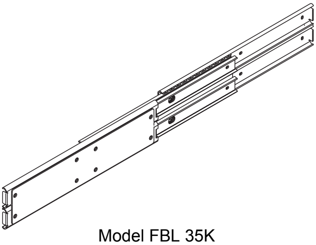
Model FBL 51H-P14

[Double Slides for Heavy Load]

Model FBL 35K

Specification Table⇒B-560

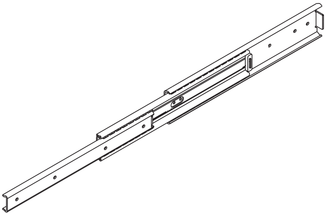
A double-slide type combining 4 units of model FBL 35S. It achieves the largest permissible load among all types and is optimal for opening/ closing heavy objects.


Model FBL 35K

Model FBL 56H

Specification Table⇒B-561

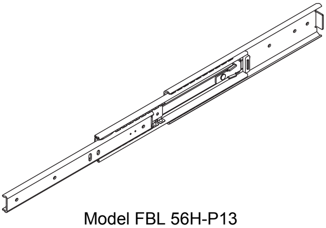
A double-slide type with the largest permissible load among the three rails. It is used extensively in various types of OA furniture.


Model FBL 56H

Model FBL 56H-P13

Specification Table⇒B-562

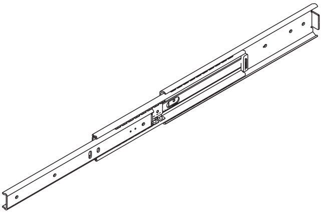
A double-slide type with the largest permissible load among the three rails. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the locked state with the disconnect spring is manually released. It is also equipped with a lock mechanism that functions when the slide rail is fully opened.


Model FBL 56H-P13

Model FBL 561H-P14

Specification Table⇒B-563

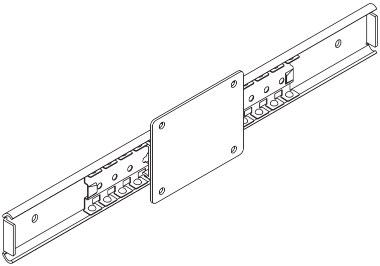
A double-slide type with the largest permissible load among the three rails. Releasing the automatic free disconnection spring attached on the inner rail allows the inner rail to be pulled out. When folded, the locked state is automatically released under a certain pressure in the folding direction.


Model FBL 56H-P14

Light Load Type Model FBL 35F

Specification Table⇒B-564

Using a flange type that can easily be mounted, this slide-type model is capable of performing straight, finite motion.

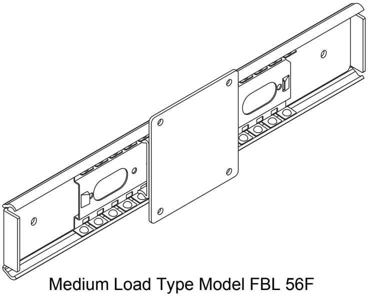


Light Load Type Model FBL 35F

Medium Load Type Model FBL 56F

Specification Table⇒B-565

Using a flange type that can easily be mounted, this slide-type model is capable of performing straight, finite motion. It is optimal for locations under a large working load.

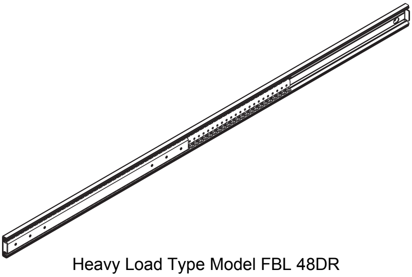


Medium Load Type Model FBL 56F

Heavy Load Type Model FBL 48DR

Specification Table⇒B-566

A heavy-load, low-friction slide rail developed for sliding heavy doors.



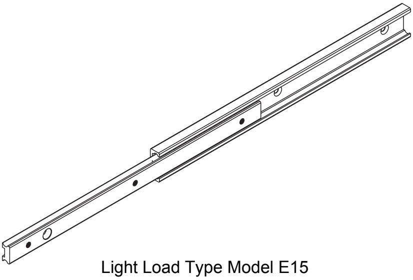
Heavy Load Type Model FBL 48DR

[Aluminum Alloy Slide Rail]

Light Load Type Model E15

Specification Table⇒B-567

The lightest and most compact single slide in the aluminum alloy series. It is especially suitable for locations with magnetism, locations requiring antirust measures and locations where much importance is given to appearance.

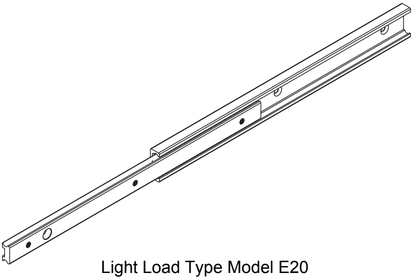


Light Load Type Model E15

Light Load Type Model E20

Specification Table⇒B-568

A single-slide with the most fundamental shape in the aluminum alloy series. It is especially suitable for locations with magnetism, locations requiring antirust measures and locations where much importance is given to appearance.

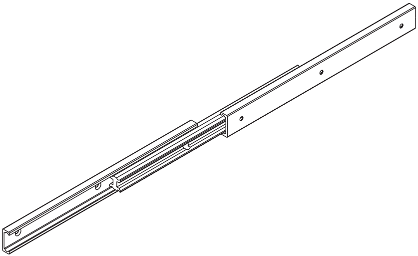


Light Load Type Model E20

Light Load Type Model D20

Specification Table⇒B-569

The lightest and most compact double slides in the aluminum alloy series. It is especially suitable for locations with magnetism, locations requiring antirust measures and locations where much importance is given to appearance.



Light Load Type Model D20

Classification Table for Slide Rails

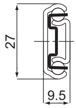
Slide Rail

Single Slide

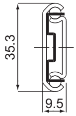
For Light Load

Model FBL27S

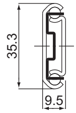
Model FBL27S-P14



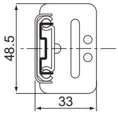
Model FBL35S



Model FBL35M



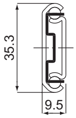
Model FBL35B



Model FBL35J

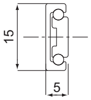
Model FBL35J-P13

Model FBL35J-P14



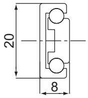
Model E15

(Made of Aluminum)



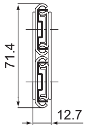
Model E20

(Made of Aluminum)



For Medium Load

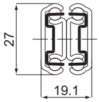
Model FBL35T



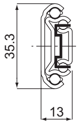
Double Slide

For Light Load

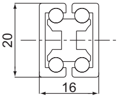
Model FBL27D



Model FBL35E-P14



Model D20 (Made of Aluminum)

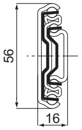


For Heavy Load

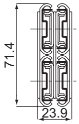
Model FBL56H

Model FBL56H-P13

Model FBL56H-P14



Model FBL35K

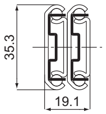


Linear Type Slide

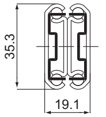
For Medium Load

Model FBL35G-P13

Model FBL35G-P14



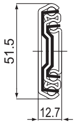
Model FBL35D



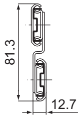
Model FBL51H

Model FBL51H-P13

Model FBL51H-P14

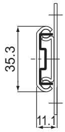


Model FBL35W



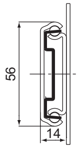
For Light Load

Model FBL35F



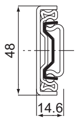
For Medium Load

Model FBL56F



For Heavy Load

Model FBL48DR



Mounting the Slide Rail

[Mounting Screws of the Slide Rail]

The slide rail is designed to be mounted using M4 screws. Since the mounting space is small as shown in Fig.1, we recommend using button-head bolt or binding-head bolt (JIS B 1111 annex).

Note) For models FBL27S/27S-P14/27D, use M4 binding-head bolt, or M3 button-head bolt or binding-head bolt.
Note) For model FBL48DR, use M5×8 mounting screw.
Note) For model E15, use M2.6 countersunk screw.
Note) For models E20 and D20, use M3 countersunk screw.
Note) For model FBL 35E, use M3 button-head bolts or binding-head bolts.

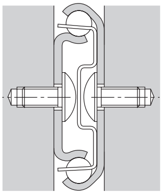


Fig.1

[Attaching the Slide Rail]

While keeping the maximum stroke, mount the outer rail at the section where the inner rail and the outer rail overlap, slide the inner rail backward, and then secure the rail using a screw through the access hole.

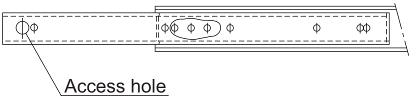


Fig.2

[Permissible Load and Mounting Orientation]

For use other than with the mounting orientation shown in Fig.3, contact THK.

The permissible load of the Slide Rail indicates the load in the direction Pa that two rails can receive in the middle of the inner rail length at the maximum stroke.

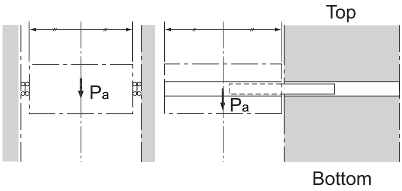


Fig.3

[Surface Treatment]

The surface of the Slide Rail is treated with electro-galvanizing (gloss chromate treatment) as standard. Colored chromate treatment and chrome plating are also available. Contact THK for details.

[Handling]

(1) Tilting a slide rail may cause it to fall by its own weight.

(2) Dropping or hitting the Slide Rail may damage it. Giving an impact force to the slide rail could also cause damage even if the product looks intact.

[Precautions on Use]

(1) When mounting the Slide Rail, use care to always keep both rails in parallel.

(2) Entrance of foreign material may cause damage to the Slide Rail or functional loss.

(3) Avoid using the product at other than normal temperature, or using it in harsh conditions such as intensive reciprocations that generate frictional heat and environments with water or dust.

(4) The durability of the Slide Rail varies depending on factors such as the drawing dimension, travel distance, mounting conditions and environment in addition to operating frequency. Take these factors into account when making a selection.

[Storage]

When storing the Slide Rail, avoid high temperature, low temperature and high humidity.

Ball Screw

THK General Catalog

Ball Screw

THK General Catalog

A Technical Descriptions of the Products

Rolled Ball Screw

B Product Specifications (Separate)

Dimensional Drawing, Dimensional Table

Precision, Caged Ball Screw

Standard-Stock Precision Ball Screw Unfinished Shaft Ends

Standard-Stock Precision Ball Screw

Precision Ball Screw

Precision Rotary Ball Screw

Precision Ball Screw / Spline

Rolled Ball Screw

* Please see the separate "B Product Specifications".

Features of the Ball Screw

Driving Torque One Third of the Sliding Screw

With the Ball Screw, balls roll between the screw shaft and the nut to achieve high efficiency. Its required driving torque is only one third of the conventional sliding screw. (See Fig.1 and Fig.2.) As a result, it is capable of not only converting rotational motion to straight motion, but also converting straight motion to rotational motion.

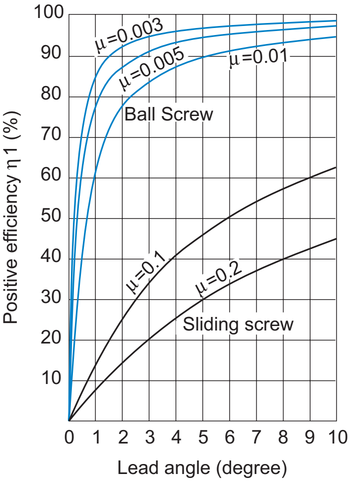


Fig.1 Positive Efficiency (Rotational to Linear)

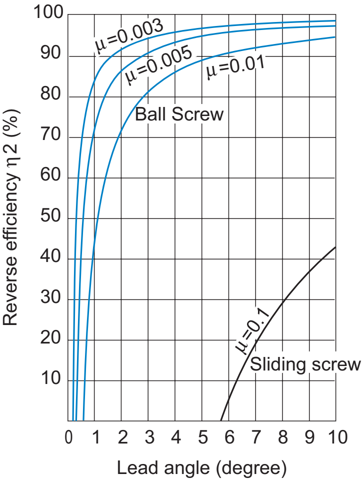


Fig.2 Reverse Efficiency (Linear to Rotational)

[Calculating the Lead Angle]

$$\tan\beta = \frac{Ph}{\pi \cdot d_P} \quad \cdots\cdots\cdots (1)$$

β	: Lead angle	(°)
d_P	: Ball center-to-center diameter	(mm)
Ph	: Feed screw lead	(mm)

[Relationship between Thrust and Torque]

The torque or the thrust generated when thrust or torque is applied is obtained from equations (2) to (4).

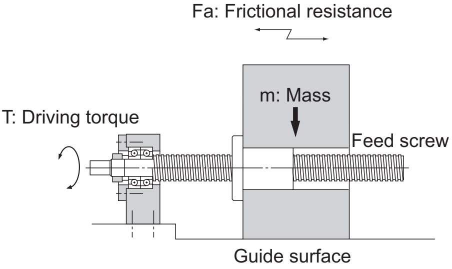
● Driving Torque Required to Gain Thrust

$$T = \frac{Fa \cdot Ph}{2\pi \cdot \eta 1} \quad \cdots\cdots\cdots (2)$$

T	: Driving torque	(N-mm)
Fa	: Frictional resistance on the guide surface	(N)

$Fa=\mu \times mg$

μ	: Frictional coefficient of the guide surface	
g	: Gravitational acceleration	($9.8\ m/s^2$)
m	: Mass of the transferred object	(kg)
Ph	: Feed screw lead	(mm)
$\eta 1$	: Positive efficiency of feed screw	(see Fig.1 on A-664)



● Thrust Generated When Torque is Applied

$$Fa = \frac{2\pi \cdot \eta 1 \cdot T}{Ph} \quad \cdots\cdots\cdots (3)$$

Fa	: Thrust generated	(N)
T	: Driving torque	(N-mm)
Ph	: Feed screw lead	(mm)
$\eta 1$	: Positive efficiency of feed screw	(see Fig.1 on A-664)

● Torque Generated When Thrust is Applied

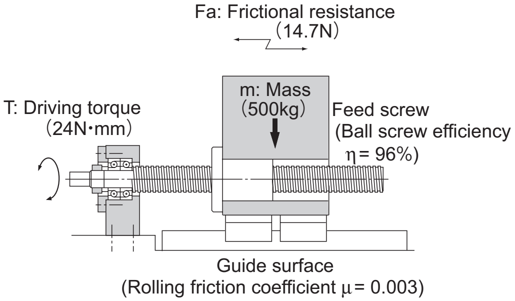
$$T = \frac{Ph \cdot \eta 2 \cdot Fa}{2\pi} \quad \cdots\cdots\cdots (4)$$

T	: Torque generated	(N-m)
Fa	: Thrust generated	(N)
Ph	: Feed screw lead	(mm)
$\eta 2$	: Reverse efficiency of feed screw	(see Fig.2 on A-664)

[Examples of Calculating Driving Torque]

When moving an object with a mass of 500 kg using a screw with an effective diameter of 33 mm and a lead length of 10 mm (lead angle: 5°30'), the required torque is obtained as follows.

Rolling guide ($\mu = 0.003$)
Ball Screw (from $\mu = 0.003$, $\eta = 0.96$)



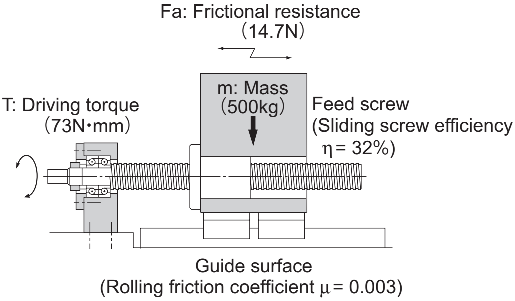
Frictional resistance on the guide surface

$$Fa = 0.003 \times 500 \times 9.8 = 14.7\text{N}$$

Driving torque

$$T = \frac{14.7 \times 10}{2\pi \times 0.96} = 24\ \text{N} \cdot \text{mm}$$

Rolling guide ($\mu = 0.003$)
Ball Screw (from $\mu = 0.2$, $\eta = 0.32$)



Frictional resistance on the guide surface

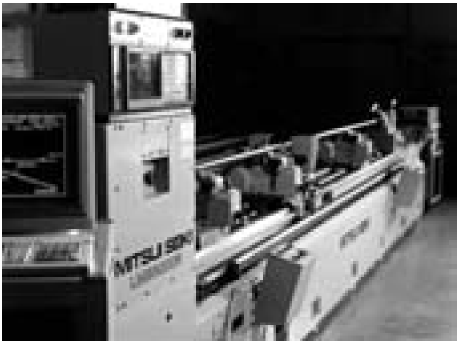
$$Fa = 0.003 \times 500 \times 9.8 = 14.7\text{N}$$

Driving torque

$$T = \frac{14.7 \times 10}{2\pi \times 0.32} = 73\ \text{N} \cdot \text{mm}$$

Ensuring High Accuracy

The Ball Screw is ground with the highest-level facilities and equipment at a strictly temperaturecontrolled factory, Its accuracy is assured under a thorough quality control system that covers assembly to inspection.



Automatic lead-measuring machine using laser

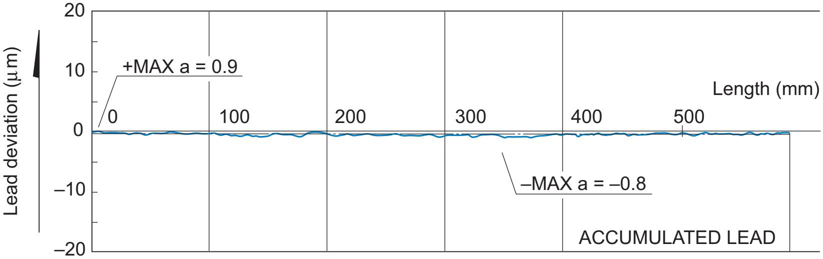


Fig.3 Lead Accuracy Measurement

[Conditions]
Model No.: BIF3205-10RRG0+903LC2

Table1 Lead Accuracy Measurement Unit: mm

Item	Standard value	Actual measurement
Directional target point	0	—
Representative travel distance error	±0.011	−0.0012
Fluctuation	0.008	0.0017

Capable of Micro Feeding

The Ball Screw requires a minimal starting torque due to its rolling motion, and does not cause a slip, which is inevitable with a sliding motion. Therefore, it is capable of an accurate micro feeding.
Fig.4 shows a travel distance of the Ball Screw in one-pulse, 0.1-µm feeding. (LM Guide is used for the guide surface.)

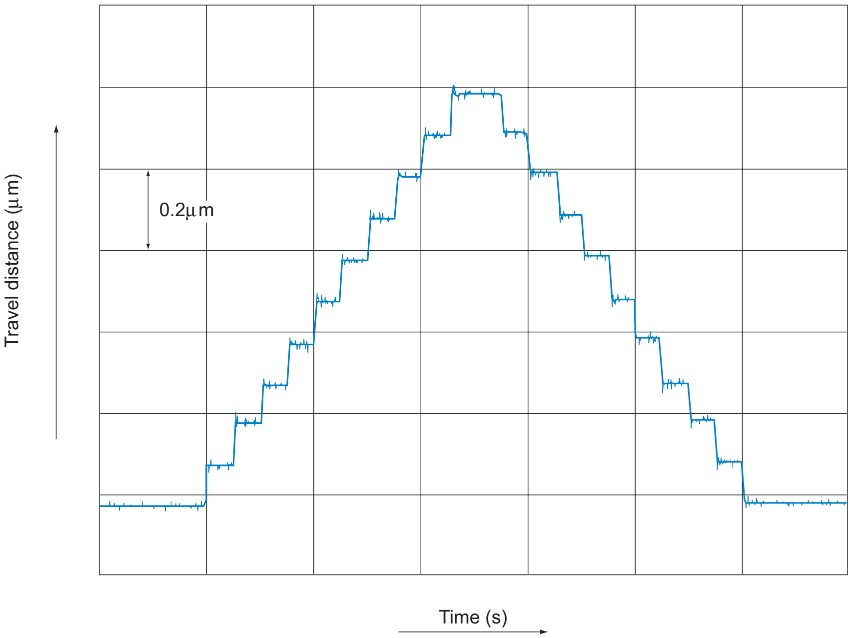


Fig.4 Data on Travel in 0.1-µm Feeding

High Rigidity without Backlash

Since the Ball Screw is capable of receiving a preload, the axial clearance can be reduced to below zero and the high rigidity is achieved because of the preload. In Fig.5, when an axial load is applied in the positive (+) direction, the table is displaced in the same (+) direction. When an axial load is provided in the reverse (-) direction, the table is displaced in the same (-) direction. Fig.6 shows the relationship between the axial load and the axial displacement. As indicated in Fig.6, as the direction of the axial load changes, the axial clearance occurs as a displacement. Additionally, when the Ball Screw is provided with a preload, it gains a higher rigidity and a smaller axial displacement than a zero clearance in the axial direction.

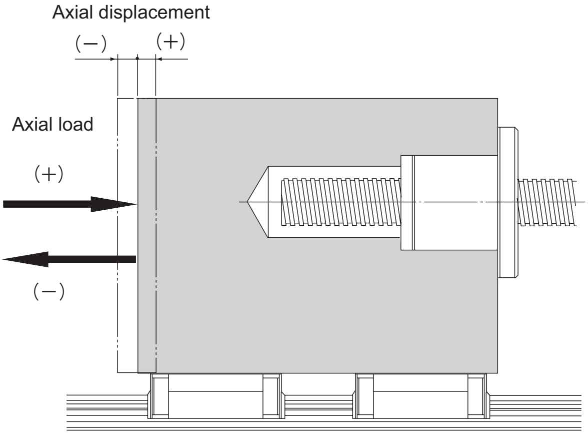


Fig.5

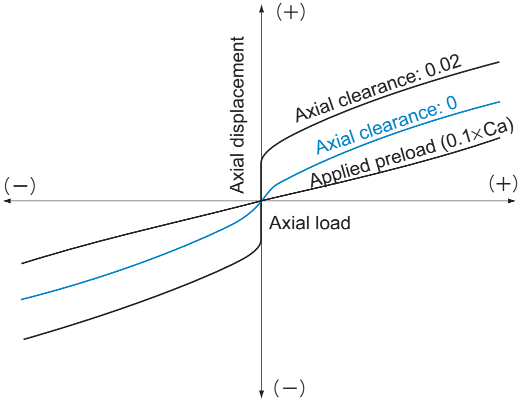


Fig.6 Axial Displacement in Relation to Axial Load

Capable of Fast Feed

Since the Ball Screw is highly efficient and generates little heat, it is capable of a fast feed.

[Example of High Speed]
Fig.7 shows a speed diagram for a large lead rolled Ball Screw operating at 2 m/s.

[Conditions]

Item	Description
Sample	Large Lead Rolled Ball Screw WTF3060 (Shaft diameter: 30mm; lead: 60mm)
Maximum speed	2m/s (Ball Screw rotational speed: 2,000 min^{-1})
Guide surface	LM Guide model SR25W

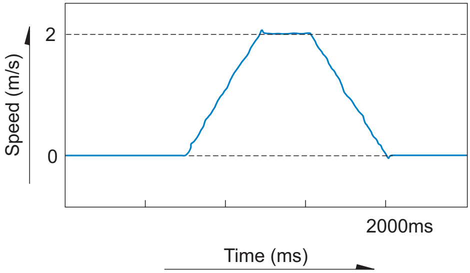


Fig.7 Velocity diagram

[Example of Heat Generation]

Fig.8 shows data on heat generation from the screw shaft when a Ball Screw is used in an operating pattern indicated in Fig.9

[Conditions]

Item	Description
Sample	Double-nut precision Ball Screw BNFN4010-5 (Shaft diameter: 40 mm; lead: 10 mm; applied preload: 2,700 N)
Maximum speed	0.217m/s (13m/min) (Ball Screw rotational speed: 1300 min^{-1})
Low speed	0.0042m/s (0.25m/min) (Ball Screw rotational speed: 25 min^{-1})
Guide surface	LM Guide model HSR35CA
Lubricant	Lithium-based grease (No. 2)

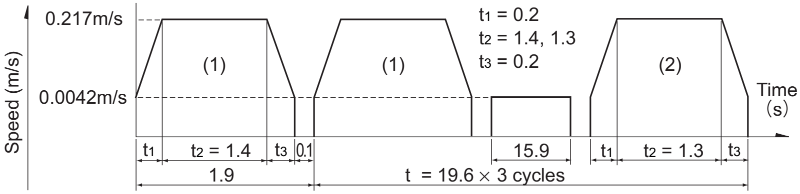


Fig.8 Operating Pattern

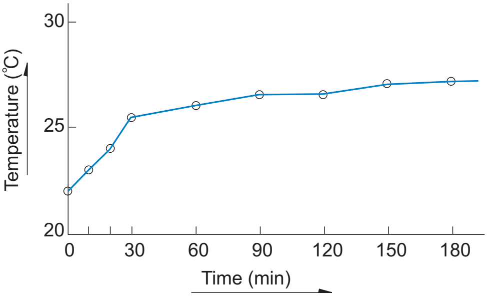
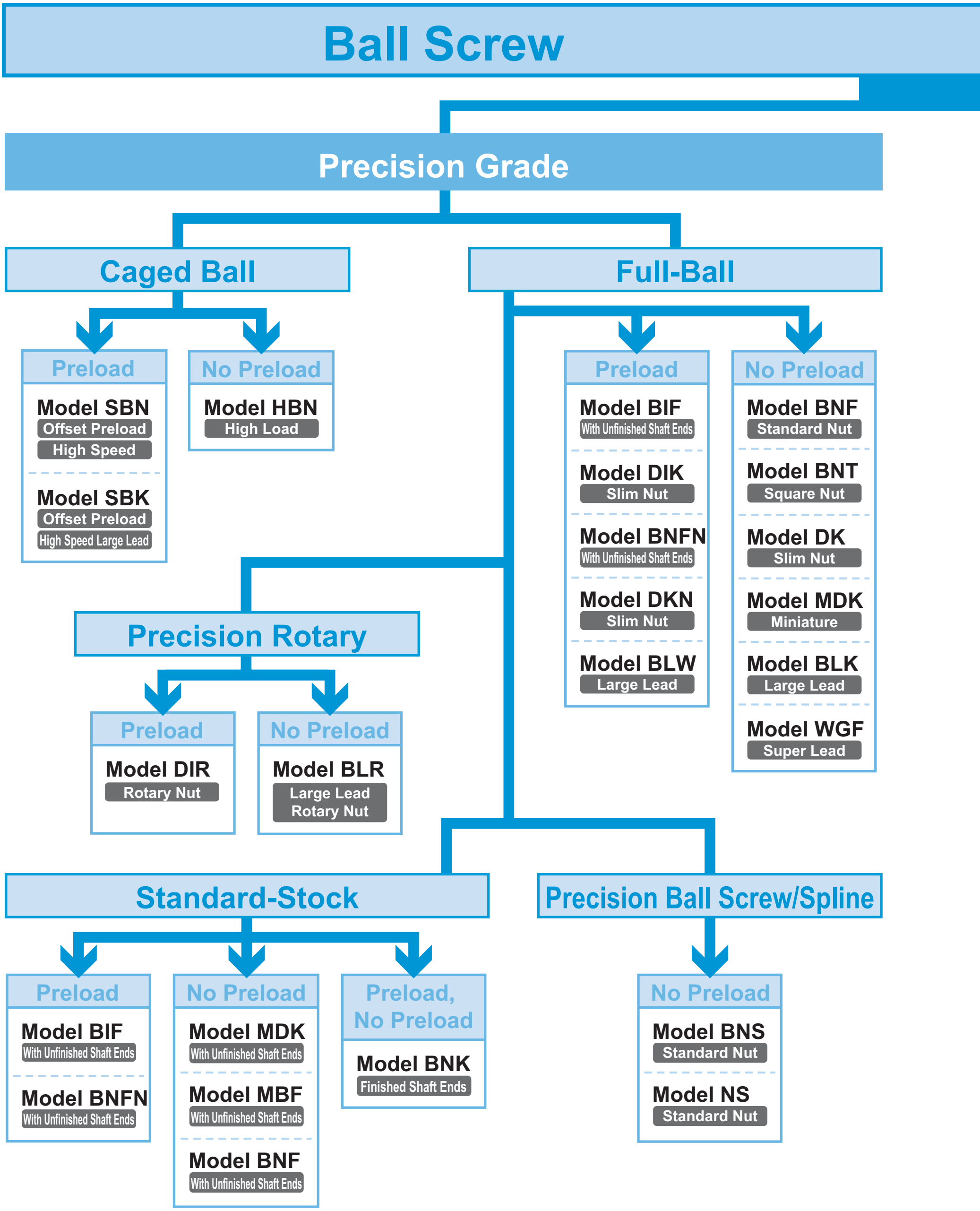
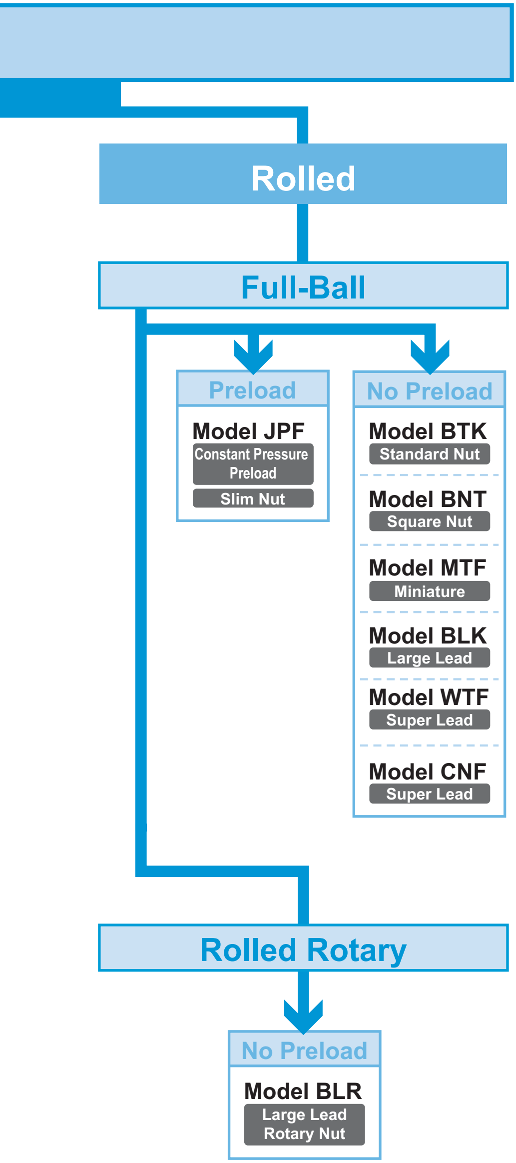


Fig.9 Ball Screw Heat Generation Data

Types of Ball Screws



- **Ball Screw**
  - **Precision Grade**
    - **Caged Ball**
      - Preload
        - **Model SBN** Offset Preload, High Speed
        - **Model SBK** Offset Preload, High Speed Large Lead
      - No Preload
        - **Model HBN** High Load
    - **Full-Ball**
      - Preload
        - **Model BIF** With Unfinished Shaft Ends
        - **Model DIK** Slim Nut
        - **Model BNFN** With Unfinished Shaft Ends
        - **Model DKN** Slim Nut
        - **Model BLW** Large Lead
      - No Preload
        - **Model BNF** Standard Nut
        - **Model BNT** Square Nut
        - **Model DK** Slim Nut
        - **Model MDK** Miniature
        - **Model BLK** Large Lead
        - **Model WGF** Super Lead
    - **Precision Rotary**
      - Preload
        - **Model DIR** Rotary Nut
      - No Preload
        - **Model BLR** Large Lead, Rotary Nut
    - **Standard-Stock**
      - Preload
        - **Model BIF** With Unfinished Shaft Ends
        - **Model BNFN** With Unfinished Shaft Ends
      - No Preload
        - **Model MDK** With Unfinished Shaft Ends
        - **Model MBF** With Unfinished Shaft Ends
        - **Model BNF** With Unfinished Shaft Ends
      - Preload, No Preload
        - **Model BNK** Finished Shaft Ends
    - **Precision Ball Screw/Spline**
      - No Preload
        - **Model BNS** Standard Nut
        - **Model NS** Standard Nut



Rolled

Full-Ball

Preload

Model JPF
Constant Pressure Preload
Slim Nut

No Preload

Model BTK
Standard Nut

Model BNT
Square Nut

Model MTF
Miniature

Model BLK
Large Lead

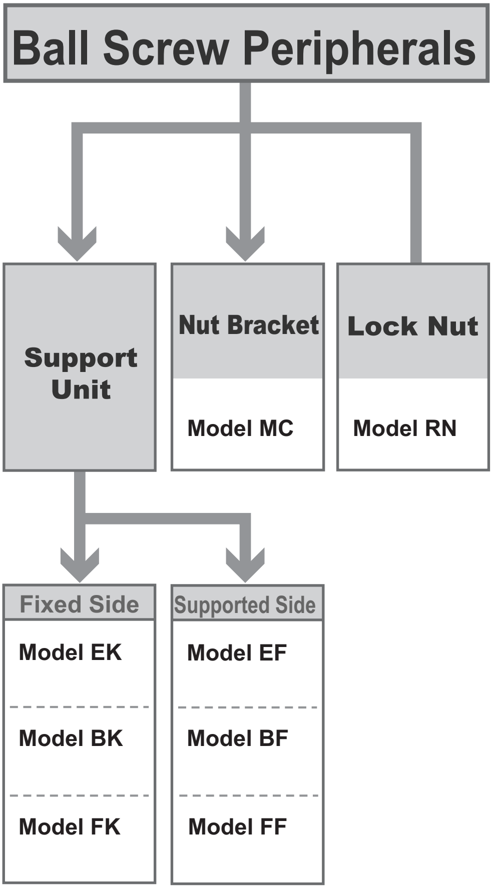
Model WTF
Super Lead

Model CNF
Super Lead

Rolled Rotary

No Preload

Model BLR
Large Lead Rotary Nut



Ball Screw Peripherals

Support Unit

Fixed Side

- Model EK
- Model BK
- Model FK

Supported Side

- Model EF
- Model BF
- Model FF

Nut Bracket

Model MC

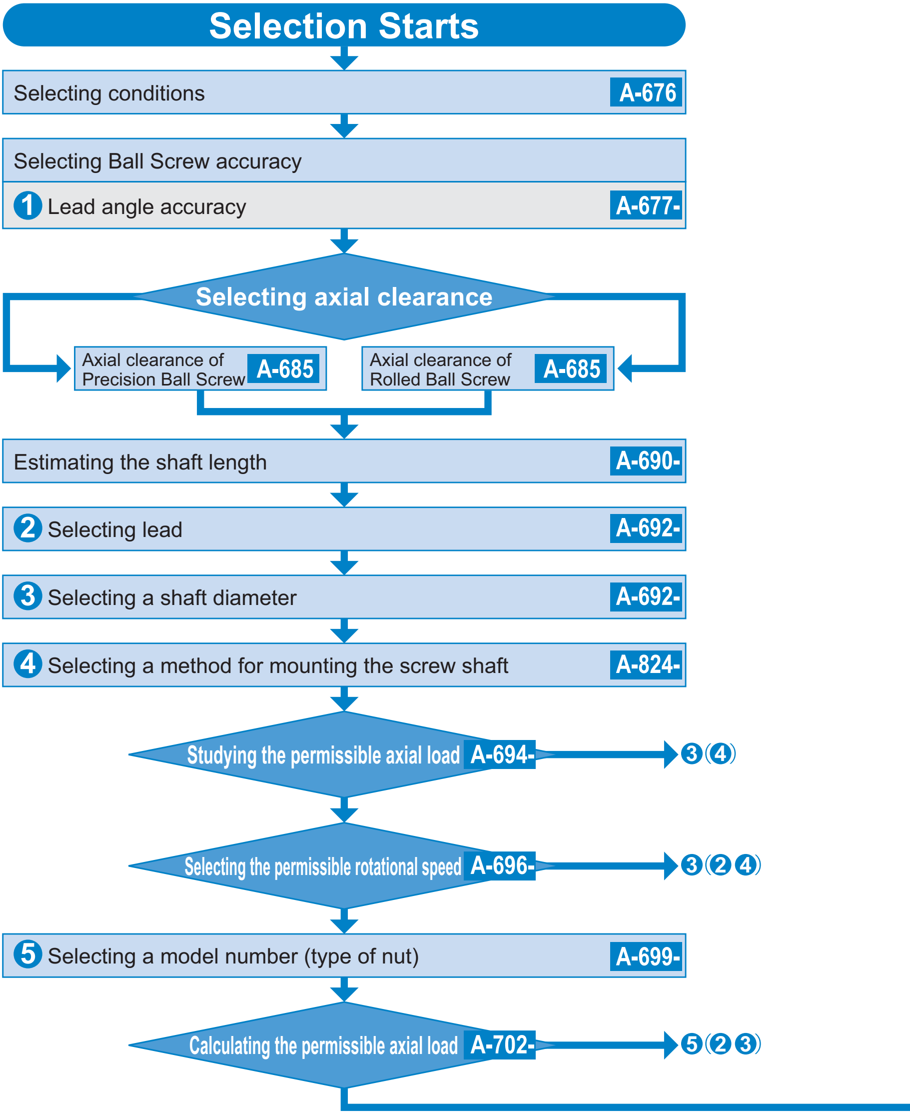
Lock Nut

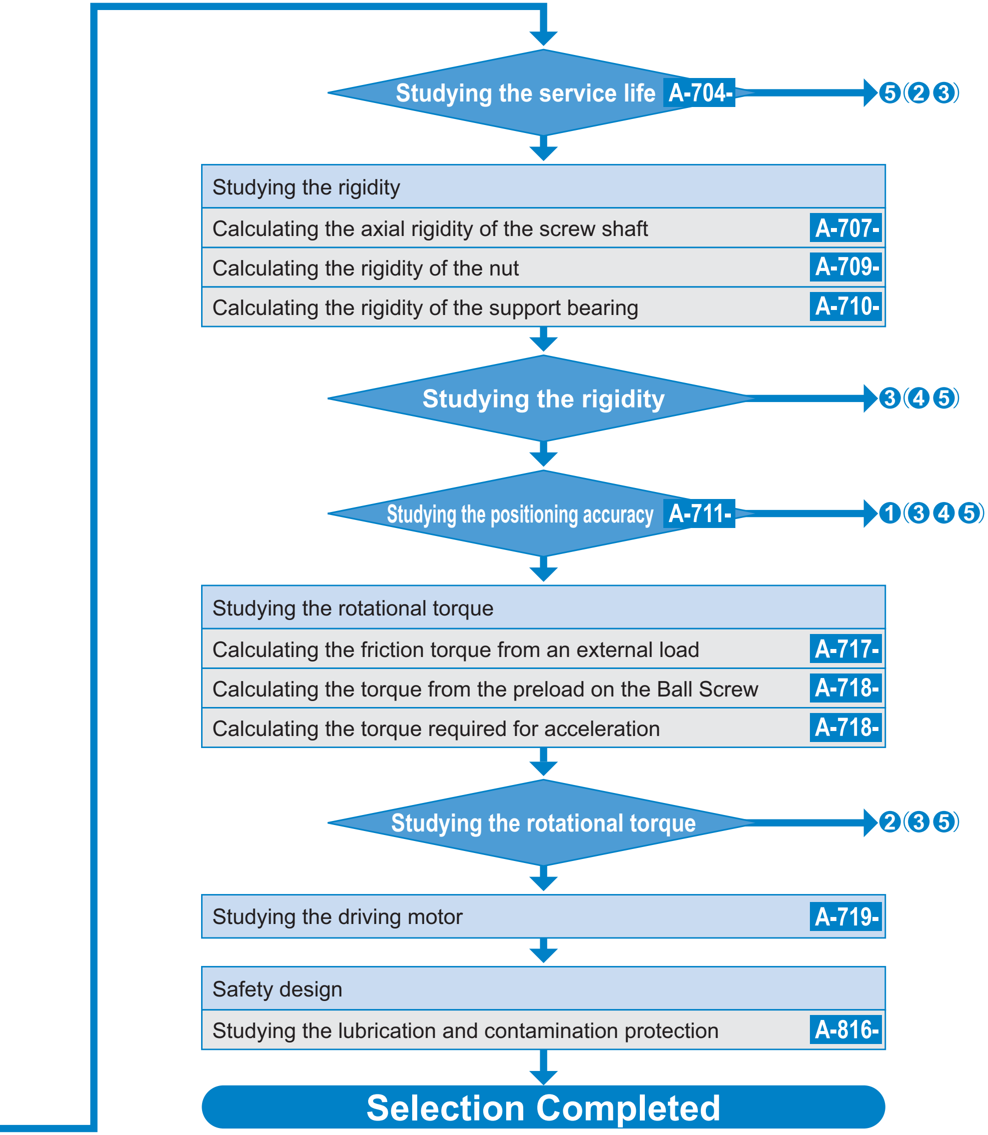
Model RN

Flowchart for Selecting a Ball Screw

[Ball Screw Selection Procedure]

When selecting a Ball Screw, it is necessary to make a selection while considering various parameters. The following is a flowchart for selecting a Ball Screw.




Studying the service life A-704-
⑤(②③)
Studying the rigidity
Calculating the axial rigidity of the screw shaft A-707-
Calculating the rigidity of the nut A-709-
Calculating the rigidity of the support bearing A-710-
Studying the rigidity
③(④⑤)
Studying the positioning accuracy A-711-
①(③④⑤)
Studying the rotational torque
Calculating the friction torque from an external load A-717-
Calculating the torque from the preload on the Ball Screw A-718-
Calculating the torque required for acceleration A-718-
Studying the rotational torque
②(③⑤)
Studying the driving motor A-719-
Safety design
Studying the lubrication and contamination protection A-816-
Selection Completed

[Conditions of the Ball Screw]

The following conditions are required when selecting a Ball Screw.

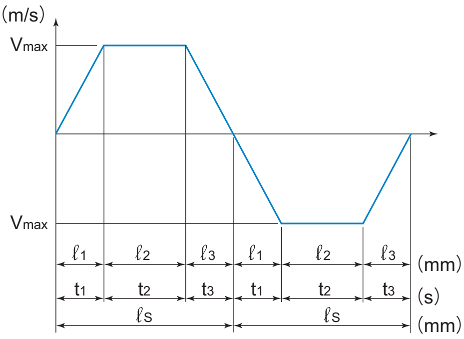
Transfer orientation	(horizontal, vertical, etc.)
Transferred mass	m (kg)
Table guide method	(sliding, rolling)
Frictional coefficient of the guide surface	μ (-)
Guide surface resistance	f (N)
External load in the axial direction	F (N)
Desired service life time	L_h (h)

Stroke length	ℓ_S (mm)
Operating speed	V_{max} (m/s)
Acceleration time	t_1 (s)
Even speed time	t_2 (s)
Deceleration time	t_3 (s)

Acceleration

$$\alpha = \frac{V_{max}}{t_1} \quad (\mathrm{m/s^2})$$

Acceleration distance	$\ell_1 = V_{max} \times t_1 \times 1000/2$ (mm)
Even speed distance	$\ell_2 = V_{max} \times t_2 \times 1000$ (mm)
Deceleration distance	$\ell_3 = V_{max} \times t_3 \times 1000/2$ (mm)
Number of reciprocations per minute	n ($\mathrm{min^{-1}}$)



Velocity diagram

Positioning accuracy	(mm)
Positioning accuracy repeatability	(mm)
Backlash	(mm)
Minimum feed amount	s (mm/pulse)

Driving motor (AC servomotor, stepping motor, etc.)

The rated rotational speed of the motor	N_{MO} ($\mathrm{min^{-1}}$)
Inertial moment of the motor	J_M ($\mathrm{kg \cdot m^2}$)
Motor resolution	(pulse/rev)
Reduction ratio	A (-)

Accuracy of the Ball Screw

Lead Angle Accuracy

The accuracy of the Ball Screw in the lead angle is controlled in accordance with the JIS standards (JIS B 1192 - 1997).

Accuracy grades C0 to C5 are defined in the linearity and the directional property, and C7 to C10 in the travel distance error in relation to 300 mm.

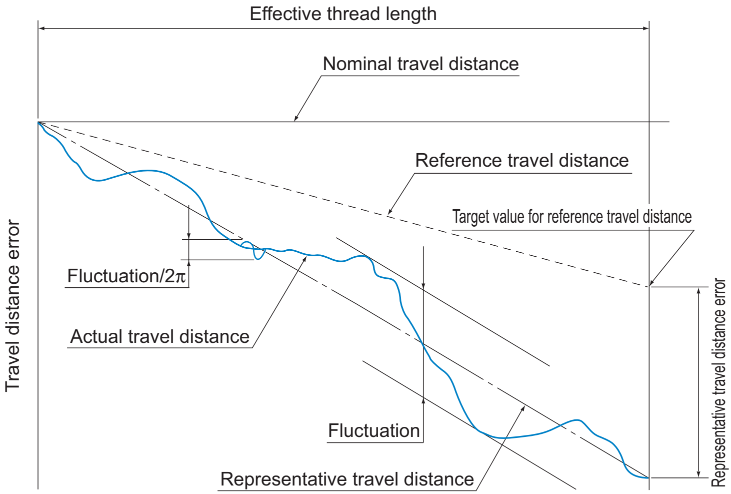


Fig.1 Terms on Lead Angle Accuracy

[Actual Travel Distance]
An error in the travel distance measured with an actual Ball Screw.

[Reference Travel Distance]
Generally, it is the same as nominal travel distance, but can be an intentionally corrected value of the nominal travel distance according to the intended use.

[Target Value for Reference Travel Distance]
You may provide some tension in order to prevent the screw shaft from runout, or set the reference travel distance in "negative" or "positive" value in advance given the possible expansion/contraction from external load or temperature. In such cases, indicate a target value for the reference travel distance.

[Representative Travel Distance]
It is a straight line representing the tendency in the actual travel distance, and obtained with the least squares method from the curve that indicates the actual travel distance.

[Representative Travel Distance Error (in ±)]
Difference between the representative travel distance and the reference travel distance.

[Fluctuation]
The maximum width of the actual travel distance between two straight lines drawn in parallel with the representative travel distance.

[Fluctuation/300]
Indicates a fluctuation against a given thread length of 300 mm.

[Fluctuation/2π]
A fluctuation in one revolution of the screw shaft.

Table1 Lead Angle Accuracy (Permissible Value) Unit: µm

		Precision Ball Screw												
												Rolled Ball Screw		
Accuracy grades		C0		C1		C2		C3		C5		C7	C8	C10
Effective thread length		Representative travel distance error	Fluctuation	Representative travel distance error	Fluctuation	Representative travel distance error	Fluctuation	Representative travel distance error	Fluctuation	Representative travel distance error	Fluctuation	Travel distance error	Travel distance error	Travel distance error
Above	Or less													
—	100	3	3	3.5	5	5	7	8	8	18	18	±50/ 300mm	±100/ 300mm	±210/ 300mm
100	200	3.5	3	4.5	5	7	7	10	8	20	18			
200	315	4	3.5	6	5	8	7	12	8	23	18			
315	400	5	3.5	7	5	9	7	13	10	25	20			
400	500	6	4	8	5	10	7	15	10	27	20			
500	630	6	4	9	6	11	8	16	12	30	23			
630	800	7	5	10	7	13	9	18	13	35	25			
800	1000	8	6	11	8	15	10	21	15	40	27			
1000	1250	9	6	13	9	18	11	24	16	46	30			
1250	1600	11	7	15	10	21	13	29	18	54	35			
1600	2000	—	—	18	11	25	15	35	21	65	40			
2000	2500	—	—	22	13	30	18	41	24	77	46			
2500	3150	—	—	26	15	36	21	50	29	93	54			
3150	4000	—	—	30	18	44	25	60	35	115	65			
4000	5000	—	—	—	—	52	30	72	41	140	77			
5000	6300	—	—	—	—	65	36	90	50	170	93			
6300	8000	—	—	—	—	—	—	110	60	210	115			
8000	10000	—	—	—	—	—	—	—	—	260	140			

Note) Unit of effective thread length: mm

Table2 Fluctuation in Thread Length of 300 mm and in One Revolution (permissible value) Unit: µm

Accuracy grades	C0	C1	C2	C3	C5	C7	C8	C10
Fluctuation/300	3.5	5	7	8	18	—	—	—
Fluctuation/2π	3	4	5	6	8	—	—	—

Table3 Types and Grades

Type	Series symbol	Grade	Remarks
For positioning	Cp	1, 3, 5	ISO compliant
For conveyance	Ct	1, 3, 5, 7, 10	

Note) Accuracy grades apply also to the Cp series and Ct series. Contact THK for details.

Example: When the lead of a Ball Screw manufactured is measured with a target value for the reference travel distance of −9 µm/500 mm, the following data are obtained.

Table4 Measurement Data on Travel Distance Error

Unit: mm

Command position (A)	0	50	100	150
Travel distance (B)	0	49.998	100.001	149.996
Travel distance error (A−B)	0	−0.002	+0.001	−0.004

Command position (A)	200	250	300	350
Travel distance (B)	199.995	249.993	299.989	349.885
Travel distance error (A−B)	−0.005	−0.007	−0.011	−0.015

Command position (A)	400	450	500
Travel distance (B)	399.983	449.981	499.984
Travel distance error (A−B)	−0.017	−0.019	−0.016

The measurement data are expressed in a graph as shown in Fig.2.
The positioning error (A-B) is indicated as the actual travel distance while the straight line representing the tendency of the (A-B) graph refers to the representative travel distance.
The difference between the reference travel distance and the representative travel distance appears as the representative travel distance error.

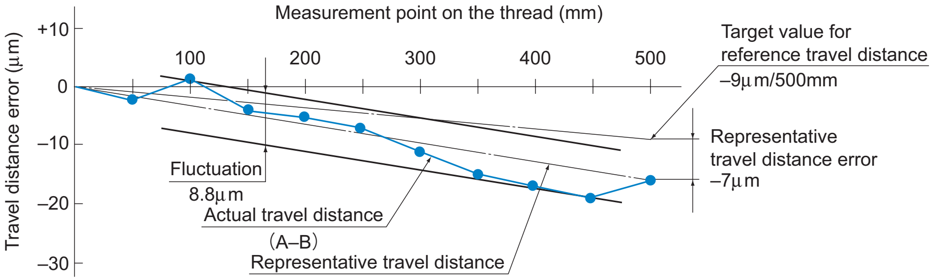
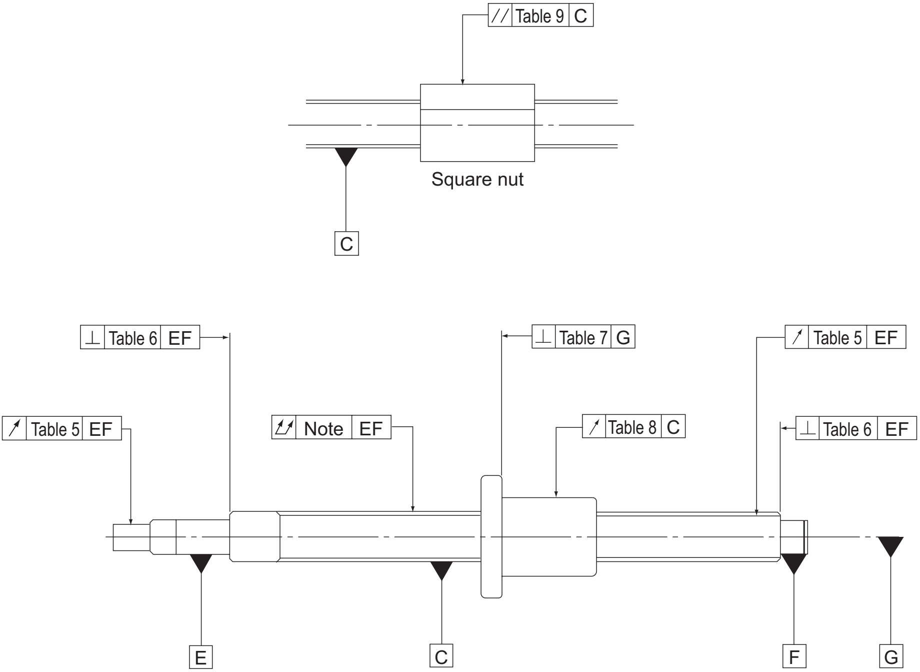


Fig.2 Measurement Data on Travel Distance Error

[Measurements]
Representative travel distance error: -7µm
Fluctuation: 8.8µm

Accuracy of the Mounting Surface

The accuracy of the Ball Screw mounting surface complies with the JIS standard (JIS B 1192-1997).



Note) For the overall radial runout of the screw shaft axis, refer to JIS B 1192-1997.

Fig.3 Accuracy of the Mounting Surface of the Ball Screw

[Accuracy Standards for the Mounting Surface]

Table5 to Table9 show accuracy standards for the mounting surfaces of the precision Ball Screw.

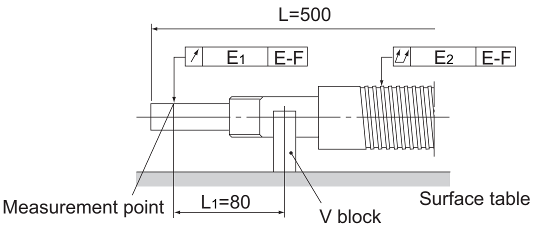
Table5 Radial Runout of the Circumference of the Thread Root in Relation to the Supporting Portion Axis of the Screw Shaft

Unit: µm

Screw shaft outer diameter (mm)		Runout (maximum)					
Above	Or less	C0	C1	C2	C3	C5	C7
—	8	3	5	7	8	10	14
8	12	4	5	7	8	11	14
12	20	4	6	8	9	12	14
20	32	5	7	9	10	13	20
32	50	6	8	10	12	15	20
50	80	7	9	11	13	17	20
80	100	—	10	12	15	20	30

Note) The measurements on these items include the effect of the runout of the screw shaft diameter. Therefore, it is necessary to obtain the correction value from the overall runout of the screw shaft axis, using the ratio of the distance between the fulcrum and measurement point to the overall screw shaft length, and add the obtained value to the table above.

Example: model No. DIK2005-6RRGO+500LC5



$$E_1 = e + \Delta e$$

e : Standard value in Table5 (0.012)
Δe : Correction value

$$\Delta e = \frac{L_1}{L} \times E_2$$

$$= \frac{80}{500} \times 0.06$$

$$= 0.01$$

E_2 : Overall radial runout of the screw shaft axis (0.06)

$$E_1 = 0.012 + 0.01$$

$$= 0.022$$

Table6 Perpendicularity of the Supporting Portion End of the Screw Shaft to the Supporting Portion Axis

Unit: µm

Screw shaft outer diameter (mm)		Perpendicularity (maximum)					
Above	Or less	C0	C1	C2	C3	C5	C7
—	8	2	3	3	4	5	7
8	12	2	3	3	4	5	7
12	20	2	3	3	4	5	7
20	32	2	3	3	4	5	7
32	50	2	3	3	4	5	8
50	80	3	4	4	5	7	10
80	100	—	4	5	6	8	11

Table7 Perpendicularity of the Flange Mounting Surface of the Screw Shaft to the Screw Shaft Axis

Unit: µm

Nut diameter (mm)		Perpendicularity (maximum)					
Above	Or less	C0	C1	C2	C3	C5	C7
—	20	5	6	7	8	10	14
20	32	5	6	7	8	10	14
32	50	6	7	8	8	11	18
50	80	7	8	9	10	13	18
80	125	7	9	10	12	15	20
125	160	8	10	11	13	17	20
160	200	—	11	12	14	18	25

Table8 Radial Runout of the Nut Circumference in Relation to the Screw Shaft Axis

Unit: µm

Nut diameter (mm)		Runout (maximum)					
Above	Or less	C0	C1	C2	C3	C5	C7
—	20	5	6	7	9	12	20
20	32	6	7	8	10	12	20
32	50	7	8	10	12	15	30
50	80	8	10	12	15	19	30
80	125	9	12	16	20	27	40
125	160	10	13	17	22	30	40
160	200	—	16	20	25	34	50

Table9 Parallelism of the Nut Circumference (Flat Mounting Surface) to the Screw Shaft Axis

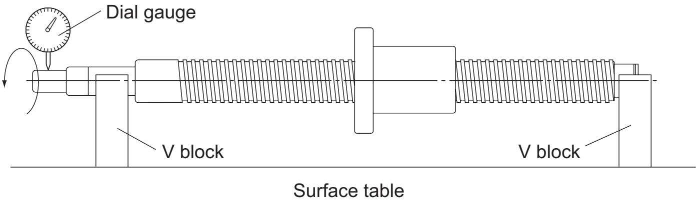
Unit: µm

Mounting reference length (mm)		Parallelism (maximum)					
Above	Or less	C0	C1	C2	C3	C5	C7
—	50	5	6	7	8	10	17
50	100	7	8	9	10	13	17
100	200	—	10	11	13	17	30

[Method for Measuring Accuracy of the Mounting Surface]

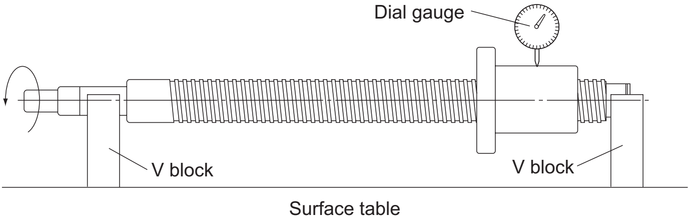
● Radial Runout of the Circumference of the Part Mounting Section in Relation to the Supporting Portion Axis of the Screw Shaft (see Table5 on A-681)

Support the supporting portion of the screw shaft with V blocks. Place a probe on the circumference of the part mounting section, and read the largest difference on the dial gauge as a measurement when turning the screw shaft by one revolution.



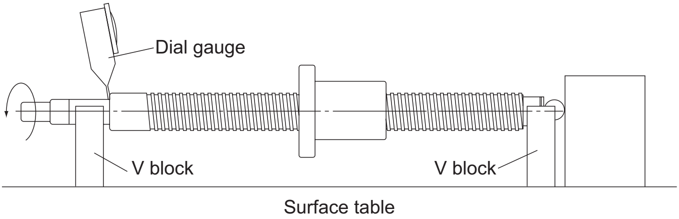
● Radial Runout of the Circumference of the Thread Root in Relation to the Supporting Portion Axis of the Screw Shaft (see Table5 on A-681)

Support the supporting portion of the screw shaft with V blocks. Place a probe on the circumference of the nut, and read the largest difference on the dial gauge as a measurement when turning the screw shaft by one revolution without turning the nut.



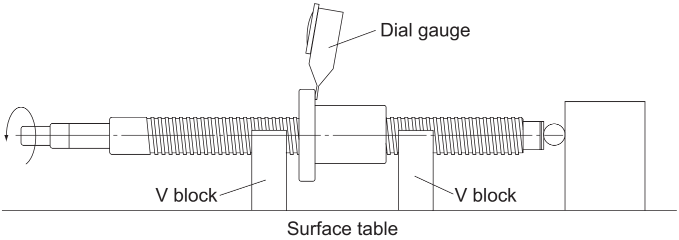
● Perpendicularity of the Supporting Portion End of the Screw Shaft to the Supporting Portion Axis (see Table6 on A-682)

Support the supporting portion of the screw shaft with V blocks. Place a probe on the screw shaft's supporting portion end, and read the largest difference on the dial gauge as a measurement when turning the screw shaft by one revolution.



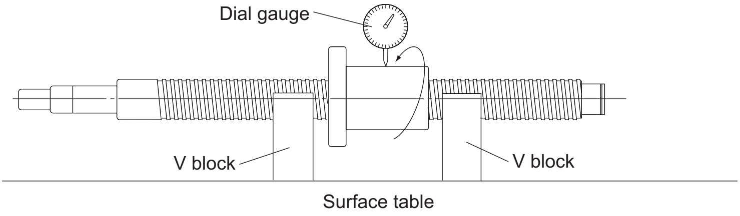
● Perpendicularity of the Flange Mounting Surface of the Screw Shaft to the Screw Shaft Axis (see Table7 on A-682)

Support the thread of the screw shaft with V blocks near the nut. Place a probe on the flange end, and read the largest difference on the dial gauge as a measurement when simultaneously turning the screw shaft and the nut by one revolution.



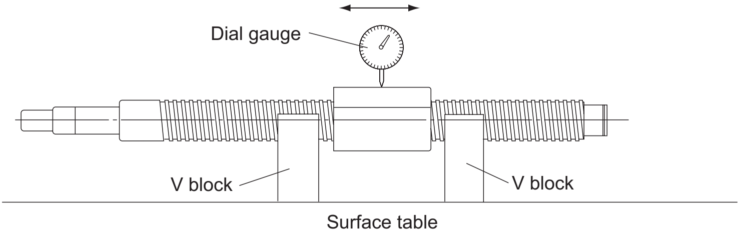
Radial Runout of the Nut Circumference in Relation to the Screw Shaft Axis (see Table8 on A-682)

Support the thread of the screw shaft with V blocks near the nut. Place a probe on the circumference of the nut, and read the largest difference on the dial gauge as a measurement when turning the nut by one revolution without turning the screw shaft.



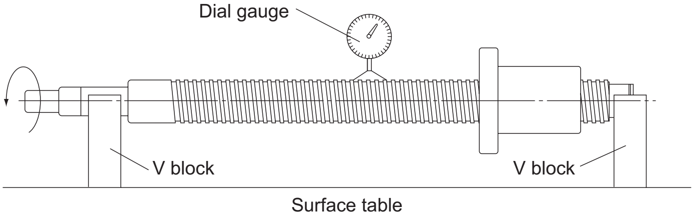
Parallelism of the Nut Circumference (Flat Mounting Surface) to the Screw Shaft Axis (see Table9 on A-682)

Support the thread of the screw shaft with V blocks near the nut. Place a probe on the circumference of the nut (flat mounting surface), and read the largest difference on the dial gauge as a measurement when moving the dial gauge in parallel with the screw shaft.



Overall Radial Runout of the Screw Shaft Axis

Support the supporting portion of the screw shaft with V blocks. Place a probe on the circumference of the screw shaft, and read the largest difference on the dial gauge at several points in the axial directions as a measurement when turning the screw shaft by one revolution.



Note) For the overall radial runout of the screw shaft axis, refer to JIS B 1192-1997.

Axial Clearance

[Axial Clearance of the Precision Ball Screw]

Table10 shows the axial clearance of the precision Screw Ball. If the manufacturing length exceeds the value in Table11, the resultant clearance may partially be negative (preload applied).

Table10 Axial Clearance of the Precision Ball Screw

Unit: mm

Clearance symbol	G0	GT	G1	G2	G3
Axial clearance	0 or less	0 to 0.005	0 to 0.01	0 to 0.02	0 to 0.05

Table11 Maximum Length of the Precision Ball Screw in Axial Clearance

Unit: mm

Screw shaft outer diameter	Overall thread length						
	Clearance GT		Clearance G1		Clearance G2		
	C0 to C3	C5	C0 to C3	C5	C0 to C3	C5	C7
4 to 6	80	100	80	100	80	100	120
8 to 10	250	200	250	250	250	300	300
12 to 16	500	400	500	500	700	600	500
18 to 25	800	700	800	700	1000	1000	1000
28 to 32	900	800	1100	900	1400	1200	1200
36 to 45	1000	800	1300	1000	2000	1500	1500
50 to 70	1200	1000	1600	1300	2500	2000	2000
80 to 100	—	—	1800	1500	4000	3000	3000

* When manufacturing the Ball Screw of precision-grade accuracy C7 with clearance GT or G1, the resultant clearance is partially negative.

[Axial Clearance of the Rolled Ball Screw]

Table12 shows axial clearance of the rolled Ball Screw.

Table12 Axial Clearance of the Rolled Ball Screw

Unit: mm

Screw shaft outer diameter	Axial clearance (maximum)
6 to 12	0.05
14 to 28	0.1
30 to 32	0.14
36 to 45	0.17
50	0.2

Preload

A preload is provided in order to eliminate the axial clearance and minimize the displacement under an axial load.
When performing a highly accurate positioning, a preload is generally provided.

[Rigidity of the Ball Screw under a Preload]
When a preload is provided to the Ball Screw, the rigidity of the nut is increased.
Fig.4 shows elastic displacement curves of the Ball Screw under a preload and without a preload.

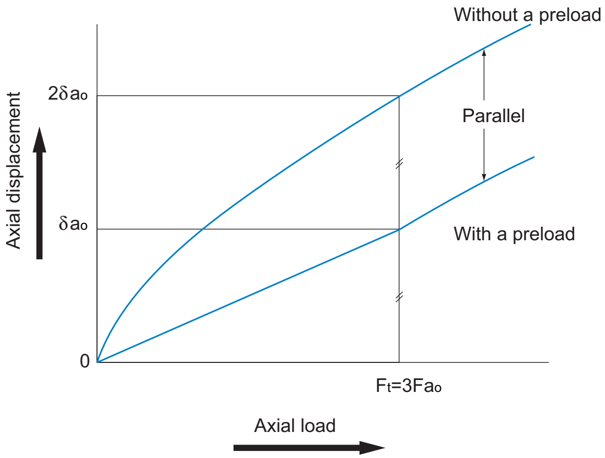
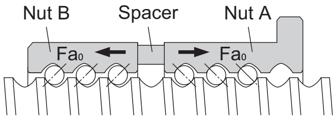
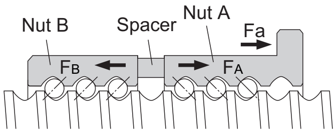


Fig.4 Elastic Displacement Curve of the Ball Screw

Fig.5 shows a double-nut type of the Ball Screw.



External load: 0



External load: Fa

Fig.5

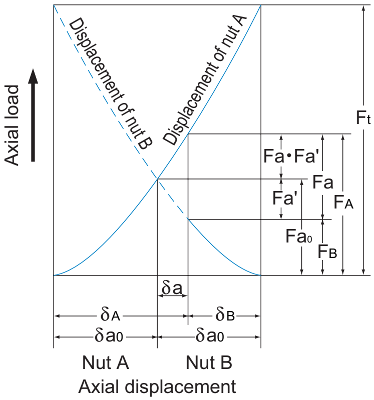


Fig.6

Nuts A and B are provided with preload Fa_0 from the spacer. Because of the preload, nuts A and B are elastically displaced by δa_0 each. If an axial load (Fa) is applied from outside in this state, the displacement of nuts A and B is calculated as follows.

$$\delta_A = \delta a_0 + \delta a \qquad \delta_B = \delta a_0 - \delta a$$

In other words, the loads on nut A and B are expressed as follows:

$$F_A = Fa_0 + (Fa - Fa') \qquad F_B = Fa_0 - Fa'$$

Therefore, under a preload, the load that nut A receives equals to Fa - Fa'. This means that since load Fa', which is applied when nut A receives no preload, is deducted from Fa, the displacement of nut A is smaller.

This effect extends to the point where the displacement (δa_0) caused by the preload applied on nut B reaches zero.

To what extent is the elastic displacement reduced? The relationship between the axial load on the Ball Screw under no preload and the elastic displacement can be expressed by $\delta a \propto Fa^{2/3}$. From Fig.6, the following equations are established.

$$\delta a_0 = KFa_0^{2/3} \qquad (K : \text{constant})$$

$$2\delta a_0 = KF_t^{2/3}$$

$$\left(\frac{F_t}{Fa_0}\right)^{\frac{2}{3}} = 2 \qquad F_t = 2^{3/2} \times Fa_0 = 2.8Fa_0 \fallingdotseq 3Fa_0$$

Thus, the Ball Screw under a preload is displaced by δa_0 when an axial load (F_t) approximately three times greater than the preload is provided from outside. As a result, the displacement of the Ball Screw under a preload is half the displacement ($2\delta a_0$) of the Ball Screw without a preload.

As stated above, since the preloading is effective up to approximately three times the applied preload, the optimum preload is one third of the maximum axial load.

Note, however, that an excessive preload adversely affects the service life and heat generation. As a guideline, the maximum preload should be set at 10% of the basic dynamic load rating (Ca) at a maximum.

[Preload Torque]

The preload torque of the Ball Screw in lead is controlled in accordance with the JIS standard (JIS B 1192-1997).

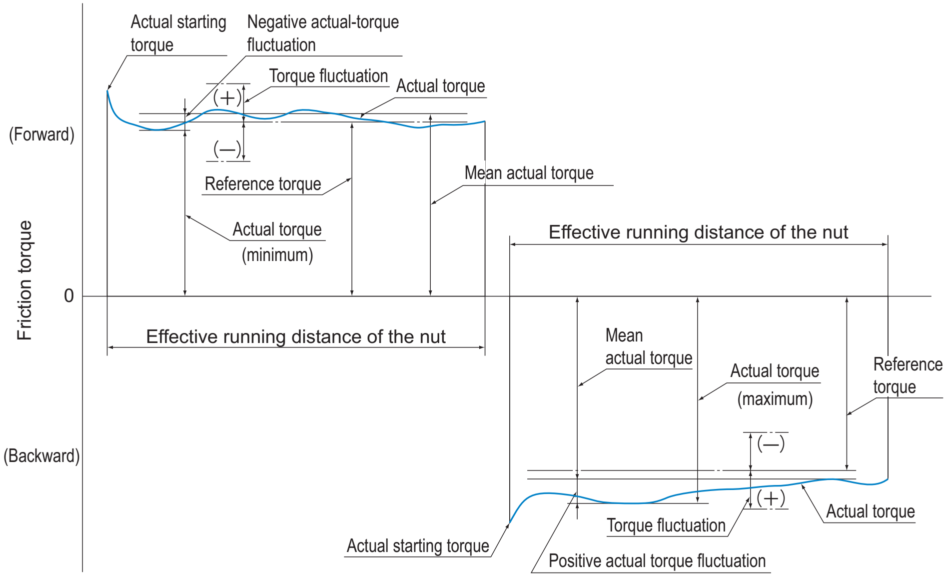


Fig.7 Terms on Preload Torque

● Dynamic Preload Torque

A torque required to continuously rotate the screw shaft of a Ball Screw under a given preload without an external load applied.

● Actual Torque

A dynamic preload torque measured with an actual Ball Screw.

● Torque Fluctuation

Variation in a dynamic preload torque set at a target value. It can be positive or negative in relation to the reference torque.

● Coefficient of Torque Fluctuation

Ratio of torque fluctuation to the reference torque.

● Reference Torque

A dynamic preload torque set as a target.

● Calculating the Reference Torque

The reference torque of a Ball Screw provided with a preload is obtained in the following equation (5).

$$T_p = 0.05\,(\tan\beta)^{-0.5}\,\frac{Fa_0 \cdot Ph}{2\pi} \quad \cdots\cdots\cdots(5)$$

T_p : Reference torque (N-mm)
β : Lead angle
Fa_0 : Applied preload (N)
Ph : Lead (mm)

Example: When a preload of 3,000 N is provided to the Ball Screw model BNFN4010-5G0 + 1500LC3 with a thread length of 1,300 mm (shaft diameter: 40 mm; ball center-to-center diameter: 41.75 mm; lead: 10 mm), the preload torque of the Ball Screw is calculated in the steps below.

■Calculating the Reference Torque

β : Lead angle

$$\tan\beta = \frac{\text{lead}}{\pi\times\text{ball center-to-center diameter}} = \frac{10}{\pi\times41.75} = 0.0762$$

Fa_0 : Applied preload=3000N
Ph : Lead = 10mm

$$T_p = 0.05\,(\tan\beta)^{-0.5}\,\frac{Fa_0\cdot Ph}{2\pi} = 0.05\,(0.0762)^{-0.5}\,\frac{3000\times10}{2\pi} = 865\text{N}\cdot\text{mm}$$

■Calculating the Torque Fluctuation

$$\frac{\text{thread length}}{\text{screw shaft outer diameter}} = \frac{1300}{40} = 32.5 \leqq 40$$

Thus, with the reference torque in Table13 being between 600 and 1,000 N-mm, effective thread length 4,000 mm or less and accuracy grade C3, the coefficient of torque fluctuation is obtained as ±30%.
As a result, the torque fluctuation is calculated as follows.
$865\times(1\pm0.3) = 606$ N・mm to 1125 N・mm

■Result

Reference torque : 865 N-mn
Torque fluctuation : 606 N-mm to 1125 N-mm

Table13 Tolerance Range in Torque Fluctuation

Reference torque N・mm		Effective thread length									
		4000mm or less								Above 4,000 mm and 10,000 mm or less	
		$\frac{\text{thread length}}{\text{screw shaft outer diameter}} \leqq 40$				$40 < \frac{\text{thread length}}{\text{screw shaft outer diameter}} < 60$				—	
		Accuracy grades				Accuracy grades				Accuracy grades	
Above	Or less	C0	C1	C2, C3	C5	C0	C1	C2, C3	C5	C2, C3	C5
200	400	±35%	±40%	±45%	±55%	±45%	±45%	±55%	±65%	—	—
400	600	±25%	±30%	±35%	±45%	±38%	±38%	±45%	±50%	—	—
600	1000	±20%	±25%	±30%	±35%	±30%	±30%	±35%	±40%	±40%	±45%
1000	2500	±15%	±20%	±25%	±30%	±25%	±25%	±30%	±35%	±35%	±40%
2500	6300	±10%	±15%	±20%	±25%	±20%	±20%	±25%	±30%	±30%	±35%
6300	10000	—	—	±15%	±20%	—	—	±20%	±25%	±25%	±30%

Selecting a Screw Shaft

Maximum Length of the Screw Shaft

The maximum length of the precision Ball Screw and the rolled Ball Screw are shown in Table14 and Table15 (A-691) respectively.
If the shaft dimensions exceed the manufacturing limit in Table14 or Table15, contact THK.

Table14 Maximum Length of the Precision Ball Screw by Accuracy Grade

Unit: mm

Screw shaft outer diameter	Overall screw shaft length					
	C0	C1	C2	C3	C5	C7
4	90	110	120	120	120	120
6	150	170	210	210	210	210
8	230	270	340	340	340	340
10	350	400	500	500	500	500
12	440	500	630	680	680	680
13	440	500	630	680	680	680
14	530	620	770	870	890	890
15	570	670	830	950	980	1100
16	620	730	900	1050	1100	1400
18	720	840	1050	1220	1350	1600
20	820	950	1200	1400	1600	1800
25	1100	1400	1600	1800	2000	2400
28	1300	1600	1900	2100	2350	2700
30	1450	1700	2050	2300	2570	2950
32	1600	1800	2200	2500	2800	3200
36	2000	2100	2550	2950	3250	3650
40		2400	2900	3400	3700	4300
45		2750	3350	3950	4350	5050
50		3100	3800	4500	5000	5800
55		3450	4150	5300	6050	6500
63		4000	5200	5800	6700	7700
70			6300	6450	7650	9000
80				7900	9000	10000
100				10000	10000	

Table15 Maximum Length of the Rolled Ball Screw by Accuracy Grade

Unit: mm

Screw shaft outer diameter	Overall screw shaft length		
	C7	C8	C10
6 to 8	320	320	—
10 to 12	500	1000	—
14 to 15	1500	1500	1500
16 to 18	1500	1800	1800
20	2000	2200	2200
25	2000	3000	3000
28	3000	3000	3000
30	3000	3000	4000
32 to 36	3000	4000	4000
40	3000	5000	5000
45	3000	5500	5500
50	3000	6000	6000

Standard Combinations of Shaft Diameter and Lead for the Precision Ball Screw

Table16 shows the standard combinations of shaft diameter and lead for the precision Ball Screw.
If a Ball Screw not covered by the table is required,contact THK.

Table16 Standard Combinations of Screw Shaft and Lead (Precision Ball Screw) Unit: mm

Screw shaft outer diameter	Lead																					
	1	2	4	5	6	8	10	12	15	16	20	24	25	30	32	36	40	50	60	80	90	100
4	●																					
5	●																					
6	●																					
8	●	●					●	○														
10		●	●				●		○													
12		●		●		●																
13											○											
14		●	●	●		●																
15							●				●			○			○					
16			○	●	○		○			●												
18							●															
20			○	●	○	○	●	○			●						○		○			
25			○	●	○	○	●	○		○	●		○					○				
28				○	●	○	○															
30																			○		○	
32			○	●	●	○	●	○			○				○							
36					○	○	●	○		○	○	○				○						
40				○	○	○	●	●		○	○			○			○			○		
45					○	○	○	○		○	○											
50				○		○	●	○		○	○			○		○		○				○
55							○	○		○	○			○		○						
63							○	○		○	○											
70							○	○			○											
80							○	○			○											
100											○											

●: off-the-shelf products [standard-stock products equipped with the standardized screw shafts (with unfinished shaft ends/finished shaft ends)]
○: Semi-standard stock

Standard Combinations of Shaft Diameter and Lead for the Rolled Ball Screw

Table17 shows the standard combinations of shaft diameter and lead for the rolled Ball Screw.

Table17 Standard Combinations of Screw Shaft and Lead (Rolled Ball Screw) Unit: mm

Screw shaft outer diameter	Lead																			
	1	2	4	5	6	8	10	12	16	20	24	25	30	32	36	40	50	60	80	100
6	●																			
8		●																		
10		●			○															
12		●				○														
14			●	●																
15							●			●			●							
16				●					●											
18						●														
20				●			●			●						●				
25				●			●					●					●			
28					●															
30																		●		
32							●							●						
36							●			●	●				●					
40							●									●			●	
45								●												
50									●								●			●

●: Standard stock
○: Semi-standard stock

Permissible Axial Load

[Buckling Load on the Screw Shaft]

With the Ball Screw, it is necessary to select a screw shaft so that it will not buckle when the maximum compressive load is applied in the axial direction.

Fig.8 on A-695 shows the relationship between the screw shaft diameter and a buckling load.

If determining a buckling load by calculation, it can be obtained from the equation (6) below. Note that in this equation, a safety factor of 0.5 is multiplied to the result.

$$P_1 = \frac{\eta_1 \cdot \pi^2 \cdot E \cdot I}{\ell_a^2} 0.5 = \eta_2 \frac{d_1^4}{\ell_a^2} 10^4 \quad \cdots\cdots\cdots(6)$$

P_1 : Buckling load (N)

ℓ_a : Distance between two mounting surfaces (mm)

E : Young's modulus (2.06×10^5 N/mm^2)

I : Minimum geometrical moment of inertia of the shaft (mm^4)

$I = \frac{\pi}{64} d_1^4$ d_1: screw-shaft thread minor diameter (mm)

η_1, η_2=Factor according to the mounting method

Fixed - free $\eta_1=0.25$ $\eta_2=1.3$

Fixed - supported $\eta_1=2$ $\eta_2=10$

Fixed - fixed $\eta_1=4$ $\eta_2=20$

[Permissible Tensile Compressive Load on the Screw Shaft]

If an axial load is applied to the Ball Screw, it is necessary to take into account not only the buckling load but also the permissible tensile compressive load in relation to the yielding stress on the screw shaft.

The permissible tensile compressive load is obtained from the equation (7).

$$P_2 = \sigma \frac{\pi}{4} d_1^2 = 116 d_1^2 \quad \cdots\cdots\cdots(7)$$

P_2 : Permissible tensile compressive load (N)

σ : Permissible tensile compressive stress (147 MPa)

d_1 : Screw-shaft thread minor diameter (mm)

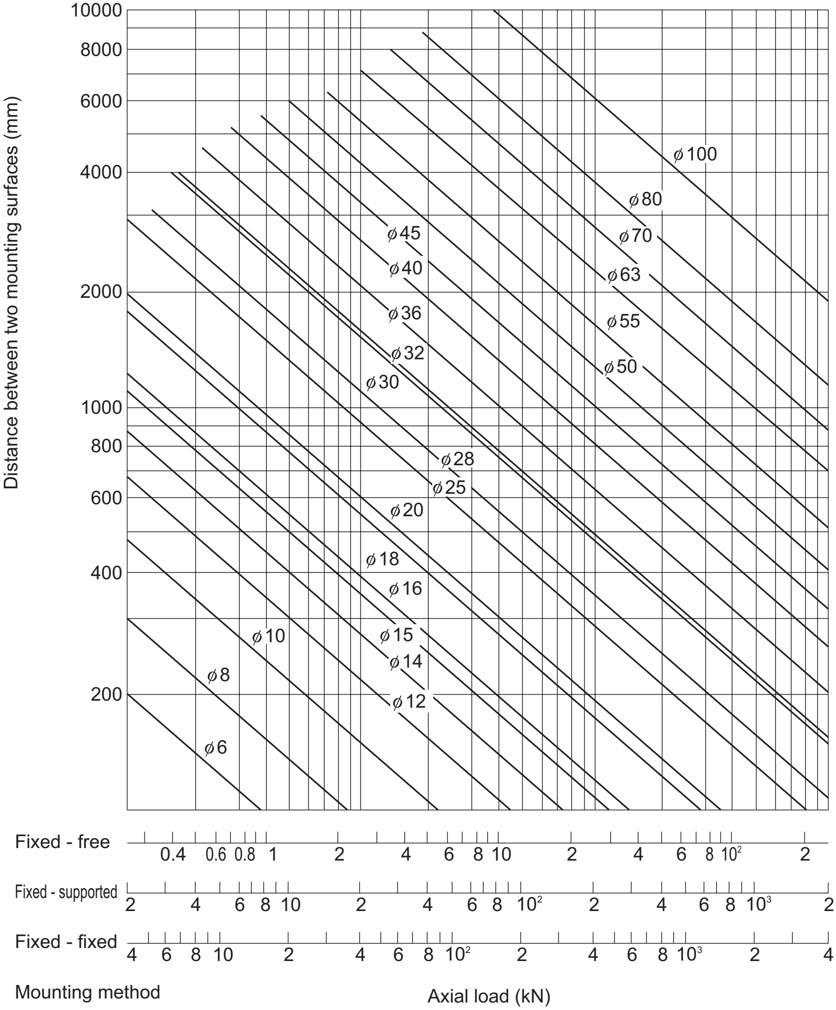


Fig.8 Permissible Tensile Compressive Load Diagram

Permissible Rotational Speed

[Dangerous Speed of the Screw Shaft]

When the rotational speed reaches a high magnitude, the Ball Screw may resonate and eventually become unable to operate due to the screw shaft's natural frequency. Therefore, it is necessary to select a model so that it is used below the resonance point (dangerous speed).

Fig.9 on A-698 shows the relationship between the screw shaft diameter and a dangerous speed.

If determining a dangerous speed by calculation, it can be obtained from the equation (8) below. Note that in this equation, a safety factor of 0.8 is multiplied to the result.

$$N_1 = \frac{60 \cdot \lambda_1^2}{2\pi \cdot \ell_b^2} \times \sqrt{\frac{E \times 10^3 \cdot I}{\gamma \cdot A}} \times 0.8 = \lambda_2 \cdot \frac{d_1}{\ell_b^2} \cdot 10^7 \quad \cdots\cdots(8)$$

N_1 : Permissible rotational speed determined by dangerous speed (min^{-1})

ℓ_b : Distance between two mounting surfaces (mm)

E : Young's modulus (2.06×10^5 N/mm^2)

I : Minimum geometrical moment of inertia of the shaft (mm^4)

$$I = \frac{\pi}{64} d_1^4$$

d_1: screw-shaft thread minor diameter (mm)

γ : Density (specific gravity) (7.85×10^{-6} kg/mm^3)

A : Screw shaft cross-sectional area (mm^2)

$$A = \frac{\pi}{4} d_1^2$$

λ_1, λ_2 : Factor according to the mounting method

Fixed - free	λ_1=1.875	λ_2=3.4
Supported - supported	λ_1=3.142	λ_2=9.7
Fixed - supported	λ_1=3.927	λ_2=15.1
Fixed - fixed	λ_1=4.73	λ_2=21.9

[DN Value]

The permissible rotational speed of the Ball Screw must be obtained from the dangerous speed of the screw shaft and the DN value.

The permissible rotational speed determined by the DN value is obtained using the equations (9) to (13) below.

● Ball Screw with Ball Cage

■Models SBN and HBN

$$N_2 = \frac{130000}{D} \quad \cdots\cdots\cdots(9)$$

N_2 : Permissible rotational speed determined by the DN value (min^{-1}(rpm))
D : Ball center-to-center diameter
(indicated in the specification tables of the respective model number)

■Model SBK

$$N_2 = \frac{160000}{D} \quad \cdots\cdots\cdots(10)$$

● Precision Ball Screw

$$N_2 = \frac{70000}{D} \quad \cdots\cdots\cdots(11)$$

● Rolled Ball Screw

(excluding large lead type)

$$N_2 = \frac{50000}{D} \quad \cdots\cdots\cdots(12)$$

● Large-Lead Rolled Ball Screw

$$N_2 = \frac{70000}{D} \quad \cdots\cdots\cdots(13)$$

Of the permissible rotational speed determined by dangerous speed (N_1) and the permissible rotational speed determined by DN value (N_2), the lower rotational speed is regarded as the permissible rotational speed.

If the working rotational speed exceeds N_2, a high-speed type Ball Screw is available. Contact THK for details.

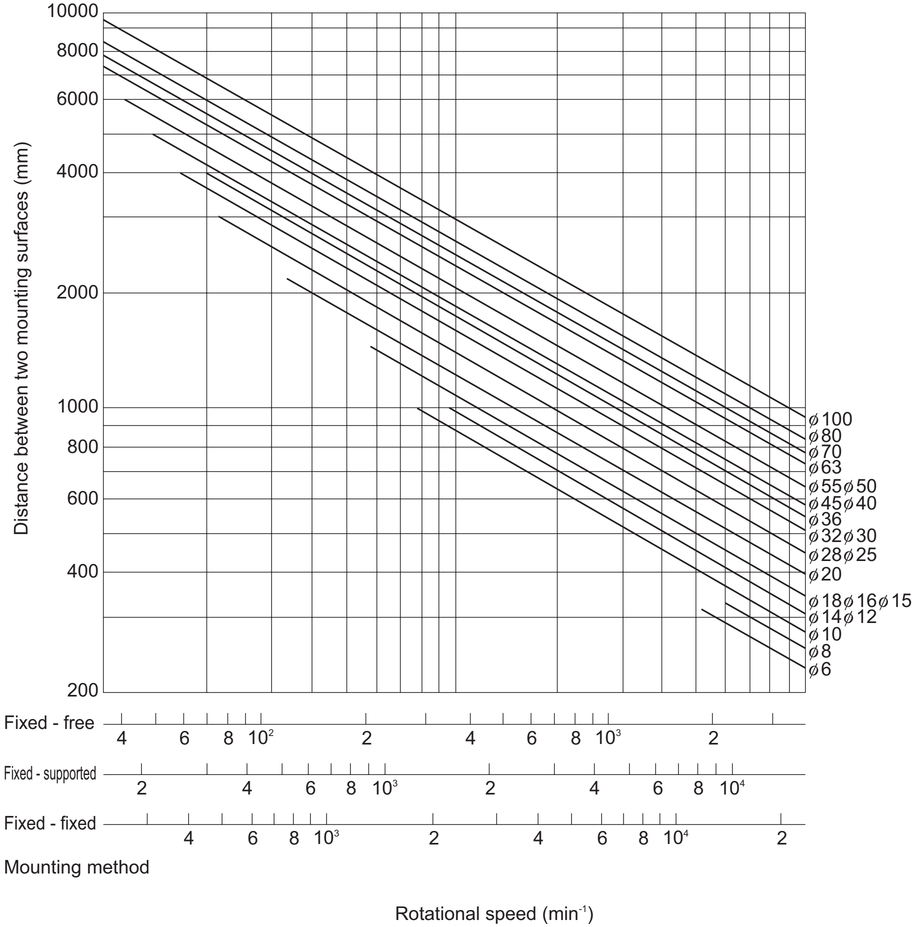


Fig.9 Permissible Rotational Speed Diagram

Selecting a Nut

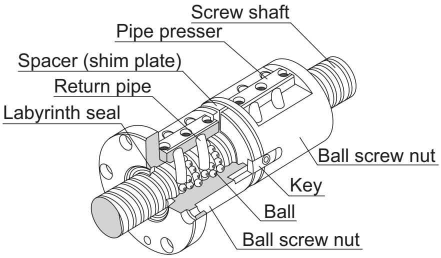
Types of Nuts

The nuts of the Ball Screws are categorized by the ball circulation method into the return-pipe type, the deflector type and end the cap type. These three nut types are described as follows.
In addition to the circulation methods, the Ball Screws are categorized also by the preloading method.

[Types by Ball Circulation Method]

- **Return-pipe Type**
  (Models SBN, BNF, BNT, BNFN, BIF and BTK)
  Return-piece Type (Model HBN)

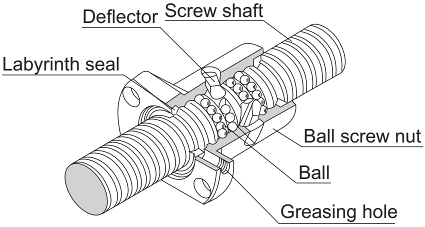
These are most common types of nuts that use a return pipe for ball circulation. The return pipe allows balls to be picked up, pass through the pipe, and return to their original positions to complete infinite motion.



Example of Structure of Return-Pipe Nut

- **Deflector Type**
  (Models DK, DKN, DIK, JPF and DIR)

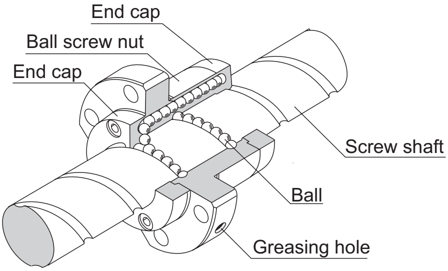
These are the most compact type of nut. The balls change their traveling direction with a deflector, pass over the circumference of the screw shaft, and return to their original positions to complete an infinite motion.



Example of Structure of Simple Nut

- **End-cap Type: Large lead Nut**
  (Models SBK, BLK, WGF, BLW, WTF, CNF and BLR)

These nuts are most suitable for the fast feed. The balls are picked up with an end cap, pass through the through hole of the nut, and return to their original positions to complete an infinite motion.



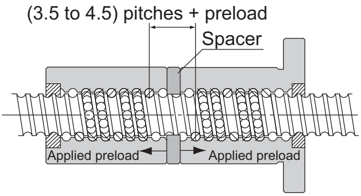
Example of Structure of Large lead Nut

[Types by Preloading Method]

● Fixed-point Preloading

■Double-nut Preload (Models BNFN, DKN and BLW)

A spacer is inserted between two nuts to provide a preload.



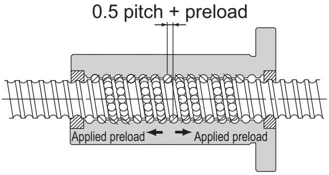

Model BNFN

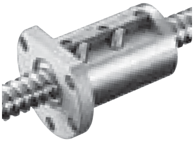

Model DKN

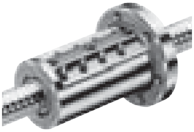

Model BLW

■Offset Preload (Models SBN, BIF, DIK, SBK and DIR)

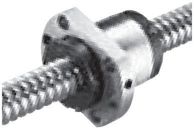
More compact than the double-nut method, the offset preloading provides a preload by changing the groove pitch of the nut without using a spacer.

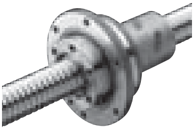



Model SBN


Model BIF

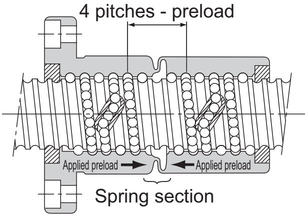

Model DIK


Model SBK


Model DIR

● Constant Pressure Preloading (Model JPF)

With this method, a spring structure is installed almost in the middle of the nut, and it provides a preload by changing the groove pitch in the middle of the nut.



Model JPF

Selecting a Model Number

Calculating the Axial Load

[In Horizontal Mount]

With ordinary conveyance systems, the axial load (Fa_n) applied when horizontally reciprocating the work is obtained in the equation below.

$$Fa_1 = \mu \cdot mg + f + m\alpha \quad \cdots\cdots (14)$$

$$Fa_2 = \mu \cdot mg + f \quad \cdots\cdots (15)$$

$$Fa_3 = \mu \cdot mg + f - m\alpha \quad \cdots\cdots (16)$$

$$Fa_4 = -\mu \cdot mg - f - m\alpha \quad \cdots\cdots (17)$$

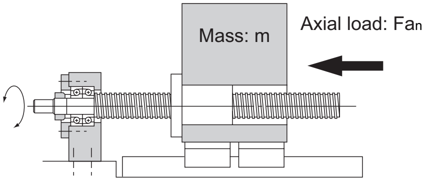
$$Fa_5 = -\mu \cdot mg - f \quad \cdots\cdots (18)$$

$$Fa_6 = -\mu \cdot mg - f + m\alpha \quad \cdots\cdots (19)$$

V_{max} : Maximum speed (m/s)
t_1 : Acceleration time (m/s)

$$\alpha = \frac{V_{max}}{t_1} : \text{Acceleration} \quad (m/s^2)$$

Fa_1 : Axial load during forward acceleration (N)
Fa_2 : Axial load during forward uniform motion (N)
Fa_3 : Axial load during forward deceleration (N)
Fa_4 : Axial load during backward acceleration (N)
Fa_5 : Axial load during uniform backward motion (N)



Guide surface
Friction coefficient : μ
Resistance without load : f
Gravitational acceleration: g

Fa_6 : Axial load during backward deceleration (N)
m : Transferred mass (kg)
μ : Frictional coefficient of the guide surface (−)
f : Guide surface resistance (without load) (N)

[In Vertical Mount]

With ordinary conveyance systems, the axial load (Fa_n) applied when vertically reciprocating the work is obtained in the equation below.

$$Fa_1 = mg + f + m\alpha \quad \cdots\cdots (20)$$

$$Fa_2 = mg + f \quad \cdots\cdots (21)$$

$$Fa_3 = mg + f - m\alpha \quad \cdots\cdots (22)$$

$$Fa_4 = mg - f - m\alpha \quad \cdots\cdots (23)$$

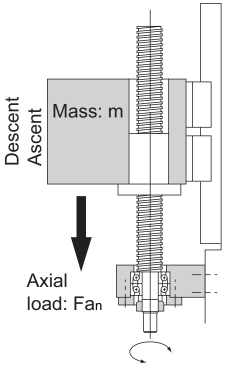
$$Fa_5 = mg - f \quad \cdots\cdots (24)$$

$$Fa_6 = mg - f + m\alpha \quad \cdots\cdots (25)$$

V_{max} : Maximum speed (m/s)
t_1 : Acceleration time (m/s)

$$\alpha = \frac{V_{max}}{t_1} : \text{Acceleration} \quad (m/s^2)$$

Fa_1 : Axial load during upward acceleration (N)
Fa_2 : Axial load during uniform upward motion (N)
Fa_3 : Axial load during upward deceleration (N)
Fa_4 : Axial load during downward acceleration (N)
Fa_5 : Axial load during uniform downward motion (N)



Guide surface
Friction coefficient : μ
Resistance without load: f

Fa_6 : Axial load during downward deceleration (N)
m : Transferred mass (kg)
f : Guide surface resistance (without load) (N)

Static Safety Factor

The basic static load rating (C_0a) generally equals to the permissible axial load of a Ball Screw. Depending on the conditions, it is necessary to take into account the following static safety factor against the calculated load. When the Ball Screw is stationary or in motion, unexpected external force may be applied through an inertia caused by the impact or the start and stop.

$$Fa_{max} = \frac{C_0a}{f_S} \quad \cdots\cdots\cdots(26)$$

Fa_{max} : Permissible Axial Load (kN)
C_0a : Basic static load rating* (kN)
f_S : Static safety factor (see Table18)

Table18 Static Safety Factor (f_S)

Machine using the LM system	Load conditions	Lower limit of f_S
General industrial machinery	Without vibration or impact	1 to 1.3
	With vibration or impact	2 to 3
Machine tool	Without vibration or impact	1 to 1.5
	With vibration or impact	2.5 to 7

The basic static load rating (C_0a) is a static load with a constant direction and magnitude whereby the sum of the permanent deformation of the rolling element and that of the raceway on the contact area under the maximum stress is 0.0001 times the rolling element diameter. With the Ball Screw, it is defined as the axial load. (Specific values of each Ball Screw model are indicated in the specification tables for the corresponding model number.)

Studying the Service Life

[Service Life of the Ball Screw]

The Ball Screw in motion under an external load receives the continuous stress on its raceways and balls. When the stress reaches the limit, the raceways break from the fatigue and their surfaces partially disintegrate in scale-like pieces. This phenomenon is called flaking. The service life of the Ball Screw is the total number of revolutions until the first flaking occurs on any of the raceways or the balls as a result of the rolling fatigue of the material.

The service life of the Ball Screw varies from unit to unit even if they are manufactured in the same process and used in the same operating conditions. For this reason, when determining the service life of a Ball Screw unit, the nominal life as defined below is used as a guideline.

The nominal life is the total number of revolutions that 90% of identical Ball Screw units in a group achieve without developing flaking (scale-like pieces of a metal surface) after they independently operate in the same conditions.

[Calculating the Rated Life]

The service life of the Ball Screw is calculated from the equation (27) below using the basic dynamic load rating (Ca) and the applied axial load.

● Nominal Life (Total Number of Revolutions)

$$L = \left(\frac{C_a}{f_W \cdot F_a}\right)^3 \times 10^6 \quad \cdots\cdots\cdots (27)$$

L	:	Nominal life (total number of revolutions)	(rev)
Ca	:	Basic dynamic load rating*	(N)
Fa	:	Applied axial load	(N)
f_W	:	Load factor	(see Table19)

Table19 Load Factor (f_W)

Vibrations/ impact	Speed(V)	f_W
Faint	Very low $V \leqq 0.25$m/s	1 to 1.2
Weak	Slow $0.25 < V \leqq 1$m/s	1.2 to 1.5
Medium	Medium $1 < V \leqq 2$m/s	1.5 to 2
Strong	High $V > 2$m/s	2 to 3.5

* The basic dynamic load rating (Ca) is used in calculating the service life when a Ball Screw operates under a load. The basic dynamic load rating is a load with interlocked direction and magnitude under which the nominal life (L) equals to 10^6rev. when a group of the same Ball Screw units independently operate. (Specific basic dynamic load ratings (Ca) are indicated in the specification tables of the corresponding model numbers.)

● Service Life Time

If the revolutions per minute is determined, the service life time can be calculated from the equation (28) below using the nominal life (L).

$$L_h = \frac{L}{60 \times N} = \frac{L \times Ph}{2 \times 60 \times n \times \ell_S} \quad \cdots\cdots\cdots (28)$$

L_h : Service life time (h)
N : Revolutions per minute (min^{-1})
n : Number of reciprocations per minute (min^{-1})
Ph : Ball Screw lead (mm)
ℓ_S : Stroke length (mm)

● Service Life in Travel Distance

The service life in travel distance can be calculated from the equation (29) below using the nominal life (L) and the Ball Screw lead.

$$L_S = \frac{L \times Ph}{10^6} \quad \cdots\cdots\cdots (29)$$

L_S : Service Life in Travel Distance (km)
Ph : Ball Screw lead (mm)

● Applied Load and Service Life with a Preload Taken into Account

If the Ball Screw is used under a preload (medium preload), it is necessary to consider the applied preload in calculating the service life since the ball screw nut already receives an internal load. For details on applied preload for a specific model number, contact THK.

● Average Axial Load

If an axial load acting on the Ball Screw is present, it is necessary to calculate the service life by determining the average axial load.

The average axial load (F_m) is a constant load that equals to the service life in fluctuating the load conditions.

If the load changes in steps, the average axial load can be obtained from the equation below.

$$F_m = \sqrt[3]{\frac{1}{\ell}\left(Fa_1^{\,3}\ell_1 + Fa_2^{\,3}\ell_2 + \cdots\cdots + Fa_n^{\,3}\ell_n\right)} \quad \cdots\cdots\cdots (30)$$

F_m : Average Axial Load (N)
Fa_n : Varying load (N)
ℓ_n : Distance traveled under load (F_n)
ℓ : Total travel distance

To determine the average axial load using a rotational speed and time, instead of a distance, calculate the average axial load by determining the distance in the equation below.

$\ell = \ell_1 + \ell_2 + \cdots \ell_n$

$\ell_1 = N_1 \cdot t_1$

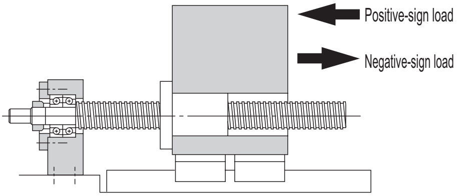
$\ell_2 = N_2 \cdot t_2$

$\ell_n = N_n \cdot t_n$

N: Rotational speed

t: Time

■When the Applied Load Sign Changes



When all signs for fluctuating loads are the same, the equation (30) applies without problem. However, if the sign for the fluctuating load changes according to the operation, it is necessary to calculate both the average axial load of the positive-sign load and that of the negative-sign load while taking in to account the load direction (when calculating the average axial load of the positive-sign load, assume the negative-sign load to be zero). Of the two average axial loads, the greater value is regarded as the average axial load for calculating the service life.

Example: Calculate the average axial load with the following load conditions.

Operation No.	Varying load Fa_n(N)	Travel distance ℓ_n(mm)
No.1	10	10
No.2	50	50
No.3	−40	10
No.4	−10	70

The subscripts of the fluctuating load symbol and the travel distance symbol indicate operation numbers.

- Average axial load of positive-sign load

To calculate the average axial load of the positive-sign load, assume Fa_3 and Fa_4 to be zero.

$$F_{m1} = \sqrt[3]{\frac{Fa_1^{3} \times \ell_1 + Fa_2^{3} \times \ell_2}{\ell_1 + \ell_2 + \ell_3 + \ell_4}} = 35.5\text{N}$$

- Average axial load of negative-sign load

To calculate the average axial load of the negative-sign load, assume Fa_1 and Fa_2 to be zero.

$$F_{m2} = \sqrt[3]{\frac{|Fa_3|^{3} \times \ell_3 + |Fa_4|^{3} \times \ell_4}{\ell_1 + \ell_2 + \ell_3 + \ell_4}} = 17.2\text{N}$$

Accordingly, the average axial load of the positive-sign load (F_{m1}) is adopted as the average axial load (F_m) for calculating the service life.

Studying the Rigidity

To increase the positioning accuracy of feed screws in NC machine tools or the precision machines, or to reduce the displacement caused by the cutting force, it is necessary to design the rigidity of the components in a well-balanced manner.

Axial Rigidity of the Feed Screw System

When the axial rigidity of a feed screw system is K, the elastic displacement in the axial direction can be obtained using the equation (31) below.

$$\delta = \frac{Fa}{K} \quad \cdots\cdots\cdots(31)$$

δ : Elastic displacement of a feed screw system in the axial direction (μm)
Fa : Applied axial load (N)

The axial rigidity (K) of the feed screw system is obtained using the equation (32) below.

$$\frac{1}{K} = \frac{1}{K_S} + \frac{1}{K_N} + \frac{1}{K_B} + \frac{1}{K_H} \quad \cdots\cdots\cdots(32)$$

K : Axial Rigidity of the Feed Screw System (N/μm)
K_S : Axial rigidity of the screw shaft (N/μm)
K_N : Axial rigidity of the nut (N/μm)
K_B : Axial rigidity of the support bearing(N/μm)
K_H : Rigidity of the nut bracket and the support bearing bracket (N/μm)

[Axial rigidity of the screw shaft]

The axial rigidity of a screw shaft varies depending on the method for mounting the shaft.

- **For Fixed-Supported (or -Free) Configuration**

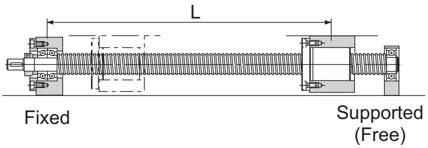
$$K_S = \frac{A \cdot E}{1000 \cdot L} \quad \cdots\cdots\cdots(33)$$

A : Screw shaft cross-sectional area (mm^2)

$$A = \frac{\pi}{4} d_1^{\,2}$$

d_1 : Screw-shaft thread minor diameter (mm)
E : Young's modulus (2.06×10^5 N/mm^2)
L : Distance between two mounting surfaces (mm)

Fig.10 onA-708 shows an axial rigidity diagram for the screw shaft.



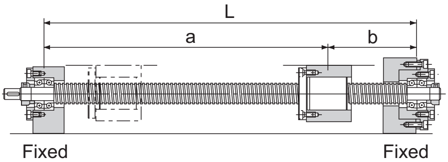
- **For Fixed-Fixed Configuration**

$$K_S = \frac{A \cdot E \cdot L}{1000 \cdot a \cdot b} \quad \cdots\cdots\cdots(34)$$

K_S becomes the lowest and the elastic displacement in the axial direction is the greatest at the position of $a = b = \frac{L}{2}$.

$$K_S = \frac{4A \cdot E}{1000L}$$

Fig.11 on A-709 shows an axial rigidity diagram of the screw shaft in this configuration.



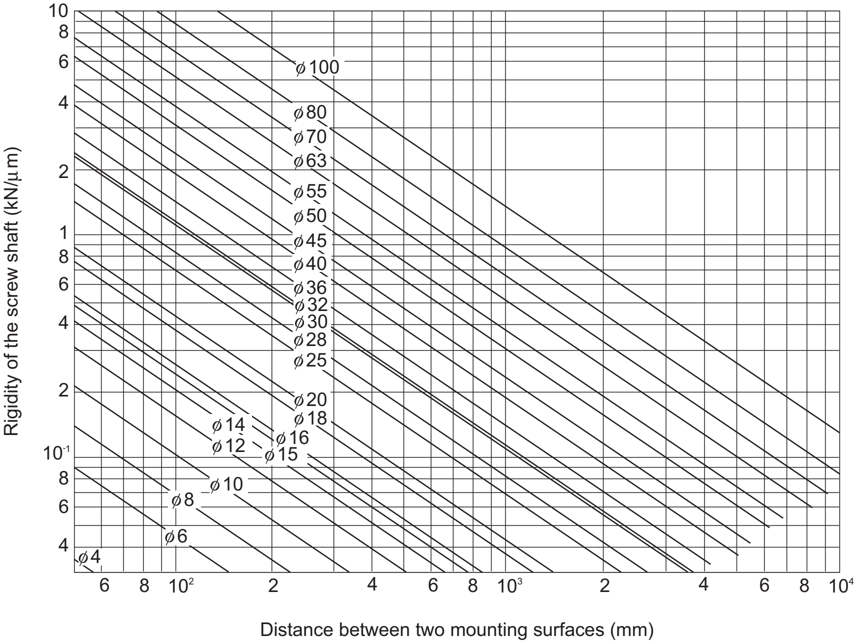


Fig.10 Axial Rigidity of the Screw Shaft (Fixed-Free, Fixed-Supported)

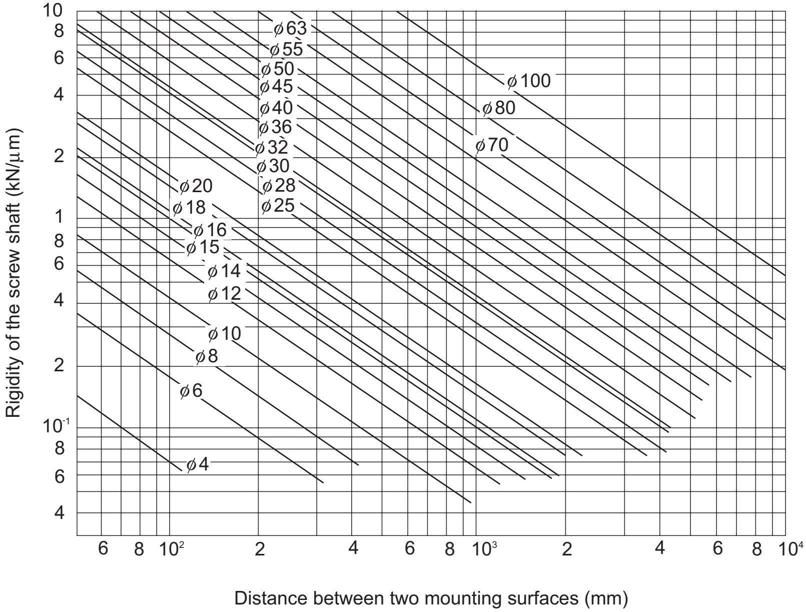


Fig.11 Axial Rigidity of the Screw Shaft (Fixed-Fixed)

[Axial rigidity of the nut]

The axial rigidity of the nut varies widely with preloads.

● No Preload Type

The logical rigidity in the axial direction when an axial load accounting for 30% of the basic dynamic load rating (Ca) is applied is indicated in the specification tables of the corresponding model number. This value does not include the rigidity of the components related to the nut-mounting bracket. In general, set the rigidity at roughly 80% of the value in the table.

The rigidity when the applied axial load is not 30% of the basic dynamic load rating (Ca) is calculated using the equation (35) below.

$$K_N = K\left(\frac{Fa}{0.3Ca}\right)^{\frac{1}{3}} \times 0.8 \quad \cdots\cdots\cdots(35)$$

K_N : Axial rigidity of the nut (N/μm)
K : Rigidity value in the specification tables (N/μm)
Fa : Applied axial load (N)
Ca : Basic dynamic load rating (N)

● Preload Type

The logical rigidity in the axial direction when an axial load accounting for 10% of the basic dynamic load rating (Ca) is applied is indicated in the dimensional table of the corresponding model number. This value does not include the rigidity of the components related to the nut-mounting bracket. In general, generally set the rigidity at roughly 80% of the value in the table.

The rigidity when the applied preload is not 10% of the basic dynamic load rating (Ca) is calculated using the equation (36) below.

$$K_N = K\left(\frac{Fa_0}{0.1Ca}\right)^{\frac{1}{3}} \times 0.8 \quad \cdots\cdots\cdots(36)$$

K_N : Axial rigidity of the nut (N/μm)
K : Rigidity value in the specification tables (N/μm)
Fa_0 : Applied preload (N)
Ca : Basic dynamic load rating (N)

[Axial rigidity of the support bearing]

The rigidity of the Ball Screw support bearing varies depending on the support bearing used.

The calculation of the rigidity with a representative angular ball bearing is shown in the equation (37) below.

$$K_B \fallingdotseq \frac{3Fa_0}{\delta a_0} \quad \cdots\cdots\cdots(37)$$

K_B : Axial rigidity of the support bearing (N/μm)
Fa_0 : Applied preload of the support bearing (N)
δa_0 : Axial displacements (μm)

$$\delta a_0 = \frac{0.45}{\sin\alpha}\left(\frac{Q^2}{Da}\right)^{\frac{1}{3}}$$

$$Q = \frac{Fa_0}{Z\sin\alpha}$$

Q : Axial load (N)
Da : Ball diameter of the support bearing (mm)
α : Initial contact angle of the support bearing (°)
Z : Number of balls

For details of a specific support bearing, contact its manufacturer.

[Axial Rigidity of the Nut Bracket and the Support Bearing Bracket]

Take this factor into consideration when designing your machine. Set the rigidity as high as possible.

Studying the Positioning Accuracy

Causes of Error in the Positioning Accuracy

The causes of error in the positioning accuracy include the lead angle accuracy, the axial clearance and the axial rigidity of the feed screw system. Other important factors include the thermal displacement from heat and the orientation change of the guide system during traveling.

Studying the Lead Angle Accuracy

It is necessary to select the correct accuracy grade of the Ball Screw that satisfies the required positioning accuracy from the Ball Screw accuracies (Table1 on A-678). Table20 on A-712 shows examples of selecting the accuracy grades by the application.

Studying the Axial Clearance

The axial clearance is not a factor of positioning accuracy in single-directional feed. However, it will cause a backlash when the feed direction is inversed or the axial load is inversed. Select an axial clearance that meets the required backlash from Table10 and Table12 on A-685.

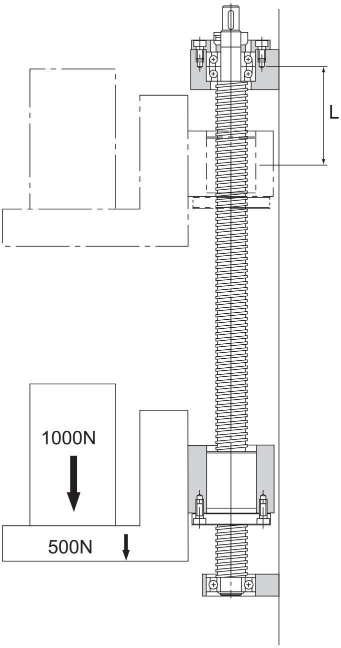
Table20 Examples of Selecting Accuracy Grades by Application

Applications		Shaft	Accuracy grades							
			C0	C1	C2	C3	C5	C7	C8	C10
NC machine tools	Lathe	X		●	●	●	●			
		Z				●	●			
	Machining center	XY			●	●	●			
		Z			●	●	●			
	Drilling machine	XY				●	●			
		Z					●	●		
	Jig borer	XY	●	●						
		Z	●	●						
	Surface grinder	X				●	●			
		Y		●	●	●	●			
		Z		●	●	●	●			
	Cylindrical grinder	X	●	●	●					
		Z		●	●	●				
	Electric discharge machine	XY	●	●	●					
		Z		●	●	●	●			
	Electric discharge machine Wire cutting machine	XY	●	●	●					
		Z	●	●	●	●				
		UV		●	●	●				
	Punching press	XY				●	●	●		
	Laser beam machine	X				●	●	●		
		Z				●	●	●		
	Woodworking machine						●	●	●	●
General-purpose machine; dedicated machine						●	●	●	●	●
Industrial robot	Cartesian coordinate	Assembly				●	●	●	●	
		Other					●	●	●	●
	Vertical articulated type	Assembly					●	●	●	
		Other						●	●	
	Cylindrical coordinate					●	●	●		
Semiconductor manufacturing machine	Photolithography machine		●	●						
	Chemical treatment machine				●	●	●	●	●	●
	Wire bonding machine			●	●					
	Prober		●	●	●	●				
	Printed circuit board drilling machine			●	●	●	●	●		
	Electronic component inserter				●	●	●	●		
3D measuring instrument			●	●	●					
Image processing machine			●	●	●					
Injection molding machine								●	●	●
Office equipment							●	●	●	●

Studying the Axial Clearance of the Feed Screw System

Of the axial rigidities of the feed screw system, the axial rigidity of the screw shaft fluctuates according to the stroke position. When the axial rigidity is large, such change in the axial rigidity of the screw shaft will affect the positioning accuracy. Therefore, it is necessary to take into account the rigidity of the feed screw system (A-707 to A-710).

Example: Positioning error due to the axial rigidity of the feed screw system during a vertical transfer



[Conditions]
Transferred weight: 1,000 N; table weight: 500 N
Ball Screw used: model BNF2512–2.5 (screw-shaft thread minor diameter d_1 = 21.9 mm)
Stroke length: 600 mm (L=100 mm to 700 mm)
Screw shaft mounting type: fixed-supported

[Consideration]

The difference in axial rigidity between L = 100 mm and L = 700 mm applied only to the axial rigidity of the screw shaft.
Therefore, positioning error due to the axial rigidity of the feed screw system equals to the difference in the axial displacement of the screw shaft between L = 100 mm and L = 700 mm.

[Axial Rigidity of the Screw Shaft (see A-707 and A-708)]

$$K_S = \frac{A \cdot E}{1000L} = \frac{376.5 \times 2.06 \times 10^5}{1000 \times L} = \frac{77.6 \times 10^3}{L}$$

$$A = \frac{\pi}{4} d_1^2 = \frac{\pi}{4} \times 21.9^2 = 376.5\text{mm}^2$$

$$E = 2.06 \times 10^5 \text{ N/mm}^2$$

(1) When L = 100 mm

$$K_{S1} = \frac{77.6 \times 10^3}{100} = 776 \text{ N/}\mu\text{m}$$

(2) When L = 700mm

$$K_{S2} = \frac{77.6 \times 10^3}{700} = 111 \text{ N/}\mu\text{m}$$

[Axial Displacement due to Axial Rigidity of the Screw Shaft]

(1) When L = 100 mm

$$\delta_1 = \frac{Fa}{K_{S1}} = \frac{1000+500}{776} = 1.9\mu\text{m}$$

(2) When L = 700mm

$$\delta_2 = \frac{Fa}{K_{S2}} = \frac{1000+500}{111} = 13.5\mu\text{m}$$

[Positioning Error due to Axial Rigidity of the Feed Screw System]

Positioning accuracy=$\delta_1 - \delta_2 = 1.9 - 13.5$

$= -11.6\mu\text{m}$

Therefore, the positioning error due to the axial rigidity of the feed screw system is 11.6 µm.

Studying the Thermal Displacement through Heat Generation

If the temperature of the screw shaft increases during operation, the screw shaft is elongated due to heat thereby to lowering the positioning accuracy. The expansion and contraction of the screw shaft is calculated using the equation (38) below.

$$\Delta \ell = \rho \times \Delta t \times \ell \quad \cdots\cdots\cdots(38)$$

$\Delta \ell$: Axial expansion/contraction of the screw shaft (mm)
ρ : Thermal expansion coefficient (12×10^{-6}/℃)
Δt : Temperature change in the screw shaft (℃)
ℓ : Effective thread length (mm)

Thus, if the temperature of the screw shaft increases by 1℃, the screw shaft is elongated by 12 μm per meter. Therefore, as the Ball Screw travels faster, the more heat is generated. So, as the temperature increases, the positioning accuracy lowers. Accordingly, if high accuracy is required, it is necessary to take measures to cope with the temperature increase.

[Measures to Cope with the Temperature Rise]

● Minimize the Heat Generation

- Minimize the preloads on the Ball Screw and the support bearing.
- Increase the Ball Screw lead and reduce the rotational speed.
- Select a correct lubricant. (See Accessories for Lubrication on A-954.)
- Cool the circumference of the screw shaft with a lubricant or air.

● Avoid Effect of Temperature Rise through Heat Generation

- Set a negative target value for the reference travel distance of the Ball Screw.
  Generally, set a negative target value for the reference travel distance assuming a temperature increase of 2℃ to 5℃ by heat.
  (−0.02mm to −0.06 mm/m)
- Preload the shaft screw with tension. (See Fig.3 of the structure on A-825.)

Studying the Orientation Change during Traveling

The lead angle accuracy of the Ball Screw equals the positioning accuracy of the shaft center of the Ball Screw. Normally, the point where the highest positioning accuracy is required changes according to the ball screw center and the vertical or horizontal direction. Therefore, the orientation change during traveling affects the positioning accuracy.

The largest factor of orientation change affecting the positioning accuracy is pitching if the change occurs in the ball screw center and the vertical direction, and yawing if the change occurs in the horizontal direction.

Accordingly, it is necessary to study the orientation change (accuracy in pitching, yawing, etc.) during the traveling on the basis of the distance from the ball screw center to the location where positioning accuracy is required.

Positioning error due to pitching and yawing is obtained using the equation (39) below.

$$\mathbf{A = \ell \times \sin\theta} \quad \cdots\cdots\cdots(39)$$

A: Positioning accuracy due to pitching (or yawing) (mm)
ℓ : Vertical (or horizontal) distance from the ball screw center (mm) (see Fig.12)
θ : Pitching (or yawing) (°)

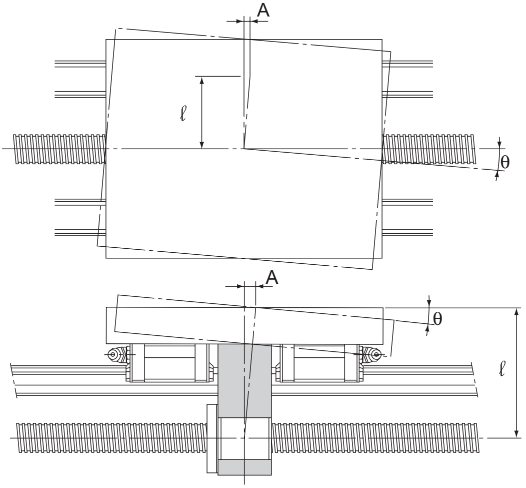


Fig.12

Studying the Rotational Torque

The rotational torque required to convert rotational motion of the Ball Screw into straight motion is obtained using the equation (40) below.

[During Uniform Motion]

$$T_t = T_1 + T_2 + T_4 \quad \cdots\cdots\cdots(40)$$

T_t : Rotational torque required during uniform motion (N-mm)
T_1 : Frictional torque due to an external load (N-mm)
T_2 : Preload torque of the Ball Screw (N-mm)
T_4 : Other torque (N-mm)
(frictional torque of the support bearing and oil seal)

[During Acceleration]

$$T_K = T_t + T_3 \quad \cdots\cdots\cdots(41)$$

T_K : Rotational torque required during acceleration (N-mm)
T_3 : Torque required for acceleration (N-mm)

[During Deceleration]

$$T_g = T_t - T_3 \quad \cdots\cdots\cdots(42)$$

T_g : Rotational torque required for deceleration (N-mm)

Frictional Torque Due to an External Load

Of the turning forces required for the Ball Screw, the rotational torque needed for an external load (guide surface resistance or external force) is obtained using the equation (43) below

$$T_1 = \frac{Fa \cdot Ph}{2\pi \cdot \eta} \cdot A \quad \cdots\cdots\cdots(43)$$

T_1 : Frictional torque due to an external load (N-mm)
Fa : Applied axial load (N)
Ph : Ball Screw lead (mm)
η : Ball Screw efficiency (0.9 to 0.95)
A : Reduction ratio

Torque Due to a Preload on the Ball Screw

For a preload on the Ball Screw, see "Preload Torque" on A-688.

$$\mathbf{T_2 = T_d \cdot A} \quad \cdots\cdots\cdots(44)$$

T_2 : Preload torque of the Ball Screw (N-mm)
T_d : Preload torque of the Ball Screw (N-mm)
A : Reduction ratio

Torque Required for Acceleration

$$\mathbf{T_3 = J \times \omega' \times 10^3} \quad \cdots\cdots\cdots(45)$$

T_3 : Torque required for acceleration (N-mm)
J : Inertial moment (kg•m²)
ω´ : Angular acceleration (rad/s²)

$$J = m\left(\frac{Ph}{2\pi}\right)^2 \cdot A^2 \cdot 10^{-6} + J_S \cdot A^2 + J_A \cdot A^2 + J_B$$

m : Transferred mass (kg)
Ph : Ball Screw lead (mm)
J_S : Inertial moment of the screw shaft (kg•m²)
(indicated in the specification tables of the respective model number)
A : Reduction ratio
J_A : Inertial moment of gears, etc. attached to the screw shaft side (kg•m²)
J_B : Inertial moment of gears, etc. attached to the motor side d (kg•m²)

$$\omega' = \frac{2\pi \cdot Nm}{60t}$$

Nm : Motor revolutions per minute (min⁻¹)
t : Acceleration time (s)

[Ref.] Inertial moment of a round object

$$J = \frac{m \cdot D^2}{8 \cdot 10^6}$$

J : Inertial moment (kg•m²)
m : Mass of a round object (kg)
D : Screw shaft outer diameter (mm)

Studying the Driving Motor

When selecting a driving motor required to rotate the Ball Screw, normally take into account the rotational speed, rotational torque and minimum feed amount.

When Using a Servomotor

[Rotational Speed]

The rotational speed required for the motor is obtained using the equation (46) based on the feed speed, Ball Screw lead and reduction ratio.

$$N_M = \frac{V \times 1000 \times 60}{Ph} \times \frac{1}{A} \quad \cdots\cdots\cdots(46)$$

N_M	:	Required rotational speed of the motor	(min^{-1})
V	:	Feeding speed	(m/s)
Ph	:	Ball Screw lead	(mm)
A	:	Reduction ratio	

The rated rotational speed of the motor must be equal to or above the calculated value (N_M) above.

$N_M \leqq N_R$

N_R	:	The rated rotational speed of the motor	(min^{-1})

[Required Resolution]

Resolutions required for the encoder and the driver are obtained using the equation (47) based on the minimum feed amount, Ball Screw lead and reduction ratio.

$$B = \frac{Ph \cdot A}{S} \quad \cdots\cdots\cdots(47)$$

B	:	Resolution required for the encoder and the driver	(p/rev)
Ph	:	Ball Screw lead	(mm)
A	:	Reduction ratio	
S	:	Minimum feed amount	(mm)

[Motor Torque]

The torque required for the motor differs between uniform motion, acceleration and deceleration. To calculate the rotational torque, see "Studying the Rotational Torque" on A-717.

a. Maximum torque

The maximum torque required for the motor must be equal to or below the maximum peak torque of the motor.

$T_{max} \leqq Tp_{max}$

T_{max} : Maximum torque acting on the motor

Tp_{max} : Maximum peak torque of the motor

b. Effective torque value

The effective value of the torque required for the motor must be calculated. The effective value of the torque is obtained using the equation (48) below.

$$T_{rms} = \sqrt{\frac{T_1^2 \times t_1 + T_2^2 \times t_2 + T_3^2 \times t_3}{t}} \quad \cdots\cdots\cdots(48)$$

T_{rms}	: Effective torque value	(N-mm)
T_n	: Fluctuating torque	(N-mm)
t_n	: Time during which the torque T_n is applied	(s)
t	: Cycle time ($t=t_1+t_2+t_3$)	(s)

The calculated effective value of the torque must be equal to or below the rated torque of the motor.

$T_{rms} \leqq T_R$

T_R : Rated torque of the motor (N-mm)

[Inertial Moment]

The inertial moment required for the motor is obtained using the equation (49) below.

$$J_M = \frac{J}{C} \quad \cdots\cdots\cdots(49)$$

J_M : Inertial moment required for the motor ($kg \cdot m^2$)

C : Factor determined by the motor and the driver

(It is normally between 3 to 10. However, it varies depending on the motor and the driver. Check the specific value in the catalog by the motor manufacturer.)

The inertial moment of the motor must be equal to or above the calculated J_M value.

When Using a Stepping Motor (Pulse Motor)

[Minimal Feed Amount(per Step)]

The step angle required for the motor and the driver is obtained using the equation (50) below based on the minimum feed amount, the Ball Screw lead and the reduction ratio.

$$E = \frac{360S}{Ph \cdot A} \quad \cdots\cdots\cdots (50)$$

E : Step angle required for the motor and the driver (°)
S : Minimum feed amount (per step) (mm)
Ph : Ball Screw lead (mm)
A : Reduction ratio

[Pulse Speed and Motor Torque]

a. Pulse speed

The pulse speed is obtained using the equation (51) below based on the feed speed and the minimum feed amount.

$$f = \frac{V \times 1000}{S} \quad \cdots\cdots\cdots (51)$$

f : Pulse speed (Hz)
V : Feeding speed (m/s)
S : Minimum feed amount (mm)

b. Torque required for the motor

The torque required for the motor differs between the uniform motion, the acceleration and the deceleration. To calculate the rotational torque, see "Studying the Rotational Torque" on A-717.

Thus, the pulse speed required for the motor and the required torque can be calculated in the manner described above.

Although the torque varies depending on the motors, normally the calculated torque should be doubled to ensure safety. Check if the torque can be used in the motor's speed-torque curve.

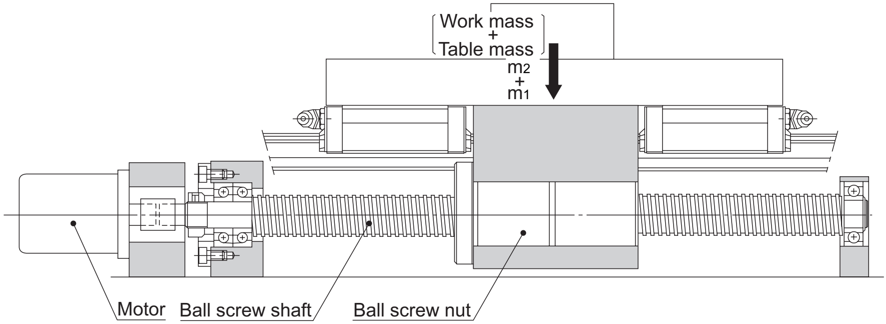
Examples of Selecting a Ball Screw

High-speed Transfer Equipment (Horizontal Use)

[Selection Conditions]

Table Mass	m_1 =60kg
Work Mass	m_2 =20kg
Stroke length	ℓ_S=1000mm
Maximum speed	V_{max}=1m/s
Acceleration time	t_1 = 0.15s
Deceleration time	t_3 = 0.15s
Number of reciprocations per minute	n =8min^{-1}
Backlash	0.15mm
Positioning accuracy	±0.3 mm/1000 mm (Perform positioning from the negative direction)

Positioning Repeatability	±0.1 mm
Minimum feed amount	s = 0.02mm/pulse
Desired service life time	30000h
Driving motor	AC servo motor Rated rotational speed: 3,000 min^{-1}
Inertial moment of the motor	J_m =1×10^{-3} kg•m^2
Reduction gear	None (direct coupling) A=1
Frictional coefficient of the guide surface	μ =0.003 (rolling)
Guide surface resistance	f=15 N (without load)



[Selection Items]

Screw shaft diameter
Lead
Nut model No.
Accuracy
Axial clearance
Screw shaft support method
Driving motor

[Selecting Lead Angle Accuracy and Axial Clearance]

● Selecting Lead Angle Accuracy

To achieve positioning accuracy of ±0.3 mm/1,000 mm:

$$\frac{\pm 0.3}{1000} = \frac{\pm 0.09}{300}$$

The lead angle accuracy must be ±0.09 mm/300 mm or higher.

Therefore, select the following as the accuracy grade of the Ball Screw (see Table1 on A-678).

C7 (travel distance error: ±0.05mm/300mm)

Accuracy grade C7 is available for both the Rolled and the Precision Ball Screws. Assume that a Rolled Ball Screw is selected here because it is less costly.

● Selecting Axial Clearance

To satisfy the backlash of 0.15 mm, it is necessary to select a Ball Screw with an axial clearance of 0.15 mm or less.

Therefore, a Rolled Ball Screw model with a screw shaft diameter of 32 mm or less that meets the axial clearance of 0.15 mm or less (see Table12 on A-685) meets the requirements.

Thus, a Rolled Ball Screw model with a screw shaft diameter of 32 mm or less and an accuracy grade of C7 is selected.

[Selecting a Screw Shaft]

● Assuming the Screw Shaft Length

Assume the overall nut length to be 100 mm and the screw shaft end length to be 100 mm.

Therefore, the overall length is determined as follows based on the stroke length of 1,000 mm.

1000 + 200 = 1200 mm

Thus, the screw shaft length is assumed to be 1,200 mm.

● Selecting a Lead

With the driving motor's rated rotational speed being 3,000 min^{-1} and the maximum speed 1 m/s, the Ball Screw lead is obtained as follows:

$$\frac{1 \times 1000 \times 60}{3000} = 20\ \text{mm}$$

Therefore, it is necessary to select a type with a lead of 20 mm or longer.

In addition, the Ball Screw and the motor can be mounted in direct coupling without using a reduction gear. The minimum resolution per revolution of an AC servomotor is obtained based on the resolution of the encoder (1,000 p/rev; 1,500 p/rev) provided as a standard accessory for the AC servomotor, as indicated below.

1000 p/rev(without multiplication)
1500 p/rev(without multiplication)
2000 p/rev(doubled)
3000 p/rev(doubled)
4000 p/rev(quadrupled)
6000 p/rev(quadrupled)

To meet the minimum feed amount of 0.02 mm/pulse, which is the selection requirement, the following should apply.

Lead 20mm —— 1000 p/rev
30mm —— 1500 p/rev
40mm —— 2000 p/rev
60mm —— 3000 p/rev
80mm —— 4000 p/rev

● Selecting a Screw Shaft Diameter

Those Ball Screw models that meet the requirements defined in Section [Selecting Lead Angle Accuracy and Axial Clearance] on A-723: a rolled Ball Screw with a screw shaft diameter of 32 mm or less; and the requirement defined in Section [Selecting a Screw Shaft] on A-723: a lead of 20, 30, 40, 60 or 80 mm (see Table17 on A-693) are as follows.

Shaft diameter Lead
15mm —— 20mm
15mm —— 30mm
20mm —— 20mm
20mm —— 40mm
30mm —— 60mm

Since the screw shaft length has to be 1,200 mm as indicated in Section [Selecting a Screw Shaft] on A-723, the shaft diameter of 15 mm is insufficient. Therefore, the Ball Screw should have a screw shaft diameter of 20 mm or greater.

Accordingly, there are three combinations of screw shaft diameters and leads that meet the requirements: screw shaft diameter of 20 mm/lead of 20 mm; 20 mm/40 mm; and 30 mm/60 mm.

● Selecting a Screw Shaft Support Method

Since the assumed type has a long stroke length of 1,000 mm and operates at high speed of 1 m/s, select either the fixed-supported or fixed-fixed configuration for the screw shaft support.

However, the fixed-fixed configuration requires a complicated structure, needs high accuracy in the installation.

Accordingly, the fixed-supported configuration is selected as the screw shaft support method.

● Studying the Permissible Axial Load

■Calculating the Maximum Axial Load

Guide surface resistance	$f=15$ N (without load)
Table Mass	$m_1=60$ kg
Work Mass	$m_2=20$ kg
Frictional coefficient of the guide surface	$\mu=0.003$
Maximum speed	$V_{max}=1$ m/s
Gravitational acceleration	$g=9.807$ m/s^2
Acceleration time	$t_1=0.15$s

Accordingly, the required values are obtained as follows.

Acceleration:

$$\alpha=\frac{V_{max}}{t_1}=6.67\ \text{m/s}^2$$

During forward acceleration:

$Fa_1=\mu\cdot(m_1+m_2)\,g+f+(m_1+m_2)\cdot\alpha=550$ N

During forward uniform motion:

$Fa_2=\mu\cdot(m_1+m_2)\,g+f=17$ N

During forward deceleration:

$Fa_3=\mu\cdot(m_1+m_2)\,g+f-(m_1+m_2)\cdot\alpha=-516$ N

During backward acceleration:

$Fa_4=-\mu\cdot(m_1+m_2)\,g-f-(m_1+m_2)\cdot\alpha=-550$ N

During uniform backward motion:

$Fa_5=-\mu\cdot(m_1+m_2)\,g-f=-17$ N

During backward deceleration:

$Fa_6=-\mu\cdot(m_1+m_2)\,g-f+(m_1+m_2)\cdot\alpha=516$ N

Thus, the maximum axial load applied on the Ball Screw is as follows:

$Fa_{max}=Fa_1=550$ N

Therefore, if there is no problem with a shaft diameter of 20 mm and a lead of 20 mm (smallest thread minor diameter of 17.5 mm), then the screw shaft diameter of 30 mm should meet the requirements. Thus, the following calculations for the buckling load and the permissible compressive and tensile load of the screw shaft are performed while assuming a screw shaft diameter of 20 mm and a lead of 20 mm.

■Buckling Load on the Screw Shaft

Factor according to the mounting method η_2=20 (see A-694)

Since the mounting method for the section between the nut and the bearing, where buckling is to be considered, is "fixed-fixed: "

Distance between two mounting surfaces ℓ_a=1100 mm (estimate)

Screw-shaft thread minor diameter d_1=17.5 mm

$$P_1 = \eta_2 \cdot \frac{d_1^4}{\ell_a^2} \times 10^4 = 20 \times \frac{17.5^4}{1100^2} \times 10^4 = 15500 \text{ N}$$

■Permissible Compressive and Tensile Load of the Screw Shaft

$P_2 = 116 \times d_1^2 = 116 \times 17.5^2 = 35500$ N

Thus, the buckling load and the permissible compressive and the tensile load of the screw shaft are at least equal to the maximum axial load. Therefore, a Ball Screw that meets these requirements can be used without a problem.

● Studying the Permissible Rotational Speed

■Maximum Rotational Speed

- Screw shaft diameter: 20 mm; lead: 20 mm

Maximum speed V_{max}=1 m/s

Lead Ph= 20 mm

$$N_{max} = \frac{V_{max} \times 60 \times 10^3}{Ph} = 3000 \text{ min}^{-1}$$

- Screw shaft diameter: 20 mm; lead: 40mm

Maximum speed V_{max}=1 m/s

Lead Ph= 40 mm

$$N_{max} = \frac{V_{max} \times 60 \times 10^3}{Ph} = 1500 \text{ min}^{-1}$$

- Screw shaft diameter: 30mm; lead: 60mm

Maximum speed V_{max}=1 m/s

Lead Ph= 60 mm

$$N_{max} = \frac{V_{max} \times 60 \times 10^3}{Ph} = 1000 \text{ min}^{-1}$$

■Permissible Rotational Speed Determined by the Dangerous Speed of the Screw Shaft

Factor according to the mounting method λ_2=15.1 (see A-696)

Since the mounting method for the section between the nut and the bearing, where dangerous speed is to be considered, is "fixed-supported: "

Distance between two mounting surfaces ℓ_b=1100 mm (estimate)

- Screw shaft diameter: 20 mm; lead: 20 mm and 40 mm

Screw-shaft thread minor diameter d_1=17.5mm

$$N_1 = \lambda_2 \times \frac{d_1}{\ell_b^{\,2}} 10^7 = 15.1 \times \frac{17.5}{1100^2} \times 10^7 = 2180 \text{ min}^{-1}$$

- Screw shaft diameter: 30mm; lead: 60mm

Screw-shaft thread minor diameter d_1=26.4mm

$$N_1 = \lambda_2 \times \frac{d_1}{\ell_b^{\,2}} 10^7 = 15.1 \times \frac{26.4}{1100^2} \times 10^7 = 3294 \text{ min}^{-1}$$

■Permissible Rotational Speed Determined by the DN Value

- Screw shaft diameter: 20 mm; lead: 20 mm and 40mm (large lead Ball Screw)

Ball center-to-center diameter D=20.75 mm

$$N_2 = \frac{70000}{D} = \frac{70000}{20.75} = 3370 \text{ min}^{-1}$$

- Screw shaft diameter: 30 mm; lead: 60 mm (large lead Ball Screw)

Ball center-to-center diameter D=31.25 mm

$$N_2 = \frac{70000}{D} = \frac{70000}{31.25} = 2240 \text{ min}^{-1}$$

Thus, with a Ball Screw having a screw shaft diameter of 20 mm and a lead of 20 mm, the maximum rotational speed exceeds the dangerous speed.

In contrast, a combination of a screw shaft diameter of 20 mm and a lead of 40 mm, and another of a screw shaft diameter of 30 mm and a lead of 60 mm, meet the dangerous speed and the DN value. Accordingly, a Ball Screw with a screw shaft diameter of 20 mm and a lead of 40 mm, or with a screw shaft diameter of 30 mm and a lead of 60 mm, is selected.

[Selecting a Nut]

● Selecting a Nut Model Number

Rolled Ball Screw models with a screw shaft diameter of 20 mm and a lead of 40 mm, or with a screw shaft diameter of 30 mm and a lead of 60 mm, are large lead Rolled Ball Screw model WTF variations.

WTF2040-2
(C_a=5.4 kN, C_{0a}=13.6 kN)
WTF2040-3
(C_a=6.6 kN, C_{0a}=17.2 kN)
WTF3060-2
(C_a=11.8 kN, C_{0a}=30.6 kN)
WTF3060-3
(C_a=14.5 kN, C_{0a}=38.9 kN)

● Studying the Permissible Axial Load

Study the permissible axial load of model WTF2040-2 (C_0a = 13.6 kN).

Assuming that this model is used in high-speed transfer equipment and an impact load is applied during deceleration, set the static safety factor (f_S) at 2.5 (see Table18 on A-703).

$$\frac{C_0a}{f_S} = \frac{13.6}{2.5} = 5.44\ \text{kN} = 5440\ \text{N}$$

The obtained permissible axial load is greater than the maximum axial load of 550 N, and therefore, there will be no problem with this model.

■Calculating the Travel Distance

Maximum speed V_{max}=1 m/s

Acceleration time t_1 = 0.15s

Deceleration time t_3 = 0.15s

● Travel distance during acceleration

$$\ell_{1,4} = \frac{V_{max} \cdot t_1}{2} \times 10^3 = \frac{1 \times 0.15}{2} \times 10^3 = 75\ \text{mm}$$

● Travel distance during uniform motion

$$\ell_{2,5} = \ell_S - \frac{V_{max} \cdot t_1 + V_{max} \cdot t_3}{2} \times 10^3 = 1000 - \frac{1 \times 0.15 + 1 \times 0.15}{2} \times 10^3 = 850\ \text{mm}$$

● Travel distance during deceleration

$$\ell_{3,6} = \frac{V_{max} \cdot t_3}{2} \times 10^3 = \frac{1 \times 0.15}{2} \times 10^3 = 75\ \text{mm}$$

Based on the conditions above, the relationship between the applied axial load and the travel distance is shown in the table below.

Motion	Applied axial load Fa_N(N)	Travel distance ℓ_N(mm)
No.1: During forward acceleration	550	75
No.2: During forward uniform motion	17	850
No.3: During forward deceleration	–516	75
No.4: During backward acceleration	–550	75
No.5: During uniform backward motion	–17	850
No.6: During backward deceleration	516	75

* The subscript (N) indicates a motion number.

Since the load direction (as expressed in positive or negative sign) is reversed with Fa_3, Fa_4 and Fa_5, calculate the average axial load in the two directions.

■Average Axial Load

● Average axial load in the positive direction

Since the load direction varies, calculate the average axial load while assuming $Fa_{3,\,4,\,5}$ = 0N.

$$F_{m1} = \sqrt[3]{\frac{Fa_1^{\,3} \times \ell_1 + Fa_2^{\,3} \times \ell_2 + Fa_6^{\,3} \times \ell_6}{\ell_1 + \ell_2 + \ell_3 + \ell_4 + \ell_5 + \ell_6}} = 225\ \text{N}$$

● Average axial load in the negative direction

Since the load direction varies, calculate the average axial load while assuming $Fa_{1,\,2,\,6}$ = 0N.

$$F_{m2} = \sqrt[3]{\frac{|Fa_3|^3 \times \ell_3 + |Fa_4|^3 \times \ell_4 + |Fa_5|^3 \times \ell_5}{\ell_1 + \ell_2 + \ell_3 + \ell_4 + \ell_5 + \ell_6}} = 225\ \text{N}$$

Since $F_{m1} = F_{m2}$, assume the average axial load to be $F_m = F_{m1} = F_{m2} = 225$ N.

■Nominal Life

Load factor	f_W= 1.5 (see Table19 on A-704)
Average load	F_m= 225 N
Nominal life	L (rev)

$$L = \left(\frac{Ca}{f_W \cdot F_m}\right)^3 \times 10^6$$

Assumed model number	Dynamic load rating Ca(N)	Nominal life L(rev)
WTF 2040-2	5400	4.1×10^9
WTF 2040-3	6600	7.47×10^9
WTF 3060-2	11800	4.27×10^{10}
WTF 3060-3	14500	7.93×10^{10}

■Average Revolutions per Minute

Number of reciprocations per minute $n = 8\text{min}^{-1}$

Stroke $\ell_s = 1000$ mm

- Lead: Ph = 40 mm

$$N_m = \frac{2 \times n \times \ell_s}{Ph} = \frac{2 \times 8 \times 1000}{40} = 400\ \text{min}^{-1}$$

- Lead: Ph = 60 mm

$$N_m = \frac{2 \times n \times \ell_s}{Ph} = \frac{2 \times 8 \times 1000}{60} = 267\ \text{min}^{-1}$$

■Calculating the Service Life Time on the Basis of the Nominal Life

- WTF2040-2

Nominal life $L = 4.1 \times 10^9$ rev

Average revolutions per minute $Nm = 400\ \text{min}^{-1}$

$$L_h = \frac{L}{60 \times N_m} = \frac{4.1 \times 10^9}{60 \times 400} = 171000\ \text{h}$$

- WTF2040-3

Nominal life $L = 7.47 \times 10^9$ rev

Average revolutions per minute $Nm = 400\ \text{min}^{-1}$

$$L_h = \frac{L}{60 \times N_m} = \frac{7.47 \times 10^9}{60 \times 400} = 311000\ \text{h}$$

- WTF3060-2

Nominal life $L = 4.27 \times 10^{10}$ rev

Average revolutions per minute $Nm = 267\ \text{min}^{-1}$

$$L_h = \frac{L}{60 \times N_m} = \frac{4.27 \times 10^{10}}{60 \times 267} = 2670000\ \text{h}$$

- WTF3060-3

Nominal life $L = 7.93 \times 10^{10}$ rev

Average revolutions per minute $Nm = 267\ \text{min}^{-1}$

$$L_h = \frac{L}{60 \times N_m} = \frac{7.93 \times 10^{10}}{60 \times 267} = 4950000\ \text{h}$$

■Calculating the Service Life in Travel Distance on the Basis of the Nominal Life

- WTF2040-2

Nominal life	$L=4.1\times10^{9}$ rev
Lead	$Ph= 40$ mm

$L_S = L \times Ph \times 10^{-6} = 164000$ km

- WTF2040-3

Nominal life	$L=7.47\times10^{9}$ rev
Lead	$Ph= 40$ mm

$L_S = L \times Ph \times 10^{-6} = 298800$ km

- WTF3060-2

Nominal life	$L=4.27\times10^{10}$ rev
Lead	$Ph= 60$ mm

$L_S = L \times Ph \times 10^{-6} = 2562000$ km

- WTF3060-3

Nominal life	$L=7.93\times10^{10}$ rev
Lead	$Ph= 60$ mm

$L_S = L \times Ph \times 10^{-6} = 4758000$ km

With all the conditions stated above, the following models satisfying the desired service life time of 30,000 hours are selected.

WTF 2040-2
WTF 2040-3
WTF 3060-2
WTF 3060-3

[Studying the Rigidity]

Since the conditions for selection do not include rigidity and this element is not particularly necessary, it is not described here.

[Studying the Positioning Accuracy]

● Studying the Lead Angle Accuracy

Accuracy grade C7 was selected in Section [Selecting Lead Angle Accuracy and Axial Clearance] on A-723.

C7 (travel distance error: ±0.05mm/300mm)

● Studying the Axial Clearance

Since positioning is performed in a given direction only, axial clearance is not included in the positioning accuracy. As a result, there is no need to study the axial clearance.

WTF2040: axial clearance: 0.1 mm
WTF3060: axial clearance: 0.14 mm

● Studying the Axial Rigidity

Since the load direction does not change, it is unnecessary to study the positioning accuracy on the basis of the axial rigidity.

● Studying the Thermal Displacement through Heat Generation

Assume the temperature rise during operation to be 5℃.

The positioning accuracy based on the temperature rise is obtained as follows:

$$\begin{aligned} \Delta \ell &= \rho \times \Delta t \times \ell \\ &= 12 \times 10^{-6} \times 5 \times 1000 \\ &= 0.06 \text{ mm} \end{aligned}$$

● Studying the Orientation Change during Traveling

Since the ball screw center is 150 mm away from the point where the highest accuracy is required, it is necessary to study the orientation change during traveling.

Assume that pitching can be done within ±10 seconds because of the structure. The positioning error due to the pitching is obtained as follows:

$$\begin{aligned} \Delta a &= \ell \times \sin\theta \\ &= 150 \times \sin(\pm 10'') \\ &= \pm\ 0.007 \text{ mm} \end{aligned}$$

Thus, the positioning accuracy (Δp) is obtained as follows:

$$\Delta p = \frac{\pm 0.05 \times 1000}{300} \pm 0.007 + 0.06 = 0.234 \text{ mm}$$

Since models WTF2040-2, WTF2040-3, WTF3060-2 and WTF3060-3 meet the selection requirements throughout the studying process in Section [Selecting Lead Angle Accuracy and Axial Clearance] on A-723 to Section [Studying the Positioning Accuracy] on A-732, the most compact model WTF2040-2 is selected.

[Studying the Rotational Torque]

● Friction Torque Due to an External Load

The friction toruque is obtained as follows:

$$T_1 = \frac{Fa \cdot Ph}{2\pi \cdot \eta} \cdot A = \frac{17 \times 40}{2 \times \pi \times 0.9} \times 1 = 120\ N \cdot mm$$

● Torque Due to a Preload on the Ball Screw

The Ball Screw is not provided with a preload.

● Torque Required for Acceleration

Inertial Moment

Since the inertial moment per unit length of the screw shaft is 1.23×10^{-3} kg•cm²/mm (see the specification table), the inertial moment of the screw shaft with an overall length of 1200 mm is obtained as follows.

$J_s = 1.23 \times 10^{-3} \times 1200 = 1.48\ kg \cdot cm^2$
$= 1.48 \times 10^{-4}\ kg \cdot m^2$

$$J = (m_1+m_2)\left(\frac{Ph}{2 \times \pi}\right)^2 \cdot A^2 \times 10^{-6} + J_s \cdot A^2 = (60+20)\left(\frac{40}{2 \times \pi}\right)^2 \times 1^2 \times 10^{-6} + 1.48 \times 10^{-4} \times 1^2$$

$$= 3.39 \times 10^{-3}\ kg \cdot m^2$$

Angular acceleration:

$$\omega' = \frac{2\pi \cdot Nm}{60 \cdot t_1} = \frac{2\pi \times 1500}{60 \times 0.15} = 1050\ rad/s^2$$

Based on the above, the torque required for acceleration is obtained as follows.

$T_2 = (J + J_m) \times \omega' = (3.39 \times 10^{-3} + 1 \times 10^{-3}) \times 1050 = 4.61 N \cdot m$
$= 4.61 \times 10^3\ N \cdot mm$

Therefore, the required torque is specified as follows.

During acceleration

$T_k = T_1 + T_2 = 120 + 4.61 \times 10^3 = 4730\ N \cdot mm$

During uniform motion

$T_t = T_1 = 120\ N \cdot mm$

During deceleration

$T_g = T_1 - T_2 = 120 - 4.61 \times 10^3 = -4490\ N \cdot mm$

[Studying the Driving Motor]

● Rotational Speed

Since the Ball Screw lead is selected based on the rated rotational speed of the motor, it is unnecessary to study the rotational speed of the motor.

Maximum working rotational speed: 1500 min^{-1}
Rated rotational speed of the motor: 3000 min^{-1}

● Minimum Feed Amount

As with the rotational speed, the Ball Screw lead is selected based on the encoder normally used for an AC servomotor. Therefore, it is unnecessary to study this factor.

Encoder resolution : 1000 p/rev.
Doubled : 2000 p/rev

● Motor Torque

The torque during acceleration calculated in Section [Studying the Rotational Torque] on A-733 is the required maximum torque.

$T_{max} = 4730\ \text{N} \cdot \text{mm}$

Therefore, the instantaneous maximum torque of the AC servomotor needs to be at least 4,730 N-mm.

● Effective Torque Value

The selection requirements and the torque calculated in Section [Studying the Rotational Torque] on A-733 can be expressed as follows.

During acceleration:
$T_k = 4730\ \text{N} \cdot \text{mm}$
$t_1 = 0.15\ \text{s}$

During uniform motion:
$T_t = 120\ \text{N} \cdot \text{mm}$
$t_2 = 0.85\ \text{s}$

During deceleration:
$T_g = 4490\ \text{N} \cdot \text{mm}$
$t_3 = 0.15\ \text{s}$

When stationary:
$T_S = 0$
$t_4 = 2.6\ \text{s}$

The effective torque is obtained as follows, and the rated torque of the motor must be 1305 N•mm or greater.

$$T_{rms} = \sqrt{\frac{T_k^2 \cdot t_1 + T_t^2 \cdot t_2 + T_g^2 \cdot t_3 + T_s^2 \cdot t_4}{t_1 + t_2 + t_3 + t_4}} = \sqrt{\frac{4730^2 \times 0.15 + 120^2 \times 0.85 + 4490^2 \times 0.15 + 0}{0.15 + 0.85 + 0.15 + 2.6}}$$

$$= 1305\ \text{N} \cdot \text{mm}$$

● Inertial Moment

The inertial moment applied to the motor equals to the inertial moment calculated in Section [Studying the Rotational Torque] on A-733.

$J = 3.39 \times 10^{-3}\ \mathrm{kg \cdot m^2}$

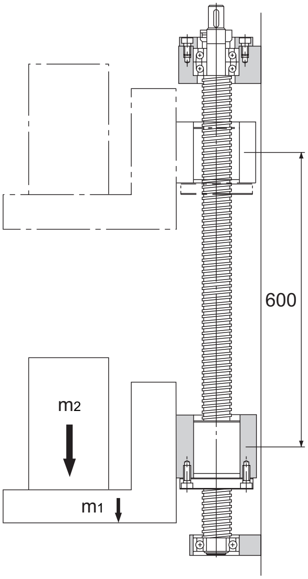
Normally, the motor needs to have an inertial moment at least one tenth of the inertial moment applied to the motor, although the specific value varies depending on the motor manufacturer.
Therefore, the inertial moment of the AC servomotor must be $3.39 \times 10^{-4}\mathrm{kg\text{-}m^2}$ or greater.

The selection has been completed.

Vertical Conveyance System

[Selection Conditions]

Table Mass	m_1 =40kg
Work Mass	m_2 =10kg
Stroke length	ℓ_s= 600mm
Maximum speed	V_{max}=0.3m/s
Acceleration time	t_1 = 0.2s
Deceleration time	t_3 = 0.2s
Number of reciprocations per minute	n =5min^{-1}
Backlash	0.1mm
Positioning accuracy	±0.7mm/600mm
Positioning Repeatability	±0.05mm
Minimum feed amount	s = 0.01mm/pulse
Service life time	20000h
Driving motor	AC servo motor Rated rotational speed: 3,000 min^{-1}
Inertial moment of the motor	J_m =5×10^{-5} kg•m^2
Reduction gear	None (direct coupling)
Frictional coefficient of the guide surface	μ =0.003 (rolling)
Guide surface resistance	f=20 N (without load)



[Selection Items]

Screw shaft diameter

Lead

Nut model No.

Accuracy

Axial clearance

Screw shaft support method

Driving motor

[Selecting Lead Angle Accuracy and Axial Clearance]

● Selecting the Lead Angle Accuracy

To achieve positioning accuracy of ±0.7mm/600mm:

$$\frac{\pm 0.7}{600} = \frac{\pm 0.35}{300}$$

The lead angle accuracy must be ±0.35mm/300 mm or higher.

Therefore, the accuracy grade of the Ball Screw (see Table1 on A-678) needs to be C10 (travel distance error: ±0.21 mm/300 mm).

Accuracy grade C10 is available for low priced, Rolled Ball Screws. Assume that a Rolled Ball Screw is selected.

● Selecting the Axial Clearance

The required backlashes is 0.1 mm or less. However, since an axial load is constantly applied in a single direction with vertical mount, the axial load does not serve as a backlash no matter how large it is.

Therefore, a low price, rolled Ball Screw is selected since there will not be a problem in axial clearance.

[Selecting a Screw Shaft]

● Assuming the Screw Shaft Length

Assume the overall nut length to be 100 mm and the screw shaft end length to be 100 mm.

Therefore, the overall length is determined as follows based on the stroke length of 600mm.

$$600 + 200 = 800 \text{ mm}$$

Thus, the screw shaft length is assumed to be 800 mm.

● Selecting the Lead

With the driving motor's rated rotational speed being 3,000 min^{-1} and the maximum speed 0.3 m/s, the Ball Screw lead is obtained as follows:

$$\frac{0.3 \times 60 \times 1000}{3000} = 6 \text{ mm}$$

Therefore, it is necessary to select a type with a lead of 6mm or longer.

In addition, the Ball Screw and the motor can be mounted in direct coupling without using a reduction gear. The minimum resolution per revolution of an AC servomotor is obtained based on the resolution of the encoder (1,000 p/rev; 1,500 p/rev) provided as a standard accessory for the AC servomotor, as indicated below.

1000 p/rev(without multiplication)
1500 p/rev(without multiplication)
2000 p/rev(doubled)
3000 p/rev(doubled)
4000 p/rev(quadrupled)
6000 p/rev(quadrupled)

To meet the minimum feed amount of 0.010mm/pulse, which is the selection requirement, the following should apply.

Lead 6mm —— 3000 p/rev
8mm —— 4000 p/rev
10mm —— 1000 p/rev
20mm —— 2000 p/rev
40mm —— 2000 p/rev

However, with the lead being 6 mm or 8 mm, the feed distance is 0.002 mm/pulse, and the starting pulse of the controller that issues commands to the motor driver needs to be at least 150 kpps, and the cost of the controller may be higher.

In addition, if the lead of the Ball Screw is greater, the torque required for the motor is also greater, and thus the cost will be higher.

Therefore, select 10 mm for the Ball Screw lead.

● Selecting the Screw Shaft Diameter

Those Ball Screw models that meet the lead being 10 mm as described in Section [Selecting Lead Angle Accuracy and Axial Clearance] on A-737 and Section [Selecting a Screw Shaft] on A-737 (see Table17 on A-693) are as follows.

Shaft diameter Lead
15mm —— 10mm
20mm —— 10mm
25mm —— 10mm

Accordingly, the combination of a screw shaft diameter of 15 mm and a lead 10 mm is selected.

● Selecting the Screw Shaft Support Method

Since the assumed Ball Screw has a stroke length of 600 mm and operates at a maximum speed of 0.3 m/s (Ball Screw rotational speed: 1,800 min^{-1}), select the fixed-supported configuration for the screw shaft support.

- **Studying the Permissible Axial Load**

■Calculating the Maximum Axial Load

Guide surface resistance	f=20 N (without load)
Table Mass	m_1 =40 kg
Work Mass	m_2 =10 kg
Maximum speed	V_{max}=0.3 m/s
Acceleration time	t_1 = 0.2s

Accordingly, the required values are obtained as follows.

Acceleration

$$\alpha = \frac{V_{max}}{t_1} = 1.5\ \mathrm{m/s^2}$$

During upward acceleration:

$$Fa_1 = (m_1 + m_2) \cdot g + f + (m_1 + m_2) \cdot \alpha = 585\ \mathrm{N}$$

During upward uniform motion:

$$Fa_2 = (m_1 + m_2) \cdot g + f = 510\ \mathrm{N}$$

During upward deceleration:

$$Fa_3 = (m_1 + m_2) \cdot g + f - (m_1 + m_2) \cdot \alpha = 435\ \mathrm{N}$$

During downward acceleration:

$$Fa_4 = (m_1 + m_2) \cdot g - f - (m_1 + m_2) \cdot \alpha = 395\ \mathrm{N}$$

During downward uniform motion:

$$Fa_5 = (m_1 + m_2) \cdot g - f = 470\ \mathrm{N}$$

During downward deceleration:

$$Fa_6 = (m_1 + m_2) \cdot g - f + (m_1 + m_2) \cdot \alpha = 545\ \mathrm{N}$$

Thus, the maximum axial load applied on the Ball Screw is as follows:

$$Fa_{max} = Fa_1 = 585\ \mathrm{N}$$

■Buckling Load of the Screw Shaft

Factor according to the mounting method η_2=20 (see A-694)

Since the mounting method for the section between the nut and the bearing, where buckling is to be considered, is "fixed-fixed: "

Distance between two mounting surfaces	ℓ_a=700 mm (estimate)
Screw-shaft thread minor diameter	d_1=12.5 mm

$$P_1 = \eta_2 \cdot \frac{d_1^{\,4}}{\ell_a^{\,2}} \times 10^4 = 20 \times \frac{12.5^4}{700^2} \times 10^4 = 9960\ \mathrm{N}$$

■Permissible Compressive and Tensile Load of the Screw Shaft

$$P_2 = 116 d_1^{\,2} = 116 \times 12.5^2 = 18100\ \mathrm{N}$$

Thus, the buckling load and the permissible compressive and tensile load of the screw shaft are at least equal to the maximum axial load. Therefore, a Ball Screw that meets these requirements can be used without a problem.

● Studying the Permissible Rotational Speed

■Maximum Rotational Speed

- Screw shaft diameter: 15mm; lead: 10mm

Maximum speed $V_{max}=0.3$ m/s
Lead $Ph = 10$ mm

$$N_{max} = \frac{V_{max} \times 60 \times 10^3}{Ph} = 1800 \text{ min}^{-1}$$

■Permissible Rotational Speed Determined by the Dangerous Speed of the Screw Shaft

Factor according to the mounting method $\lambda_2=15.1$ (see A-696)

Since the mounting method for the section between the nut and the bearing, where dangerous speed is to be considered, is "fixed-supported: "

Distance between two mounting surfaces $\ell_b=700$ mm (estimate)

- Screw shaft diameter: 15mm; lead: 10mm

Screw-shaft thread minor diameter $d_1=12.5$ mm

$$N_1 = \lambda_2 \times \frac{d_1}{\ell_b^2} 10^7 = 15.1 \times \frac{12.5}{700^2} \times 10^7 = 3852 \text{ min}^{-1}$$

■Permissible Rotational Speed Determined by the DN Value

- Screw shaft diameter: 15mm; lead: 10mm (large lead Ball Screw)

Ball center-to-center diameter $D=15.75$ mm

$$N_2 = \frac{70000}{D} = \frac{70000}{15.75} = 4444 \text{ min}^{-1}$$

Thus, the dangerous speed and the DN value of the screw shaft are met.

[Selecting a Nut]

● Selecting a Nut Model Number

The Rolled Ball Screw with a screw shaft diameter of 15 mm and a lead of 10 mm is the following large-lead Rolled Ball Screw model.

BLK1510-5.6
(C_a=9.8 kN, C_{0a}=25.2 kN)

● Studying the Permissible Axial Load

Assuming that an impact load is applied during an acceleration and a deceleration, set the static safety factor (f_S) at 2 (see Table18 on A-703).

$$Fa_{max} = \frac{C_{0a}}{f_S} = \frac{25.2}{2} = 12.6\ \text{kN} = 12600\ \text{N}$$

The obtained permissible axial load is greater than the maximum axial load of 585 N, and therefore, there will be no problem with this model.

● Studying the Service Life

■Calculating the Travel Distance

Maximum speed	V_{max}=0.3 m/s
Acceleration time	t_1 = 0.2s
Deceleration time	t_3 = 0.2s

● Travel distance during acceleration

$$\ell_{1,4} = \frac{V_{max} \cdot t_1}{2} \times 10^3 = \frac{1.3 \times 0.2}{2} \times 10^3 = 30\ \text{mm}$$

● Travel distance during uniform motion

$$\ell_{2,5} = \ell_S - \frac{V_{max} \cdot t_1 + V_{max} \cdot t_3}{2} \times 10^3 = 600 - \frac{0.3 \times 0.2 + 0.3 \times 0.2}{2} \times 10^3 = 540\ \text{mm}$$

● Travel distance during deceleration

$$\ell_{3,6} = \frac{V_{max} \cdot t_3}{2} \times 10^3 = \frac{0.3 \times 0.2}{2} \times 10^3 = 30\ \text{mm}$$

Based on the conditions above, the relationship between the applied axial load and the travel distance is shown in the table below.

Motion	Applied axial load Fa_N(N)	Travel distance ℓ_N(mm)
No1: During upward acceleration	585	30
No2: During upward uniform motion	510	540
No3: During upward deceleration	435	30
No4: During downward acceleration	395	30
No5: During downward uniform motion	470	540
No6: During downward deceleration	545	30

* The subscript (N) indicates a motion number.

■Average Axial Load

$$F_m = \sqrt[3]{\frac{1}{2\times\ell_s}\left(Fa_1^{3}\bullet\ell_1 + Fa_2^{3}\bullet\ell_2 + Fa_3^{3}\bullet\ell_3 + Fa_4^{3}\bullet\ell_4 + Fa_5^{3}\bullet\ell_5 + Fa_6^{3}\bullet\ell_6\right)} = 225\ \text{N}$$

■Nominal Life

Dynamic load rating	C_a= 9800 N
Load factor	f_W= 1.5 (see Table19 on A-704)
Average load	F_m= 492 N
Nominal life	L (rev)

$$L = \left(\frac{C_a}{f_W\cdot F_m}\right)^3 \times 10^6 = \left(\frac{9800}{1.5\times 492}\right)^3 \times 10^6 = 2.34\times 10^9\ \text{rev}$$

■Average Revolutions per Minute

Number of reciprocations per minute	n = 5 min^{-1}
Stroke	ℓ_s=600 mm
Lead	Ph= 10 mm

$$N_m = \frac{2\times n\times\ell_s}{Ph} = \frac{2\times 5\times 600}{10} = 600\ \text{min}^{-1}$$

■Calculating the Service Life Time on the Basis of the Nominal Life

Nominal life	$L=2.34\times 10^9$ rev
Average revolutions per minute	N_m = 600 min^{-1}

$$L_h = \frac{L}{60\bullet N_m} = \frac{2.34\times 10^9}{60\times 600} = 65000\ \text{h}$$

■Calculating the Service Life in Travel Distance on the Basis of the Nominal Life

Nominal life	$L=2.34\times 10^9$ rev
Lead	Ph= 10 mm

$L_s = L \times Ph \times 10^{-6} = 23400$ km

With all the conditions stated above, model BLK1510-5.6 satisfies the desired service life time of 20,000 hours.

[Studying the Rigidity]

Since the conditions for selection do not include rigidity and this element is not particularly necessary, it is not described here.

[Studying the Positioning Accuracy]

● Studying the Lead Angle Accuracy

Accuracy grade C10 was selected in Section [Selecting Lead Angle Accuracy and Axial Clearance] on A-737.

C10 (travel distance error: ±0.21mm/300mm)

● Studying the Axial Clearance

Since the axial load is constantly present in a given direction only because of vertical mount, there is no need to study the axial clearance.

● Studying the Axial Rigidity

Since the lead angle accuracy is achieved beyond the required positioning accuracy, there is no need to study the positioning accuracy determined by axial rigidity.

● Studying the Thermal Displacement through Heat Generation

Since the lead angle accuracy is achieved beyond the required positioning accuracy, there is no need to study the positioning accuracy determined by the heat generation.

● Studying the Orientation Change during Traveling

Since the lead angle accuracy is achieved at a much higher degree than the required positioning accuracy, there is no need to study the positioning accuracy.

[Studying the Rotational Torque]

● Frictional Torque Due to an External Load

During upward uniform motion:

$$T_1 = \frac{Fa_2 \cdot Ph}{2\times\pi\times\eta} = \frac{510\times10}{2\times\pi\times0.9} = 900\ \text{N}\cdot\text{mm}$$

During downward uniform motion:

$$T_2 = \frac{Fa_5 \cdot Ph}{2\times\pi\times\eta} = \frac{470\times10}{2\times\pi\times0.9} = 830\ \text{N}\cdot\text{mm}$$

● Torque Due to a Preload on the Ball Screw

The Ball Screw is not provided with a preload.

● Torque Required for Acceleration

Inertial Moment:

Since the inertial moment per unit length of the screw shaft is 3.9 x 10^{-4} kg•cm²/mm (see the specification table), the inertial moment of the screw shaft with an overall length of 800mm is obtained as follows.

$J_S = 3.9 \times 10^{-4} \times 800 = 0.31\ \text{kg} \cdot \text{cm}^2$

$= 0.31 \times 10^{-4}\ \text{kg} \cdot \text{m}^2$

$$J = (m_1+m_2)\left(\frac{Ph}{2\times\pi}\right)^2 \cdot A^2 \times 10^{-6} + J_S \cdot A^2 = (40+10)\left(\frac{10}{2\times\pi}\right)^2 \times 1^2 \times 10^{-6} + 0.31 \times 10^{-4} \times 1^2$$

$$= 1.58 \times 10^{-4}\ \text{kg} \cdot \text{m}^2$$

Angular acceleration:

$$\omega' = \frac{2\pi \cdot Nm}{60 \cdot t} = \frac{2\pi \times 1800}{60 \times 0.2} = 942\ \text{rad/s}^2$$

Based on the above, the torque required for acceleration is obtained as follows.

$T_3 = (J + J_m) \cdot \omega' = (1.58 \times 10^{-4} + 5 \times 10^{-5}) \times 942 = 0.2\ \text{N}\cdot\text{m} = 200\ \text{N}\cdot\text{mm}$

Therefore, the required torque is specified as follows.

During upward acceleration:

$T_{k1} = T_1 + T_3 = 900 + 200 = 1100\ \text{N}\cdot\text{mm}$

During upward uniform motion:

$T_{t1} = T_1 = 900\ \text{N}\cdot\text{mm}$

During upward deceleration:

$T_{g1} = T_1 - T_3 = 900 - 200 = 700\ \text{N}\cdot\text{mm}$

During downward acceleration:

$T_{k2} = 630\ \text{N}\cdot\text{mm}$

During downward uniform motion:

$T_{t2} = 830\ \text{N}\cdot\text{mm}$

During downward deceleration:

$T_{g2} = 1030$ N-mm

[Studying the Driving Motor]

● Rotational Speed

Since the Ball Screw lead is selected based on the rated rotational speed of the motor, it is unnecessary to study the rotational speed of the motor.

Maximum working rotational speed: 1800 min^{-1}
Rated rotational speed of the motor: 3000 min^{-1}

● Minimum Feed Amount

As with the rotational speed, the Ball Screw lead is selected based on the encoder normally used for an AC servomotor. Therefore, it is unnecessary to study this factor.

Encoder resolution: 1000 p/rev.

● Motor Torque

The torque during acceleration calculated in Section [Studying the Rotational Torque] on A-743 is the required maximum torque.

$T_{max} = T_{K1} = 1100\ N \cdot mm$

Therefore, the maximum peak torque of the AC servomotor needs to be at least 1100 N-mm.

● Effective Torque Value

The selection requirements and the torque calculated in Section [Studying the Rotational Torque] on A-743 can be expressed as follows.

During upward acceleration:
$T_{K1} = 1100\ N \cdot mm$
$t_1 = 0.2\ s$

During upward uniform motion:
$T_{t1} = 900\ N \cdot mm$
$t_2 = 1.8\ s$

During upward deceleration:
$T_{g1} = 700\ N \cdot mm$
$t_3 = 0.2\ s$

During downward acceleration:
$T_{K2} = 630\ N \cdot mm$
$t_1 = 0.2\ s$

During downward uniform motion:
$T_{t2} = 830\ N \cdot mm$
$t_2 = 1.8\ s$

During downward deceleration:
$T_{g2} = 1030\ N\text{-}mm$
$t_3 = 0.2\ s$

When stationary(m_2=0):
$T_S = 658\ N \cdot mm$
$t_4 = 7.6\ s$

The effective torque is obtained as follows, and the rated torque of the motor must be 743 N•mm or greater.

$$T_{rms} = \sqrt{\frac{T_{k1}^2 \cdot t_1 + T_{t1}^2 \cdot t_2 + T_{g1}^2 \cdot t_3 + T_{k2}^2 \cdot t_1 + T_{t2}^2 \cdot t_2 + T_{g2}^2 \cdot t_3 + T_s^2 \cdot t_4}{t_1 + t_2 + t_3 + t_1 + t_2 + t_3 + t_4}}$$

$$= \sqrt{\frac{1100^2 \times 0.2 + 900^2 \times 1.8 + 700^2 \times 0.2 + 630^2 \times 0.2 + 830^2 \times 1.8 + 1030^2 \times 0.2 + 658^2 \times 7.6}{0.2 + 1.8 + 0.2 + 0.2 + 1.8 + 0.2 + 7.6}}$$

$$= 743 \text{ N} \cdot \text{mm}$$

● Inertial Moment

The inertial moment applied to the motor equals to the inertial moment calculated in Section [Studying the Rotational Torque] on A-743.

$J = 1.58 \times 10^{-4}$ kg · m^2

Normally, the motor needs to have an inertial moment at least one tenth of the inertial moment applied to the motor, although the specific value varies depending on the motor manufacturer.
Therefore, the inertial moment of the AC servomotor must be 1.58×10^{-5}kg-m^2 or greater.

The selection has been completed.

Ball Screw

Accuracy of Each Model

Precision, Caged Ball Screw

Models SBN, SBK and HBN

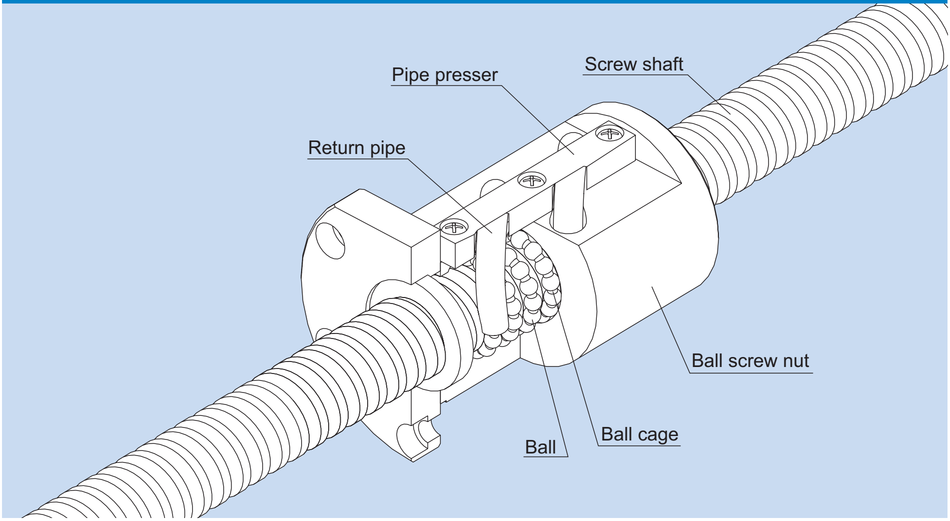


Fig.1 Structure of High-Speed Ball Screw with Ball Cage Model SBN

Structure and Features

The use of a ball cage in the Ball Screw with the Ball Cage eliminates collision and friction between balls and increases the grease retention. This makes it possible to achieve a low noise, a low torque fluctuation and a long-term maintenance-free operation.
In addition, this Ball Screw is superbly capable of responding to the high speed because of an ideal ball recirculation structure, a strengthened circulation path and an adoption of the ball cage.

Ball Cage Effect

[Low Noise, Acceptable Running Sound]

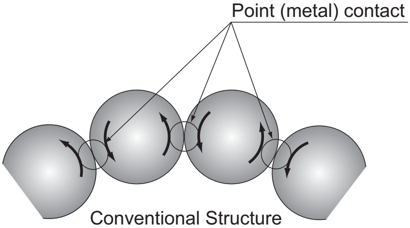
The use of the ball cage eliminates the collision noise between the balls. Additionally, as balls are picked up in the tangential direction, the collision noise from the ball circulation has also been eliminated.

[Long-term Maintenance-free Operation]

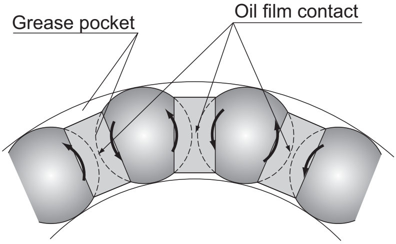
The friction between the balls has been eliminated, and the grease retention has been improved through the provision of grease pockets. As a result, the long-term maintenance-free operation (i.e., lubrication is unnecessary over a long period) is achieved.

[Smooth Motion]

The use of a ball cage eliminates the friction between the balls and minimizes the torque fluctuation, thus allowing the smooth motion to be achieved.



Conventional Structure



Structure of the Ball Screw with Ball Cage

[Low Noise]

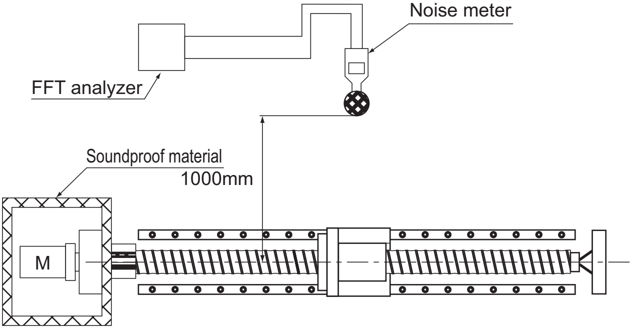
● Noise Level Data

Since the balls in the Ball Screw with the Ball Cage do not collide with each other, they do not produce a metallic sound and a low noise level is achieved.

■Noise Measurement

[Conditions]

Item	Description
Sample	High load ball screw with ball cage HBN3210-5 Conventional type: model BNF3210-5
Stroke	600mm
Lubrication	Grease lubrication (lithium-based grease containing extreme pressure agent)



Noise measurement instrument

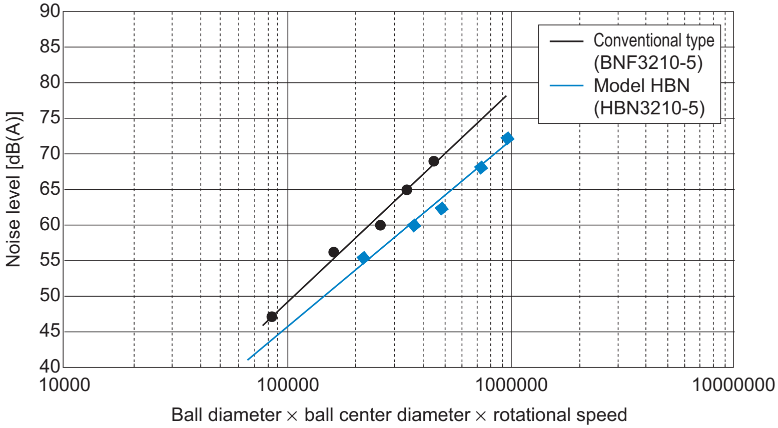


Fig.2 Ball Screw Noise Level

[Long-term Maintenance-free Operation]

● High speed, Load-bearing Capacity

Thanks to the ball circulating method supporting high speed and the caged ball technology, the Ball Screw with Ball Cage excels in high speed and load-bearing capacity.

■High Speed Durability Test

[Test conditions]

Item	Description
Sample	High Speed Ball Screw with Ball Cage SBN3210-7
Speed	3900(min^{-1})(DN value*: 130,000)
Stroke	400mm
Lubricant	THK AFG Grease
Quantity	12cm^3(lubricated every 1000km)
Applied load	1.73kN
Acceleration	1G

* DN value: Ball center-to-center diameter x revolutions per minute

[Test result]
Shows no deviation after running 10,000 km.

■Load Bearing Test

[Test conditions]

Item	Description
Sample	High Speed Ball Screw with Ball Cage SBN3210-7
Speed	1500(min^{-1})(DN value*: 50,000)
Stroke	300mm
Lubricant	THK AFG Grease
Quantity	12cm^3
Applied load	17.3kN(0.5Ca)
Acceleration	0.5G

[Test result]
Shows no deviation after running a distance 2.5 times the calculated service life.

[Smooth Motion]

● Low Torque Fluctuation

The caged ball technology allows smoother motion than the conventional type to be achieved, thus to reduce torque fluctuation.

[Conditions]

Item	Description
Shaft diameter/ lead	32/10mm
Shaft rotational speed	60min^{-1}

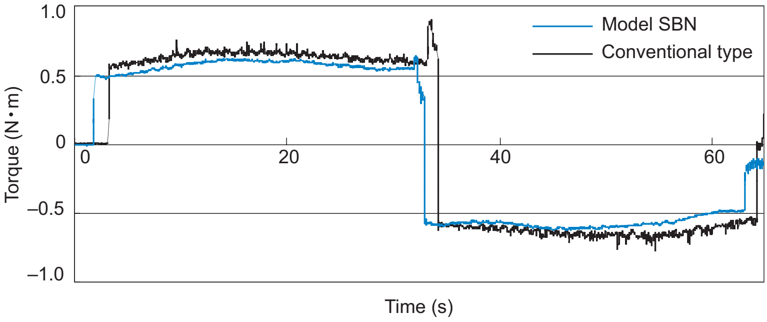


Fig.3 Torque Fluctuation Data

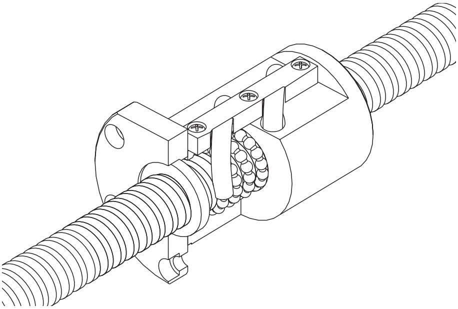
Types and Features

[Preload Type]

Model SBN

Specification Table⇒B-576

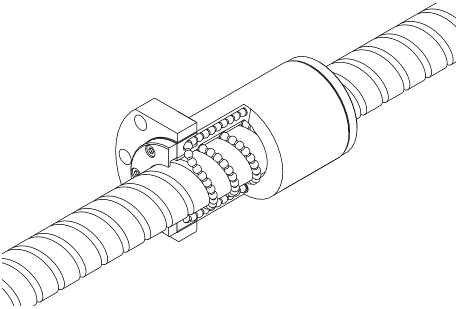
Model SBN has a circulation structure where balls are picked up in the tangential direction and is provided with a strengthened circulation path, thus to achieve a DN value of 130,000.



Model SBK

Specification Table⇒B-578

As a result of adopting the offset preloading method, which shifts two rows of grooves of the ball screw nut, a compact structure is achieved.

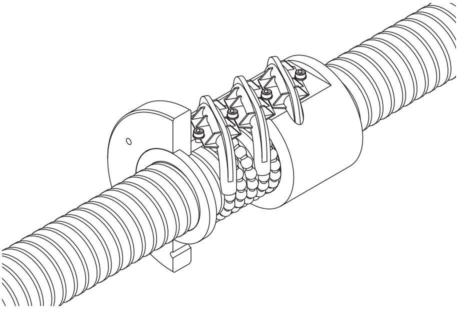


[No Preload Type]

Model HBN

Specification Table⇒B-580

With the optimal design for high loads, this Ball Screw model achieves a rated load more than twice the conventional type.



Service Life

For details,see A-704.

Axial Clearance

For details,see A-685.

Accuracy Standards

For details,see A-678.

Standard-Stock Precision Ball Screw

Unfinished Shaft Ends
Models BIF, BNFN, MDK, MBF and BNF

Structure and Features

This type of Ball Screw is mass manufactured by cutting the standardized screw shafts of Precision Ball Screws to regular lengths. Additional machining of the shaft ends can easily be performed.
To meet various intended purposes, THK offers several Ball Screw models with different types of nuts: the double-nut type (model BNFN), the single-nut type (model BNF), the offset preload-nut type (model BIF) and the miniature Ball Screw (models MDK and MBF).

[Contamination Protection]

Nuts of the following model numbers are attached with a labyrinth seal.

- All variations of models BNFN, BNF and BIF
- Model MDK0802/1002/1202/1402/1404/1405

When dust or other foreign materials may enter the Ball Screw, it is necessary to use a contamination protection device (e.g., bellows) to completely protect the screw shaft.

[Lubrication]

The ball screw nuts are supplied with lithium soap-group grease with shipments.
(Models MDK and MBF are applied only with an anti-rust oil.)

[Additional Machining of the Shaft End]

Since only the effective thread of the screw shaft is surface treated with induction-hardening (all variations of models BNFN, BNF and BIF; model MDK 1405) or carburizing (all variations of model MBF; model MDK0401 to 1404), the shaft ends can additionally be machined easily either by grinding or milling.
In addition, since both ends of the screw shaft have a center hole, they can be cylindrically ground.

Surface hardness of the effect thread	: HRC58 to 64
Hardness of the screw shaft ends	
All variation of models BNFN, BNF and BIF; model MDK 1405	: HRC22 to 27
All variations of model MBF; model MDK0401 to 1404	: HRC35 or below

THK has standardized the shapes of the screw shaft ends in order to allow speedy estimation and manufacturing of the Ball Screws.
The shapes of shaft ends are divided into those allowing the standard support units to be used (symbols H, K and J) and those compliant with JIS B 1192-1997 (symbols A, B and C). See A-810 for details.

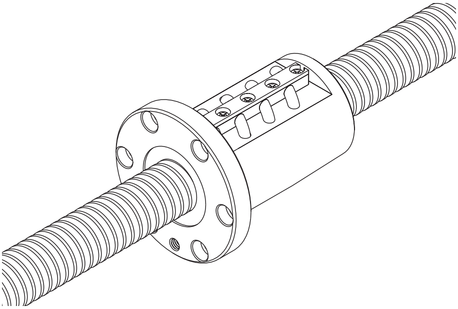
Types and Features

[Preload Type]

Model BIF

Specification Table⇒B-594

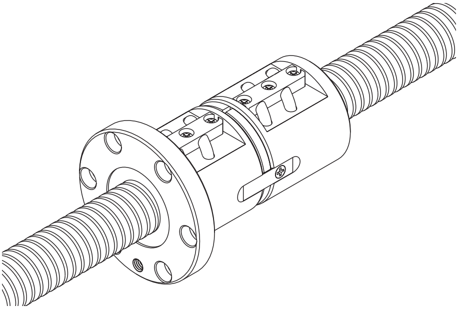
The right and left screws are provided with a phase in the middle of the ball screw nut, and an axial clearance is set at a below-zero value (under a preload). This compact model is capable of a smooth motion.



Model BNFN

Specification Table⇒B-594

The most common type with a preload provided via a spacer between the two combined ball screw nuts to eliminate backlash. It can be mounted using the bolt holes drilled on the flange.

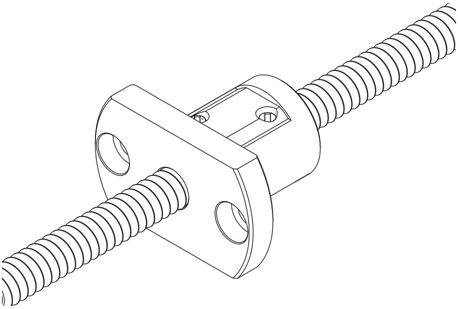


[No Preload Type]

Models MDK and MBF

Specification Table⇒B-584

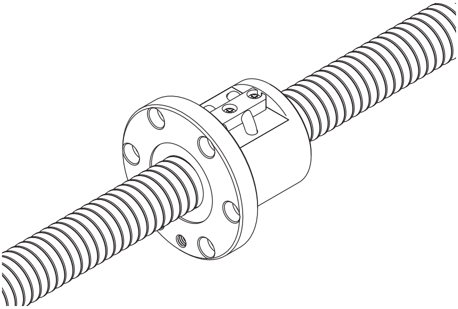
A miniature type with a screw shaft diameter of ϕ4 to ϕ14 mm and a lead of 1 to 5mm.



Model BNF

Specification Table⇒B-594

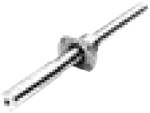
The simplest type with a single ball screw nut. It is designed to be mounted using the bolt holes drilled on the flange.



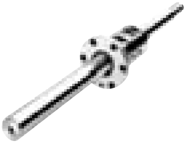
Service Life

For details,see A-704.

Nut Types and Axial Clearance

Screw shaft outer diameter (mm)	ϕ 4 to 14			
Nut type	Model MDK		Model MBF	
	 No preload type		 No preload type	
Accuracy grades	C3, C5	C7	C3, C5	C7
Axial clearance (mm)	0.005 or less (GT)	0.02 or less (G2)	0.005 or less (GT)	0.02 or less (G2)
Preload	—		—	

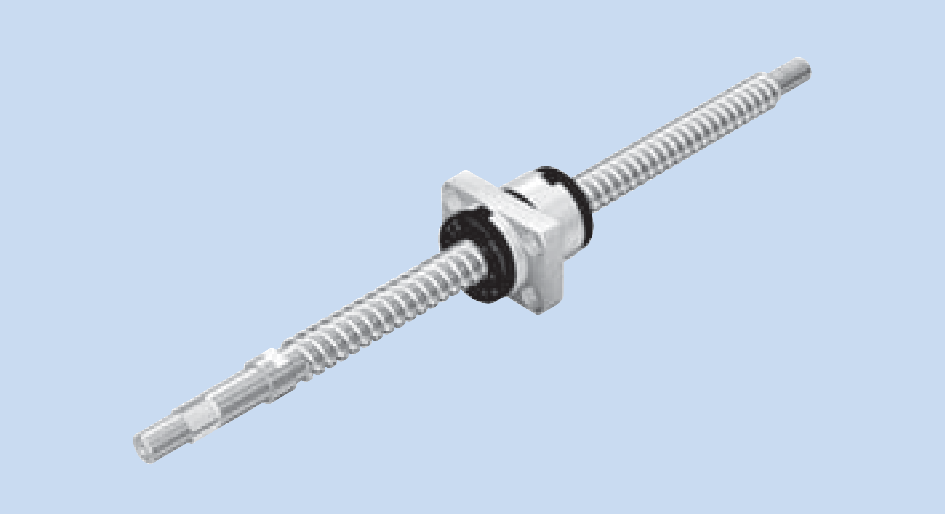
Note) The symbols in the parentheses indicate axial clearance symbols.

Screw shaft out diameter (mm)	ϕ16 to 50					
Nut type	Model BIF		Model BNFN		Model BNF	
	 Preload Type		 Preload Type		 No preload type	
Accuracy grades	C5	C7	C5	C7	C5	C7
Axial clearance (mm)	0 or less (G0)	0 or less (G0)	0 or less (G0)	0 or less (G0)	0.01 or less (G1)	0.02 or less (G2)
Preload	0.05Ca	0.05Ca	0.05Ca	0.05Ca	—	—

Note1) The symbols in the parentheses indicate axial clearance symbols.
Note2) Symbol "Ca" for preload indicates the basic dynamic load rating.

Standard-Stock Precision Ball Screw

Finished Shaft Ends
Model BNK



Features

To meet the space-saving requirement, this type of Ball Screw has a standardized screw shaft and a ball screw nut. The ends of the screw shaft are standardized to fit the corresponding support unit. The shaft support method with models BNK0401, 0501 and 0601 is "fixed-free," while other models use the "fixed-supported" method with the shaft directly coupled with the motor.
Screw shafts and nuts are compactly designed. When a support unit and a nut bracket are combined with a Ball Screw, the assembly can be mounted on your machine as it is. Thus, a high-accuracy feed mechanism can easily be achieved.

[Contamination Protection and Lubrication]
Each ball screw nut contains a right amount of grease. In addition, the ball nuts of model BNK0802 or higher contain a labyrinth seal (with models BNK1510, BNK1520, BNK1616, BNK2020 and BNK2520, the end cap also serves as a labyrinth seal).
When foreign materials may enter the screw nut, it is necessary to use a dust-prevention device (e.g., bellows) to completely protect the screw shaft.

Types and Features

Model BNK

Specification Table⇒B-608

For this model, screw shafts with a diameter ϕ4 to ϕ25 mm and a lead 1 to 20 mm are available as the standard.

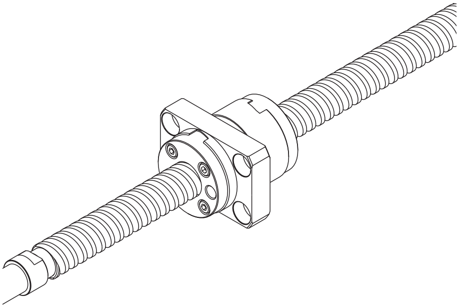


Table of Ball Screw Types with Finished Shaft Ends and the Corresponding Support Units and Nut Brackets

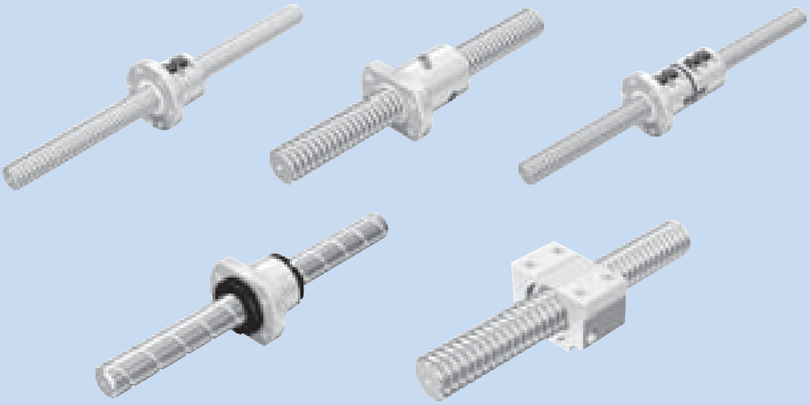
Model No.		BNK								
		0401	0501	0601	0801	0802	0810	1002	1004	1010
Accuracy grades		C3, C5, C7	C3, C5, C7	C3, C5, C7	C3, C5, C7	C3, C5, C7	C5, C7	C3, C5, C7	C3, C5, C7	C5, C7
Axial clearance[Note]		G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	— GT G2	G0 GT G2	G0 GT G2	G0 GT G2
Stroke (mm)	20	●	●							
	30									
	40	●	●	●	●	●				
	50							●	●	
	60									
	70	●	●	●	●	●				
	100			●	●	●	●	●	●	●
	120									
	150				●	●	●	●	●	●
	170									
	200						●	●	●	●
	250						●		●	●
	300						●			●
	350									
	400									
	450									
	500									
	550									
	600									
	700									
	800									
	900									
	1000									
	1100									
	1200									
	1400									
	1600									
Support unit: square on fixed side		EK4	EK4	EK5	EK6	EK6	EK6	EK8	EK10	EK10
Support unit: round on fixed side		FK4	FK4	FK5	FK6	FK6	FK6	FK8	FK10	FK10
Support unit: square on supported side		—	—	—	EF6	EF6	EF6	EF8	EF10	EF10
Support unit: round on supported side		—	—	—	FF6	FF6	FF6	FF8	FF10	FF10
Nut bracket		—	—	—	—	—	—	—	MC1004	MC1004

Note) Axial clearance: G0: 0 or less
GT: 0.005 mm or less
G2: 0.02 mm or less
For details of the support unit and the nut bracket, see A-802 onward and A-812 onward, respectively.

	BNK											
	1202	1205	1208	1402	1404	1408	1510	1520	1616	2010	2020	2520
	C3, C5, C7	C3, C5, C7	C7	C3, C5, C7	C3, C5, C7	C5, C7	C5, C7	C5, C7	C5, C7	C5, C7	C5, C7	C5, C7
	G0 GT G2	G0 GT G2	— — G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2	G0 GT G2
	●	●	●	●								
	●	●	●	●	●							
	●	●	●	●	●	●	●	●	●			
	●	●	●	●	●	●	●	●	●			
	●	●	●			●	●	●	●			
				●	●	●	●	●	●	●	●	
						●	●	●	●			
					●	●	●	●	●	●	●	
						●	●	●	●			
						●	●	●	●	●	●	●
						●	●	●	●			
						●	●	●	●	●	●	●
						●	●	●	●	●	●	
							●	●	●	●	●	●
										●	●	
										●	●	●
										●	●	
												●
												●
												●
	EK10	EK10	EK10	EK12	EK12	EK12	EK12	EK12	EK12	EK15	EK15	EK20
	FK10	FK10	FK10	FK12	FK12	FK12	FK12	FK12	FK12	FK15	FK15	FK20
	EF10	EF10	EF10	EF12	EF12	EF12	EF12	EF12	EF12	EF15	EF15	EF20
	FF10	FF10	FF10	FF12	FF12	FF12	FF12	FF12	FF12	FF15	FF15	FF20
	—	MC1205	MC1205	—	—	MC1408	MC1408	MC1408	MC1408	MC2010	MC2020	—

Precision Ball Screw

Models BIF, DIK, BNFN, DKN, BLW, BNF, DK, MDK, BLK/WGF and BNT



For THK Precision Ball Screws, a wide array of precision-ground screw shafts and ball screw nuts are available as standard to meet diversified applications.

Structure and Features

[Combinations of Various shaft Diameters and Leads]

You can select the combination of a shaft diameter and a lead that meet the intended use from the various nut types and the screw shaft leads. Those nut types include the return-pipe nuts, which represent the most extensive variations among the series, the compact simple nuts and the large-lead end-cap nuts.

[Standard-stock Types (with Unfinished Shaft Ends/Finished Shaft Ends) are Available]

The unfinished shaft end types, which are mass manufactured by cutting the standardized screw shafts to the standard lengths, and those with finished shaft ends, for which the screw shaft ends are machined to match the corresponding the support units, are available as the standard.

[Accuracy Standards Compliant with JIS (ISO)]

The accuracy of the Ball Screw is controlled in accordance with the JIS standards (JIS B1192-1997).

	Precision Ball Screw						Rolled Ball Screw	
Accuracy grades	C0	C1	C2	C3	C5	C7	C8	C10

Type	Series symbol	Grade	Remarks
For positioning	C	0, 1, 3, 5	JIS series
	Cp	1, 3, 5	ISO compliant
For conveyance	Ct	1, 3, 5, 7, 10	

[Options that Meet the Environment are Available]

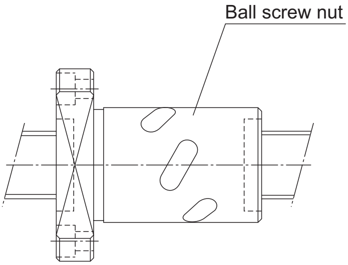
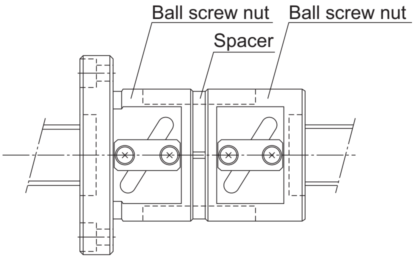
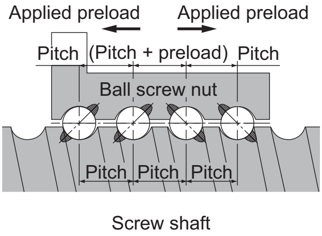
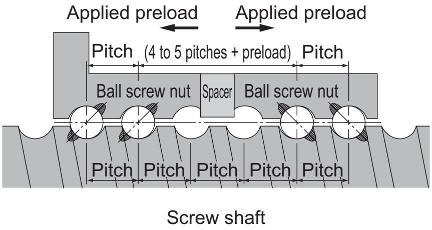
Options are available consisting of a lubricator (QZ), which enables the maintenance interval to be significantly extended, and a wiper ring (W), which improves the ability to remove foreign materials in adverse environments.

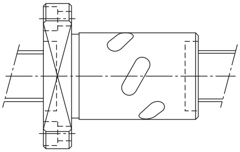
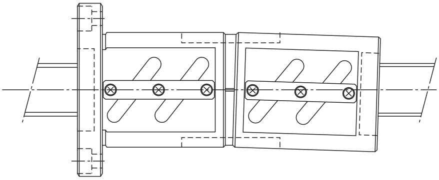
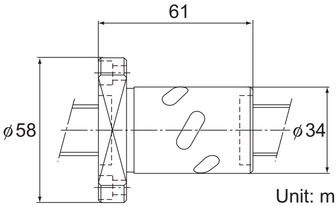
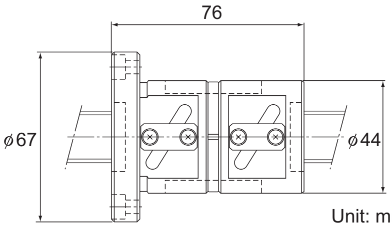
[Structure and Features of Offset Preload Type Simple-Nut Ball Screw Model DIK]

The Simple-Nut Ball Screw model DIK is an offset preload type in which a phase is provided in the middle of a single ball screw nut, and an axial clearance is set at a below-zero value (under a preload).

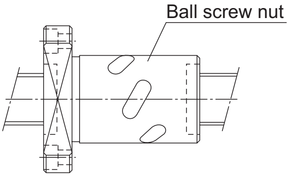
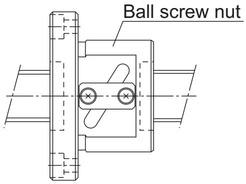
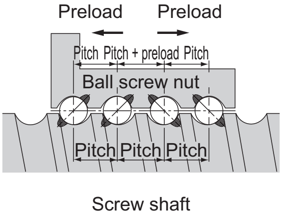
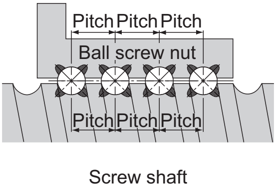
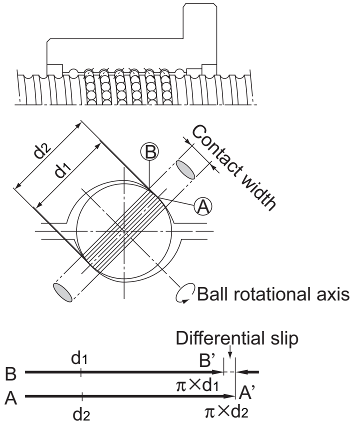
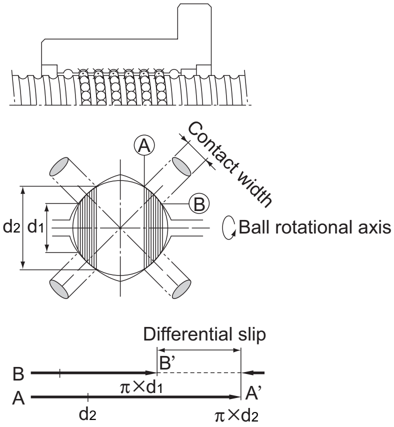
Model DIK has a more compact structure and allows smoother motion than the conventional double-nut type (spacer inserted between two nuts).

[Comparison between the Simple Nut and the Double-Nuts]

Simple-Nut Ball Screw Model DIK	Conventional Double-Nut Type Ball Screw Model BNFN
	
Preloading Structure	
	

<table>
<tr><th>Simple-Nut Ball Screw Model DIK</th><th>Conventional Double-Nut Type Ball Screw Model BNFN</th></tr>
<tr><td colspan="2">Rotational Performance</td></tr>
<tr><td>The preload adjustment with Simple Nut Ball Screw model DIK is performed according to the ball diameter. This eliminates the inconsistency in the contact angle, which is the most important factor of the Ball Screw performance. It also ensures the high rigidity, the smooth motion and the high wobbling accuracy.
</td><td>The use of a spacer in the double-nuts tends to cause inconsistency in the contact angle due to inaccurate flatness of the spacer surface and an inaccurate perpendicularity of the nut. This results in a non-uniform ball contact, an inferior rotational performance and a low wobbling accuracy.
</td></tr>
<tr><td colspan="2">Dimensions</td></tr>
<tr><td>Since Simple-Nut Ball Screw model DIK is based on a preloading mechanism that does not require a spacer, the overall nut length can be kept short. As a result, the whole nut can be lightly and compactly designed.

Unit: mm
Model DIK 2005-6</td><td>
Unit: mm
Model BNFN 2005-2.5</td></tr>
</table>

[Comparison between the Offset Preload Type of Simple-Nut Ball Screw and the Oversize Preload Nut Ball Screw]

<table>
<tr><th>Simple-Nut Ball Screw Model DIK</th><th>Conventional Oversize Preload Nut Ball Screw Model BNF</th></tr>
<tr><td> </td><td> </td></tr>
<tr><td colspan="2">Preloading Structure</td></tr>
<tr><td> </td><td> </td></tr>
<tr><td colspan="2">Accuracy Life</td></tr>
<tr><td>Simple-Nut Ball Screw model DIK has a similar preloading structure to that of the double-nut type although the former only has one ball screw shaft. As a result, no differential slip or spin occurs, thus to minimize the increase in the rotational torque and the generation of heat. Accordingly, a high level of accuracy can be maintained over a long period.
2 point contact structure
 </td><td>With the oversize preload nut Ball Screw, a preload is provided through the balls each in contact with the raceway at four points. This causes differential slip and spin to increase the rotational torque, resulting in an accelerated wear and a heat generation. Therefore, the accuracy deteriorates in a short period.
4 point contact structure
 </td></tr>
</table>

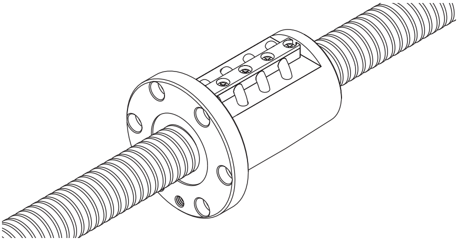
Types and Features

[Preload Type]

Model BIF

Specification Table⇒B-652

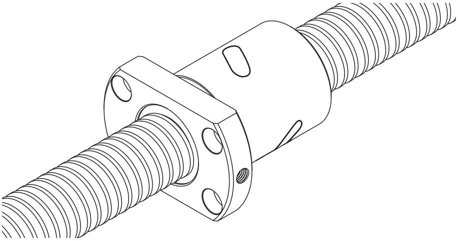
The right and the left screws are provided with a phase in the middle of the ball screw nut, and an axial clearance is set at a below-zero value (under a preload). This compact model is capable of a smooth motion.



Model DIK

Specification Table⇒B-652

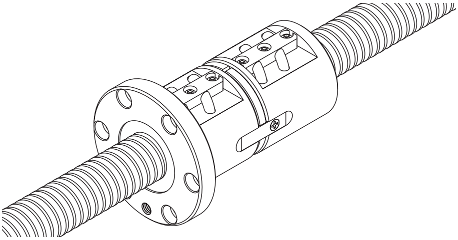
The right and the left screws are provided with a phase in the middle of the ball screw nut, and an axial clearance is set at a below-zero value (under a preload). This compact model is capable of a smooth motion.



Model BNFN

Specification Table⇒B-652

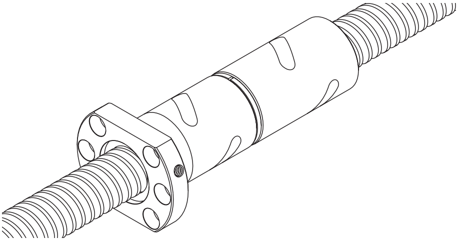
The most common type with a preload provided via a spacer between the two combined ball screw nuts to eliminate the backlash. It can be mounted using the bolt holes drilled on the flange.



Model DKN

Specification Table⇒B-672

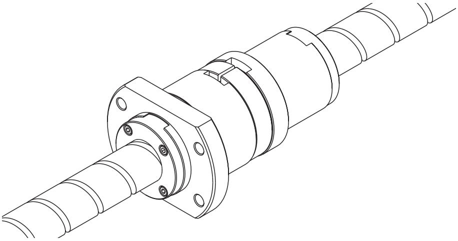
A preload is provided via a spacer between the two combined ball screw nuts to achieve a below-zero axial clearance (under a preload).



Model BLW

Specification Table⇒B-652

Since a preload is provided through a spacer between two large lead nuts, high-speed feed without by backlash is ensured.

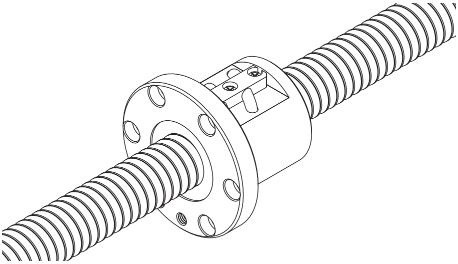


[No Preload Type]

Model BNF

Specification Table⇒B-686

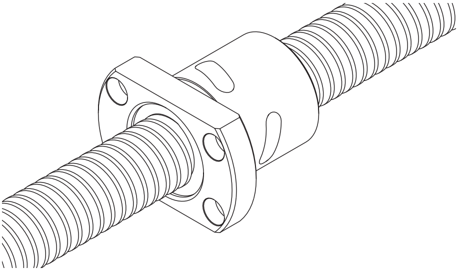
The simplest type with a single ball screw nut. It is designed to be mounted using the bolt holes drilled on the flange.



Model DK

Specification Table⇒B-686

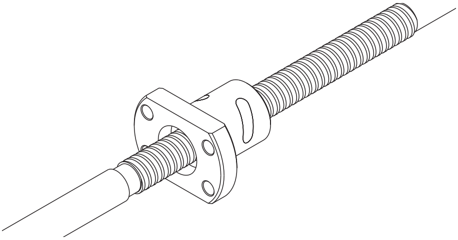
The most compact type, with a ball screw nut diameter 70 to 80% of that of the return-pipe nut.



Model MDK

Specification Table⇒B-686

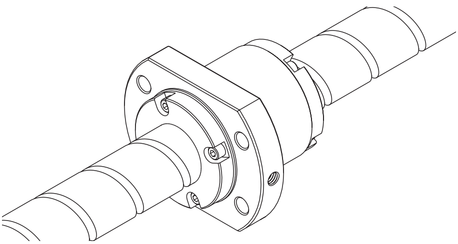
This model is a miniature nut with a screw shaft diameter of ϕ4 to 14 mm and a lead of 1 to 5 mm.



Models BLK/WGF

Specification Table⇒B-686

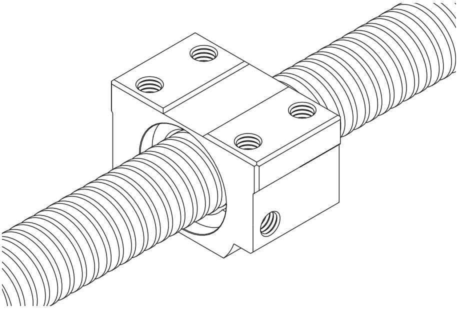
With model BLK, the shaft diameter is equal to the lead dimension. Model WGF has a lead dimension 1.5 to 3 times longer than the shaft diameter.



Square Ball Screw Nut Model BNT

Specification Table⇒B-716

Since mounting screw holes are machined on the square ball screw nut, this model can compactly be mounted on the machine without a housing.



Service Life

For details,see A-704.

Axial Clearance

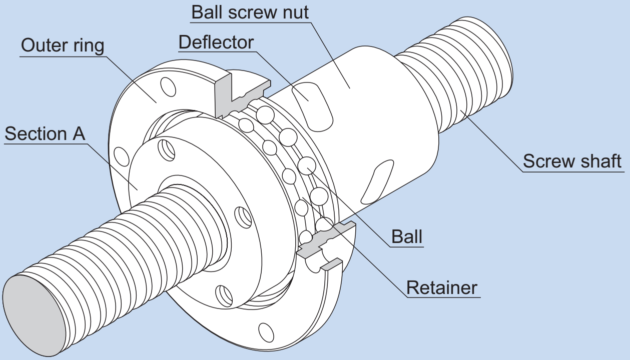
For details,see A-685.

Accuracy Standards

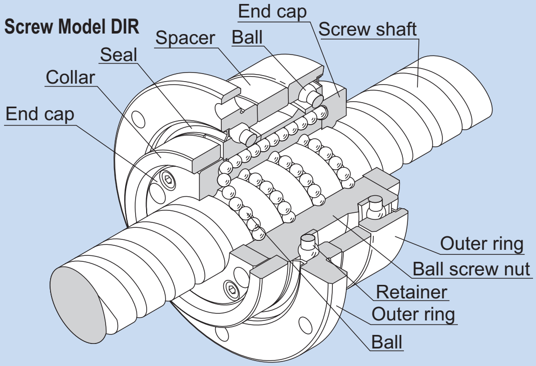
For details,see A-678.

Precision Rotary Ball Screw

Models DIR and BLR



Structure of Standard-Lead Rotary Nut Ball Screw Model DIR



Structure of Large Lead Rotary Nut Ball Screw Model BLR

Structure and Features

[Model DIR]

Standard-Lead Rotary-Nut Ball Screw model DIR is a rotary-nut Ball Screw that has a structure where a simple-nut Ball Screw is integrated with a support bearing.

Its ball screw nut serves as a ball recirculation structure using deflectors. Balls travel along the groove of the deflector mounted in the ball screw nut to the adjacent raceway, and then circulate back to the loaded area to complete an infinite rolling motion.

Being an offset preload nut, the single ball screw nut provides different phases to the right and left thread in the middle of the nut, thus to set the axial clearance below zero (a preload is provided). This allows more compact, smoother motion to be achieved than the conventional double-nut type (a spacer is inserted between two nuts).

The support bearing comprises of two rows of DB type angular bearings with a contact angle of 45° to provide a preload. The collar, previously used to mount a pulley, is integrated with the ball screw nut. (See the A section.)

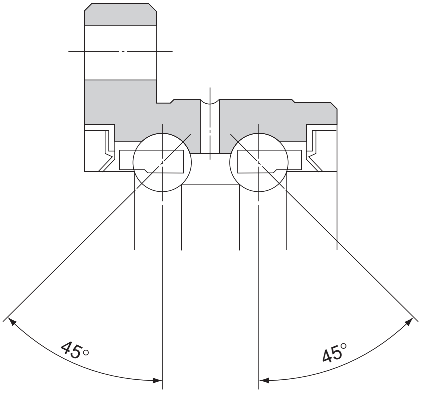


Fig.1 Structure of the Support Bearing

● Compact

Because of the internal circulation mechanism using a deflector, the outer diameter is only 70 to 80%, and the overall length is 60 to 80%, of that of the return-pipe nut, thus to reduce the weight and decrease the inertia during acceleration.

Since the nut and the support bearing are integrated, a highly accurate, and a compact design is achieved.

In addition, small inertia due to the lightweight ball screw nut ensures high responsiveness.

● Capable of Fine Positioning

Being a Standard-Lead Ball Screw, it is capable of fine positioning despite that the ball screw nut rotates.

● Accuracy can Easily be Established

As the support bearing is integrated with the outer ring, the bearing can be assembled with the nut housing on the end face of the outer ring flange. This makes it easy to center the ball screw nut and establish accuracy.

● Well Balanced

Since the deflector is evenly placed along the circumference, a superb balance is ensured while the ball screw nut is rotating.

- **Stability in the Low-speed Range**

Traditionally, motors tend to have an uneven torque and a speed in the low-speed range due to the external causes. With model DIR, the motor can be connected independently with the screw shaft and the ball screw nut, thus to allow micro feeding within the motor's stable rotation range.

[Model BLR]

The Rotary Ball Screw is a rotary-nut ball screw unit that has an integrated structure consisting of a ball screw nut and a support bearing. The support bearing is an angular bearing that has a contact angle of 60°, contains an increased number of balls and achieves large axial rigidity.

Model BLR is divided into two types: Precision Ball Screw and Rolled Screw Ball.

- **Smooth Motion**

It achieves smoother motion than rack-and-pinion based straight motion. Also, since the screw shaft does not rotate because of the ball screw nut drive, this model does not show skipping, produces low noise and generates little heat.

- **Low Noise even in High-speed Rotation**

Model BLR produces very low noise when the balls are picked up along the end cap. In addition, the balls circulate by passing through the ball screw nut, allowing this model to be used at high speed.

- **High Rigidity**

The support bearing of this model is larger than that of the screw shaft rotational type. Thus, its axial rigidity is significantly increased.

- **Compact**

Since the nut and the support bearing are integrated, a highly accurate, and a compact design is achieved.

- **Easy Installation**

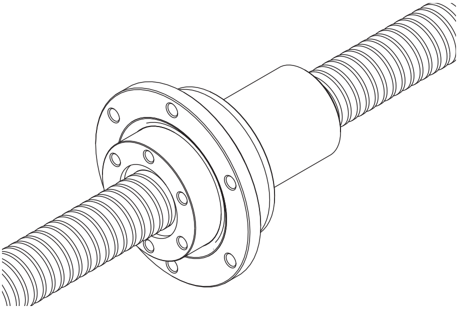
By simply mounting this model to the housing with bolts, a ball screw nut rotating mechanism can be obtained. (For the housing's inner-diameter tolerance, H7 is recommended.)

Type

[Preload Type]

Model DIR

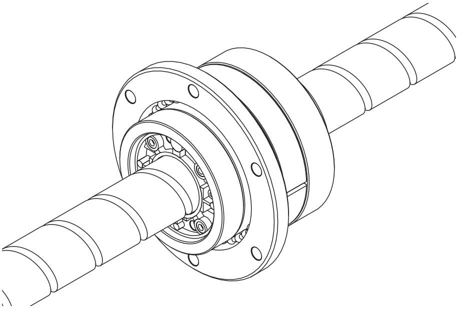
Specification Table⇒B-720



[No Preload Type]

Model BLR

Specification Table⇒B-722



Service Life

For details,see A-704.

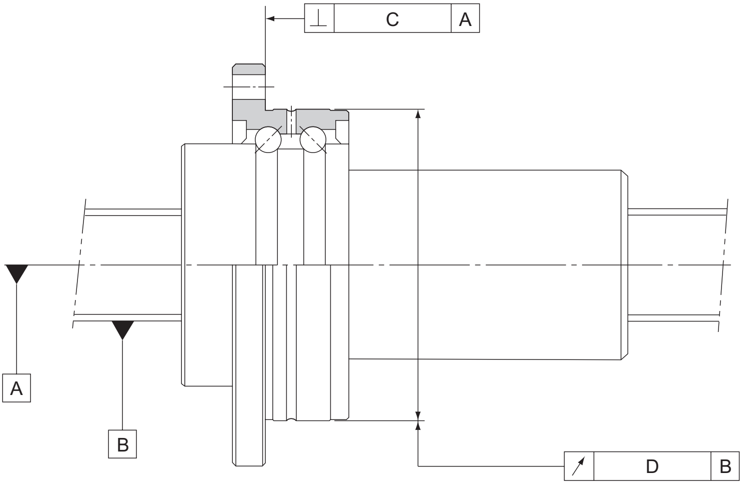
Axial Clearance

For details,see A-685.

Accuracy Standards

[Model DIR]

The accuracy of model DIR is compliant with a the JIS standard (JIS B 1192-1997) except for the radial runout of the circumference of the ball screw nut from the screw axis (D) and the perpendicularity of the flange-mounting surface against the screw axis (C).

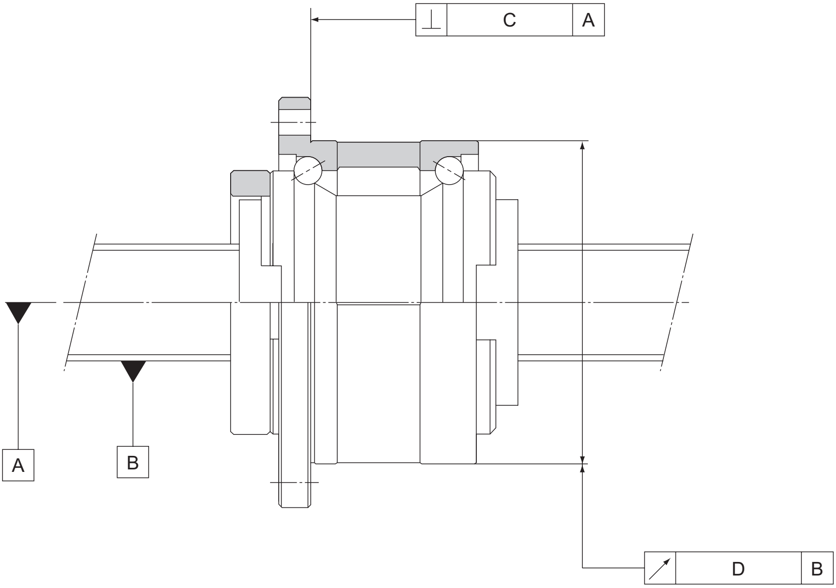


Unit: mm

Accuracy grades	C3		C5		C7	
Model No.	C	D	C	D	C	D
DIR 16□□	0.013	0.017	0.016	0.020	0.023	0.035
DIR 20□□	0.013	0.017	0.016	0.020	0.023	0.035
DIR 25□□	0.015	0.020	0.018	0.024	0.023	0.035
DIR 32□□	0.015	0.020	0.018	0.024	0.023	0.035
DIR 36□□	0.016	0.021	0.019	0.025	0.024	0.036
DIR 40□□	0.018	0.026	0.021	0.033	0.026	0.036

[Model BLR]

The accuracy of model BLR is compliant with a the JIS standard (JIS B 1192-1997) except for the radial runout of the circumference of the ball screw nut from the screw axis (D) and the perpendicularity of the flange-mounting surface against the screw axis (C).

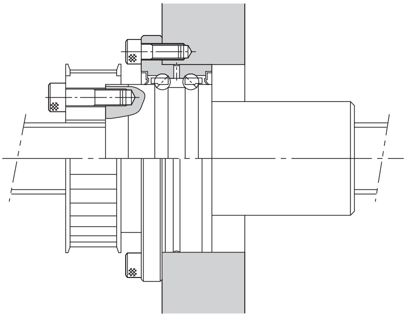


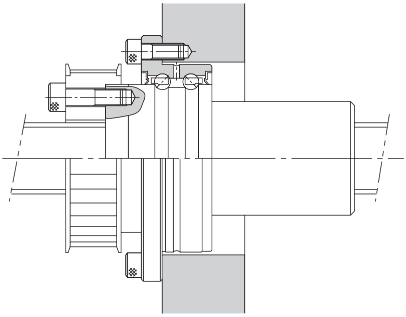
Unit: mm

Lead angle accuracy	C3		C5		C7	
Accuracy grades	C3		C5		C7	
Model No.	C	D	C	D	C	D
BLR 1616	0.013	0.017	0.016	0.020	0.023	0.035
BLR 2020	0.013	0.017	0.016	0.020	0.023	0.035
BLR 2525	0.015	0.020	0.018	0.024	0.023	0.035
BLR 3232	0.015	0.020	0.018	0.024	0.023	0.035
BLR 3636	0.016	0.021	0.019	0.025	0.024	0.036
BLR 4040	0.018	0.026	0.021	0.033	0.026	0.046
BLR 5050	0.018	0.026	0.021	0.033	0.026	0.046

Example of Assembly

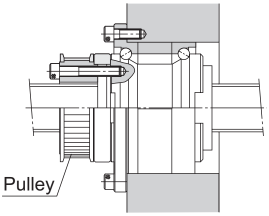
[Example of Mounting Ball Screw Nut Model DIR]



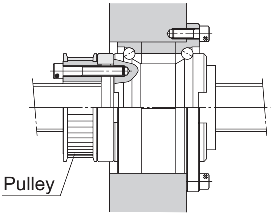


Installation to the housing can be performed
on the end face of the outer ring flange.

[Example of Mounting Ball Screw Nut Model BLR]



Standard installation method



Inverted flange

Note) If the flange is to be inverted, indicate “K” in the model number. (applicable only to model BLR)

Example: BLR 2020-3.6 K UU

Symbol for inverted flange (No symbol for standard flange orientation)

[Example of Mounting Model BLR on the Table]

(1) Screw shaft free, ball screw nut fixed
(Suitable for a long table)

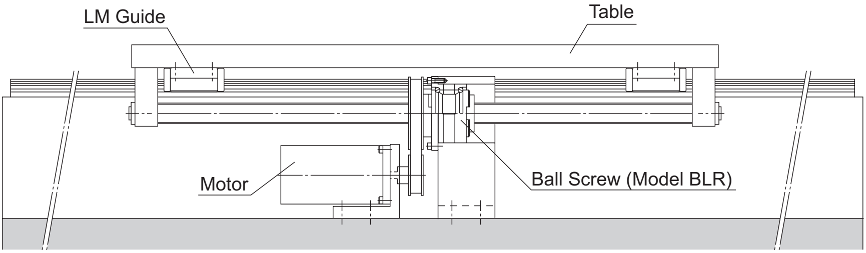


Fig.2 Example of Installation on the Table (Ball Screw Nut Fixed)

(2) Ball screw nut free, screw shaft fixed
(Suitable for a short table and a long stroke)

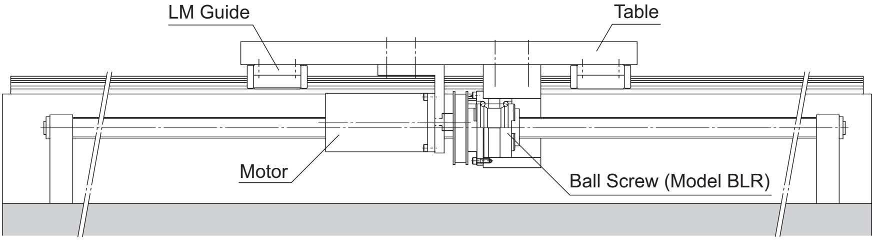
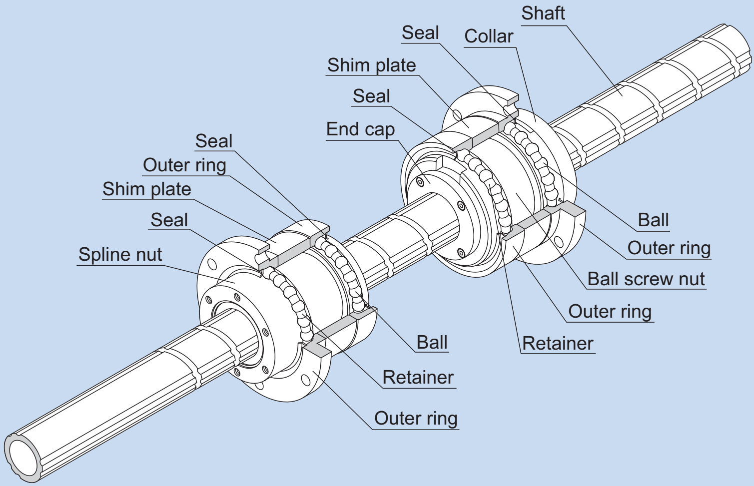


Fig.3 Example of Installation on the Table (Screw Shaft Fixed)

Precision Ball Screw/Spline

Models BNS-A, BNS, NS-A and NS



Structure and Features

The Ball Screw/Spline contains the Ball Screw grooves and the Ball Spline groove crossing one another. The nuts of the Ball Screw and the Ball Spline have dedicated support bearings directly embedded on the circumference of the nuts.
The Ball Screw/Spline is capable of performing three (rotational, linear and spiral) modes of motion with a single shaft by rotating or stopping the spline nut.
It is optimal for machines using a combination of rotary and straight motions, such as scholar robot's Z-axis, assembly robot, automatic loader, and machining center's ATC equipment.

[Zero Axial Clearance]

The Ball Spline has an angular-contact structure that causes no backlash in the rotational direction, enabling highly accurate positioning.

[Lightweight and Compact]

Since the nut and the support bearing are integrated, highly accurate, compact design is achieved. In addition, small inertia because of the lightweight ball screw nut ensures high responsiveness.

[Easy Installation]

The Ball Spline nut is designed so that balls do not fall off even if the spline nut is removed from the shaft, making installation easy. The Ball Screw/Spline can easily be mounted simply by securing it to the housing with bolts. (For the housing's inner-diameter tolerance, H7 is recommended.)

[Smooth Motion with Low Noise]

As the Ball Screw is based on an end cap mechanism, smooth motion with low noise is achieved.

[Highly Rigid Support Bearing]

The support bearing on the Ball Screw has a contact angle of 60° in the axial direction while that on the Ball Spline has a contact angle of 30° in the moment direction, thus to provide a highly rigid shaft support.
In addition, a dedicated rubber seal is attached as standard to prevent entry of foreign materials.

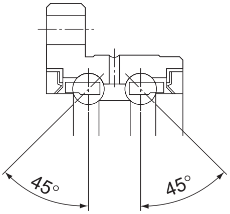


Fig.1 Structure of Support Bearing Model BNS-A

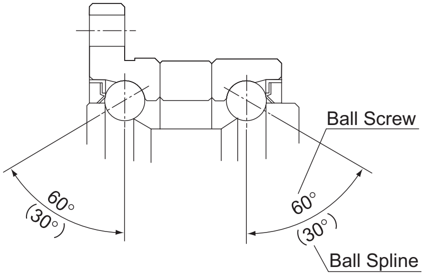
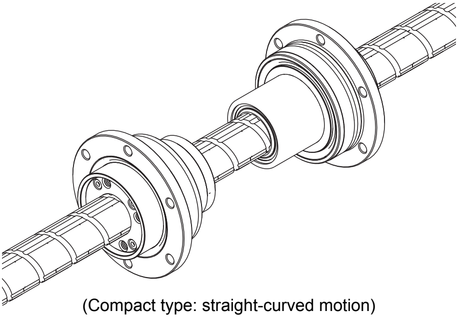


Fig.2 Structure of Support Bearing Model BNS

Type

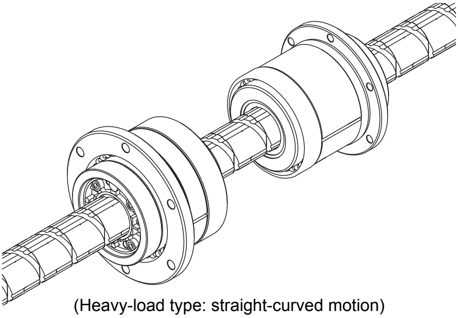
[No Preload Type]

Model BNS-A Specification Table⇒B-726



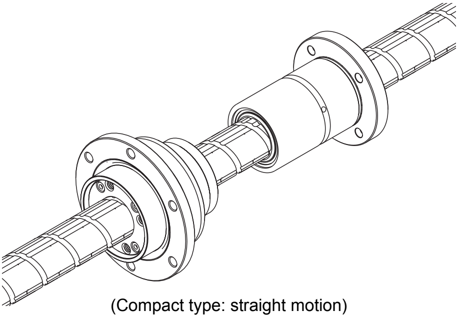
(Compact type: straight-curved motion)

Model BNS Specification Table⇒B-728



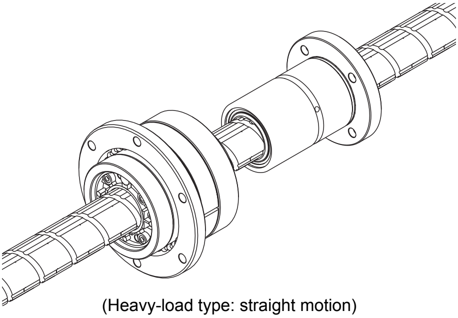
(Heavy-load type: straight-curved motion)

Model NS-A Specification Table⇒B-730



(Compact type: straight motion)

Model NS Specification Table⇒B-732



(Heavy-load type: straight motion)

Service Life

For details,see A-704.

Axial Clearance

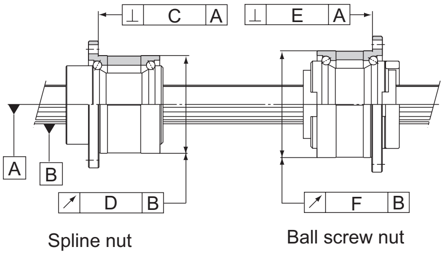
For details,see A-685.

Accuracy Standards

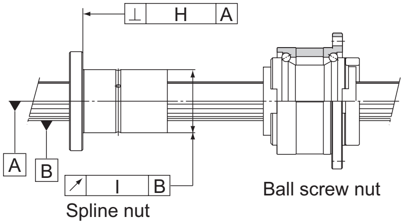
The Ball Screw/Spline is manufactured with the following specifications.

[Ball Screw]
Axial clearance: 0 or less
Lead angle accuracy: C5
(For detailed specifications, see A-678.)

[Ball Spline]
Clearance in the rotational direction: 0 or less (CL: light preload)
(For detailed specifications, see A-481.)
Accuracy grade: class H
(For detailed specifications, see A-482.)



Model BNS



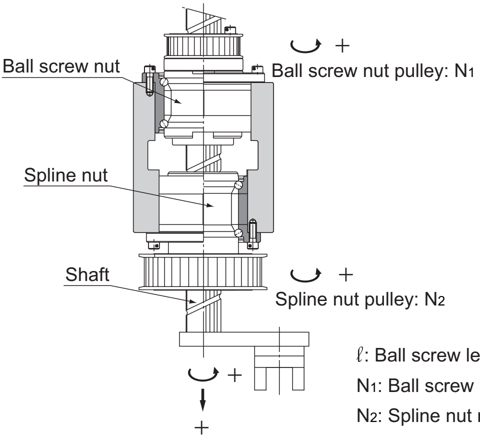
Model NS

Unit: mm

Model No.	C	D	E	F	H	I
BNS 0812 NS 0812	0.014	0.017	0.014	0.016	0.010	0.013
BNS 1015 NS 1015	0.014	0.017	0.014	0.016	0.010	0.013
BNS 1616 NS 1616	0.018	0.021	0.016	0.020	0.013	0.016
BNS 2020 NS 2020	0.018	0.021	0.016	0.020	0.013	0.016
BNS 2525 NS 2525	0.021	0.021	0.018	0.024	0.016	0.016
BNS 3232 NS 3232	0.021	0.021	0.018	0.024	0.016	0.016
BNS 4040 NS 4040	0.025	0.025	0.021	0.033	0.019	0.019
BNS 5050 NS 5050	0.025	0.025	0.021	0.033	0.019	0.019

Action Patterns

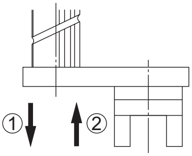
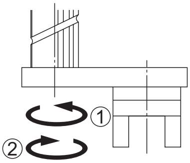
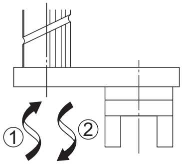
[Model BNS Basic Actions]



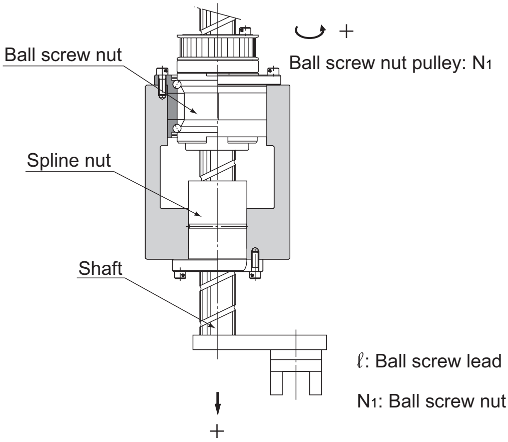
ℓ: Ball screw lead (mm)

N_1: Ball screw nut rotational speed (min^{-1})

N_2: Spline nut rotational speed (min^{-1})

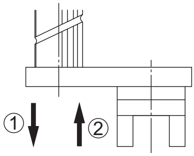
Motion		Action direction	Input		Shaft motion	
			Ball screw pulley	Ball spline pulley	Vertical direction (speed)	Rotational direction (rotation speed)
1. Vertical 	(1)	Vertical direction→down Rotational direction→0	N_1 (Forward)	0	$V=N_1\cdot\ell$ $(N_1\neq 0)$	0
	(2)	Vertical direction→up Rotational direction→0	$-N_1$ (Reverse)	0	$V=-N_1\cdot\ell$ $(N_1\neq 0)$	0
2. Rotation 	(1)	Vertical direction→0 Rotational direction→forward	N_1	N_2 (Forward)	0	N_2(Forward) $(N_1=N_2\neq 0)$
	(2)	Vertical direction→0 Rotational direction→reverse	$-N_1$	$-N_2$ (Reverse)	0	$-N_2$(Reverse) $(-N_1=-N_2\neq 0)$
3. Spiral 	(1)	Vertical direction→up Rotational direction→forward	0	N_2 $(N_2\neq 0)$	$V=N_2\cdot\ell$	N_2 (Forward)
	(2)	Vertical direction→down Rotational direction→reverse	0	$-N_2$ $(-N_2\neq 0)$	$V=-N_2\cdot\ell$	$-N_2$ (Reverse)

[Model NS Basic Actions]

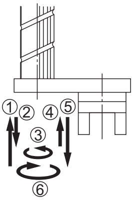
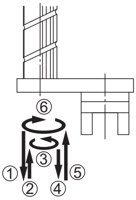
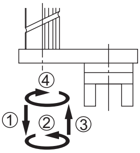
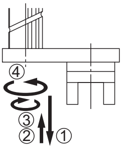


ℓ: Ball screw lead (mm)

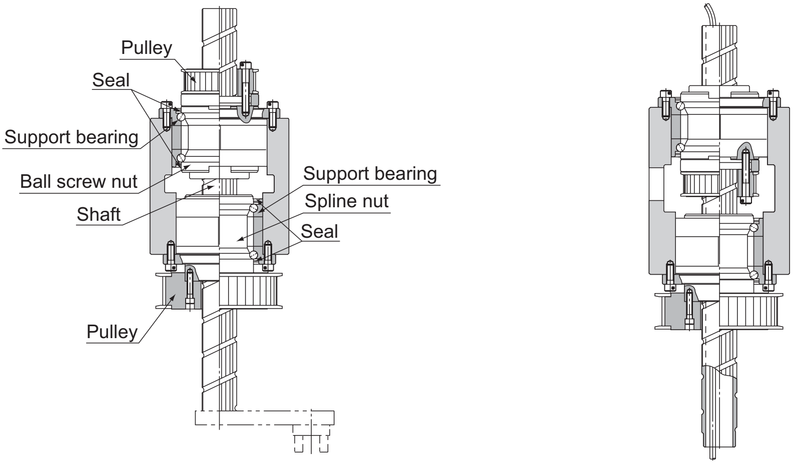
N_1: Ball screw nut rotational speed (min^{-1})

Motion		Action direction	Input	Shaft motion
			Ball screw pulley	Vertical direction (speed)
1. Vertical 	(1)	Vertical direction →down	N_1 (Forward)	$V=N_1\cdot\ell$ $(N_1\neq0)$
	(2)	Vertical direction →up	$-N_1$ (Reverse)	$V=-N_1\cdot\ell$ $(N_1\neq0)$

[Model BNS Extended Actions]

Motion		Action direction	Input		Shaft motion	
			Ball screw pulley	Ball spline pulley	Vertical direction (speed)	Rotational direction (rotational speed)
1. Up→down→forward →up→down→reverse 	(1)	Vertical direction→up	$-N_1$ (Reverse)	0	$V=-N_1\cdot\ell$ $(N_1\neq0)$	0
	(2)	Vertical direction→down	N_1 (Forward)	0	$V=N_1\cdot\ell$ $(N_1\neq0)$	0
	(3)	Rotational direction→forward	N_1	N_2 (Forward)	0	N_2(Forward) $(N_1=N_2\neq0)$
	(4)	Vertical direction→up	$-N_1$	0	$V=-N_1\cdot\ell$ $(N_1\neq0)$	0
	(5)	Vertical direction→down	N_1	0	$V=N_1\cdot\ell$ $(N_1\neq0)$	0
	(6)	Rotational direction→reverse	$-N_1$	$-N_2$ (Reverse)	0	$-N_2$(Reverse) $(-N_1=N_2\neq0)$
2. Down→up→forward →down→up→reverse 	(1)	Vertical direction→down	N_1	0	$V=N_1\cdot\ell$ $(N_1\neq0)$	0
	(2)	Vertical direction→up	$-N_1$	0	$V=-N_1\cdot\ell$ $(N_1\neq0)$	0
	(3)	Rotational direction→forward	N_1	N_2	0	N_2 $(N_1=N_2\neq0)$
	(4)	Vertical direction→down	N_1	0	$V=N_1\cdot\ell$ $(N_1\neq0)$	0
	(5)	Vertical direction→up	$-N_1$	0	$V=-N_1\cdot\ell$ $(N_1\neq0)$	0
	(6)	Rotational direction→reverse	$-N_1$	$-N_2$	0	$-N_2$ $(-N_1=N_2\neq0)$
3. Down→forward →up→reverse 	(1)	Vertical direction→down	N_1	0	$V=N_1\cdot\ell$ $(N_1\neq0)$	0
	(2)	Rotational direction→forward	N_1	N_2	0	N_2 $(N_1=N_2\neq0)$
	(3)	Vertical direction→up	$-N_1$	0	$V=-N_1\cdot\ell$ $(N_1\neq0)$	0
	(4)	Rotational direction→reverse	$-N_1$	$-N_2$	0	$-N_2$ $(-N_1=N_2\neq0)$
4. Down→up →reverse→forward 	(1)	Vertical direction→down	N_1	0	$V=N_1\cdot\ell$ $(N_1\neq0)$	0
	(2)	Vertical direction→up	$-N_1$	0	$V=-N_1\cdot\ell$ $(N_1\neq0)$	0
	(3)	Rotational direction→reverse	$-N_1$	$-N_2$	0	$-N_2$ $(-N_1=N_2\neq0)$
	(4)	Rotational direction→forward	N_1	N_2	0	N_2 $(N_1=N_2\neq0)$

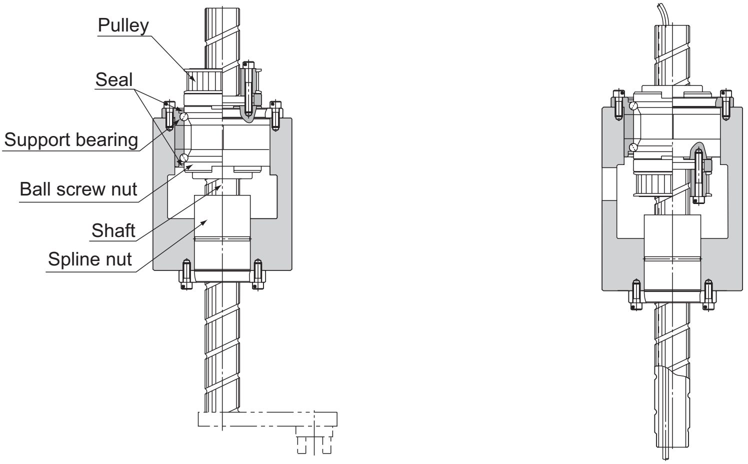
Example of Assembly



●Example of installing the ball screw nut input pulley and the spline nut input pulley, both outside the housing. The housing length is minimized.

●Example of installing the ball screw nut pulley inside the housing.

Fig.3 Example of Assembling Model BNS



●Example of installing the ball screw nut pulley outside the housing. The housing length is minimized.

●Example of installing the ball screw nut pulley inside the housing.

Fig.4 Example of Assembling Model NS

Example of Using the Spring Pad

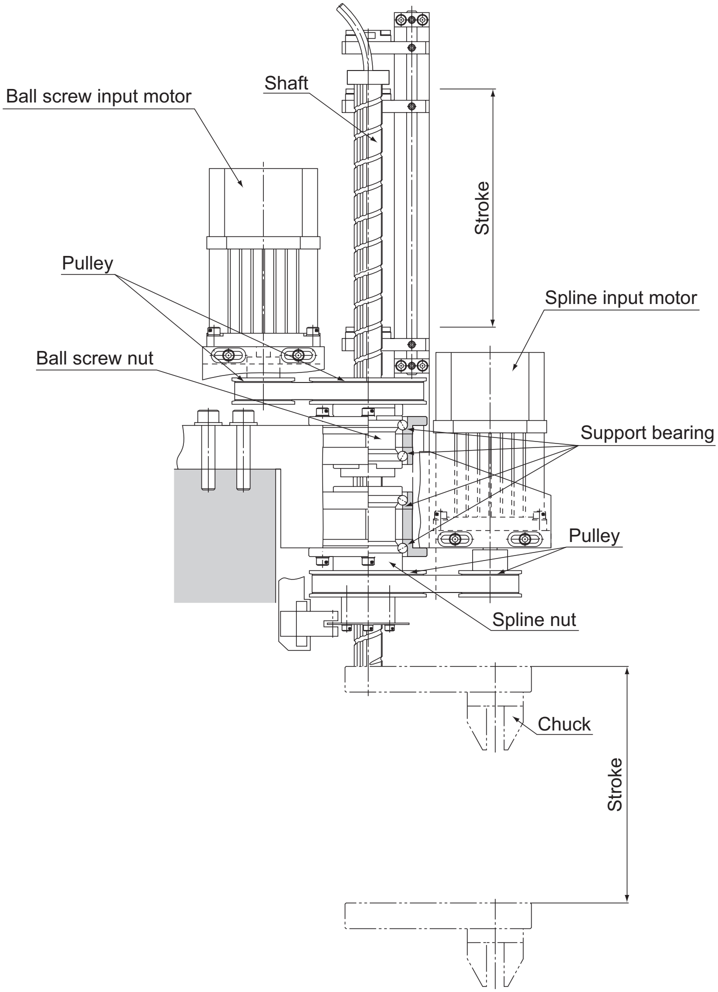


Fig.5 Example of Using Model BNS

Precautions on Use

[Lubrication]
When lubricating the Ball Screw/Spline, attach the greasing plate to the housing in advance.

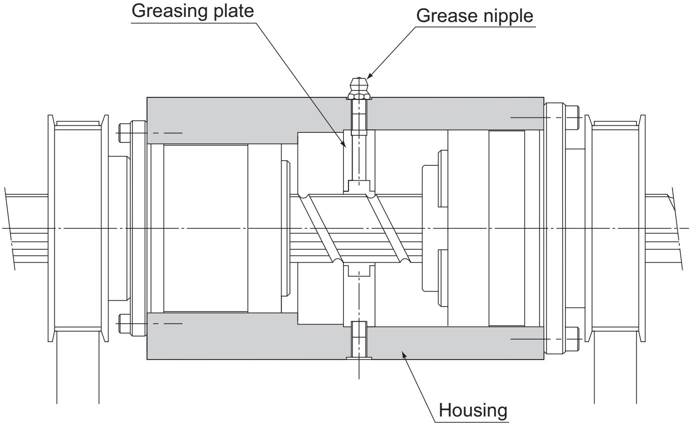
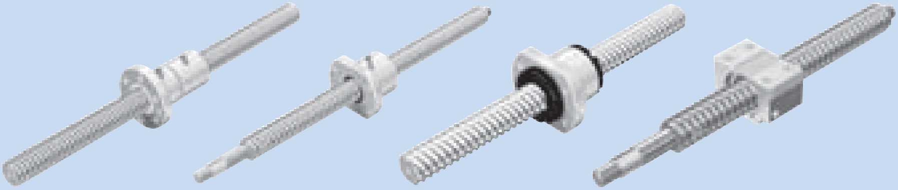


Fig.6 Lubrication Methods

Rolled Ball Screw

Models JPF, BTK, MTF, BLK/WTF, CNF and BNT



Structure and Features

THK Rolled Ball Screws are low priced feed screws that use a screw shaft rolled with high accuracy and specially surface-ground, instead of a thread-ground shaft used in the Precision Ball Screws.
The ball raceways of the ball screw nut are all thread-ground, thus to achieve a smaller axial clearance and smoother motion than the conventional rolled ball screw.
In addition, a wide array of types are offered as standard in order to allow optimal products to be selected according to the application.

[Achieves Lead Angle Accuracy of Class C7]

Screw shafts with travel distance error of classes C7 and C8 are also manufactured as the standard in addition to class C10 to meet a broad range of applications.

Travel distance C7: ±0.05/300 (mm)
C8: ±0.10/300 (mm)
C10: ±0.21/300 (mm)

(For maximum length of screw shaft by accuracy grade, see A-691.)

[Achieves Roughness of the Ball Raceways of the Screw Shaft at 0.20 a or Less]

The surface of the screw shaft's ball raceways is specially ground after the shaft is rolled to ensure surface roughness of 0.20 a or less, which is equal to that of the ground thread of the Precision Ball Screw.

[The Ball Raceways of the Ball Screw Nut are All Finished by Grinding]

THK finishes the ball raceways of Rolled Ball Screw nuts by grinding, just as the Precision Ball Screws, to secure the durability and the smooth motion.

[Low Price]

The screw shaft is induction-hardened or carburized after being rolled, and its surface is then specially ground. This allows the rolled Ball Screw to be priced lower than the Precision Ball Screw with a ground thread.

[High Dust-prevention Effect]

The ball screw nut is incorporated with a compact labyrinth seal or a brush seal. This achieves a low friction, a high dust-prevention effect and a longer service life of the Ball Screw.

Types and Features

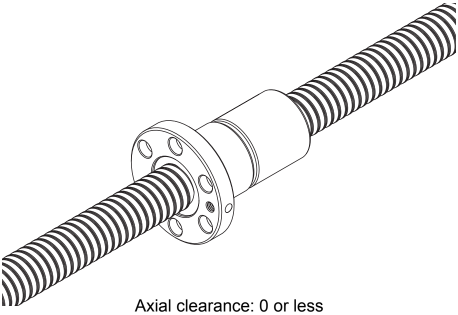
[Preload Type]

Model JPF

Specification Table⇒B-736

This model achieves a zero-backlash through a constant preloading method by shifting the phase with the central part of a simple nut as the spring structure.

The constant preload method allows the ball screw to absorb a pitch error and achieve a smooth motion.



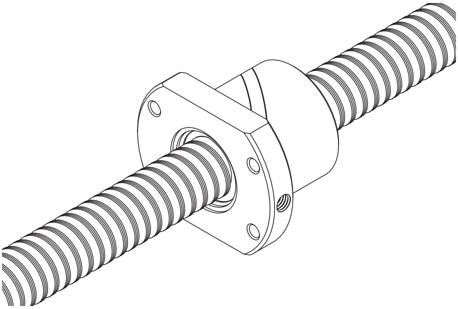
Axial clearance: 0 or less

[No Preload Type]

Model BTK

Specification Table⇒B-738

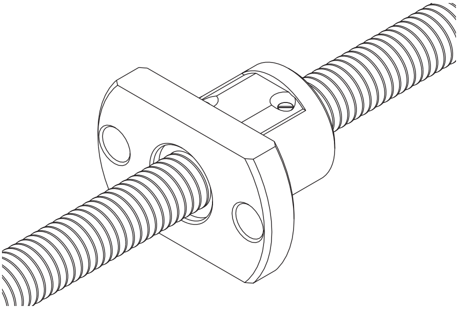
A compact type with a round nut incorporated with a return pipe. The flange circumference is cut flat at the top and bottom, allowing the shaft center to be positioned lower.



Model MTF

Specification Table⇒B-738

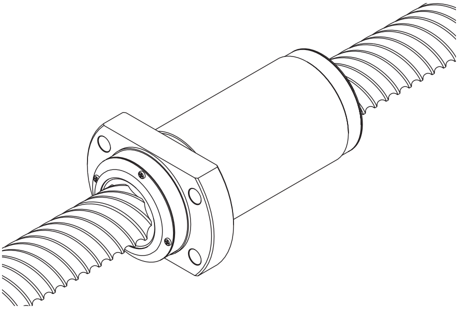
A miniature type with a screw shaft diameter of ϕ6 to ϕ12 mm and a lead of 1 to 2 mm.



Models BLK/WTF

Specification Table⇒B-738

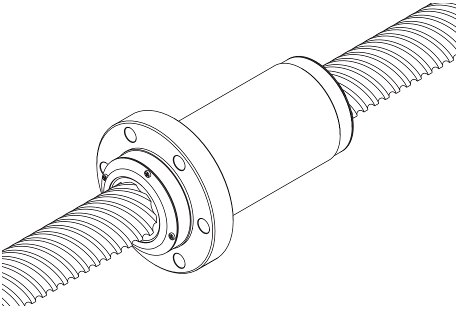
Using an end-cap method, these models achieve stable motion in a high-speed rotation.



Model CNF

Specification Table⇒B-738

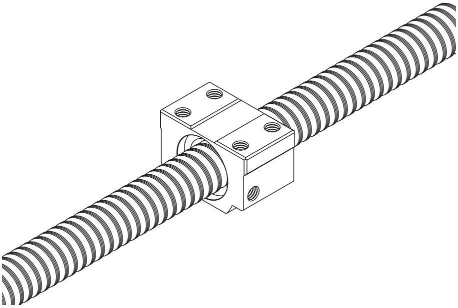
With a combination of 4 rows of large-lead loaded grooves and a long nut, a long service life is achieved.



Square Ball Screw Nut Model BNT

Specification Table⇒B-744

Since the mounting screw holes are machined on the square ball screw nut, this model can compactly be mounted on the machine without a housing.



Service Life

For details,see A-704.

Axial Clearance

For details,see A-685.

Accuracy Standards

For details,see A-678.

Rolled Rotary Ball Screw

Model BLR

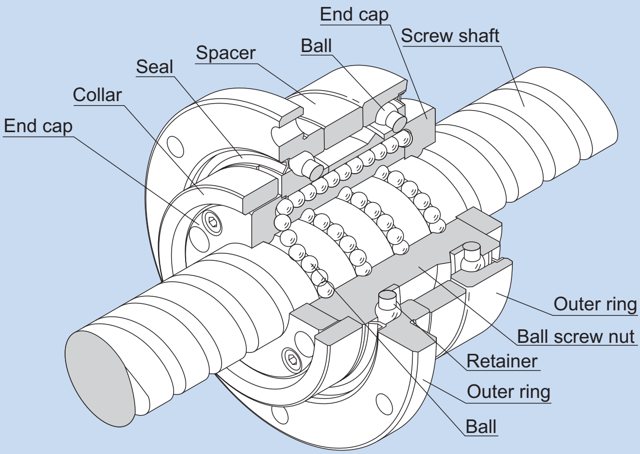


Fig.1 Structure of Large Lead Rotary Nut Ball Screw Model BLR

Structure and Features

The Rotary Ball Screw is a rotary-nut ball screw unit that has an integrated structure consisting of a ball screw nut and a support bearing. The support bearing is an angular bearing that has a contact angle of 60°, contains an increased number of balls and achieves a large axial rigidity.
Model BLR is divided into two types: the Precision Ball Screw and the Rolled Screw Ball.

[Smooth Motion]

It achieves smoother motion than the rack-and-pinion based straight motion. Also, since the screw shaft does not rotate because of the ball screw nut drive, this model does not show skipping, produces low noise and generates little heat.

[Low Noise even in High-speed Rotation]

Model BLR produces very low noise when the balls are picked up along the end cap. In addition, the balls circulate by passing through the ball screw nut, allowing this model to be used at high speed.

[High Rigidity]

The support bearing of this model is larger than that of the screw shaft rotational type. Thus, its axial rigidity is significantly increased.

[Compact]

Since the nut and the support bearing are integrated, a highly accurate, and a compact design is achieved.

[Easy Installation]

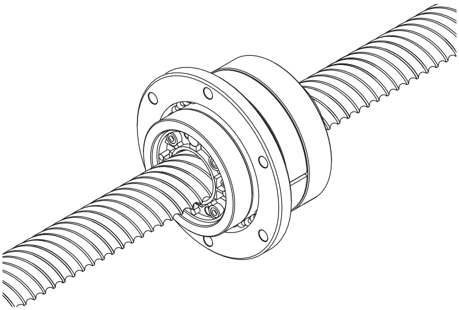
By simply mounting this model to the housing using bolts, a ball screw nut rotating mechanism can be obtained. (For the housing's inner-diameter tolerance, H7 is recommended.)

Type

[No Preload Type]

Model BLR

Specification Table⇒B-748



Service Life

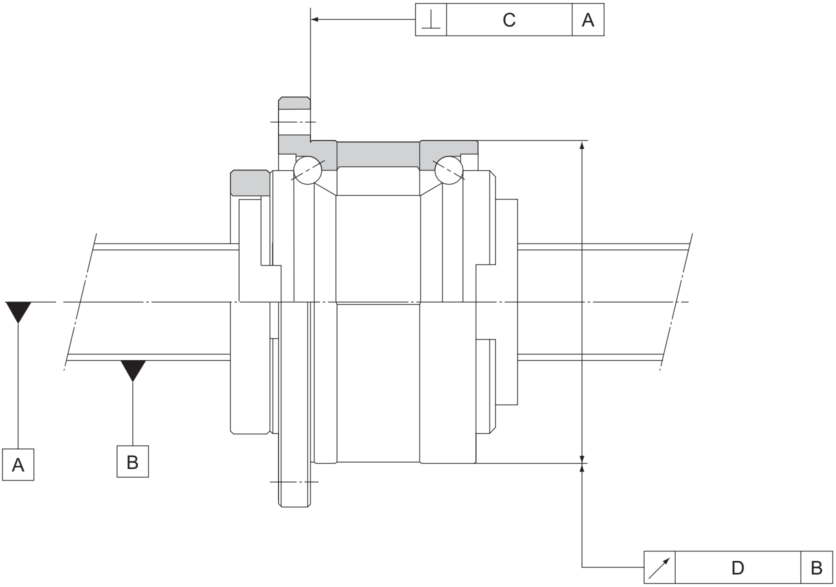
For details,see A-704.

Axial Clearance

For details,see A-685.

Accuracy Standards

The accuracy of model BLR is compliant with the JIS standard (JIS B 1192-1997) except for the radial runout of the circumference of the ball screw nut from the screw axis (D) and the perpendicularity of the flange-mounting surface against the screw axis (C).

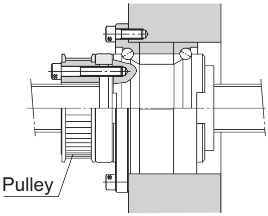


Unit: mm

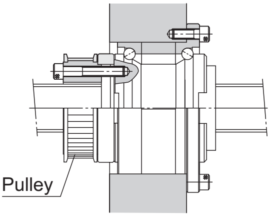
Lead angle accuracy	C7, C8, C10	
Accuracy grades	C10	
Model No.	C	D
BLR 1616	0.035	0.065
BLR 2020	0.035	0.065
BLR 2525	0.035	0.065
BLR 3232	0.035	0.065
BLR 3636	0.036	0.066
BLR 4040	0.046	0.086
BLR 5050	0.046	0.086

Example of Assembly

[Example of Mounting Ball Screw Nut Model BLR]



Standard installation method



Inverted flange

Note) If the flange is to be inverted, indicate “K” in the model number. (applicable only to model BLR)

Example: BLR 2020-3.6 K UU
Symbol for invert
(No symbol for standard flange orientation)

[Example of Mounting Model BLR on the Table]

(1) Screw shaft free, ball screw nut fixed
(Suitable for a long table)

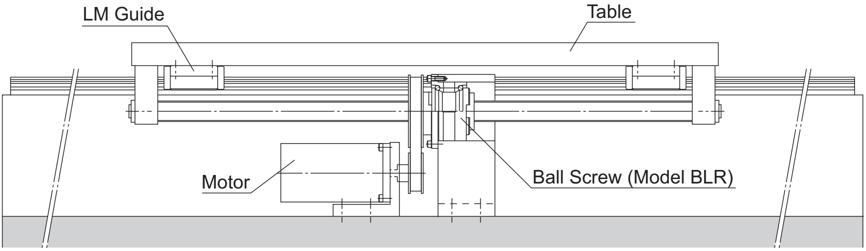


Fig.2 Example of Installation on the Table (Ball Screw Nut Fixed)

(2) Ball screw nut free, screw shaft fixed
(Suitable for a short table and a long stroke)

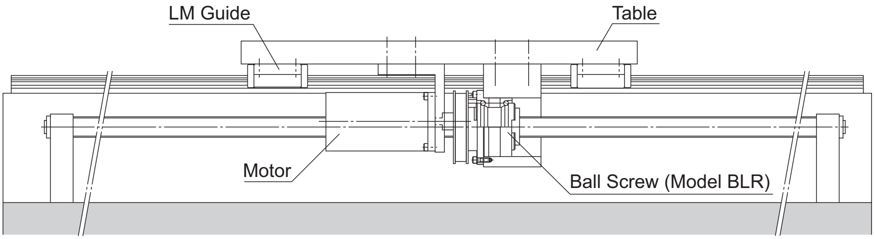


Fig.3 Example of Installation on the Table (Screw Shaft Fixed)

Ball Screw

Ball Screw Peripherals

Support Unit

Models EK, BK, FK, EF, BF and FF

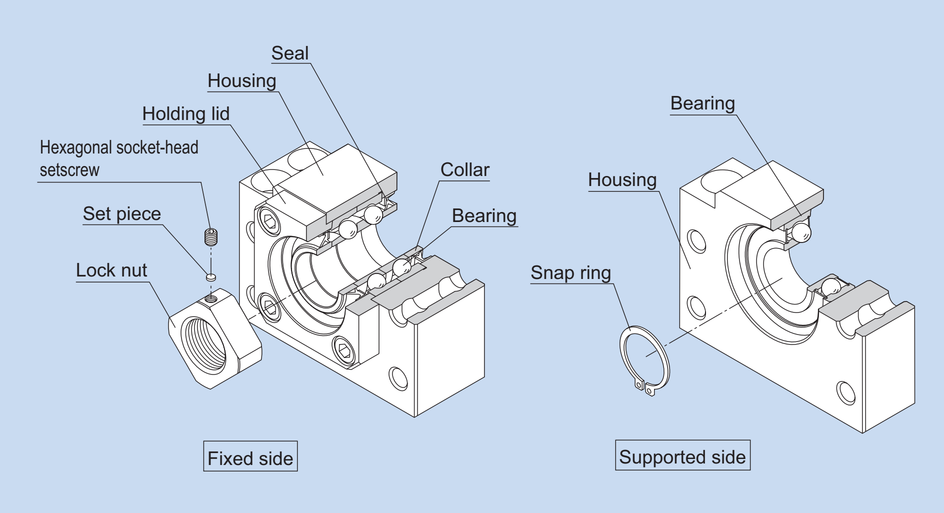


Fig.1 Structure of the Support Unit

Structure and Features

The Support Unit comes in six types: models EK, FK, EF, and FF, which are standardized for the standard Ball Screw assembly provided with the finished shaft ends, and models BK and BF, which are standardized for ball screws in general.
The Support Unit on the fixed side contains a JIS Class 5-compliant angular bearing provided with an adjusted preload. The miniature type Support Unit models EK/FK 4, 5, 6 and 8, in particular, incorporate a miniature bearing with a contact angle of 45° developed exclusively for miniature Ball Screws. This provides stable rotational performance with a high rigidity and an accuracy.
The Support Unit on the supported side uses a deep-groove ball bearing.
The internal bearings of the Support Unit models EK, FK and BK contain an appropriate amount of lithium soap-group grease that is sealed with a special seal. Thus, these models are capable of operating over a long period.

[Uses the Optimal Bearing]

To ensure the rigidity balance with the Ball Screw, the Support Unit uses an angular bearing (contact angle: 30°; DF configuration) with a high rigidity and a low torque. Miniature Support Unit models EK/FK 4, 5, 6 and 8 are incorporated with a miniature angular bearing with a contact angle of 45° developed exclusively for miniature Ball Screws. This bearing has a greater contact angle of 45° and an increased number of balls with a smaller diameter. The high rigidity and accuracy of the miniature angular bearing provides the stable rotational performance.

[Support Unit Shapes]

The square and round shapes are available for the Support Unit to allow the selection according to the intended use.

[Compact and Easy Installation]

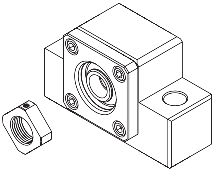
The Support Unit is compactly designed to accommodate the space in the installation site. As the bearing is provided with an appropriately adjusted preload, the Support Unit can be assembled with a Ball Screw unit with no further machining. Accordingly, the required man-hours in the assembly can be reduced and the assembly accuracy can be increased.

Type

[For the Fixed Side]

Square Type Model EK

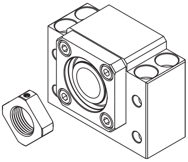
Specification Table⇒B-754



(Inner diameter: ϕ4 to ϕ20)

Square Type Model BK

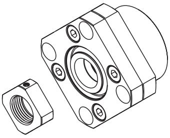
Specification Table⇒B-756



(Inner diameter: ϕ10 to ϕ40)

Round Type Model FK

Specification Table⇒B-758

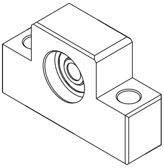


(Inner diameter: ϕ4 to ϕ30)

[For the Supported Side]

Square Type Model EF

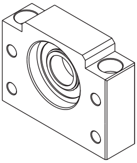
Specification Table⇒B-762



(Inner diameter: ϕ6 to ϕ20)

Square Type Model BF

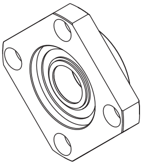
Specification Table⇒B-764



(Inner diameter: ϕ8 to ϕ40)

Round Type Model FF

Specification Table⇒B-766



(Inner diameter: ϕ6 to ϕ30)

Types of Support Units and Applicable Screw Shaft Outer Diameters

Inner diameter of the fixed side Support Unit (mm)	Applicable model No. of the fixed side Support Unit	Inner diameter of the supported side Support Unit (mm)	Applicable model No. of the supported side Support Unit	Applicable screw shaft outer diameter (mm)
4	EK 4 FK 4	—	—	ϕ4
5	EK 5 FK 5	—	—	ϕ6
6	EK 6 FK 6	6	EF 6 FF 6	ϕ8
8	EK 8 FK 8	6	EF 8 FF 6	ϕ10
10	EK 10 FK 10 BK 10	8	EF 10 FF 10 BF 10	ϕ12, ϕ14
12	EK 12 FK 12 BK 12	10	EF 12 FF 12 BF 12	ϕ14, ϕ15, ϕ16
15	EK 15 FK 15 BK 15	15	EF 15 FF 15 BF 15	ϕ20
17	BK 17	17	BF 17	ϕ20, ϕ25
20	EK 20 FK 20 BK 20	20	EF 20 FF 20 BF 20	ϕ25, ϕ28, ϕ32
25	FK 25 BK 25	25	FF 25 BF 25	ϕ36
30	FK 30 BK 30	30	FF 30 BF 30	ϕ40, ϕ45
35	BK 35	35	BF 35	ϕ45
40	BK 40	40	BF 40	ϕ50

Note) The Supports Units in this table apply only to those Ball Screw models with recommended shaft ends shapes H, J and K, indicated on A-810.

Model Numbers of Bearings and Characteristic Values

Angular ball bearing on the fixed side					Deep-groove ball bearing on the supported side			
Support Unit model No.	Bearing model No.	Axial direction			Support Unit model No.	Bearing model No.	Radial direction	
		Basic dynamic load rating Ca (kN)	Note) Permissible load (kN)	Rigidity (N/μm)			Basic dynamic load rating C(kN)	Basic static load rating C_0(kN)
EK 4 FK 4	AC4-12P5	0.93	1.1	27	—	—	—	—
EK 5 FK 5	AC5-14P5	1	1.24	29	—	—	—	—
EK 6 FK 6	AC6-16P5	1.38	1.76	35	EF 6 FF 6	606ZZ	2.19	0.87
EK 8 FK 8	79M8DF GMP5	2.93	2.15	49	EF 8	606ZZ	2.19	0.87
EK 10 FK 10 BK 10	7000HTDF GMP5	6.08	3.1	65	EF 10 FF 10 BF 10	608ZZ	3.35	1.4
EK 12 FK 12 BK 12	7001HTDF GMP5	6.66	3.25	88	EF 12 FF 12 BF 12	6000ZZ	4.55	1.96
EK 15 FK 15 BK 15	7002HTDF GMP5	7.6	4	100	EF 15 FF 15 BF 15	6002ZZ	5.6	2.84
BK 17	7203HTDF GMP5	13.7	5.85	125	BF 17	6203ZZ	9.6	4.6
EK 20 FK 20	7204HTDF GMP5	17.9	9.5	170	EF 20 FF 20	6204ZZ	12.8	6.65
BK 20	7004HTDF GMP5	12.7	7.55	140	BF 20	6004ZZ	9.4	5.05
FK 25 BK 25	7205HTDF GMP5	20.2	11.5	190	FF 25 BF 25	6205ZZ	14	7.85
FK 30 BK 30	7206HTDF GMP5	28	16.3	195	FF 30 BF 30	6206ZZ	19.5	11.3
BK 35	7207HTDF GMP5	37.2	21.9	255	BF35	6207ZZ	25.7	15.3
BK 40	7208HTDF GMP5	44.1	27.1	270	BF 40	6208ZZ	29.1	17.8

Note) "Permissible load" indicates the static permissible load.

Example of Installation

[Square Type Support Unit]

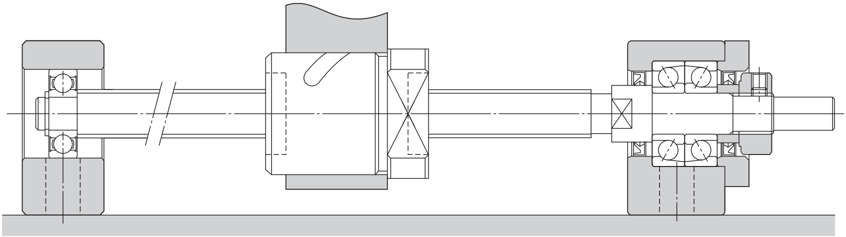


Fig.2 Example of Installing a Square Type Support Unit

[Round Type Support Unit]

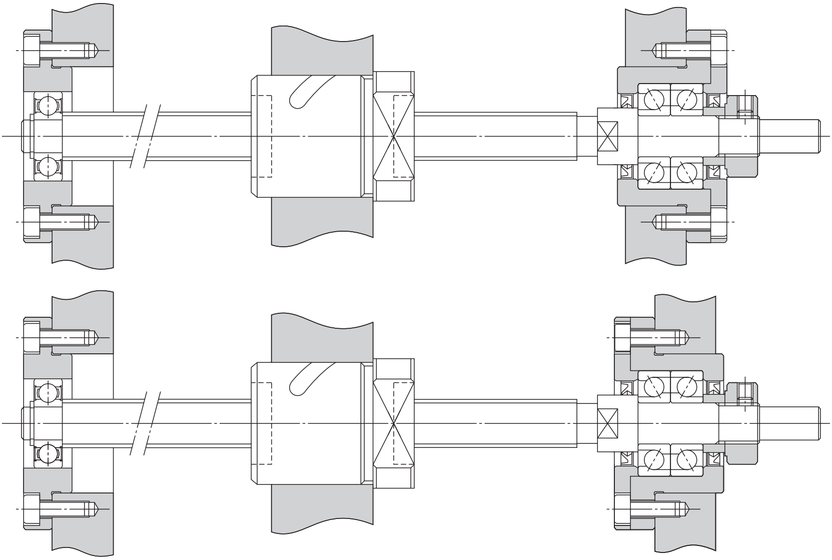


Fig.3 Example of Installing a Round Type Support Unit

Mounting Procedure

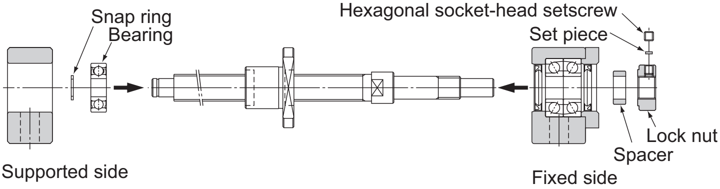
[Installing the Support Unit]

(1) Install the fixed side Support Unit with the screw shaft.

(2) After inserting the fixed side Support Unit, secure the lock nut using the fastening set piece and the hexagonal socket-head setscrews.

(3) Attach the supported side bearing to the screw shaft and secure the bearing using the snap ring, and then install the assembly to the housing on the supported side.

Note1) Do no disassemble the Support Unit.
Note2) When inserting the screw shaft to the Support Unit, take care not to let the oil seal lip turn outward.
Note3) When securing the set piece with a hexagonal socket-head setscrew, apply an adhesive to the hexagonal socket-head setscrew before tightening it in order to prevent the screw from loosening. If planning to use the product in a harsh environment, it is also necessary to take a measure to prevent other components/parts from loosening. Contact THK for details.



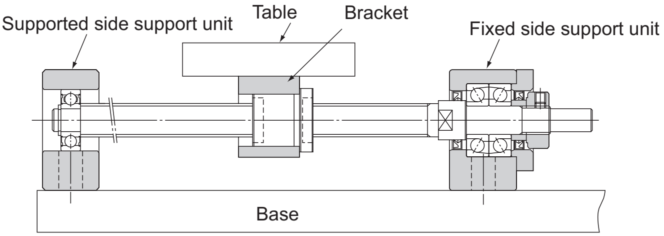
[Installation onto the Table and the Base]

(1) If using a bracket when mounting the ball screw nut to the table, insert the nut into the bracket and temporarily fasten it.

(2) Temporarily fasten the fixed side Support Unit to the base.
In doing so, press the table toward the fixed side Support Unit to align the axial center, and adjust the table so that it can travel freely.

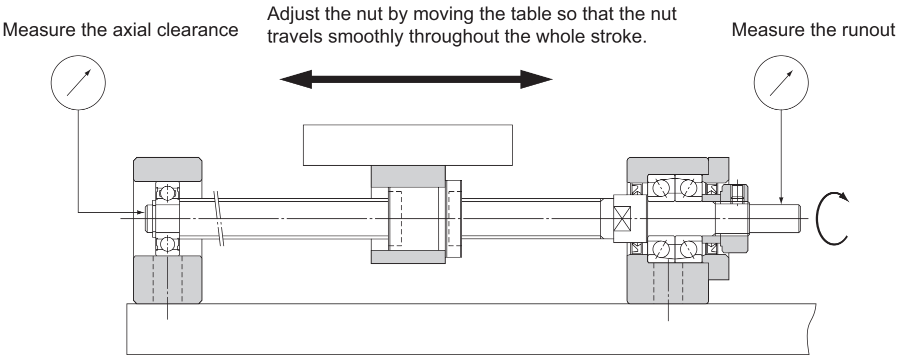
- If using the fixed side Support Unit as the reference point, secure a clearance between the ball screw nut and the table or inside the bracket when making adjustment.
- If using the table as the reference point, make the adjustment either by using the shim (for a square type Support Unit), or securing the clearance between the outer surface of the nut and the inner surface of the mounting section (for a round type Support Unit).

(3) Press the table toward the fixed-side Support Unit to align the axial center. Make the adjustment by reciprocating the table several times so that the nut travels smoothly throughout the whole stroke, and temporarily secure the Support Unit to the base.



[Checking the Accuracy and Fully Fastening the Support Unit]

While checking the runout of the ball screw shaft end and the axial clearance using a dial gauge, fully fasten the ball screw nut, the nut bracket, the fixed side Support Unit and the supported-side Support Unit, in this order.



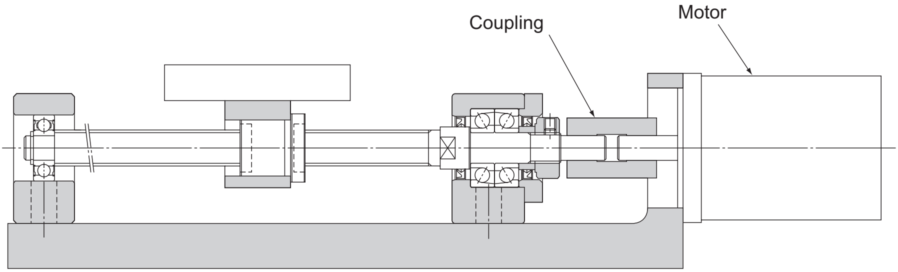
[Connection with the Motor]

(1) Mount the motor bracket to the base.

(2) Connect the motor and the ball screw using a coupling.

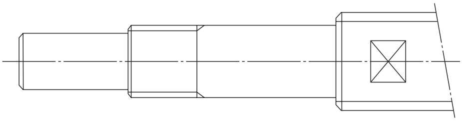
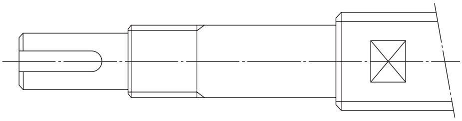
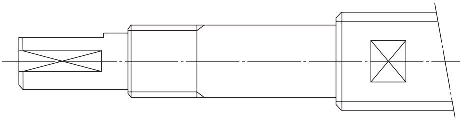
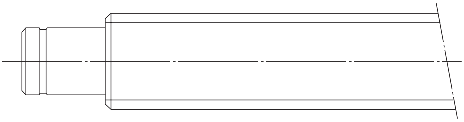
Note) Make sure the mounting accuracy is maintained.

(3) Thoroughly perform the break-in for the system.



Types of Recommended Shapes of the Shaft Ends

To ensure speedy estimates and manufacturing of Ball Screws, THK has standardized the shaft end shapes of the screw shafts. The recommended shapes of shaft ends consist of shapes H, K and J, which allow standard Support Units to be used.

Mounting method	Symbol for shaft end shape		Shape	Supported Support Unit
Fixed	H J	H1		FK EK
		J1		BK
		H2		FK EK
		J2		BK
		H3		FK EK
		J3		BK
Sup-ported	K			FF EF BF

Nut bracket

Model MC

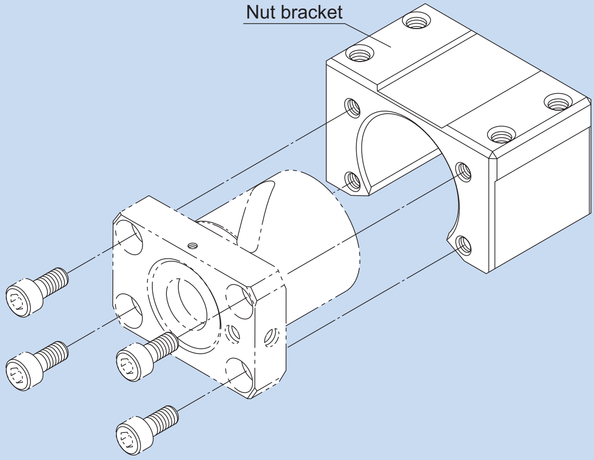


Fig.1 Structure of the Nut Bracket

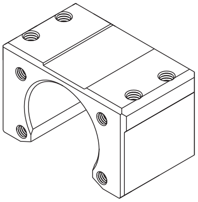
Structure and Features

The Nut Bracket is standardized for the standard Ball Screw assembly provided with finished shaft ends. It is designed to be secured directly on the table with bolts. Since the height is low, it can be mounted on the table only using bolts.

Type

Nut Bracket Model MC

Specification Table⇒B-774



Lock nut

Model RN

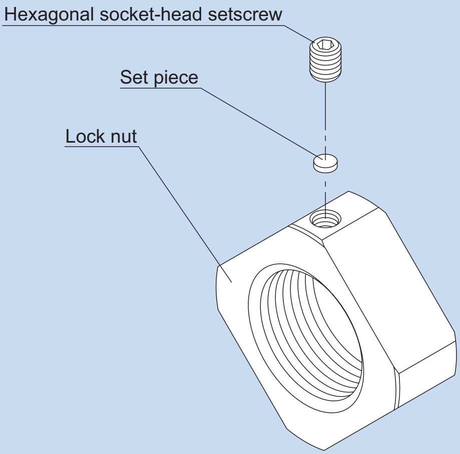


Fig.1 Structure of the Lock Nut

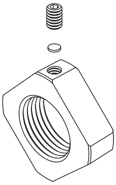
Structure and Features

The Lock Nut for the Ball Screws is capable of fastening the screw shaft and the bearing with a high accuracy.
The provided hexagonal socket-head setscrew and the set piece prevent the Lock Nut from loosening and ensure firm fastening. The Lock Nut comes in various types ranging from model M4 to model M40.

Type

Lock Nut Model RN

Specification Table⇒B-776



Ball Screw

Options

Lubrication

To maximize the performance of the Ball Screw, it is necessary to select a lubricant and a lubrication method according to the conditions.
For types of lubricants, characteristics of lubricants and lubrication methods, see the section on “Accessories for Lubrication” on A-954.
Also, QZ Lubricator is available as an optional accessory that significantly increases the maintenance interval.

Corrosion Prevention (Surface Treatment, etc.)

Depending on the service environment, the Ball Screw requires anticorrosive treatment or a different material. For details of an anticorrosive treatment and a material change, contact THK. (see A-18)

Contamination Protection

The dust and foreign materials that enter the Ball Screw may cause accelerated wear and breakage, as with roller bearings. Therefore, on parts where contamination by dust or foreign materials (e.g., cutting chips) is predicted, screw shafts must always be completely covered by contamination protection devices (e.g., bellows, screw cover, wiper ring).
If the Ball Screw is used in an atmosphere free from the foreign materials but with suspended dust, a labyrinth seal (for precision Ball Screws) with symbol RR and a brush seal (for rolled Ball Screws) with symbol ZZ can be used as contamination protection devices.
The labyrinth seal is designed to maintain a slight clearance between the seal and the screw shaft raceway so that torque does not develop and no heat is generated, though its effect in contamination protection is limited.
With Ball Screws except the large lead and super lead types, there is no difference in nut dimensions between those with and without a seal.
With the wiper ring, special resin with high wear resistance and low dust generation removes foreign materials while closely contacting the circumference of the ball screw shaft and the screw thread. It is capable of preventing foreign materials from entering the Ball Screw even in a severe environment.

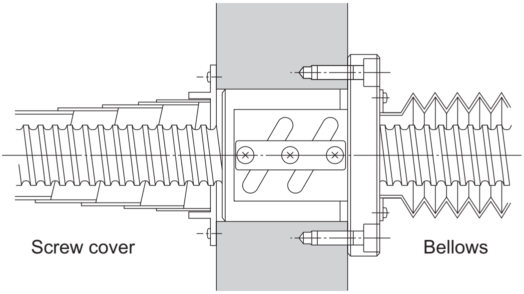


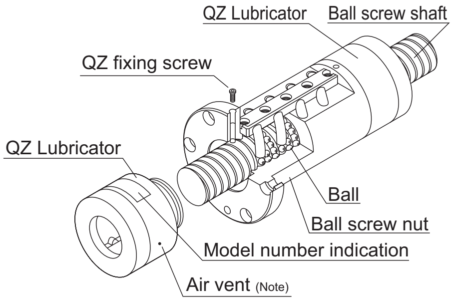
Fig.1 Contamination Protection Cover

QZ Lubricator

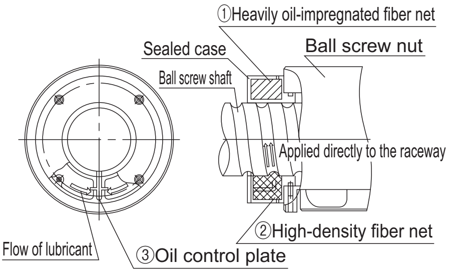
●For the supported models and the ball screw nut dimension with QZ attached, see B-778 to B-783.

QZ Lubricator feeds a right amount of lubricant to the ball raceway of the ball screw shaft. This allows an oil film to be constantly formed between the balls and the raceway, improves lubrications and significantly extends the lubrication maintenance interval.

The structure of QZ Lubricator consists of three major components: (1) a heavily oil-impregnated fiber net (stores the lubricant), (2) a high-density fiber net (applies the lubricant to the raceway) and (3) an oil-control plate (adjusts the oil flow). The lubricant contained in the QZ Lubricator is fed by the capillary phenomenon, which is used also in felt pens and many other products.



Appearance Drawing



Structural Drawing

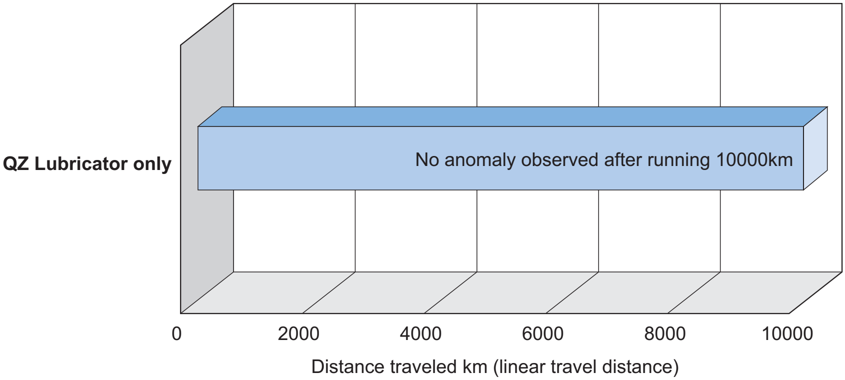
[Features]

- Since it supplements an oil loss, the lubrication maintenance interval can be significantly extended.
- Since the right amount of lubricant is applied to the ball raceway, an environmentally friendly lubrication system that does not contaminate the surroundings is achieved.

Note) QZ Lubricator has a vent hole. Do not block the hole with grease or the like.

● Significantly extended maintenance interval

Since QZ Lubricator continuously feeds a lubricant over a long period, the maintenance interval can be extended significantly.

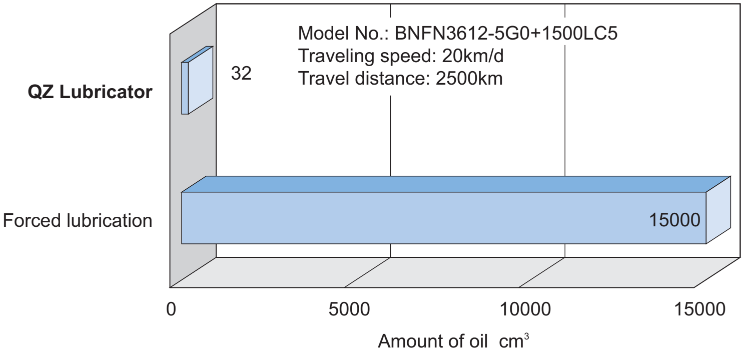


[Test conditions]

Item	Description
Ball Screw	BIF2510
Maximum rotational speed	2500min^{-1}
Maximum speed	25m/min
Stroke	500mm
Load	Internal preload only

● Environmentally friendly lubrication system

Since the QZ Lubricator feeds the right amount of lubricant directly to the raceway, the lubricant can effectively be used without waste.



Model No.: BNFN3612-5G0+1500LC5
Traveling speed: 20km/d
Travel distance: 2500km

QZ Lubricator + THK AFA Grease

32cm^3

(QZ Lubricator attached to both ends of the ball screw nut)

Compared

Forced lubrication

0.25cm^3/3min×24h×125d

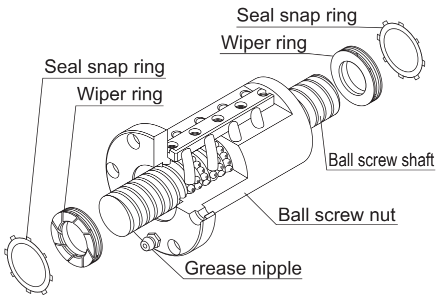
=15000cm^3

Reduced to approx. $\frac{1}{470}$

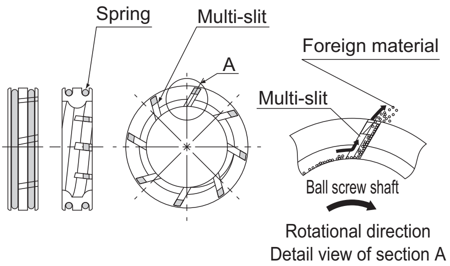
Wiper Ring W

●For the supported models and the ball screw nut dimension with Wiper ring W attached, see B-778 to B-783.

With the wiper ring W, special resin with a high wear resistance and a low dust generation which removes and prevents foreign materials from entering the ball screw nut while elastically contacting the circumference of the ball screw shaft and the screw thread.



Appearance Drawing



Structural Drawing

[Features]

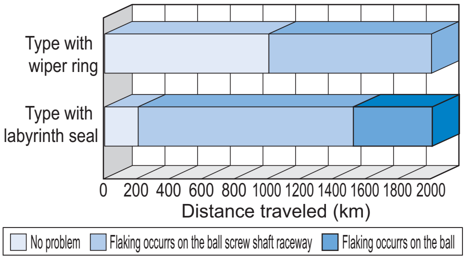
- A total of eight slits on the circumference remove foreign materials in succession, and prevent entrance of foreign material.
- Contacts the ball screw shaft to reduce the flowing out of grease.
- Contacts the ball screw shaft at a constant pressure level using a spring, thus to minimize the heat generation.
- Since the material is highly resistant to the wear and the chemicals, its performance will not easily be deteriorated even if it is used over a long period.

● Test in an environment exposed to contaminated environment

[Test conditions]

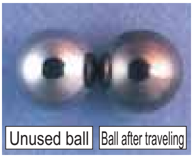
Item	Description
Model No.	BIF3210–5G0+1500LC5
Maximum rotational speed	1000min^{-1}
Maximum speed	10m/min
Maximum circumferential speed	1.8m/s
Time constant	60ms
Dowel	1s
Stroke	900mm
Load (through internal load)	1.31kN
Grease	THK AFG Grease 8cm^3 (Initial lubrication to the ball screw nut only)
Foundry dust	FCD400 average particle diameter: 250μm
Volume of foreign material per shaft	5g/h

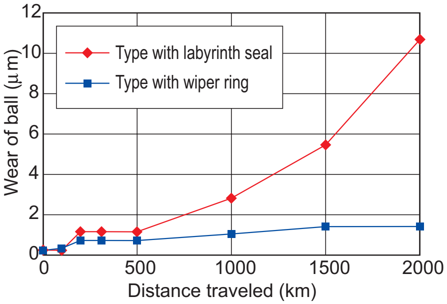
[Test result]



- Type with wiper ring
  Slight flaking occurred in the ball screw shaft at travel distant of 1,000 km.
- Type with labyrinth seal
  Flaking occurred throughout the circumference of the screw shaft raceway at travel distance of 200 km.
  Flaking occurred on the balls after traveling 1,500 km.

Change in the ball after traveling 2000 km

(1) Type with wiper ring	(2) Type with labyrinth seal
	
●Discolored, but no breakage	●Flaking occurs



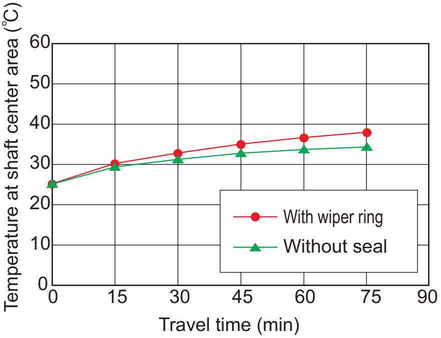
- Type with wiper ring
  Wear of balls at a travel distance of 2,000 km: 1.4 μm.
- Type with labyrinth seal
  Starts to be worn rapidly after 500 km, and the ball wear amount at the travel distance of 2,000 km: 11 μm

● Heat Generation Test

[Test conditions]

Item	Description
Model No.	BLK3232–3.6G0+1426LC5
Maximum rotational speed	1000min^{-1}
Maximum speed	32m/min
Maximum circumferential speed	1.7m/s
Time constant	100ms
Stroke	1000mm
Load (through internal load)	0.98kN
Grease	THK AFG Grease 5cm^3 (contained in the ball screw nut)

[Test result]

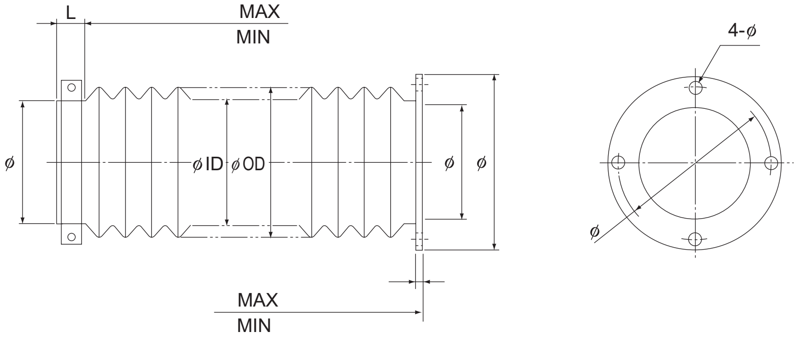


Unit: ℃

Item	With wiper ring	Without seal
Heat generation temperature	37.1	34.5
Temperature rise	12.2	8.9

Specifications of the Bellows

Bellows are available as a contamination protection accessory. Use this specification sheet.



(Band type) (Flange type)

Specifications of the Bellows

Supported Ball Screw models:

Dimensions of the Bellows

Stroke:( ) mm MAX:( ) mm MIN:( ) mm

Permissible outer diameter:(øOD) Desired inner diameter:(øID)

How It Is Used

Installation direction:(horizontal, vertical, slant) Speed: ( )mm/sec. mm/min.

Motion:(reciprocation, vibration)

Conditions

Resistance to oil and water: (necessary, unnecessary) Oil name ( )

Chemical resistance: Name ( ) × ( ) %

Location: (indoor, outdoor)

Remarks:

Number of Units To Be Manufactured:

Method for Mounting the Ball Screw Shaft

Fig.1 to Fig.4 show the representative mounting methods for the screw shaft.

The permissible axial load and the permissible rotational speed vary with mounting methods for the screw shaft. Therefore, it is necessary to select an appropriate mounting method according to the conditions.

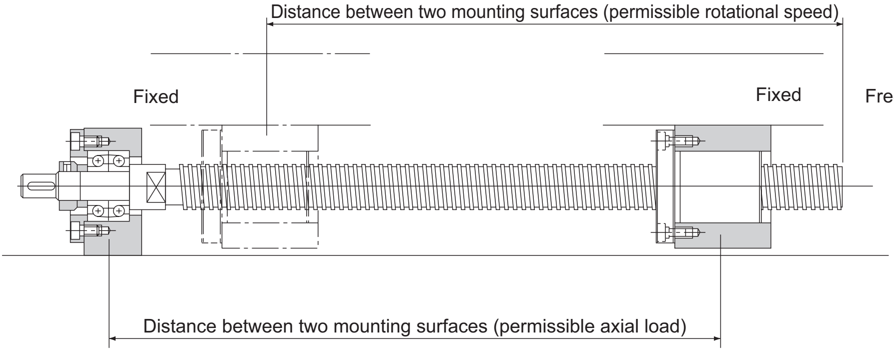


Fig.1 Screw Shaft Mounting Method: Fixed - Free

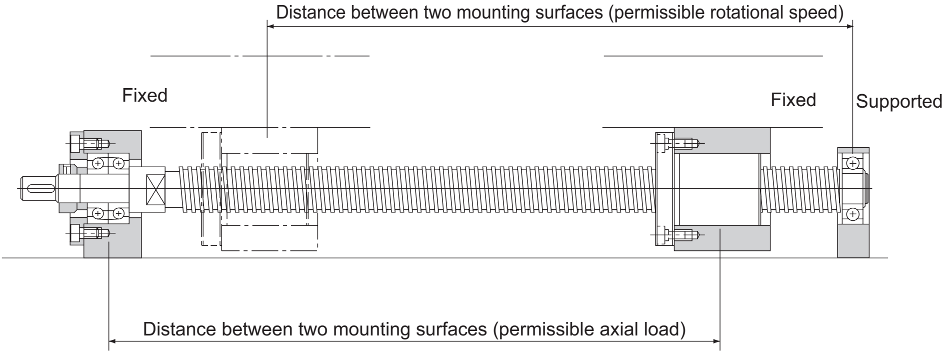


Fig.2 Screw Shaft Mounting Method: Fixed - Supported

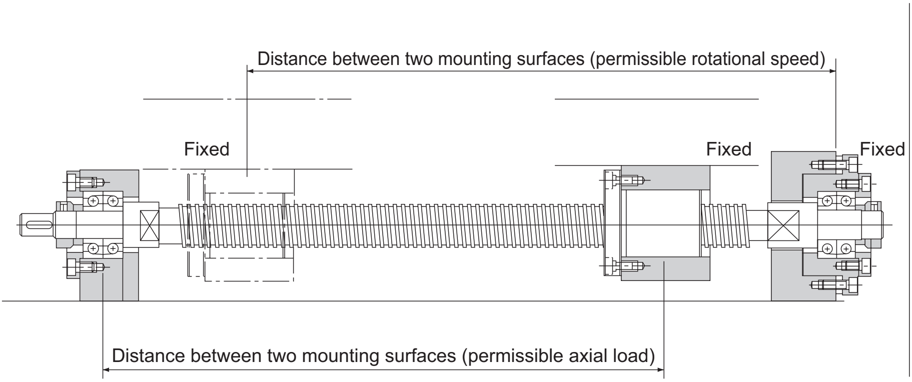


Fig.3 Screw Shaft Mounting Method: Fixed - Fixed

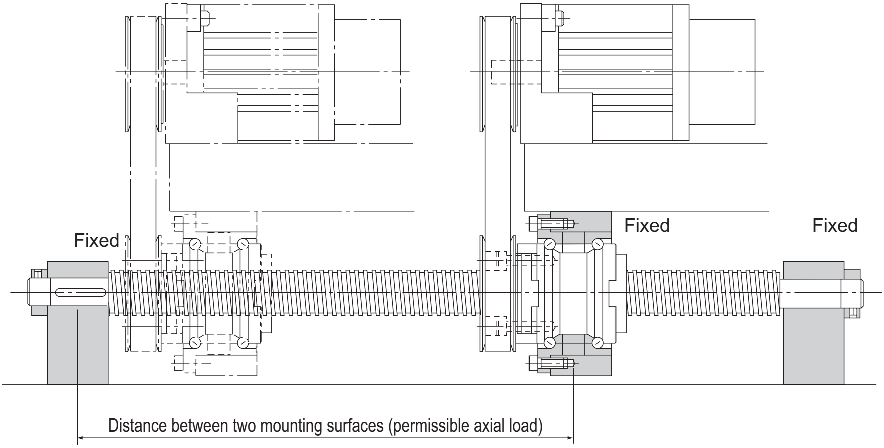


Fig.4 Screw Shaft Mounting Method for Rotary Nut Ball Screw: Fixed - Fixed

Maintenance Method

Amount of Lubricant

If the amount of the lubricant to the Ball Screw is insufficient, it may cause a lubrication breakdown, and if it is excessive, it may cause heat to be generated and the resistance to be increased. It is necessary to select an amount that meets the conditions.

[Grease]
The feed amount of grease is generally approximately one third of the spatial volume inside the nut.

[Oil]
Table 1 shows a guideline for the feed amount of oil.
Note, that the amount varies according to the stroke, the oil type and the conditions (e.g., suppressed heat generation).

Table1 Guideline for the Feed Amount of Oil

(Interval: 3 minutes)

Shaft diameter (mm)	Amount of lubricant (cc)
4 to 8	0.03
10 to 14	0.05
15 to 18	0.07
20 to 25	0.1
28 to 32	0.15
36 to 40	0.25
45 to 50	0.3
55 to 63	0.4
70 to 100	0.5

[Handling]

(1) Disassembling the components may cause dust to enter the system or degrade the mounting accuracy of parts. Do not disassemble the product.

(2) Tilting the screw shaft and the ball screw nut may cause them to fall by their own weight.

(3) Dropping or hitting the Ball Screw may damage the ball circulation section, which may cause the functional loss. Giving an impact to the product could also cause a damage to its function even if the product looks intact.

[Lubrication]

(1) Thoroughly remove anti-rust oil and feed lubricant before using the product.

(2) Do not mix the lubricants of different physical properties.

(3) In locations exposed to constant vibrations or in special environments such as clean rooms, a vacuum and a low/high temperature, normal lubricants may not be used. Contact THK for details.

(4) When planning to use a special lubricant, contact THK before using it.

(5) The lubrication interval varies according to the conditions. Contact THK for details.

[Precautions on Use]

(1) Do not remove the ball screw nut from the ball screw shaft. Doing so may cause the balls or the nut to fall off.

(2) Entrance of foreign materials to the ball screw nut may cause damages to the ball circulating path or functional loss. Prevent foreign materials, such as dust or cutting chips, from entering the system.

(3) If the foreign materials such as dust or cutting chips adheres to the product, replenish the lubricant after cleaning the product with pure white kerosene. For available types of detergent, contact THK.

(4) When planning to use the product in an environment where the coolant penetrates the spline nut, it may cause problems to product functions depending on the type of the coolant. Contact THK for details.

(5) Contact THK if you desire to use the product at a temperature of 80℃ or higher.

(6) If using the product with vertical mount, the ball screw nut may fall by its weight. Attach a mechanism to prevent it from falling.

(7) Exceeding the permissible rotational speed may lead the components to be damaged or cause an accident. Be sure to use the product within the specification range designated by THK.

(8) Forcefully driving in the ball screw shaft or the ball screw nut may cause an indentation on the raceway. Use care when mounting the components.

(9) If an offset or skewing occurs with the ball screw shaft support and the ball screw nut, it may substantially shorten the service life. Pay attention to components to be mounted and to the mounting accuracy.

(10) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, a vacuum and a low/high temperature, contact THK in advance.

(11) Letting the ball screw nut overshoot will cause balls to fall off or the ball-circulating components to be damaged.

[Storage]

When storing the Ball Screw, enclose it in a package designated by THK and store it in a horizontal orientation while avoiding a high temperature, a low temperature and a high humidity.

Lead Screw Nut

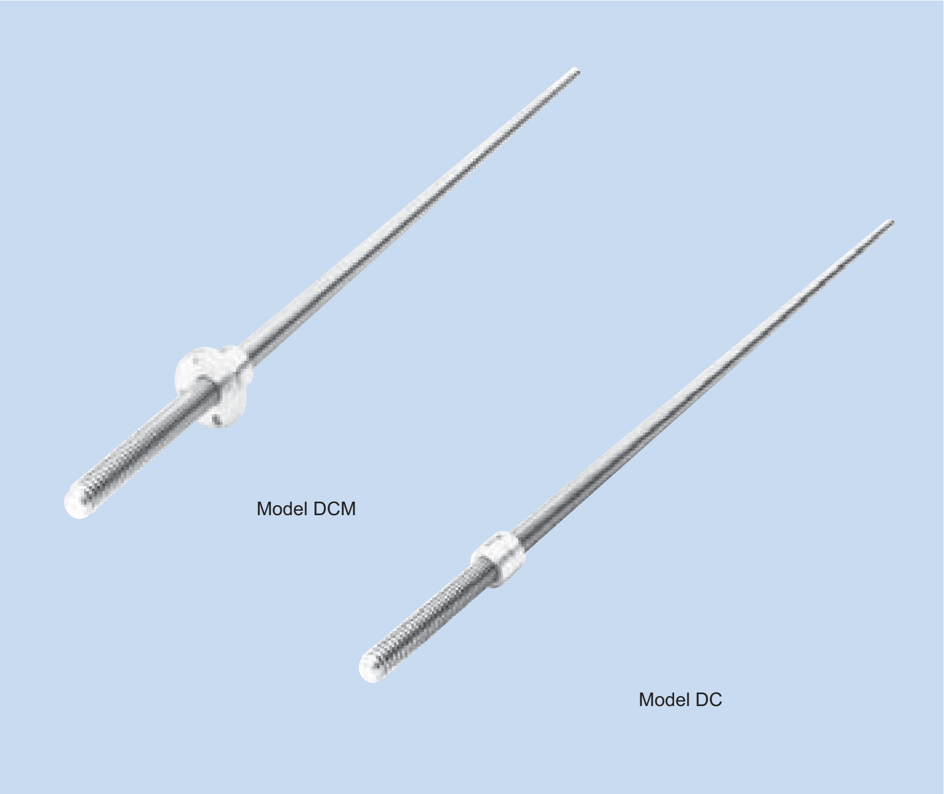
THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Lead Screw Nut



Structure and Features

The lead Screw Nut models DCM and DC are manufactured to meet the standards for the 30° trapezoidal threads. They use a special alloy (see A-831) for the nuts and have a precision male thread, formed through die casting, as the core. As a result, these bearings achieve less unevenness in accuracy and higher accuracy and wear resistance than the machined lead screw nuts.

For the screw shafts to be used with this product, the rolled shafts are available as the standard.

In addition, the cut screw shafts and the ground screw shafts are also available according to the application. Contact THK for details.

Features of the Special Rolled Shafts

The dedicated rolled shafts with the standardized lengths are available for the Lead Screw Nut.

[Increased Wear Resistance]
The shaft teeth are formed by cold gear rolling, and the surface of the tooth surface is hardened to over 250 HV and are mirror-finished. As a result, the shafts are highly wear resistant and achieve significantly smooth motion when used in combination with lead screw nuts.

[Improved Mechanical Properties]
Inside the teeth of the rolled shaft, a fiber flow occurs along the contour of the tooth surface of the shaft, making the structure around the teeth roots dense. As a result, the fatigue strength is increased.

[Additional Machining of the Shaft End Support]
Since each shaft is rolled, additional machining of the support bearing of the shaft end can easily be performed by lathing or milling.

High Strength Zinc Alloy

The high strength zinc alloy used in the lead screw nuts is a material that is highly resistant to seizure and the wear and has a high load carrying capacity. Its composition, the mechanical properties, the physical properties and the wear resistance are given below.

[Composition]

Table1 Composition of the High Strength Zinc Alloy

Unit: %

Item	Description
Aℓ	3 to 4
Cu	3 to 4
Mg	0.03 to 0.06
Be	0.02 to 0.06
Ti	0.04 to 0.12
Zn	Remaining portion

[Mechanical Properties]

Item	Description
Tensile strength	275 to 314 N/mm^2
Tensile yield strength (0.2%)	216 to 245 N/mm^2
Compressive strength	539 to 686 N/mm^2
Compressive yield strength (0.2%)	294 to 343 N/mm^2
Fatigue strength	132 $N/mm^2 \times 10^7$ (Schenk bending test)
Charpy impact	0.098 to 0.49 $N\text{-}m/mm^2$
Elongation	1 to 5 %
Hardness	120 to 145 HV

[Physical Properties]

Item	Description
Specific gravity	6.8
Specific heat	460 J/ (kg・K)
Melting point	390 ℃
Thermal expansion coefficient	24×10^{-6}

[Wear Resistance]

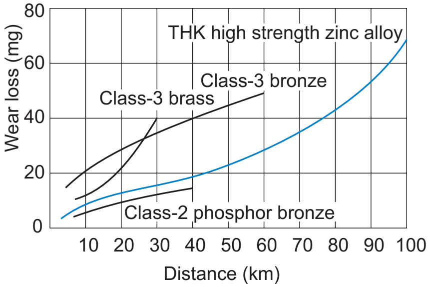


Fig.1 Wear Resistance of the High Strength Zinc Alloy

[Test conditions: Amsler wear-tester]

Item	Description
Test piece rotational speed	185 min^{-1}
Load	392 N
Lubricant	Dynamo oil

Selecting a Lead Screw Nut

[Dynamic Permissible Torque T and Dynamic Permissible Thrust F]

The dynamic permissible torque (T) and the dynamic permissible thrust (F) are the torque and the thrust at which the contact surface pressure on the tooth surface of the bearing is 9.8 N/mm². These values are used as a measuring stick for the strength of the lead screw nut.

[pV Value]

With a sliding bearing, a pV value, which is the product of the contact surface pressure (p) and the sliding speed (V), is used as a measuring stick to judge whether the assumed model can be used. Use the corresponding pV value indicated in Fig.1 as a guide for selecting a lead screw nut. The pV value varies also according to the lubrication conditions.

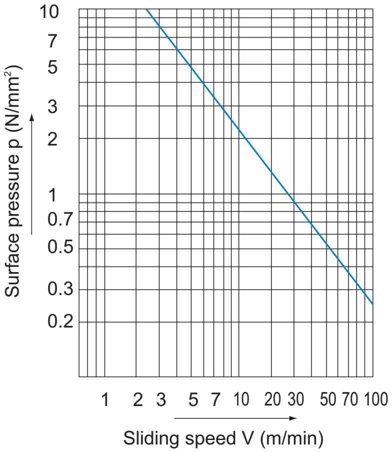


Fig.1 pV Value

● fs: Safety Factor

To calculate a load applied to the lead screw nut, it is necessary to accurately obtain the effect of the inertia that changes with the weight and dynamic speed of an object. In general, with the reciprocating or the rotating machines, it is not easy to accurately obtain all the factors such as the effect of the start and stop, which are always repeated. Therefore, if the actual load cannot be obtained, it is necessary to select a bearing while taking into account the empirically obtained safety factors (f_S) shown in Table1.

Table1 Safety Factor (f_S)

Type of load	Lower limit of f_S
For a static load less frequently used	1 to 2
For an ordinary single-directional load	2 to 3
For a load accompanied by vibrations/impact	4 or greater

● f_T: Temperature Factor

If the temperature of the lead screw nut exceeds the normal temperature range, the seizure resistance of the nut and the strength of the material will decrease. Therefore, it is necessary to multiply the dynamic permissible torque (T) and the dynamic permissible thrust (F) by the corresponding temperature factor indicated in Fig.2.
Accordingly, when selecting a lead screw nut, the following equations need to be met in terms of its strength.
Dynamic permissible torque(T)

$$f_S \leqq \frac{f_T \cdot T}{P_T}$$

Static permissible thrust(F)

$$f_S \leqq \frac{f_T \cdot F}{P_F}$$

f_S : Safety factor (see A-833Table1)
f_T : Temperature factor (see Fig.2)
T : Dynamic permissible torque (N-m)
P_T : Applied torque (N-m)
F : Dynamic permissible thrust (N)
P_F : Axial load (N)

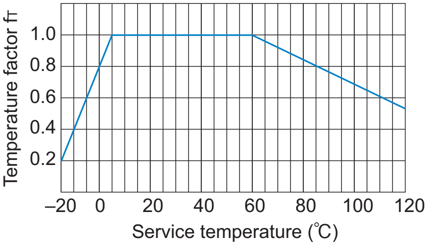


Fig.2 Temperature Factor

● Hardness of the Surface and the Wear Resistance

The hardness of the shaft significantly affects the wear resistance of the lead screw nut. If the hardness is equal to or less than 250 HV, the abrasion loss increases as indicated in Fig.3. The roughness of the surface should preferably be 0.80a or less.
A special rolled shaft achieves the surface hardness of 250 HV or greater, through hardening as a result of rolling, and surface roughness of 0.20a or less. Therefore, the dedicated rolled shaft is highly wear resistant.

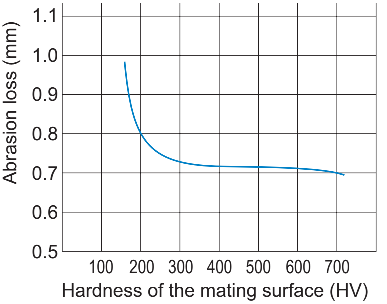


Fig.3 Hardness of the Surface and Wear Resistance

[Calculating the Contact Surface Pressure p]

The value of "p" is obtained as followed.

$$p = \frac{P_F}{F} \times 9.8$$

p : Contact surface pressure on the tooth from an axial load (P_F N) (N/mm²)
F : Dynamic permissible thrust (N)
P_F : Axial load (N)

[Calculating the Sliding Speed V on the Teeth]

The value of "V" is obtained as followed.

$$V = \frac{\pi \cdot D_o \cdot n}{\cos\alpha \times 10^3}$$

V : Sliding speed (m/min)
Do : Effective diameter (mm)
(see specification table)
n : Rotation speed per minute (min⁻¹)
α : Lead angle (degree)
(see specification table)
R : Lead (mm)

[Example of Calculation]

Assuming that Lead Screw Nut model DCM is used, select a lead screw nut that travels at feed speed S = 3 m/min while receiving an axial load P_F = 1,080 N, which is applied in one direction. First, tentatively select model DCM32 (dynamic permissible thrust F = 21,100 N). Obtain the contact surface pressure (p).

$$p = \frac{P_F}{F} \times 9.8 = \frac{1080}{21100} \times 9.8 \fallingdotseq 0.50 \text{ N/mm}^2$$

Obtain the sliding speed (V).
The rotation speed per minute (n) of the screw shaft needed to move it at feed speed S = 3 m/min is calculated as follows.

$$n = \frac{S}{\ell \times 10^{-3}} = \frac{3}{6 \times 10^{-3}} = 500 \text{ min}^{-1}$$

$$V = \frac{\pi \cdot D_o \cdot 500}{\cos\alpha \times 10^3} = \frac{\pi \times 29 \times 500}{\cos 3^\circ 46' \times 10^3} \fallingdotseq 45.6 \text{ m/min}$$

From the diagram of pV values (see Fig.1 on A-833), it is judged that there will be no abnormal wear if the sliding speed (V) is 47 m/min or below against the "p" value of 0.50 N/mm². Second, obtain the safety factor (f_S) against the dynamic permissible thrust (F). Given the conditions: temperature factor f_T = 1 and applied load P_F= 1,080 N, the safety factor is calculated as follows.

$$f_S \leqq \frac{f_T \cdot F}{P_F} = \frac{1 \times 21100}{1080} = 19.5$$

Since the required strength will be met if "f_S" is at least 2 because of the type of load, it is appropriate to select model DCM32.

Efficiency and Thrust

The efficiency (η) at which the screw transfers a torque into thrust is obtained from the following equation.

$$\eta = \frac{1 - \mu\tan\alpha}{1 + \mu/\tan\alpha}$$

η : Efficiency
α : Lead angle
μ : Frictional resistance

Fig.4 shows the result of the above equation.

The thrust generated when a torque is applied is obtained from the following equation.

$$Fa = \frac{2 \cdot \pi \cdot \eta \cdot T}{R \times 10^{-3}}$$

Fa : Thrust generated (N)
T : Torque (input) (N-m)
R : Lead (mm)

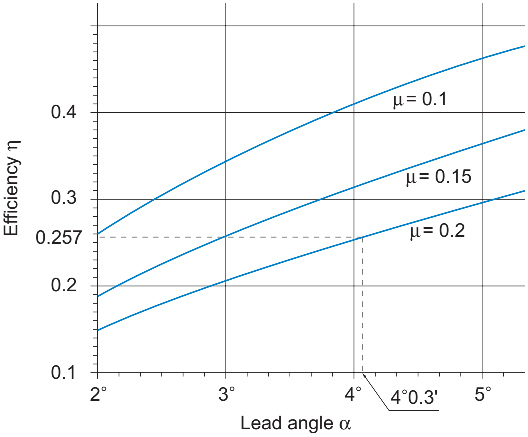


Fig.4 Efficiency

[Example of Calculation]

Assuming that Lead Screw Nut model DCM20 is used and the input torque T = 19.6 N-m, obtain the thrust to be generated.
Calculate the efficiency (η) when μ = 0.2.
The lead angle (α) of model DCM20: 4°03'
From the diagram in Fig.4, the efficiency (η) when the friction coefficient μ = 0.2 is obtained as η = 0.257.
Obtain the thrust generated.

$$Fa = \frac{2 \cdot \pi \cdot \eta \cdot T}{R \times 10^{-3}} = \frac{2 \times \pi \times 0.25 \times 19.6}{4 \times 10^{-3}} \fallingdotseq 7700\ N$$

Accuracy Standards

Table2 Accuracy of the Screw Shaft of Models DCM and DC

Unit: mm

Shaft symbol	Rolled shaft	Cut shaft	Ground shaft
Accuracy	T^{Note}	K^{Note}	G^{Note}
Single pitch error (max)	±0.020	±0.015	±0.005
Accumulated pitch error (max)	±0.15/300	±0.05/300	±0.015/300

Note) Symbols T, K and G indicate machining methods for the screw shaft. The cut shafts and ground shafts are build-to-order.

Fit

For the fitting between the lead screw nut circumference and the housing, we recommend a loose fitting or a tight fitting.
Housing inner-diameter tolerance: H8 or J8

Installation

[About Chamfer of the Housing's Mouth]

To increase the strength of the root of the flange of the lead screw nut, the corner is machined to have an R shape. Therefore, it is necessary to chamfer the inner edge of the housing's mouth.

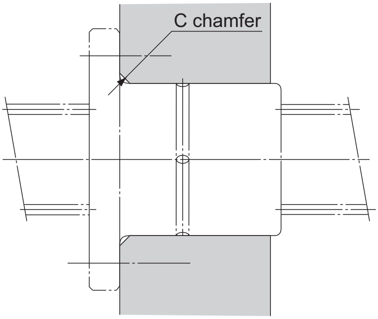


Fig.1

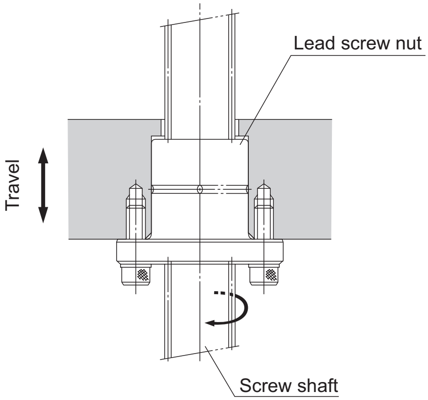
Table1 Chamfer of the Housing's Mouth

Unit: mm

Model No.	Chamfer of the mouth C (Min.)
DCM	
12	2
14	
16	
18	
20	
22	2.5
25	
28	
32	
36	3
40	
45	
50	

[Recommended Mounting Orientation]

When vertically conveying a heavy object using the screw shaft, it is safe to mount the screw as shown in Fig.2 where supports are provided on the mounting holes to prevent the moving object from falling even if the lead screw nut is broken due to an overload or an impact.



Shaft rotation
(Shaft side fixed)

Fig.2 Recommended Mounting Orientation

[Example of Installation]

Fig.3 shows examples of mounting the lead screw nuts. When mounting a lead screw nut, secure sufficient tightening strength in the axial direction. For the housing inner-diameter tolerance, see the section concerning fitting on A-838.

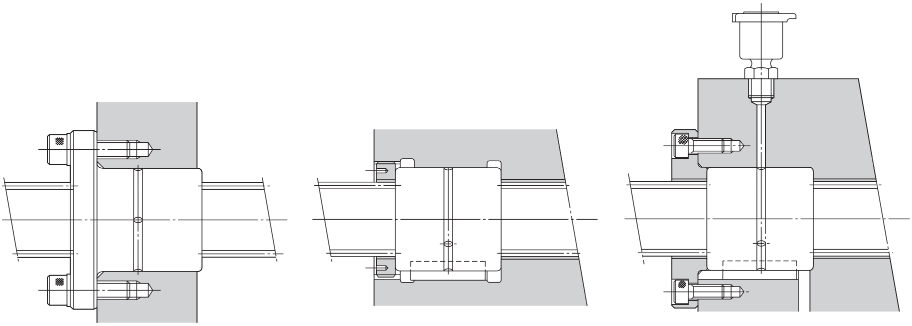


Fig.3 Examples of Installing the Lead Screw Nut

Lubrication

Select a lubrication method according to the conditions of the lead screw nut.

[Oil Lubrication]

For a lubrication of the lead screw nut, an oil lubrication is recommended. Specifically, an oil-bath lubrication or drop the lubrication is particularly effective. An oil-bath lubrication is the most appropriate method since it meets harsh conditions such as high speed, a heavy load or an external heat transmission and it cools the lead screw nut. The drop lubrication is appropriate for low to medium speed and a light to medium load. Select a lubricant according to the conditions as indicated in Table2.

Table2 Selection of a Lubricant

Condition	Types of Lubricants
Low speed, high load, high temperature	High-viscosity sliding surface oil or turbine oil
High speed, light load, low temperature	Low-viscosity sliding surface oil or turbine oil

[Grease Lubrication]

In the low-speed feed, which occurs less frequently, the user can lubricate the slide system by manually applying grease to the shaft on a regular basis or using the greasing hole on the lead screw nut. We recommend using lithium-soap group grease No. 2.

Change Nut

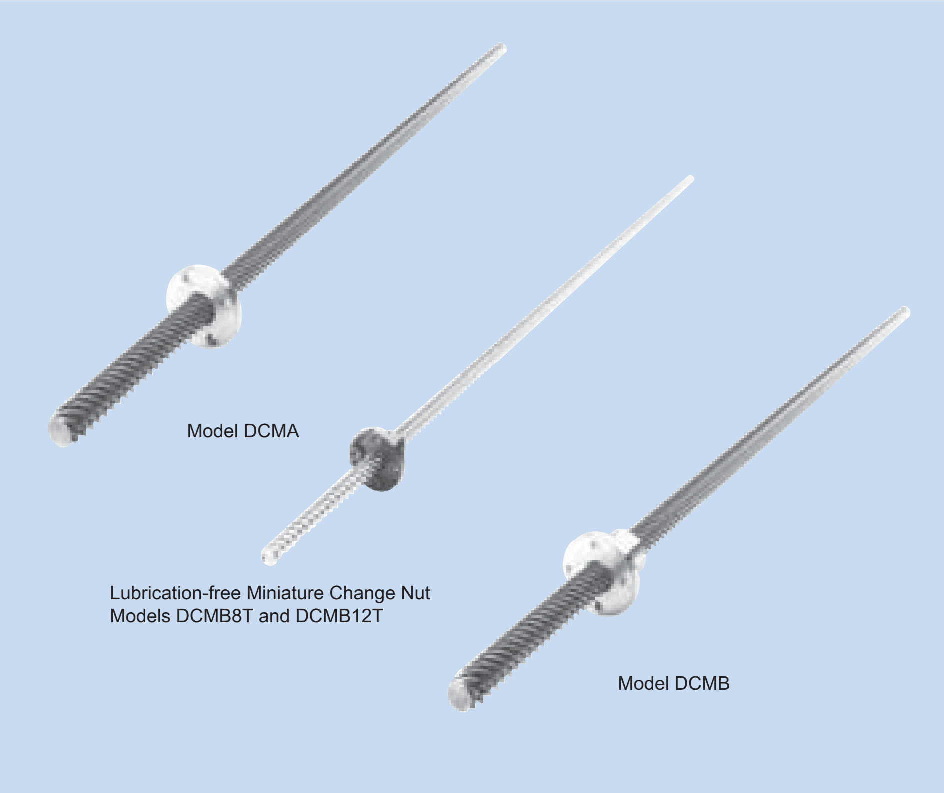
THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Change Nut



Structure and Features

The Change Nut models DCMA and DCMB have a lead angle of 45°, which is difficult to achieve through machining. Each model is capable of converting a straight motion to a rotary motion, or a vise versa, at 70% efficiency. Because of the large leads, they are optimal for providing a fast feed mechanism at a low-speed rotation. The multi-thread screw shafts to be combined with these change nuts are formed through cold gear rolling. The surface of the teeth is hardened to over 250 HV and mirror-finished. As a result, the shafts are highly wear resistant and achieve significantly smooth motion when used in combination with these change nuts. Models DCMA40, DCMB40 or higher are designed for use in combination with the cut screw shafts.

The Miniature Change Nuts are made of an oil-impregnated plastic, and have a wear resistance and excel in lubrication especially in an oil-less operation. In addition, since the high level of their performances can be maintained for a long period, they allow long-term maintenance-free operation.

Features of the Special Rolled Shafts

Dedicated rolled shafts with the standardized lengths are available for the Change Nut.

[Increased Wear Resistance]
The shaft teeth are formed by cold gear rolling, and the tooth surface is hardened to over 250 HV and mirror-finished. As a result, the shafts are highly wear resistant and achieve significantly smooth motion when used in combination with the nuts.

[Improved Mechanical Properties]
Inside the teeth of the rolled shaft, a fiber flow occurs along the contour of the tooth surface of the shaft, making the structure around the teeth roots dense. As a result, the fatigue strength is increased.

[Additional Machining of the Shaft End Support]
Since each shaft is rolled, additional machining of the support bearing of the shaft end can easily be performed by lathing or milling.

High Strength Zinc Alloy

The high strength zinc alloy used in the change nuts is a material that is highly resistant to seizure and the wear and has a high load carrying capacity. Its composition, the mechanical properties, the physical properties and the wear resistance are given below.

[Composition]

Table1 Composition of the High Strength Zinc Alloy

Unit: %

Item	Description
Aℓ	3 to 4
Cu	3 to 4
Mg	0.03 to 0.06
Be	0.02 to 0.06
Ti	0.04 to 0.12
Zn	Remaining portion

[Mechanical Properties]

Item	Description
Tensile strength	275 to 314 N/mm^2
Tensile yield strength (0.2%)	216 to 245 N/mm^2
Compressive strength	539 to 686 N/mm^2
Compressive yield strength (0.2%)	294 to 343 N/mm^2
Fatigue strength	132 N/mm^2 × 10^7 (Schenk bending test)
Charpy impact	0.098 to 0.49 N-m/mm^2
Elongation	1 to 5 %
Hardness	120 to 145 HV

[Physical Properties]

Item	Description
Specific gravity	6.8
Specific heat	460 J/(kg•K)
Melting point	390 ℃
Thermal expansion coefficient	24 × 10^{-6}

[Wear Resistance]

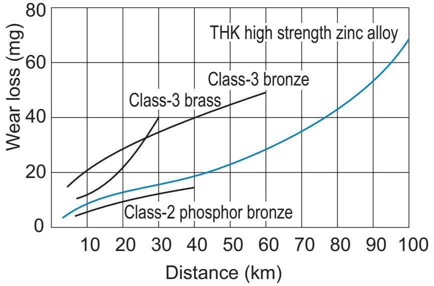


Fig.1 Wear Resistance of the High Strength Zinc Alloy

[Test conditions: Amsler wear-tester]

Item	Description
Test piece rotational speed	185 min^{-1}
Load	392 N
Lubricant	Dynamo oil

Selecting a Change Nut

[Dynamic Permissible Torque T and Dynamic Permissible Thrust F]

The dynamic permissible torque (T) and the dynamic permissible thrust (F) are the torque and the thrust at which the contact surface pressure on the tooth surface of the bearing is 9.8 N/mm^2. These values are used as a measuring stick for the strength of the chang nut.

[pV Value]

With a sliding bearing, a pV value, which is the product of the contact surface pressure (p) and the sliding speed (V), is used as a measuring stick to judge whether the assumed model can be used. Use the corresponding pV value indicated in Fig.1 as a guide for selecting a change nut. The pV value varies also according to the lubrication conditions.

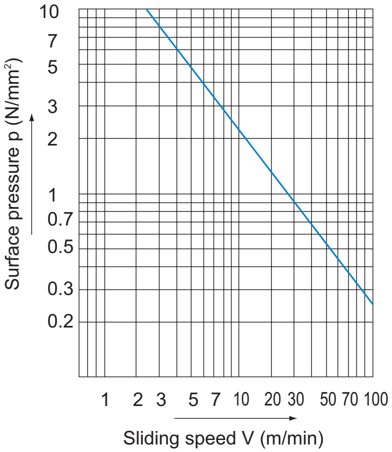


Fig.1 pV Value

● f_S: Safety Factor

To calculate a load applied to the change nut, it is necessary to accurately obtain the effect of the inertia that changes with the weight and the dynamic speed of an object. In general, with the reciprocating or the rotating machines, it is not easy to accurately obtain all the factors such as the effect of the start and stop, which are always repeated. Therefore, if the actual load cannot be obtained, it is necessary to select a bearing while taking into account the empirically obtained safety factors (f_S) shown in Table1.

Table1 Safety Factor (f_S)

Type of load	Lower limit of f_S
For a static load less frequently used	1 to 2
For an ordinary single-directional load	2 to 3
For a load accompanied by vibrations/impact	4 or greater

● f_T: Temperature Factor

If the temperature of the change nut exceeds the normal temperature range, the seizure resistance of the nut and the strength of the material will decrease. Therefore, it is necessary to multiply the dynamic permissible torque (T) and the dynamic permissible thrust (F) by the corresponding temperature factor indicated in Fig.2.

Note) In the case of a miniature Change Nut, be sure to use it at 60℃ or below.

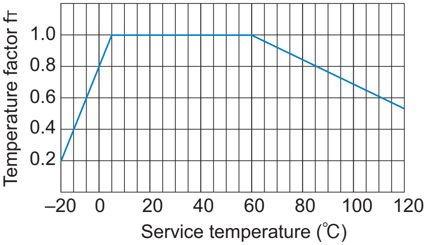


Fig.2 Temperature Factor

Accordingly, when selecting a change nut, the following equations need to be met in terms of its strength.

Dynamic permissible torque(T)

$$f_S \leqq \frac{f_T \cdot T}{P_T}$$

Static permissible thrust(F)

$$f_S \leqq \frac{f_T \cdot F}{P_F}$$

f_S : Static safety factor (see Table1 on A-845)
f_T : Temperature factor (see Fig.2)
T : Dynamic permissible torque (N-m)
P_T : Applied torque (N-m)
F : Dynamic permissible thrust (N)
P_F : Axial load (N)

● Hardness of the Surface and Wear Resistance

The hardness of the shaft significantly affects the wear resistance of the change nut. If the hardness is equal to or less than 250 HV, the abrasion loss increases as indicated in Fig.3. The roughness of the surface should preferably be 0.80a or less.

A special rolled shaft achieves surface hardness of 250 HV or greater, through hardening as a result of rolling, and surface roughness of 0.20a or less. Thus, the dedicated rolled shaft is highly wear resistant.

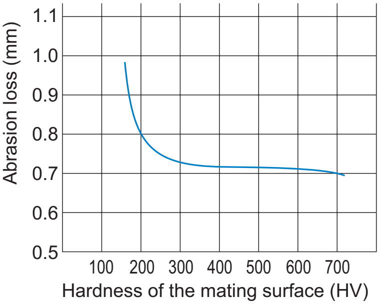


Fig.3 Hardness of the Surface and Wear Resistance

[Calculating the Contact Surface Pressure p]

The value of "p" is obtained as followed.

- **If an axial load is applied:**

$$p = \frac{P_F}{F} \times 9.8$$

p : Contact surface pressure on the tooth from an axial load (P_F N) (N/mm²)
F : Dynamic permissible thrust (N)
P_F : Axial load (N)

- **If a torque is applied:**

$$p = \frac{P_T}{T} \times 9.8$$

p : Contact surface pressure on the tooth under a load torque (P_T N-m) (N/mm²)
T : Dynamic permissible torque (N-m)
P_T : Applied torque (N-m)

[Calculating the Sliding Speed V on the Teeth]

The value of "V" is obtained as followed.

$$V = \frac{\sqrt{2} \cdot \pi \cdot Do \cdot n}{10^3}$$

V : Sliding speed (m/min)
Do : Effective diameter
(see specification table) (mm)
n : Rotation speed per minute (min⁻¹)
R : Lead (mm)

[Example of Calculation]

Assuming that Change Nut model DCMB is used, select a screw nut that travels at feed speed S = 10 m/min while receiving an axial load P_F = 1,760 N accompanied by vibrations.
Obtain the pV value.
First, tentatively select model DCMB25T (dynamic permissible thrust F = 12,700 N).
Obtain the contact surface pressure (p).

$$p = \frac{P_F}{F} \times 9.8 = \frac{1760}{12700} \times 9.8 \fallingdotseq 1.36\ \mathrm{N/mm^2}$$

Obtain the sliding speed (V). The revolutions per minute (n) of the screw shaft needed to move it at feed speed S = 10 m/min is calculated as follows.

$$n = \frac{S}{R \times 10^{-3}} = \frac{3}{73.3 \times 10^{-3}} \fallingdotseq 136\mathrm{min}^{-1}$$

$$V = \frac{\sqrt{2} \cdot \pi \cdot Do \cdot n}{10^3} = \frac{\sqrt{2} \times \pi \times 23.1 \times 136}{10^3} \fallingdotseq 14.0\ \mathrm{m/min}$$

From the diagram of pV values (see Fig.1 on A-845), it is judged that there will be no abnormal wear if the sliding speed (V) is 16m/min or below against the "p" value of1.36 N/mm².

Second, obtain the safety factor (f_S) against the dynamic permissible thrust (F).
Given the conditions:
Temperature factor f_T = 1, and
Applied load P_F= 1,760 N, the safety factor is calculated as follows.

$$f_S \leqq \frac{f_T \cdot F}{P_F} = \frac{1 \times 12700}{1760} = 7.2$$

Since the required strength will be met if "f_S" is at least 4 because of the type of load, it is appropriate to select model DCMB25T.

Efficiency, Thrust and Torque

The efficiency (η) of the change nut in relation to the friction coefficient (μ) is indicated in Table2.

Table2 Friction Coefficient and Efficiency

Frictional coefficient (μ)	0.1	0.15	0.2
Efficiency (η)	0.82	0.74	0.67

The thrust generated when a torque is applied is obtained from the following equation.

$$F_a = 2\cdot\pi\cdot\eta\cdot T/R\times10^{-3}$$

Fa : Thrust generated (N)
T : Torque (input) (N-m)
R : Lead (mm)

Also, the torque generated when a thrust is applied is obtained from the following equation.

$$T = \eta\cdot F_a\cdot R\times10^{-3}/2\pi$$

T : Torque generated (N-m)
Fa : Thrust (input) (N)
R : Lead (mm)

[Example of Calculation - 1]

Assuming that Change Nut model DCMB20T is used and the torque T is equal to 19.6 N-m, obtain the thrust to be generated.
If "μ" is 0.2, the efficiency "η" is 0.67 (see Table2), and the generated thrust (Fa) is calculated as follows.

$$F_a = 2\cdot\pi\cdot\eta\cdot T/R\times10^{-3} = \frac{2\times\pi\times0.67\times19.6}{60\times10^{-3}} \fallingdotseq 1370\ \mathrm{N}$$

[Example of Calculation - 2]

Assuming that Change Nut model DCMB20T is used and the thrust Fa is equal to 980 N, obtain the torque to be generated.
If "μ" is 0.2, the efficiency "η" is 0.67 (see Table2), and the generated torque (T) is calculated as follows.

$$T = \frac{\eta\cdot F_a\cdot R\times10^{-3}}{2\pi} = \frac{0.67\times980\times60\times10^{-3}}{2\pi} = 6.27\ \mathrm{N\cdot m}$$

Accuracy Standards

Table3 Accuracy of the Screw Shaft of Models DCMA and DCMB

Unit: mm

Shaft symbol	Rolled shaft
Accuracy	T$^{\text{Note}}$
Single pitch error (max)	±0.025
Accumulated pitch error (max)	±0.2/300

Note) Symbol T indicates the machining method for the screw shaft.

Fit

For the fitting between the change nut circumference and the housing, we recommend a loose fitting or a tight fitting.

Housing inner-diameter tolerance: H8 or J8

Installation

[About Chamfer of the Housing's Mouth]

To increase the strength of the root of the flange of the change nut, the corner is machined to have an R shape. Therefore, it is necessary to chamfer the inner edge of the housing's mouth.

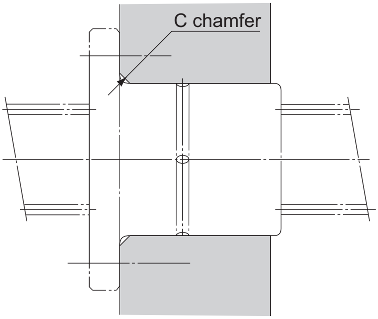


Fig.1

Table1 Chamfer of the Housing's Mouth

Unit: mm

Model No. DCMA DCMB	Chamfer of the mouth C (Min.)
8	1.2
12	1.5
15	2
17	
20	
25	2.5
30	
35	3
40	
45	
50	

[Recommended Mounting Orientation]

When vertically conveying a heavy object using the screw shaft, it is safe to mount the screw as shown in Fig.2 where supports are provided on the mounting holes to prevent the moving object from falling even if the change nut is broken due to an overload or an impact.

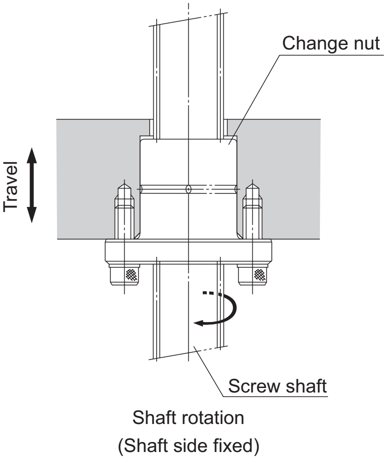


Fig.2 Recommended Mounting Orientation

Lubrication

Select a lubrication method according to the conditions of the change nut.

[Oil Lubrication]

For the lubrication of the change nut, an oil lubrication is recommended. Specifically, an oil-bath lubrication or a drop lubrication is particularly effective. An oil-bath lubrication is the most appropriate method since it meets the harsh conditions such as a high speed, a heavy load or an external heat transmission and it cools the change nut. The drop lubrication is appropriate for the low to medium speed and a light to medium load. Select a lubricant according to the conditions as indicated in Table2.

Table2 Selection of a Lubricant

Conditions	Types of Lubricants
Low speed, high load, high temperature	High-viscosity sliding surface oil or turbine oil
High speed, light load, low temperature	Low-viscosity sliding surface oil or turbine oil

[Grease Lubrication]

In a low-speed feed, which occurs less frequently, the user can lubricate the slide system by manually applying the grease to the shaft on a regular basis or using the greasing hole on the change nut. We recommend using the lithium-soap group grease No. 2.

[Initial Lubrication of the Miniature Change Nut]

Since the Miniature Change Nut is made of oil-impregnated plastics, it can be used without the lubrication during an operation. For the initial lubrication, use some oil or grease. Note that lubricants containing large amount of extreme pressure agent are not suitable.

Cross-Roller Ring

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Cross-Roller Ring

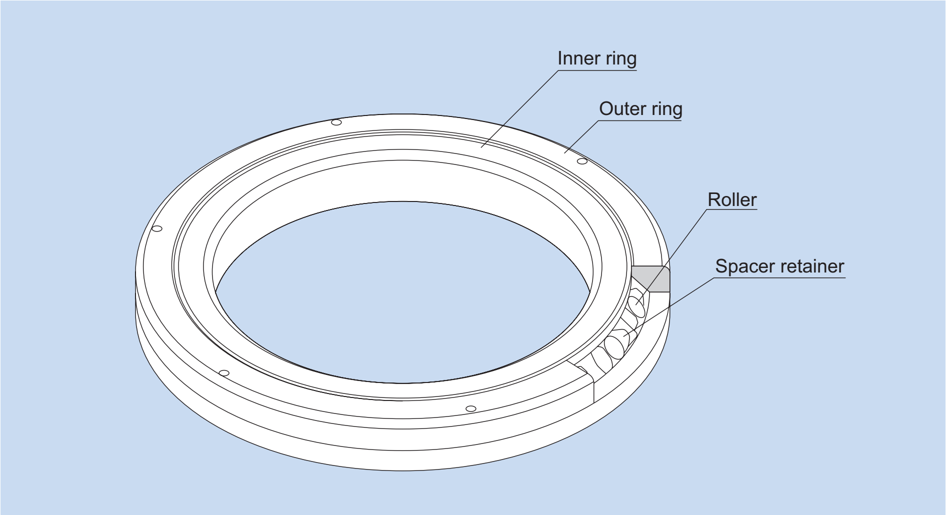


Fig.1 Structure of Cross Roller-Ring Model RB

Structure and Features

With the Cross-Roller Ring, cylindrical rollers are arranged with each roller perpendicular to the adjacent roller, in a 90° V groove, separated from each other by a spacer retainer. This design allows just one bearing to receive loads in all directions including radial, axial and moment loads.
Since the Cross-Roller Ring achieves high rigidity despite the minimum possible dimensions of the inner and outer rings, it is optimal for applications such as joints and swiveling units of industrial robots, swiveling tables of machining centers, rotary units of manipulators, precision rotary tables, medical equipment, measuring instruments and IC manufacturing machines.

[High Rotation Accuracy]

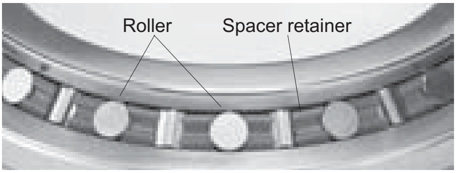
The spacer retainer fitting among cross-arrayed rollers prevents rollers from skewing and the rotational torque from increasing due to friction between rollers. Unlike conventional types using steel sheet retainers, the Cross-Roller Ring does not cause unilateral contact of roller or seize. Thus, even under a preload, the Cross-Roller Ring provides stable rotation.
Since the inner and outer rings are designed to be separable, the bearing clearance can be adjusted. In addition, a preload can be applied. These features enable accurate rotation.

[Easy Handling]

The inner and outer rings, which are separable, are secured to the Cross-Roller Ring body after being installed with rollers and spacer retainers in order to prevent the rings from separating from each other. Thus, it is easy to handle the rings when installing the Cross-Roller Ring.

[Skewing Prevention]

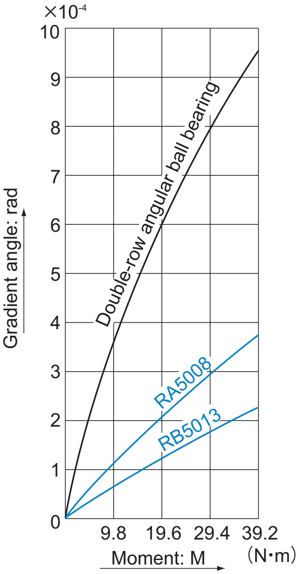
The spacer retainer keeps rollers in their proper position, thereby preventing them from skewing (tilted rollers). This eliminates friction between rollers, and therefore secures a stable rotational torque.

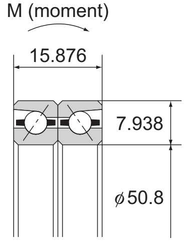


[Increased Rigidity (Three to Four Times Greater than the Conventional Type)]

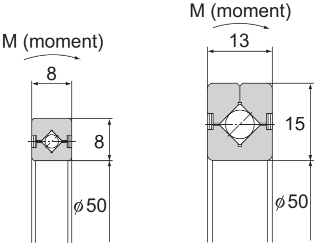
Unlike the thin angular ball bearings installed in double rows, the cross array of rollers allows a single Cross-Roller Ring unit to receive loads in all directions, increasing the rigidity to three to four times greater than the conventional type.

Moment Rigidity Diagram





Angular Ball Bearing



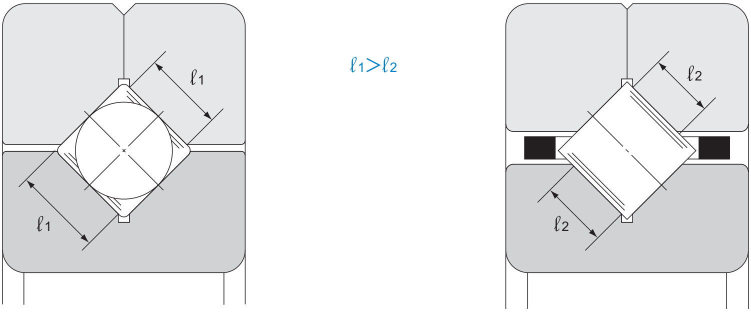
Model RA5008 Model RB5013

Cross Roller Ring

[Large Load Capacity]

(1) Compared with conventional steel sheet retainers, the spacer retainer allows a longer effective contact length of each roller, thus significantly increasing the load capacity.
The spacer retainer guides rollers by supporting them over the entire length of each roller, whereas the conventional type of retainer supports them only at a point at the center of each roller. Such one-point contact cannot sufficiently prevent skewing.

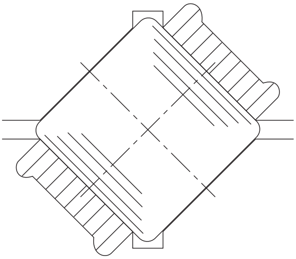
Roller contact length



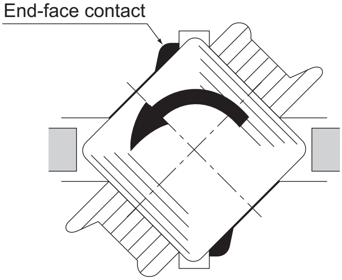
With a spacer retainer

With a steel sheet retainer (conventional type)

(2) In conventional types, the loaded areas are asymmetrical between the outer ring and the inner ring sides around the roller longitudinal axis. The greater the applied load is, the greater the moment becomes, leading end-face contact to occur. This causes frictional resistance, which hinders smooth rotation and quickens wear.



Loaded areas symmetrical
With a spacer retainer



Loaded areas asymmetrical
With a steel sheet retainer (conventional type)

Types of the Cross-Roller Ring

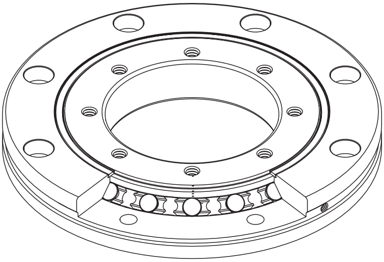
Types and Features

Model RU (Integrated Inner/Outer Ring Type)

Specification Table⇒B-796

Since holes are drilled for mounting, the need for a presser flange and a housing is eliminated.Also, owing to the integrated inner/outer ring type stryucture with washer, there is almost no effect from installation on performance, allowing stable rotational accuracy and torque to be obtained.

Can be used for both outer and inner ring rotation.



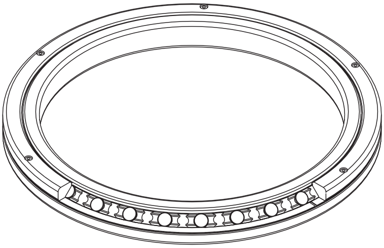
Model RU

Model RB (Separable Outer Ring Type for Inner Ring Rotation)

Specification Table⇒B-798

Cross-Roller Ring basic type, with a separable outer ring, and an inner ring integrated with the main body.It is used in locations where the rotational accuracy of the inner ring is required.

It is used, for example, in the swivel portions of index tables of machine tools.

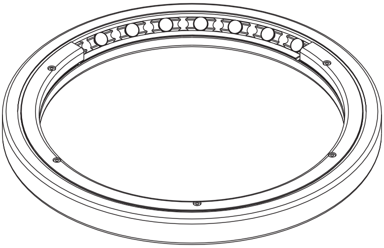


Model RB

Model RE (Two-piece Inner Ring Type for Outer Ring Rotation)

Specification Table⇒B-801

Main dimensions are the same as model RB. This model is used in locations where the rotational accuracy of the outer ring is required.

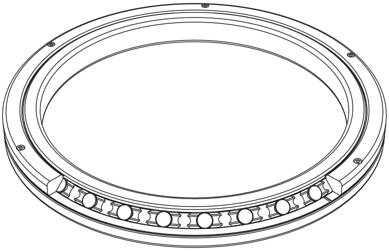


Model RE

USP-Grade Series of Models RB and RE

Specification Table⇒B-804

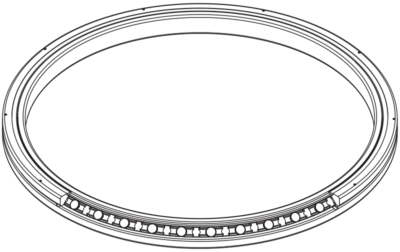
The rotation accuracy of the USP-Grade Series achieves the ultra precision grade that surpasses the world's highest accuracy standards such as JIS Class 2, ISO Class 2, DIN P2 and AFBMA ABCE9.



Model RA (Separable Outer Ring Type for Inner Ring Rotation)

Specification Table⇒B-805

A compact type similar to model RB with the thinnest possible inner and outer rings.
Optimal for locations requiring a light-weight and compact design such as the swivel portions of robots and manipulators.

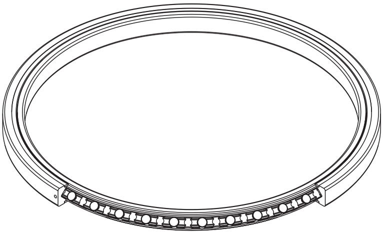


Model RA

Model RA-C (Singe-Split Type)

Specification Table⇒B-806

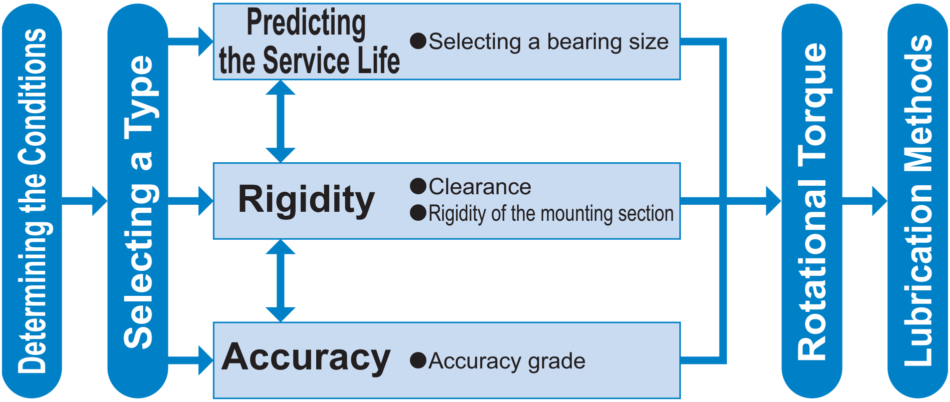
The main dimensions are the same as that of model RA.Owing to its Single-split Outer Ring structure with a highly rigid outer ring, this model can be used for outer ring rotation.



Model RA-C

Selecting a Cross-Roller Ring

The following diagram shows a typical procedure for selecting a Cross-Roller Ring.



- Inner ring rotating······Model RB
- Outer ring rotating······Model RE
- Mounting space···Models RA-C and RA

Nominal Life

The service life of the Cross-Roller Ring is obtained from the following equation.

$$L = \left(\frac{f_T \cdot C}{f_W \cdot P_C}\right)^{\frac{10}{3}} \times 10^6$$

L : Nominal life
(The total number of revolutions that 90% of a group of identical Cross-Roller Ring units independently operating under the same conditions can achieve without showing flaking from rolling fatigue)
C : Basic dynamic load rating* (N)
P_C : Dynamic equivalent radial load (N)
f_T : Temperature factor (see Fig.1)
f_W : Load factor (see Table1)

* The basic dynamic load rating (C) of the Cross-Roller Ring shows the radial load with interlocked direction and magnitude, under which the nominal life (L) is 1 million revolutions when a group of identical Cross-Roller Ring units independently operate under the same conditions. The basic dynamic load rating (C) is indicated in the specification tables.

[Dynamic Equivalent Radial Load P_C]

The dynamic equivalent radial load of the Cross-Roller Ring is obtained from the following equation.

$$P_C = X \cdot \left(F_r + \frac{2M}{dp}\right) + Y \cdot F_a$$

P_C : Dynamic equivalent radial load (N)
Fr : Radial load (N)
Fa : Axial load (N)
M : Moment (N-mm)
X : Dynamic radial facto (see Table2)
Y : Dynamic axial factor (see Table2)
dp : Roller pitch circle diameter (mm)

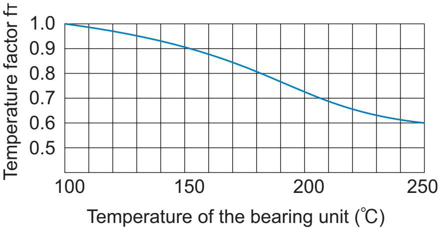


Fig.1 Temperature Factor (f_T)

Note) The normal service temperature is 80 ℃ or below. If the product is to be used at a higher temperature, contact THK.

Table1 Load Factor (f_W)

Service condition	f_W
Smooth motion without impact	1 to 1.2
Normal motion	1.2 to 1.5
Motion with severe impact	1.5 to 3

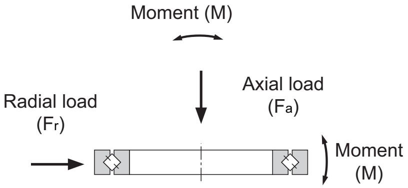


Fig.2

Table2 Dynamic Radial Factor and Dynamic Axial Factor

Classification	X	Y
$\frac{Fa}{Fr + 2M/dp} \leqq 1.5$	1	0.45
$\frac{Fa}{Fr + 2M/dp} > 1.5$	0.67	0.67

- If Fr = 0N and M = 0 N-mm, perform calculation while assuming that X = 0.67 and Y = 0.67.
- For service life calculation with a preload taken into account, contact THK.

[Example of Calculating the Nominal Life]

Assuming that model RB25025 is used under the following conditions, calculate its nominal life (L).

m_1 =100 kg
m_2 =200 kg
m_3 =300 kg
D_1 =300 mm
D_2 =150 mm
H =200 mm
C =69.3 kN
C_0 =150 kN
dp =277.5 mm
F =100 N
ω =2 rad/s(ω: angular velocity)

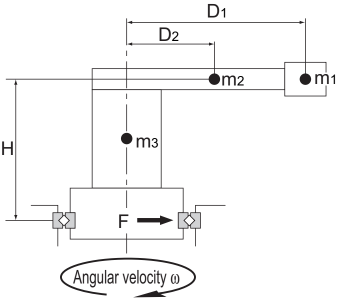


Fig.3

Radial load : Fr $=F+m_1\cdot D_1\times10^{-3}\cdot\omega^2+m_2\cdot D_2\times10^{-3}\cdot\omega^2$
$= 100+100\cdot300\times10^{-3}\cdot2^2+200\cdot150\times10^{-3}\cdot2^2$
$=340$ N

Axial load : Fa $=(m_1+m_2+m_3)\times g$
$=(100+200+300)\times9.807$
$=5884.2$ N

Moment :M $=m_1\cdot g\times D_1+m_2\cdot g\times D_2+(m_1\cdot D_1\times10^{-3}\cdot\omega^2+m_2\cdot D_2\times10^{-3}\cdot\omega^2)\times H$
$=100\cdot9.807\times300+200\cdot9.807\times150+$
$(100\cdot300\times10^{-3}\cdot2^2+200\cdot150\times10^{-3}\cdot2^2)\times200$
$=636420$ N·mm

$$\frac{Fa}{Fr+2M/dp}=\frac{5884.2}{340+2\times636420/277.5}=1.19\leqq1.5$$

∴X =1 , Y =0.45

Therefore, the dynamic equivalent radial load (P_c) is obtained as follows.

$$P_C=X\left(Fr+\frac{2M}{dp}\right)+Y\cdot Fa=1\times\left(340+\frac{2\cdot636420}{277.5}\right)+0.45\times5884.2=7574.7\ \text{N}$$

If f_W = 1.2, the nominal life is calculated as follows.Thus, the nominal life (L) is 8.7×10^8 revolutions.

$$L=\left(\frac{f_T\cdot C}{f_W\cdot P_C}\right)^{\frac{10}{3}}=\left(\frac{1\times69.3\times10^3}{1.2\times7574.7}\right)^{\frac{10}{3}}\times10^6=8.7\times10^8\quad\text{Rotation}$$

Static Safety Factor

The basic static load rating C_0 refers to the static load with constant direction and magnitude, under which the calculated contact stress in the center of the contact area between the roller and the raceway under the maximum load is 4000 MPa. (If the contact stress exceeds this level, it will affect the rotation.) This value is indicated as "C_0" in the specification tables. When a load is statically or dynamically applied, it is necessary to consider the static safety factor as shown below.

$$\frac{C_0}{P_0} = f_S$$

f_S : Static safety factor (see Table3)
C_0 : Basic static load rating (N)
P_0 : Static equivalent radial load (N)

Table3 Static Safety Factor (f_S)

Load conditions	Lower limit of f_S
Normal load	1 to 2
Impact load	2 to 3

[Static Equivalent Radial Load P_0]

The static equivalent radial load of the Cross-Roller Ring is obtained from the following equation.

$$P_0 = X_0 \cdot \left(F_r + \frac{2M}{dp} \right) + Y_0 \cdot F_a$$

P_0 : Static equivalent radial load (N)
F_r : Radial load (N)
F_a : Axial load (N)
M : Moment (N-mm)
X_0 : Static radial factor ($X_0=1$)
Y_0 : Static axial factor ($Y_0=0.44$)
dp : Roller pitch circle diameter (mm)

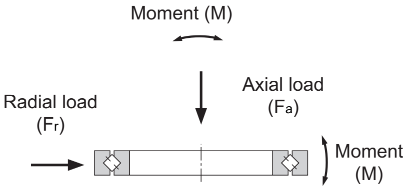


Fig.4

[Example of Calculating a Static Safety Factor]

Assuming that model RB25025 is used under the following conditions, calculate its static safety factor (f_s).

m_1 =100 kg
m_2 =200 kg
m_3 =300 kg
D_1 =300 mm
D_2 =150 mm
H =200 mm
C =69.3 kN
C_0 =150 kN
dp =277.5 mm
F =100 N
ω =2 rad/s(ω: angular velocity)

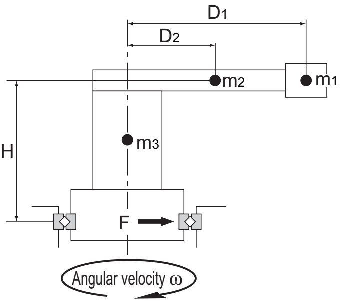


Fig.5

Radial load : Fr $=F+m_1 \cdot D_1 \times 10^{-3} \cdot \omega^2+m_2 \cdot D_2 \times 10^{-3} \cdot \omega^2$
$= 100+100 \cdot 300 \times 10^{-3} \cdot 2^2+200 \cdot 150 \times 10^{-3} \cdot 2^2$
$=340$ N

Axial load : Fa $=(m_1+m_2+m_3) \times g$
$= (100+200+300) \times 9.807$
$=5884.2$ N

Moment :M $=m_1 \cdot g \times D_1+m_2 \cdot g \times D_2+(m_1 \cdot D_1 \times 10^{-3} \cdot \omega^2+m_2 \cdot D_2 \times 10^{-3} \cdot \omega^2) \times H$
$= 100 \cdot 9.807 \times 300+200 \cdot 9.807 \times 150+$
$(100 \cdot 300 \times 10^{-3} \cdot 2^2+200 \cdot 150 \times 10^{-3} \cdot 2^2) \times 200$
$=636420$ N·mm

Therefore, the static equivalent radial load (P_0) is obtained as follows.

$$P_0 = X\left(Fr + \frac{2M}{dp}\right) + Y \cdot Fa = 1 \times \left(340 + \frac{2 \cdot 636420}{277.5}\right) + 0.44 \times 5884.2 = 7515.8 \text{ N}$$

$$\therefore fs = \frac{150 \times 10^3}{7515.8} = 20$$

Thus, the static safety factor (f_s) is 20.

Static Permissible Moment

The static permissible moment (M_0) of the Cross-Roller Ring is obtained from the following equation.

$$M_0 = C_0 \cdot \frac{dp}{2} \times 10^{-3}$$

M_0 : Static permissible moment (kN-m)
C_0 : Basic static load rating (kN)
dp : Roller pitch circle diameter (mm)

[Example of Calculating a Static Permissible Moment]

Model No. RB25025
C =69.3 kN
C_0 =150 kN
dp =277.5 mm
The static permissible moment is calculated as follows.

$$M_0 = C_0 \cdot \frac{dp}{2} \times 10^{-3} = 150 \cdot \frac{277.5}{2} \times 10^{-3} = 20.8\ \mathrm{kN \cdot m}$$

Static Permissible Axial Load

The static permissible axial load (Fa_0) of the Cross-Roller Ring is obtained from the following equation.

$$Fa_0 = \frac{C_0}{Y_0}$$

Fa_0 : Static permissible axial load (kN)
Y_0 : Static axial factor (Y_0=0.44)

[Example of Calculating a Static Permissible Axial Load]

Model No. RB25025
C =69.3 kN
C_0 =150 kN
The static permissible axial load (Fa_0) is calculated as follows.

$$Fa_0 = \frac{C_0}{Y_0} = \frac{150}{0.44} = 340.9\ \mathrm{kN}$$

Accuracy Standards

The Cross-Roller Ring is manufactured with the accuracy and the dimensional tolerance according to Table4 to Table13.

Table4 Rotational Accuracy of the Inner Ring of Model RU

Unit: µm

Model No.	Radial runout tolerance of the inner ring			Axial runout tolerance of the inner ring		
	Grade P5	Grade P4	Grade P2	Grade P5	Grade P4	Grade P2
RU42	4	3	2.5	4	3	2.5
RU66	5	4	2.5	5	4	2.5
RU85	5	4	2.5	5	4	2.5
RU124	5	4	2.5	5	4	2.5
RU148	6	5	2.5	6	5	2.5
RU178	6	5	2.5	6	5	2.5
RU228	8	6	5	8	6	5
RU297	10	8	5	10	8	5
RU445	15	12	7	15	12	7

Note) For model RU, grade P5 is standard rotational accuracy.(Not indicated in model number.)

Table5 Rotational Accuracy of the Outer Ring of Model RU

Unit: µm

Model No.	Radial runout tolerance of the outer ring			Axial runout tolerance of the outer ring		
	Grade P5	Grade P4	Grade P2	Grade P5	Grade P4	Grade P2
RU42	8	5	4	8	5	4
RU66	10	6	5	10	6	5
RU85	10	6	5	10	6	5
RU124	13	8	5	13	8	5
RU148	15	10	7	15	10	7
RU178	15	10	7	15	10	7
RU228	18	11	7	18	11	7
RU297	20	13	8	20	13	8
RU445	25	16	10	25	16	10

Note) For model RU, grade P5 is standard rotational accuracy.(Not indicated in model number.)

Table6 Rotational Accuracy of the Inner Ring of Model RB

Unit: µm

Nominal dimension of the bearing inner diameter (d) (mm)		Radial runout tolerance of the inner ring					Axial runout tolerance of the inner ring				
		Grade 0	Grade PE6	Grade PE5	Grade PE4	Grade PE2	Grade 0	Grade PE6	Grade PE5	Grade PE4	Grade PE2
Above	Or less		Grade P6	Grade P5	Grade P4	Grade P2		Grade P6	Grade P5	Grade P4	Grade P2
18	30	13	8	4	3	2.5	13	8	4	3	2.5
30	50	15	10	5	4	2.5	15	10	5	4	2.5
50	80	20	10	5	4	2.5	20	10	5	4	2.5
80	120	25	13	6	5	2.5	25	13	6	5	2.5
120	150	30	18	8	6	2.5	30	18	8	6	2.5
150	180	30	18	8	6	5	30	18	8	6	5
180	250	40	20	10	8	5	40	20	10	8	5
250	315	50	25	13	10	—	50	25	13	10	—
315	400	60	30	15	12	—	60	30	15	12	—
400	500	65	35	18	14	—	65	35	18	14	—
500	630	70	40	20	16	—	70	40	20	16	—
630	800	80	—	—	—	—	80	—	—	—	—
800	1000	90	—	—	—	—	90	—	—	—	—
1000	1250	100	—	—	—	—	100	—	—	—	—

Table7 Rotational Accuracy of the Outer Ring of Model RE

Unit: µm

Nominal dimension of the bearing outer diameter (D) (mm)		Radial runout tolerance of the outer ring					Axial runout tolerance of the outer ring				
		Grade 0	Grade PE6	Grade PE5	Grade PE4	Grade PE2	Grade 0	Grade PE6	Grade PE5	Grade PE4	Grade PE2
Above	Or less		Grade P6	Grade P5	Grade P4	Grade P2		Grade P6	Grade P5	Grade P4	Grade P2
30	50	20	10	7	5	2.5	20	10	7	5	2.5
50	80	25	13	8	5	4	25	13	8	5	4
80	120	35	18	10	6	5	35	18	10	6	5
120	150	40	20	11	7	5	40	20	11	7	5
150	180	45	23	13	8	5	45	23	13	8	5
180	250	50	25	15	10	7	50	25	15	10	7
250	315	60	30	18	11	7	60	30	18	11	7
315	400	70	35	20	13	8	70	35	20	13	8
400	500	80	40	23	15	—	80	40	23	15	—
500	630	100	50	25	16	—	100	50	25	16	—
630	800	120	60	30	20	—	120	60	30	20	—
800	1000	120	75	—	—	—	120	75	—	—	—
1000	1250	120	—	—	—	—	120	—	—	—	—
1250	1600	120	—	—	—	—	120	—	—	—	—

Table8 Rotational Accuracy of the Inner Ring of Model RA and RA-C

Unit: µm

Nominal dimension of the bearing inner diameter (d) (mm)		Tolerance in radial runout and axial runout
Above	Or less	
40	65	13
65	80	15
80	100	15
100	120	20
120	140	25
140	180	25
180	200	30

Note) If higher accuracy than the above values is required for the inner ring in rotational accuracy for models RA and RA-C, contact THK.

Table9 Rotational Accuracy of the Outer Ring of Model RA-C

Unit: µm

Nominal dimension of the bearing outer diameter (D) (mm)		Tolerance in radial runout and axial runout
Above	Or less	
65	80	13
80	100	15
100	120	15
120	140	20
140	180	25
180	200	25
200	250	30

Note) The rotational accuracy of the outer ring for model RA-C indicates the value before separation.

Table10 Dimensional Tolerance of the Bearing Inner Diameter

Unit: μm

Nominal dimension of the bearing inner diameter (d) (mm)		Tolerance of dm(note 2)							
		Grades 0, P6, P5, P4 and P2		Grade PE6		Grade PE5		Grade PE4 and PE2	
Above	Or less	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
18	30	0	-10	0	-8	0	-6	0	-5
30	50	0	-12	0	-10	0	-8	0	-6
50	80	0	-15	0	-12	0	-9	0	-7
80	120	0	-20	0	-15	0	-10	0	-8
120	150	0	-25	0	-18	0	-13	0	-10
150	180	0	-25	0	-18	0	-13	0	-10
180	250	0	-30	0	-22	0	-15	0	-12
250	315	0	-35	0	-25	0	-18	—	—
315	400	0	-40	0	-30	0	-23	—	—
400	500	0	-45	0	-35	—	—	—	—
500	630	0	-50	0	-40	—	—	—	—
630	800	0	-75	—	—	—	—	—	—
800	1000	0	-100	—	—	—	—	—	—
1000	1250	0	-125	—	—	—	—	—	—

Note1) Standard inner diameter accuracy of models RA, RA-C and RU is 0. For higher accuracy than 0, contact THK.
Note2) "dm" represents the arithmetic average of the maximum and minimum diameters obtained in measuring the bearing inner diameter at two points.
Note3) For accuracy grades in bearing inner diameter with no values indicated in the table, the highest value among low accuracy grades applies.

Table11 Dimensional Tolerance of the Bearing Outer Diameter

Unit: μm

Nominal dimension of the bearing outer diameter (D) (mm)		Tolerance of Dm(note 2)							
		Grades 0, P6, P5, P4 and P2		Grade PE6		Grade PE5		Grade PE4 and PE2	
Above	Or less	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
30	50	0	-11	0	-9	0	-7	0	-6
50	80	0	-13	0	-11	0	-9	0	-7
80	120	0	-15	0	-13	0	-10	0	-8
120	150	0	-18	0	-15	0	-11	0	-9
150	180	0	-25	0	-18	0	-13	0	-10
180	250	0	-30	0	-20	0	-15	0	-11
250	315	0	-35	0	-25	0	-18	0	-13
315	400	0	-40	0	-28	0	-20	0	-15
400	500	0	-45	0	-33	0	-23	—	—
500	630	0	-50	0	-38	0	-28	—	—
630	800	0	-75	0	-45	0	-35	—	—
800	1000	0	-100	—	—	—	—	—	—
1000	1250	0	-125	—	—	—	—	—	—
1250	1600	0	-160	—	—	—	—	—	—

Note1) Standard outer diameter accuracy of models RA, RA-C and RU is 0. For higher accuracy than 0, contact THK.
Note2) "Dm" represents the arithmetic average of the maximum and minimum diameters obtained in measuring the bearing outer diameter at two points.
Note3) For accuracy grades in bearing outer diameter with no values indicated in the table, the highest value among low accuracy grades applies.

Table12 Tolerance in the Width of the Inner and Outer Rings for Models RU

Unit: μm

Model No.	Tolerrance of B	
	Upper	Lower
RU42	0	－75
RU66	0	－75
RU85	0	－75
RU124	0	－75
RU148	0	－75
RU178	0	－100
RU228	0	－100
RU297	0	－100
RU445	0	－100

Table13 Tolerance in the Width of the Inner and Outer Rings (Common to All Grades) for Models RB and RE

Unit: μm

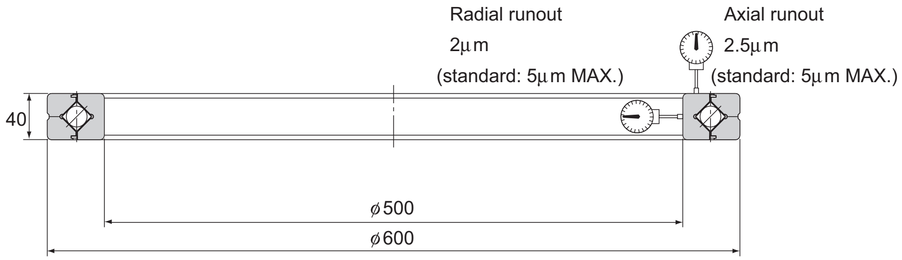
Nominal dimension of the bearing inner diameter (d) (mm)		Tolerrance of B		Tolerrance of B1	
		Applied to the inner ring of RB and the outer ring of RE		Applied to the outer ring of RB and the inner ring of RE	
Above	Or less	Upper	Lower	Upper	Lower
18	30	0	－75	0	－100
30	50	0	－75	0	－100
50	80	0	－75	0	－100
80	120	0	－75	0	－100
120	150	0	－100	0	－120
150	180	0	－100	0	－120
180	250	0	－100	0	－120
250	315	0	－120	0	－150
315	400	0	－150	0	-200
400	500	0	－150	0	-200
500	630	0	－150	0	-200
630	800	0	－150	0	-200
800	1000	0	-300	0	-400
1000	1250	0	-300	0	-400

Note) All B and B1 types of models RA and RA-C are manufactured with tolerance between -0.120 and 0.

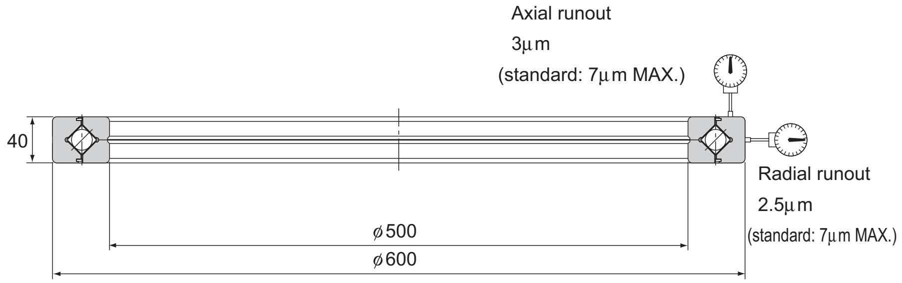
Accuracy Standard of the USP-Grade Series

[Examples of Rotational Accuracy of the USP-Grade Series Cross-Roller Rings]

The rotation accuracy of the USP-Grade Series achieves the ultra precision grade that surpasses the world's highest accuracy standards such as JIS Class 2, ISO Class 2, DIN P2 and AFBMA ABEC9.



Rotational Accuracy of the Inner Ring of Model RB50040CC0USP



Rotational Accuracy of the Outer Ring of Model RE50040CC0USP

[Accuracy Standards]

The USP-grade series of models RB and RE are manufactured with runout accuracies according to Table14.

Table14 Runout Accuracies of the USP-grade Series

Unit: µm

Nominal inner diameter (d) and outer diameter (D) (mm)		Runout accuracy of the inner ring of model RB		Runout accuracy of the outer ring of model RE	
Above	Or less	Radial runout tolerance	Axial runout tolerance	Radial runout tolerance	Axial runout tolerance
80	180	2.5	2.5	3	3
180	250	3	3	4	4
250	315	4	4	4	4
315	400	4	4	5	5
400	500	5	5	5	5
500	630	6	6	7	7
630	800	—	—	8	8

Radial Clearance

Table15 shows the radial clearance of model RU, Table16 that of the standard type of models RB and RE, Table17 that of the USP-grade series of models RB and RE, and Table18 that of the thin type of models RA and RA-C.

Table15 Radial clearance for model RU

Unit: μm

Model No.	CC0		C0	
	Starting torque (N·m)		Radial clearance (μm)	
	Min.	Max.	Min.	Max.
RU42	0.1	0.5	0	25
RU66	0.3	2.2	0	30
RU85	0.4	3	0	40
RU124	1	6	0	40
RU148	1	10	0	40
RU178	3	15	0	50
RU228	5	20	0	60
RU297	10	35	0	70
RU445	20	55	0	100

Note) Model RU clearance CC0 is controlled by starting torque.Starting torque for clearance CC0 does not include seal resistance value.

Table16 Radial Clearances of Models RB and RE

Unit: μm

Pitch circle diameter of the roller (dp) (mm)		CC0		C0		C1	
Above	Or less	Min.	Max.	Min.	Max.	Min.	Max.
18	30	−8	0	0	15	15	35
30	50	−8	0	0	25	25	50
50	80	−10	0	0	30	30	60
80	120	−10	0	0	40	40	70
120	140	−10	0	0	40	40	80
140	160	−10	0	0	40	40	90
160	180	−10	0	0	50	50	100
180	200	−10	0	0	50	50	110
200	225	−10	0	0	60	60	120
225	250	−10	0	0	60	60	130
250	280	−15	0	0	80	80	150
280	315	−15	0	30	100	100	170
315	355	−15	0	30	110	110	190
355	400	−15	0	30	120	120	210
400	450	−20	0	30	130	130	230
450	500	−20	0	30	130	130	250
500	560	−20	0	30	150	150	280
560	630	−20	0	40	170	170	310
630	710	−20	0	40	190	190	350
710	800	−30	0	40	210	210	390
800	900	−30	0	40	230	230	430
900	1000	−30	0	50	260	260	480
1000	1120	−30	0	60	290	290	530
1120	1250	−30	0	60	320	320	580
1250	1400	−30	0	70	350	350	630

Table17 Radial Clearances of USP-grade Series of Models RB and RE

Unit: μm

Pitch circle diameter of the roller (dp) (mm)		CC0		C0	
Above	Or less	Min.	Max.	Min.	Max.
120	160	−10	0	0	40
160	200	−10	0	0	50
200	250	−10	0	0	60
250	280	−15	0	0	80
280	315	−15	0	0	100
315	355	−15	0	0	110
355	400	−15	0	0	120
400	500	−20	0	0	130
500	560	−20	0	0	150
560	630	−20	0	0	170
630	710	−20	0	0	190

Table18 Radial Clearances of Models RA and RA-C

Unit: μm

Pitch circle diameter of the roller (dp) (mm)		CC0		C0	
Above	Or less	Min.	Max.	Min.	Max.
50	80	−8	0	0	15
80	120	−8	0	0	15
120	140	−8	0	0	15
140	160	−8	0	0	15
160	180	−10	0	0	20
180	200	−10	0	0	20
200	225	−10	0	0	20

Moment Rigidity

Fig.6 to Fig.9 show moment rigidity diagrams for the Cross-Roller Ring as a separate unit. Rigidity is affected by the deformation of the housing, presser flange and bolts. Therefore, the strength of these parts must be taken into account.

(Radial clearance: 0)

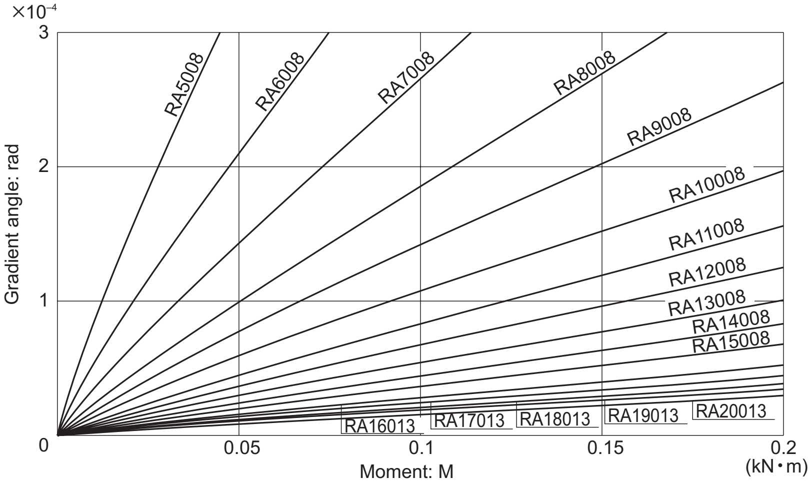


Fig.6

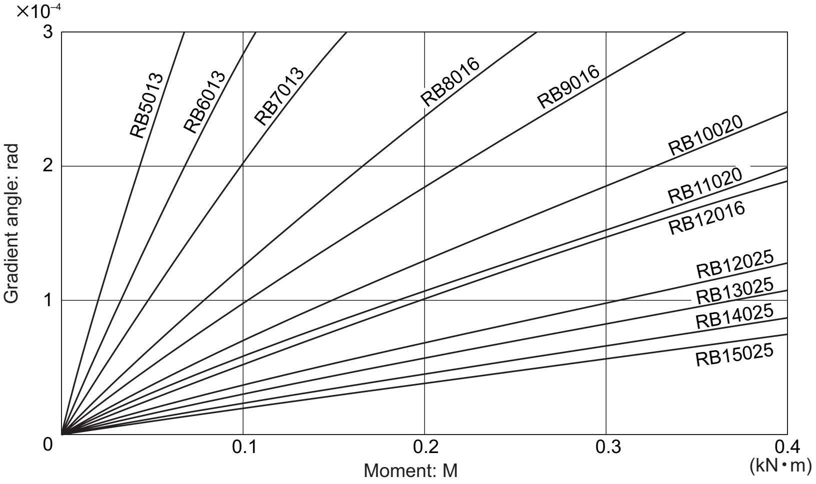


Fig.7

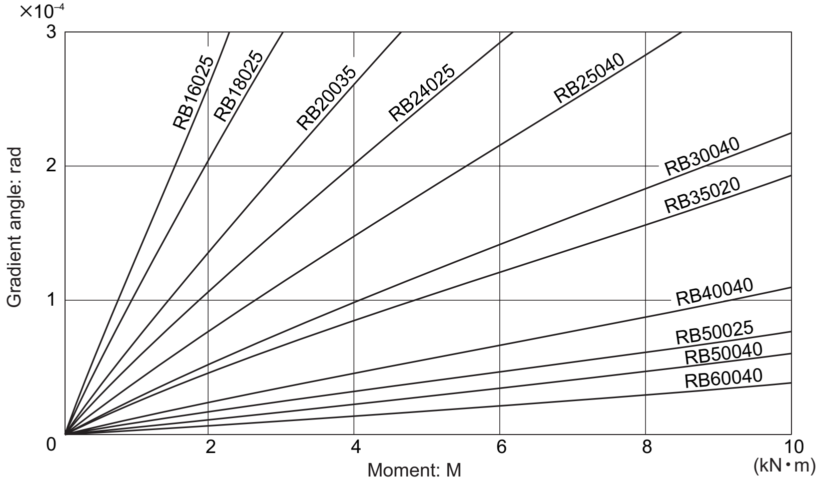

×10⁻⁴
3
2
1
0
Gradient angle: rad
RB16025
RB18025
RB20035
RB24025
RB25040
RB30040
RB35020
RB40040
RB50025
RB50040
RB60040
2
4
6
8
10
Moment: M
(kN･m)

Fig.8

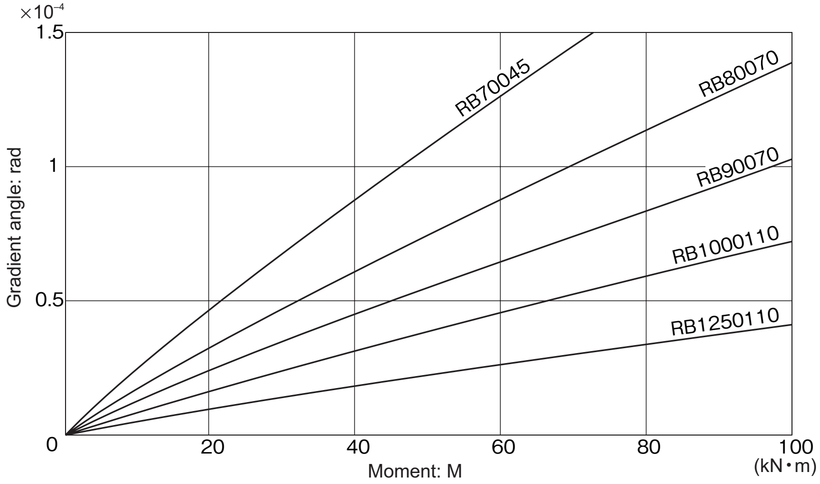

×10⁻⁴
1.5
1
0.5
0
Gradient angle: rad
RB70045
RB80070
RB90070
RB1000110
RB1250110
20
40
60
80
100
Moment: M
(kN･m)

Fig.9

Fit

[Fitting of Models RU]

Fitting for model RU is basically not required. However, for fitting requiring positioning accuracy, h7 and H7 are recommended.

[Fitting of Models RB, RE and RA]

For the fitting of models RB, RE and RA, we recommend using the combinations indicated in Table1.

Table1 Fitting of Models RB, RE and RA

Radial clearance	Service condition		Shaft	Housing
C0	Inner ring rotational load	Normal load	h5	H7
		Large impact and moment	h5	H7
	Outer ring rotational load	Normal load	g5	Js7
		Large impact and moment	g5	Js7
C1	Inner ring rotational load	Normal load	j5	H7
		Large impact and moment	k5	Js7
	Outer ring rotational load	Normal load	g6	Js7
		Large impact and moment	h5	K7

Note) For the fitting for clearance CC0, avoid interference because it will cause an excessive preload. As for the fitting when you have selected clearance CC0 for the joints or swiveling unit of a robot, the combination of g5 and H7 is recommended.

[Fitting of the USP-grade]

For the fitting of the USP-grade series of models RB and RE, we recommend using the combinations indicated in Table2.

Table2 Fitting of the USP-grade

Radial clearance	Condition	Shaft	Housing
CC0	Inner ring rotational load	h5	J7
	Outer ring rotational load	g5	Js7
C0	Inner ring rotational load	j5	J7
	Outer ring rotational load	g5	K7

[Fitting for Model RA-C]

For the fitting of model RA-C, we recommend using the combinations indicated in Table3.

Table3 Fitting for Model RA-C

Radial clearance	Condition	Shaft	Housing
CC0	Inner ring rotational load	h5	J7
	Outer ring rotational load	g5	Js7
C0	Inner ring rotational load	j5	J7
	Outer ring rotational load	g5	K7

Designing the Housing and the Presser Flange

Since the Cross-Roller Ring is a compact, thin device, special consideration must be given to the rigidity of the housing and the presser flange.

With types having a separable outer ring, insufficiency in the strength of the housing, pressure flange or the presser bolt will result in the inability to evenly hold the inner or outer ring, or the deformation of the bearing when a moment load is applied. Consequently, the contact area of the rollers will become uneven, causing the bearing's performance to significantly deteriorate.

Fig.2 shows examples of installing the Cross-Roller Ring.

[Housing]

When determining the thickness of the housing, make sure it is at least 60% of the sectional height of the bearing as a guide.

$$\text{Housing thickness } T = \frac{D-d}{2} \times 0.6 \text{ or greater}$$

(D: outer diameter of the outer ring;
d: inner diameter of the inner ring)

If tapped holes for removing the inner or outer ring (Fig.1) are provided, the ring can be removed without causing damage to the bearing. When removing the outer ring, do not press the inner ring, or vise versa. For the dimensions of the presser on the side(s), see the shoulder dimensions indicated in the corresponding specification table.

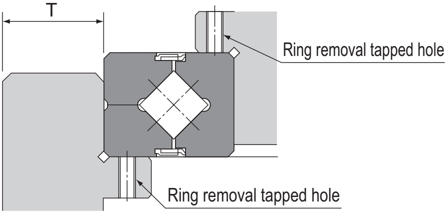
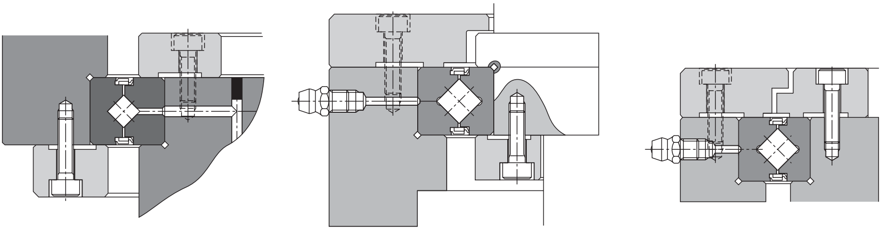


Fig.1



a. Outer ring rotating in the swiveling unit

A heavy body part is mounted after the inner and outer rings are secured.

b. Inner ring rotating in the swiveling unit
(with seals attached)

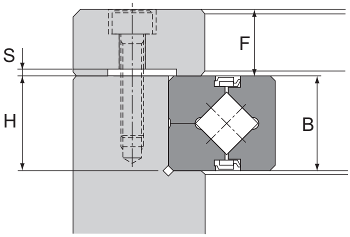
c. Inner and outer rings secured in the same direction in the swiveling unit
(with seals attached)

Fig.2 Example of Installation

[Presser Flange and Presser Bolt]

When determining the thickness of the presser flange (F) or the clearance of the flange section (S), refer to the dimensions indicated below as a guide.

As for the number of the presser bolts, the greater the number of the bolts, the more stable the system becomes. As a guide, however, it is normally appropriate to use the number of bolts indicated in Table4 and equidistantly arrange them.



$F = B\times0.5$ to $B\times1.2$

$H = B^{\,0}_{-0.1}$

$S = 0.5$ mm

Even if the shaft and the housing are made of light alloy, it is recommendable to select a steel-based material for the presser flange.

When tightening the presser bolts, firmly secure them using a torque wrench or the like so that they will not loosen. Table5 shows tightening torques for the housing and presser flanges made of typical steel materials with medium hardness.

Table4 Number of Presser Bolts and Bolt Sizes

Unit: mm

Outer diameter of the outer ring (D)		No. of bolts	Bolt size (reference value)
Above	Or less		
—	100	8 or more	M3 to M5
100	200	12 or more	M4 to M8
200	500	16 or more	M5 to M12
500	—	24 or more	M12 or thicker

Table5 Bolt Tightening Torque Unit: N-m

Screw model No.	Tightening torque	Screw model No.	Tightening torque
M3	2	M10	70
M4	4	M12	120
M5	9	M16	200
M6	14	M20	390
M8	30	M22	530

Procedure for Assembly

When assembling the Cross-Roller Ring, follow the steps below.

[Inspecting the Parts before Assembling Them]

Thoroughly clean the housing and other parts to be assembled, and check if there is no burr or knots.

[Installing the Cross-Roller Ring into the Housing or onto the Shaft]

Since the Cross-Roller Ring is a thin bearing, it tends to tilt as it is installed. To prevent it, gradually drive the Cross-Roller Ring into the housing or onto the shaft by gently hitting it with a plastic hammer while keeping it horizontal. Be sure to keep hammering it with much care until you hear it fully contact the reference surface.

[Attaching the Presser Flange]

(1) Place the presser flange onto the Cross-Roller Ring. Rock the flange several times to match the bolt holes.

(2) Insert the presser bolts into the holes. Manually turn the bolts and make sure they do not show skewing caused by misalignment of the holes.

(3) Fasten the presser bolts in three to four steps from temporary to full fastening by repeatedly securing the bolts in the diagonal order, as shown in Fig.1. When tightening the separable inner or outer ring, slightly turning the integral outer or inner ring will correct the dislocation between the ring and the body.

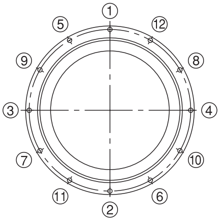


Fig.1 Tightening Sequence

[Handling]

(1) The separable inner or outer ring is fastened in place using special rivets, bolts or nuts when delivered. When installing it to the system, do not disassemble it. Also, erroneously installing the spacer retainer will significantly affect the rotational performance of the system. Do not disassemble the bearing.

(2) The matching mark of the inner or outer ring may be slightly misaligned when delivered. In that case, loosen the bolts that secure the inner or outer ring, and correct the alignment using a plastic hammer or the like, before installing it to the housing. (Let the securing rivets follow the housing.)

(3) When installing or removing the Cross-Roller Ring, do not apply force to the fixing rivets or the bolts.

(4) When mounting the presser flange, take into account the dimensional tolerances of the parts so that the flange firmly holds the inner and outer ring from the side.

(5) Dropping or hitting the Cross-Roller Ring may damage it. Giving an impact force to the bushing could also cause damage even if the product looks intact.

[Lubrication]

(1) Since each Cross-Roller Ring unit contains high-quality lithium soap group grease No. 2, you can start using the product without replenishing grease. However, the product requires regular lubrication since it has a smaller internal space than ordinary roller bearings and because the rollers need frequent lubrication due to their rolling contact structure.

To replenish grease, it is necessary to secure greasing holes that lead to the oil grooves formed on the inner and outer rings. As for the lubrication interval, normally replenish grease of the same group so that it is distributed throughout the interior of the bearing at least every six to twelve months.

When the bearing is filled up with grease, the initial rotational torque temporarily increases. However, surplus grease will run off of the seals and the torque will return to the normal level in a short period. The thin type does not have an oil groove. Secure an oil groove inside the housing for lubrication.

(2) Do not mix greases with different physical properties.

(3) In locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, normal lubricants may not be used. Contact THK for details.

(4) When planning to use a special lubricant, contact THK before using it.

[Precautions on Use]

(1) Entrance of foreign material may cause damage to the ball circulating path or functional loss. Prevent foreign material, such as dust or cutting chips, from entering the system.

(2) Contact THK if you desire to use the product at a temperature of 80℃ or higher.

(3) If planning to use the Cross-Roller Ring in an environment where a coolant penetrates into the product, contact THK.

(4) If foreign material adheres to the product, replenish the lubricant after cleaning the product.

(5) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, contact THK in advance.

Cam Follower

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Cam Follower

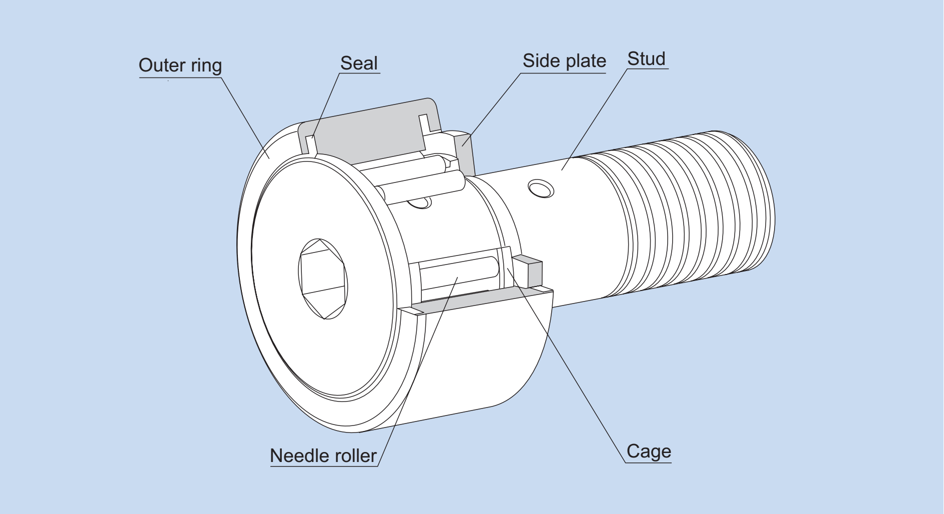


Fig.1 Structure of Cam Follower Model CF···UU-A

Structure and Features

The Cam Follower is a compact and highly rigid bearing with a shaft. It contains needle bearings and is used as a guide roller for cam mechanisms or straight motion.

Since its outer ring rotates while keeping direct contact with the mating surface, this product is thick-walled and designed to bear an impact load.

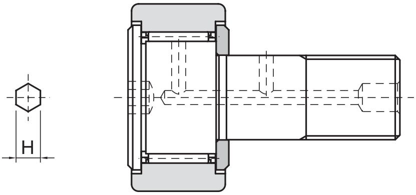
Inside the outer ring, needle rollers and a precision cage are incorporated. This prevents the product from skewing and achieves a superb rotation performance. And, as a result, the product is capable of easily withstanding high-speed rotation.

There are two types of the outer ring in shape: spherical and cylindrical. The spherical outer ring easily absorbs a distortion of the shaft center when the cam follower is installed and helps lighten a biased load.

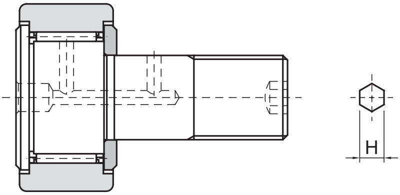
The Cam Follower is used in a wide range of applications such as cam mechanisms of automatic machines, dedicated machines as well as carrier systems, conveyors, bookbinding machines, tool changers of machining centers, pallet changers, automatic coating machines, and sliding forks of automatic warehouses.

Cam Follower with a Hexagon Socket

For Cam Follower model CF, Cam Follower Containing Thrust Balls model CFN and Eccentric Cam Follower model CFH, hexagon socket studs that allow easy eccentricity adjustment are available.
If desiring a hexagon socket on the stud head, add "A" to the end of the model number. If desiring a hexagon socket on the stud thread, add "B". ("B" applies to model CF12 or higher.)



Model CF-A



Model CF-B

The Same Dimension of the Hexagonal Width Across Flats (H Dimension) Applies to Both Type A and Type B.

Cam Follower Containing Thrust Balls

Even a slight mounting error in a high speed cam mechanism operating in a harsh environment could cause abnormal wear to the thrust unit of the cam follower. In such a case, using Cam Follower Containing Thrust Balls model CFN will bring about a significant effect in increasing the durability.
Models CFN5 to 12 are standard-stock items. If desiring a size other than the standard items, contact THK.
Model CFN is capable of receiving a thrust load caused by a slight mounting error. However, it is necessary to minimize a component of thrust force, or prevent it from occurring, when designing the cam mechanism and installing the Cam Follower.

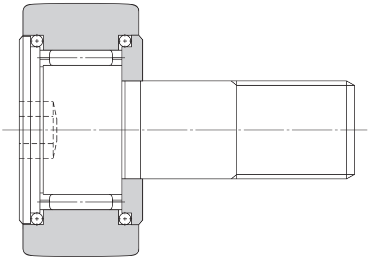


Fig.2

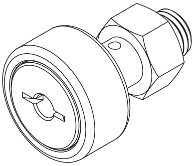
Types of the Cam Follower

Types and Features

Popular Type Cam Follower Model CF

Specification Table⇒B-808

It is a popular type of Cam Follower provided with a driver groove on the head of the stud. A highly corrosion resistant stainless steel type (symbol M) is also available.



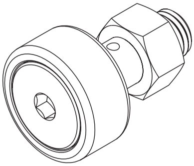
Model CF

Cam Follower with a Hexagon Socket Model CF-A

Specification Table⇒B-810

Since the stud head has a hexagon socket, this model can easily be installed using a hexagon wrench.

A type whose stud screw has a hexagon socket (CF-B) is also available. (applicable to stud diameter of 12 or greater)

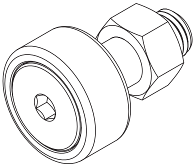


Model CF-A

Eccentric Cam Follower with a Hexagon Socket Model CFH-A

Specification Table⇒B-814

This model can be installed in the same mounting hole as that of model CF. Since the mounting shaft of the stud and the stud head are eccentric by 0.25 mm to 1.0 mm, the position of this model can easily be adjusted simply by turning the stud. Thus, it is a compact, highly accurate eccentric cam follower with an integral structure. As a result, the man-hours for machining and assembly can significantly be reduced because it is unnecessary to align the cam follower with the cam groove and machine the mounting-hole area with precision.

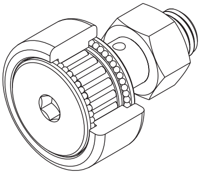


Model CFH-A

Cam Follower Containing Thrust Balls Model CFN

Specification Table⇒B-816

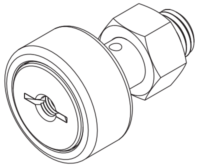
Based on the popular type Cam Follower, this model is incorporated with thrust load balls.



Model CFN

Cam Follower with a Tapped Hole for Greasing Model CFT Specification Table⇒B-818

Basically the same as the popular type Cam Follower, this model is provided with tapped holes for piping on the stud head and the thread. It is optimal for locations where an integrated piping for greasing is required.

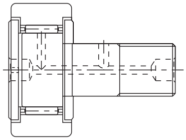
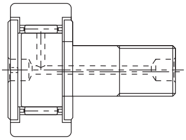
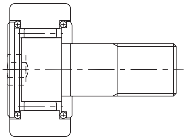


Model CFT

Types and Model Numbers of Cam Followers

The Cam Follower is divided into several types as indicated in Table1.

Table1 Types and Model Numbers of Cam Followers

Type		Popular Type	Eccentric Cam Follower	Containing Thrust Balls
Shape				
Cylindrical outer ring	Stud with a hexagon socket	CF-A (CF···UU-A)	CFH-A (CFH···UU-A)	——
	Stud with a driver groove	CF (CF···UU)	CFH (CFH···UU)	——
	With a tapped hole for greasing	CFT (CFT···UU)	CFHT (CFHT···UU)	——
	Made of stainless steel	CF-M (CF···MUU)	CFH-M (CFH···MUU)	——
Spherical outer ring	Stud with a hexagon socket	CF-R-A (CF···UUR-A)	CFH-R-A (CFH···UUR-A)	CFN-R-A
	Stud with a driver groove	CF-R (CF···UUR)	CFH-R (CFH···UUR)	——
	With a tapped hole for greasing	CFT-R (CFT···UUR)	CFHT-R (CFHT···UUR)	——
	Made of stainless steel	CF-MR (CF···MUUR)	CFH-MR (CFH···MUUR)	——

Note1) The symbols in the parentheses indicate model numbers of types with seals.
Note2) THK also manufactures low-speed full-roller types with long service lives. For these full-roller types, symbol "V" is indicated.
Note3) Symbol M indicates stainless steel type.

Example: CF 12 V UUR
└ Full-roller type

Classification Table

Cam Follower

- **Popular Type**
  - **Stud with a Hexagon Socket Type**
    - **Model CF-A**: Cylindrical Outer Ring
    - **Model CF-B**: Cylindrical Outer Ring
    - **Model CF-R-A**: Spherical Outer Ring
  - **Stud with a Driver Groove Type**
    - **Model CF**: Cylindrical Outer Ring
    - **Model CF-R**: Spherical Outer Ring
  - **With a Tapped Hole for Greasing Type**
    - **Model CFT**: Cylindrical Outer Ring
    - **Model CFT-R**: Spherical Outer Ring
- **Eccentricity Type**
  - **Stud with a Hexagon Socket Type**
    - **Model CFH-A**: Cylindrical Outer Ring
    - **Model CFH-R-A**: Spherical Outer Ring
  - **With a Tapped Hole for Greasing Type**
    - **Model CFHT**: Cylindrical Outer Ring
    - **Model CFHT-R**: Spherical Outer Ring
  - **Stud with a Driver Groove Type**
    - **Model CFH**: Cylindrical Outer Ring
    - **Model CFH-R**: Spherical Outer Ring
- **Containing Thrust Balls**
  - **Stud with a Hexagon Socket T ype**
    - **Model CFN-R-A**: Spherical Outer Ring

Nominal Life

[Static Safety Factor]

The basic static load rating C_0 refers to the static load with constant direction and magnitude, under which the calculated contact stress in the center of the contact area between the roller and the raceway under the maximum load is 4000 MPa. (If the contact stress exceeds this level, it will affect the rotation.) This value is indicated as "C_0" in the dimensional tables. When a load is statically or dynamically applied, it is necessary to consider the static safety factor as shown below.

$$\frac{C_0}{P_0} = f_S$$

f_S : Static safety factor in relation to C_0 (see Table1)
C_0 : Basic static load rating (kN)
P_0 : Radial load (kN)

The permissible load (F_0) indicates the permissible value of the applied load determined by the strength of the stud section of the Cam Follower. Therefore, it is necessary to consider the static safety factor f_M against F_0 as well as f_S.

$$\frac{F_0}{P_0} = f_M$$

f_M : Static safety factor in relation to F_0 (see Table1)
F_0 : Permissible load (kN)
P_0 : Radial load (kN)

Table1 Static Safety Factor (f_S, f_M)

Load conditions	Lower limit of f_S and f_M
Normal load	1 to 2
Impact load	2 to 3

[Nominal Life]

The service life of the Cam Follower is obtained from the following equation.

$$L = \left(\frac{f_T \cdot C}{f_W \cdot P_C}\right)^{\frac{10}{3}} \times 10^6$$

L : Nominal life
(The total number of revolutions that 90% of a group of identical Cam Follower units independently operating under the same conditions can achieve without showing flaking from rolling fatigue)
C : Basic dynamic load rating* (kN)
P_C : Radial load (kN)
f_T : Temperature factor (see Fig.1 on A-886)
f_W : Load factor (see Table2 on A-886)

* The basic dynamic load rating (C) of the Cam Follower shows the load with interlocked direction and magnitude, under which the nominal life (L) is 1 million revolutions when a group of identical Cam Follower units independently operate. The basic dynamic load rating (C) is indicated in the corresponding specification table.

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, the service life time (L_h) is obtained from the following equation.

- **For Linear Motion**

$$L_h = \frac{D \cdot \pi \cdot L}{2 \times \ell_s \cdot n_1 \times 60}$$

L_h : Service life time (h)
L : Nominal life
D : Bearing outer diameter (mm)
ℓ_s : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

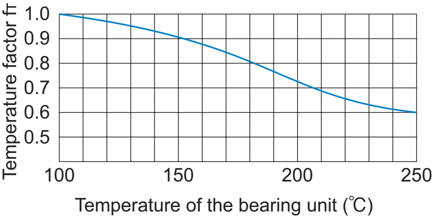


Fig.1 Temperature Factor (f_T)

Note) The normal service temperature is 80 ℃ or below. If the product is to be used at a higher temperature, contact THK.

- **For Rotary Motion**

$$L_h = \frac{D \cdot L}{D_1 \cdot n \times 60}$$

D_1 : Outer ring contact average diameter of the cam (mm)
n : Revolutions per minute of the cam (min^{-1})

Table2 Load Factor (f_W)

Condition	f_W
Smooth motion without impact	1 to 1.2
Normal motion	1.2 to 1.5
Motion with severe impact	1.5 to 3

Accuracy Standards

Cam Followers are manufactured with accuracies according to Table3.

(1) Dimensional tolerance of the cylindrical outer ring in outer diameter D: Table3
(2) Dimensional tolerance of the spherical outer ring in outer diameter D: $^{0}_{-0.05}$
(3) Dimensional tolerance of the Cam Follower in stud diameter d: h7
(4) Dimensional tolerance of the outer ring in width B: $^{0}_{-0.12}$

Table3 Accuracy of the Outer Ring (JIS Class 0)

Unit: μm

Nominal dimension of the bearing outer diameter (D) (mm)		Tolerance of the bearing in outer diameter (Dm) (note)		Tolerance of the outer ring in radial runout (max)
Above	Or less	Upper	Lower	
6	18	0	−8	15
18	30	0	−9	15
30	50	0	−11	20
50	80	0	−13	25
80	120	0	−15	35

Note) "Dm" represents the arithmetic average of the maximum and minimum diameters obtained in measuring the bearing outer diameter at two points.

Track Load Capacity

The track load capacity means the permissible load at which the outer ring of a bearing and the mating surface are capable of withstanding repeated use over a long period.
The track load capacity provided in the specification table indicates the value when using a steel material with tensile strength of 1.24 kN/mm^2 as the mating material. Therefore, it is possible to increase the track load capacity by increasing the hardness of the material. Fig.2 shows the hardness of the mating material and the track capacity factor in relation to tensile strength. To obtain the track load capacity of each mating material, multiply the track load capacity shown in the corresponding specification table by the respective track load factor.

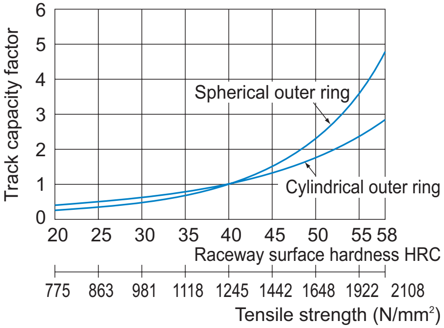


Fig.2 Track Capacity Factor

Note) For the mating material, we recommend using those materials with the raceway hardness of 20 HRC or higher and the tensile strength of 775 N/mm^2 or higher.

[Example of Calculating a Track Load Capacity]

Obtain the track load capacity when heat-treating the mating material, which a bearing whose outer ring has a track load capacity of 5.29 kN contacts, to hardness of 50 HRC.
The track capacity factor when the hardness is 50 HRC is 2.32, as indicated in Fig.2. Therefore, the desired track load capacity is calculated as follows.

The track load capacity=5.29kN×2.32=12.3kN

Radial Clearance

The radial clearances of Cam Followers meet clearance C2 (see Table4).
(Normal clearance applies to full-roller types.)

Table4 Radial Clearance Unit: μm

Model No.	Clearance C2 (with cage)		Normal clearance (full rollers)	
CF, CFN, CFH, CFT and CFHT	Min.	Max.	Min.	Max.
3 to 4	3	17	10	25
5 to 8	5	20	15	30
10 to 12–1	5	25	15	35
16 to 20–1	10	30	20	40
24 to 30–2	10	40	25	55

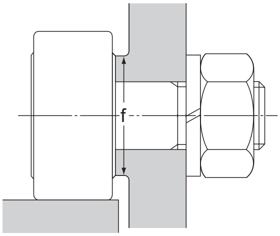
Fit

For the dimensional tolerance of the Cam Follower in stud-mounting hole, we recommend the following fitting.
The dimensional tolerance of the stud-mounting hole: H7

Installation

[Mounting Section]

Establish perpendicularity between the stud-mounting hole and the mounting surface, and chamfer the mouth of the hole to the smallest possible radius, preferably C0.5. Also, the diameter of the mounting surface should preferably be at least equal to the dimension "f" indicated in the specification table.
If the outer ring unilaterally or unevenly contacts the mating raceway, we recommend using model CF-R, whose outer ring circumference is spherically ground.



[Mating Raceway]

For the material of the mating raceway, see Track Load Capacity on A-887.

[About the Mounting Method]

Do not tap the bracket and directly tighten the product without using a nut as shown in Fig.1. Doing so may result in an insufficient tightening torque, or cause the bending stress to concentrate in the male thread and damage the stud if the thread is loosened.

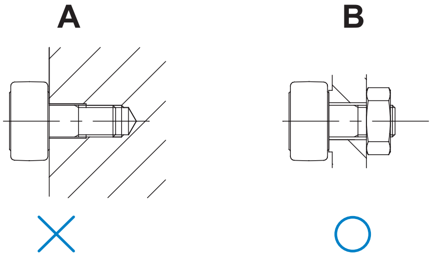


Fig.1

Installation

[Installing the Cam Follower]

If the Cam Follower is to be used under a heavy load, it is necessary to install the product so that the greasing hole on the stud is out of the loaded area. To help identify the position of the greasing hole, the THK logo is marked on the side face of the stud collar. (See Fig.1.)
The vertical hole in the middle of the stud is used as a whirl stop or a greasing hole.

Make sure that the outer ring is evenly in contact with the mating surface. When installing the Cam Follower, also make sure its axis is perpendicular to the traveling direction.

● Tightening Torque for the Stud

Since the stud of the Cam Follower receives bending stress and tensile stress caused by a bearing load, it is necessary to keep the tightening torque of the screw from exceeding the values indicated in Table1.

If the mounting screw may be loosened due to vibrations or impact, use a spring washer, thin nuts of JIS B 1811 Class 3 as double-nuts or a special nut capable of preventing itself from loosening.

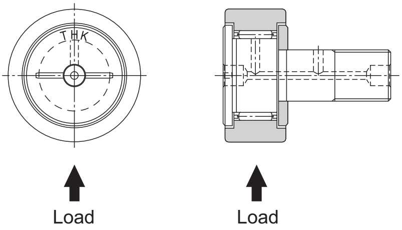


Fig.1 Positions of the THK Logo and the Greasing Holes

Table1 Maximum Tightening Torque of the Screw

Model No CF, CFN, CFH, CFT	Maximum tightening torque N-m
3	0.392
4	0.98
5	1.96
6	2.94
8	7.84
10 10-1	16.7
12 12-1	29.4
16	70.6
18	98
20 20-1	137
24 24-1	245
30 30-1 30-2	480

Note) 1 N-m equals to 0.102 kgf-m.

[Installing the Eccentric Cam Follower]

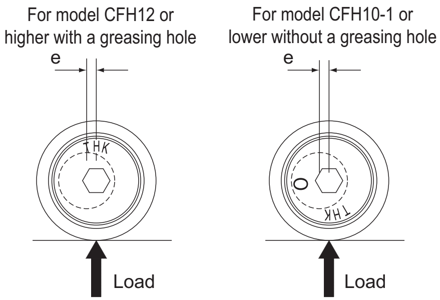
The eccentricity is adjusted in the following steps.

(1) Insert the stud into the mounting hole, and lightly tighten the nut until the nut starts turning. In doing so, position the THK logo in relation to the load direction as shown in Fig.2.

(2) Use the hexagon socket on the stud head to turn the stud and adjust the clearance between the stud and the mating contact surface.

(3) After adjusting the clearance, tighten the nut while keeping the stud from turning. Be sure the maximum tightening torque in Table1 on A-889 is not exceeded.

The surface of the Cam Follower stud is hardened. Take this into account when machining the stud.



The figure shows the position of the THK logo in relation to the eccentricity direction for model CFH12 or higher with a greasing hole.

For model CFH10-1 or lower without a greasing hole, the “O” mark indicates the eccentricity direction. There is no relationship between the THK logo and the eccentricity direction.

Fig.2

Contamination Protection and Lubrication

The Cam Follower models include seal types (model numbers: "···UU"), which are incorporated with special synthetic rubber seals that are highly resistant to wear in order to prevent foreign material from entering the interior of the cam follower and the lubricant from leaking.

Since each Cam Follower unit with seals contains high-quality lithium soap group grease No. 2, you can start using the product without replenishing grease. Exceptionally, model CFN contains AFC Grease.

If your Cam Follower does not have seals, fill grease from the greasing hole on the stud or the inner ring. However, some of the model numbers with stud diameters of 10 mm or less do not have a greasing hole and are provided with initial lubrication only, and therefore do not allow replenishment of grease.

The appropriate fill quantity is a half to one third of the space inside the bearing. The lubrication interval varies depending on the operating conditions. As a guide, however, replenish grease of the same group every six months to two years for types with a cage, or every one to 6 months for full-roller types.

Even with types equipped with seals ("···UU"), surplus grease may seep during the initial operation period or immediately after resumption of grease replenishment. If desiring to avoid contamination of the surrounding area of the machine by grease, first perform seasoning or the like in advance, and then wipe the seeping surplus grease.

When driving the dedicated grease nipple onto the Cam Follower, use a jig like the one shown in Fig.3 to provide pressure to the flange of the nipple.

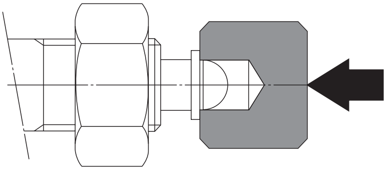


Fig.3

Accessories for the Cam Follower

Table1 shows accessories for standard types of Cam Followers. The dedicated grease nipple is attached at your request. If desiring the dedicated grease nipple, add symbol “N” to the end of the model number.

Example: CF 12 UUR -N

Dedicated grease nipple

Table1 Accessories

Model No.		Plug[note 1]	Plug[note 2]	Nut JIS Class 2	Grease[note 3]
CF CFH	Without seal	Included in package	Included in package	Included in package	Not contained
	With seal	Included in package	Included in package	Included in package	Filled with grease
CFN		Included in package	Included in package	Included in package	Filled with grease
CFT	Without seal	—	—	Included in package	Not contained
	With seal	—	—	Included in package	Filled with grease

Note1) The plug is used to prevent grease from leaking. However, it is not included in the packages of model CF5, and hexagon socket types of models CFN10 (R)-A and CF (CFH) 10-1 (R)-A or lower.

Note2) The plug is used to close an unused greasing hole. However, it is not attached to model CF (CFH) 10-1 or lower.

Note3) All models without a greasing hole are filled with grease when assembled regardless of whether a seal is attached or not.

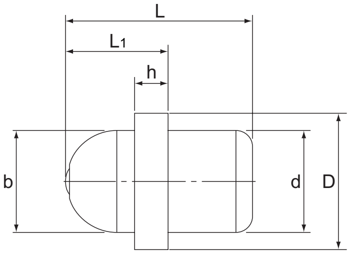


Table2 Specification Table for Grease Nipples

Supported models	Nipple dimensions						Nipple model No.
CF, CFN, CFH	d	b	D	h	L	L_1	
5	3.1	6	7.5	1.5	9	5.5	NP3.2×3.5
6 to 10	4	6	7.5	1.5	10	5.5	PB1021B
12 to 18	6	6	8	2	11	6	NP6×5
20 to 30	8	6	10	3	16	7	NP8×9

Note) The grease nipple is not attached to models CFN10 (R)-A and CF (CFH) 10-1 (R)-A or lower.

Precautions on Use

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Dropping or hitting the Cam Follower may damage it. Giving an impact to it could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Some types of the Cam Follower do not contain grease depending on the size and on whether seals are attached. Carefully refer to Table1 on A-892, and if the desired model does not contain grease, apply grease to the product as necessary before using it. Lithium soap-based grease No. 2 is available as standard. (Use THK AFC Grease for model CFN.)

(2) Do not mix lubricants of different physical properties. In addition, replenish a lubricant also during operation as necessary.

(3) We recommend applying a lubricant to the mating surface where the Cam Follower travels.

[Precautions on Use]

(1) When securing the Cam Follower, use a torque wrench or the like to tighten the product at a torque equivalent to the corresponding value in Table1 on A-889.

(2) When using the product in locations exposed to vibrations or an impact load or in a special environment such as a clean room, vacuum and low/high temperature, contact THK in advance.

(3) Entrance of foreign material such as dust may cause damage or functional loss. Prevent foreign material, such as dust and cutting chips, from entering the product.

(4) Cam Followers are designed for use under a radial load. Do not use the product under a thrust load.

[Storage]

When storing the Cam Follower, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Roller Follower

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Roller Follower

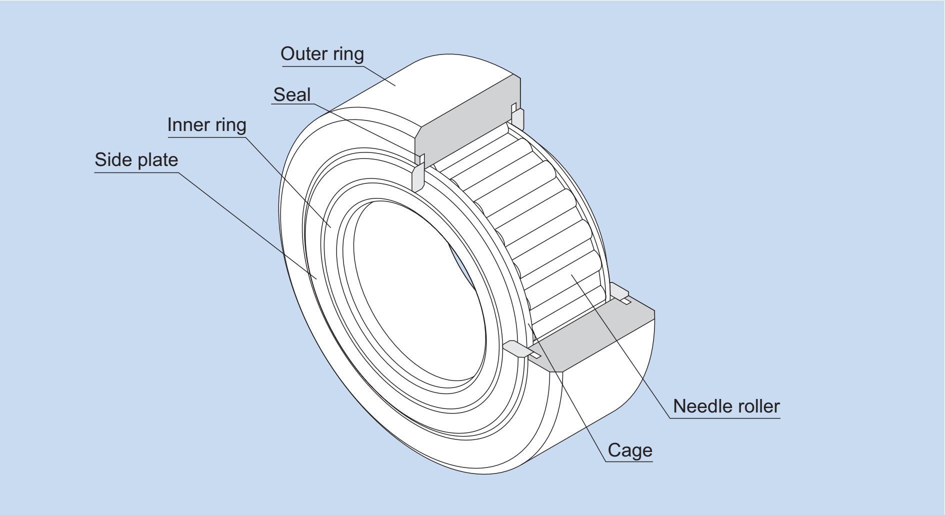


Fig.1 Structure of Roller Follower Model NAST-ZZUU

Structure and Features

The Roller Follower is a compact and highly rigid bearing system. It contains needle bearings and is used as a guide roller for cam discs and straight motion.
Since its outer ring rotates while keeping direct contact with the mating surface, this product is thick-walled and designed to bear an impact load.
Inside the outer ring, needle rollers and a precision cage are incorporated. This prevents the product from skewing and achieves a superb rotation performance. And, as a result, the product is capable of easily withstanding high-speed rotation.
Roller Followers are divided into two types: separable type whose inner ring can be separated, and non-separable type whose inner ring cannot be separated.
There are two types of the outer ring in shape: spherical and cylindrical. The spherical outer ring easily absorbs a distortion of the shaft center when the cam follower is installed and helps lighten a biased load.
The Roller Follower is used in a wide range of applications such as cam mechanisms of automatic machines, dedicated machines as well as carrier systems, conveyors, bookbinding machines, tool changers of machining centers, pallet changers, automatic coating machines, and sliding forks of automatic warehouses.

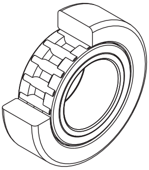
Types of the Roller Follower

Types and Features

Model NAST (Separable Type)

Specification Table⇒B-822

Model NAST is a separable type of bearing system that combines a thick-wall outer ring, an inner ring and needle rollers equipped with a precision cage.



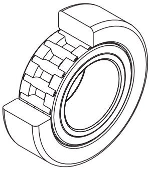
Model NAST

Model NAST-R (Separable Type)

Specification Table⇒B-822

This model is a spherical outer ring type of model NAST.

Since the circumference of the outer ring is spherically ground, it helps lighten a biased load (symbol R).

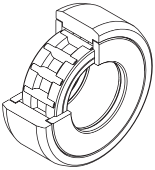


Model NAST-R

Model NAST-ZZ (Separable Type)

Specification Table⇒B-823

This separable type of bearing system has a labyrinth seal consisting of a pair of side plates formed on both sides of the inner ring of model NAST. (Model number of the type attached with seals is NAST-ZZUU.)



Model NAST-ZZ

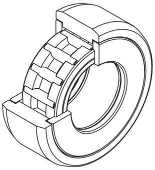
Model NAST- ZZR (Separable Type)

Specification Table⇒B-823

This model is a spherical outer ring type of model NAST-ZZ.

It easily corrects a distortion of the shaft center when the roller follower is installed.

Since the circumference of the outer ring is spherically ground, it helps lighten a biased load (symbol R). (Model number of the type attached with seals is NAST-ZZUUR.)

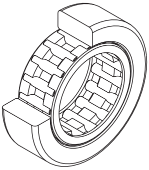


Model NAST-ZZR

Model RNAST (Separable Type)

Specification Table⇒B-824

This model is basically the same as model NAST, but does not have an inner ring.

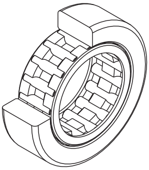


Model RNAST

Model RNAST-R (Separable Type)

Specification Table⇒B-824

This model is basically the same as model NAST-R, but does not have an inner ring.
Since the circumference of the outer ring is spherically ground, it helps lighten a biased load (symbol R).

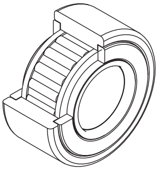


Model RNAST-R

Model NART-R(Non-separable Type)

Specification Table⇒B-825

This model is a non-separable type of bearing system whose inner ring is fixed to the side plates.
Since the circumference of the outer ring is spherically ground, it helps lighten a biased load (symbol R). (Model number of the type attached with seals is NART-UUR.)

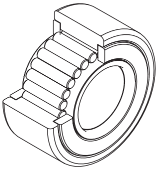


Model NART-R

Model NART-VR (Non-separable Type)

Specification Table⇒B-825

Based on model NART-R, this model is a full-roller bearing suitable for locations where a heavy load is applied in low speed operation.
Since the circumference of the outer ring is spherically ground, it helps lighten a biased load (symbol R). (Model number of the type attached with seals is NART-VUUR.)



Model NART-VR

- Stainless steel types are available for all the above models. (symbol M)

Types of the Roller Follower

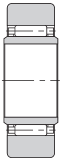
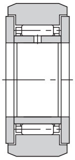
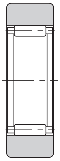
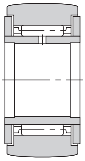
Roller Follower

- Separable Type
  - **Standard Type** Model NAST
  - **Standard Type** Model NAST-R
  - **Type with Side Plate** Model NAST-ZZ
  - **Type with Side Plate** Model NAST-ZZR
  - **Type without Inner Ring** Model RNAST
  - **Type without Inner Ring** Model RNAST-R
- Non-separable Type
  - **Standard Type** Model NART-R
  - **Full-roller Type** Model NART-VR

Types and Model Numbers of the Roller Follower

The Roller Follower is divided into several types as indicated in Table1.

Table1 Types of Roller Follower

Classification		Separable type			Non-separable type
		Standard type	Type with side plate	Type without inner ring	Standard type Full-roller type
Main model No.		NAST	NAST-ZZ	RNAST	NART
Shape					
Cylindrical outer ring	Without seal	NAST NAST-M	NAST-ZZ NAST-ZZM	RNAST RNAST-M	—
	With seal	—	NAST-ZZUU NAST-ZZMUU	—	—
Spherical outer ring	Without seal	NAST-R NAST-MR	NAST-ZZR NAST-ZZMR	RNAST-R RNAST-MR	NART-R NART-MR
	With seal	—	NAST-ZZUUR NAST-ZZMUUR	—	NART-UUR NART-MUUR
Full rollers	Without seal	—	—	—	NART-VR NART-VMR
	With seal	—	—	—	NART-VUUR NART-VMUUR

Symbol M indicates stainless steel type.

Nominal Life

[Static Safety Factor]

The basic static load rating C_0 refers to the static load with constant direction and magnitude, under which the calculated contact stress in the center of the contact area between the roller and the raceway under the maximum load is 4000 MPa. (If the contact stress exceeds this level, it will affect the rotation.) This value is indicated as "C_0" in the specification tables. When a load is statically or dynamically applied, it is necessary to consider the static safety factor as shown below.

$$\frac{C_0}{P_0} = f_S$$

f_S : Static safety factor (see Table2)
C_0 : Basic static load rating (kN)
P_0 : Radial load (kN)

Table2 Static Safety Factor (f_S)

Load conditions	Lower limit of f_S
Normal load	1 to 3
Impact load	3 to 5

[Nominal Life]

The service life of the Roller Follower is obtained from the following equation.

$$L = \left(\frac{f_T \cdot C}{f_W \cdot P_C} \right)^{\frac{10}{3}} \times 10^6$$

L : Nominal life
(The total number of revolutions that 90% of a group of identical Roller Follower units independently operating under the same conditions can achieve without showing flaking from rolling fatigue)
C : Basic dynamic load rating* (kN)
P_c : Radial load (kN)
f_T : Temperature factor (see Fig.1 on A-903)
f_W : Load factor (see Table3 on A-903)

*The basic dynamic load rating (C) of the Roller Follower shows the load with interlocked direction and magnitude, under which the nominal life (L) is 1 million revolutions when a group of identical Roller Follower units independently operate. The basic dynamic load rating (C) is indicated in the corresponding specification table.

[Calculating the Service Life Time]

When the nominal life (L) has been obtained, the service life time (L_h) is obtained from the following equation.

- **For Linear Motion**

$$L_h = \frac{D \cdot \pi \cdot L}{2 \times \ell_s \cdot n_1 \times 60}$$

L_h : Service life time (h)
L : Nominal life
D : Bearing outer diameter (mm)
ℓ_s : Stroke length (mm)
n_1 : Number of reciprocations per minute (min^{-1})

- **For Rotary Motion**

$$L_h = \frac{D \cdot L}{D_1 \cdot n \times 60}$$

D_1 : Outer ring contact average diameter of the cam (mm)
n : Rotation speed per minute of the cam (min^{-1})

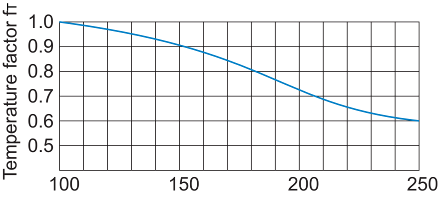


Fig.1 Temperature Factor (f_T)

Note) The normal service temperature is 80 ℃ or below. If the product is to be used at a higher temperature, contact THK.

Table3 Load Factor (f_W)

Service condition	f_W
Smooth motion without impact	1 to 1.2
Normal motion	1.2 to 1.5
Motion with severe impact	1.5 to 3

Accuracy Standards

Roller Followers are manufactured with accuracies in accordance with the following.

(1) Dimensional tolerance of the spherical outer ring in outer diameter D: $^{0}_{-0.05}$
(2) Dimensional tolerance of model RNAST in inscribed bore diameter dr: F6
(3) Dimensional tolerance of model NART in bearing width B_1: Table4
(4) Accuracy of the inner ring and accuracy of the outer ring in width: Table5
(5) Accuracy of the outer ring: Table6

Table4 Dimensional tolerance of model NART in bearing width B_1

Model No. NART	Dimensional tolerance (h12)	
	Upper limit	Lower limit
5 to 12	0	−0.18
15 to 35	0	−0.21
40 to 50	0	−0.25

Table5 Accuracy of the Inner Ring and Accuracy of the Outer Ring in Width (JIS Class 0)

Unit: μm

Nominal dimension of the bearing inner diameter (di) (mm)		Tolerance of the bearing in outer diameter (dm) (note)		Tolerance of the inner ring (or outer ring) in width		Tolerance of the inner ring in radial runout (max)
Above	Or less	Upper	Lower	Upper	Lower	
2.5	10	0	−8	0	−120	10
10	18	0	−8	0	−120	10
18	30	0	−10	0	−120	13
30	50	0	−12	0	−120	15

Note) "dm" represents the arithmetic average of the maximum and minimum diameters obtained in measuring the bearing inner diameter at two points.

Table6 Accuracy of the Outer Ring (JIS Class 0)

Unit: μm

Nominal dimension of the bearing outer diameter (D) (mm)		Tolerance of the bearing in outer diameter (Dm) (note)		Tolerance of the outer ring in radial runout (max)
Above	Or less	Upper	Lower	
6	18	0	−9	15
18	30	0	−9	15
30	50	0	−11	20
50	80	0	−13	25
80	120	0	−15	35

Note) "Dm" represents the arithmetic average of the maximum and minimum diameters obtained in measuring the bearing outer diameter at two points.

Track Load Capacity

The track load capacity means the permissible load at which the outer ring of a Roller Follower and the mating surface are capable of withstanding repeated use over a long period.
The track load capacity provided in the specification table, indicates the value when using a steel material with tensile strength of 1.2 kN/mm^2 as the mating material. Therefore, it is possible to increase the track load capacity by increasing the hardness of the material. Fig.2 shows the hardness of the mating material and the track capacity factor in relation to tensile strength. To obtain the track load capacity of each mating material, multiply the track load capacity shown in the corresponding specification table by the respective track load factor.

Note) For the mating material, we recommend using those materials with the raceway hardness of 20 HRC or higher and the tensile strength of 775 N/mm^2 or higher.

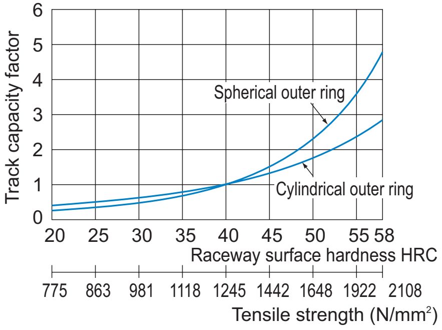


Fig.2 Track Capacity Factor

[Example of Calculating a Track Load Capacity]

Obtain the track load capacity when heat-treating the mating material, which a bearing whose outer ring has a track load capacity of 5.29 kN contacts, to hardness of 50 HRC.
The track capacity factor when the hardness is 50 HRC is 2.32, as indicated in Fig.2. Therefore, the desired track load capacity is calculated as follows.
The track load capacity=5.29kN×2.32=12.3kN

Radial Clearance

The radial clearances of Roller Followers meet the clearance indicatedin the table below. (Normal clearance applies to full-roller types.)

Model NAST, NAST-ZZ Unit: μm

Model No.	Clearance C2 (with cage)	
	Min.	Max.
6	5	20
8 to 12	5	25
15 to 25	10	30
30 to 40	10	40
45 to 50	15	50

Model RNAST Unit: μm

Model No.	Clearance C2 (with cage)	
	Min.	Max.
5 to 6	5	20
8 to 12	5	25
15 to 25	10	30
30 to 40	10	40
45 to 50	15	50

Model NART Unit: μm

Model No.	Clearance C2 (with cage)		Normal clearance (full rollers)	
	Min.	Max.	Min.	Max.
5 to 6	5	20	15	30
8 to 12	5	25	15	35
15 to 20	10	30	20	40
25 to 40	10	40	25	55
45 to 50	15	50	30	65

Fit

For the fitting of the Roller Follower with the shaft, we recommend the combinations indicated in Table1.

Table1 Fitting with the Shaft

No Inner Ring	Inner Ring
k5, k6	g6, h6

Mounting Section

- To protect the side plate of models NART and NAST-ZZ, the height of the mounting section must be equal to or greater than the “a” dimension indicated in the specification table
- The surface hardness of the shaft to be used with a Roller Follower without inner ring must be between 54 and 64 HRC. For the surface roughness, we recommend 0.2 μm Ra or below.
- For the mating raceway, see "Track Load Capacity" on A-904.
- If the outer ring unilaterally or unevenly contacts the mating raceway, we recommend using a type whose outer ring circumference is spherically ground.
- The side plate of model NART is press-fit onto the inner ring. If the plate is pressed under an external force, it may cause abnormal rotation. Do not use the product in the manner that the side plate is pressed.
- The structure of the Roller Follower is designed to receive a radial load. If it receives a thrust load, the side plates or the outer ring may be damaged. Therefore, it is necessary to design the system and install the product so that the generation of a component of the thrust is limited to a minimum.

Installation

Fig.1 shows examples of installing the Roller Follower.

- If the Roller Follower is to be used under a heavy load, it is necessary to install the product so that the greasing hole of the inner ring is out of the loaded area.

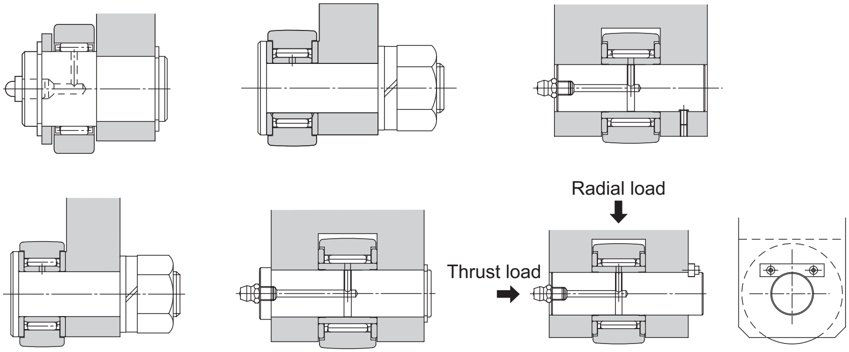


Fig.1 Examples of Installing the Roller Follower

Contamination Protection and Lubrication

The Roller Follower models include seal types (model numbers: "···UU"), which are incorporated with special synthetic rubber seals that are highly resistant to wear in order to prevent foreign material from entering the interior of the roller follower and the lubricant from leaking.

Some models are not filled with grease when assembled. When using a model not filled with grease, apply and fill grease to the interior first (lithium-based grease with consistency of No. 2).

Model No.		Grease
NAST(R)	No seal setting	Not filled with grease
RNAST(R)		
NAST-ZZ(R)	Without seal	Filled with grease
NART-(V)R	With seal	

The lubrication interval varies depending on the operating conditions. As a guide, however, replenish grease of the same group every six months to two years for types with a cage, or every one to six months for full-roller types.

Even with types equipped with seals ("···UU"), surplus grease may seep during the initial operation period or immediately after resumption of grease replenishment. If desiring to avoid contamination of the surrounding area of the machine by grease, first perform seasoning or the like in advance, and then wipe the seeping surplus grease.

Precautions on Use

[Handling]

(1) Disassembling components may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.

(2) Dropping or hitting the Roller Follower may damage it. Giving an impact to it could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) Some types of the Roller Follower do not contain grease depending on the model number. Carefully refer to A-906, and if the desired model does not contain grease, apply grease to the product as necessary before using it. Lithium soap-based grease No. 2 is available as standard.

(2) Do not mix lubricants of different physical properties. In addition, replenish a lubricant also during operation as necessary.

(3) We recommend applying a lubricant to the mating surface where the Roller Follower travels.

[Precautions on Use]

(1) When using the product in locations exposed to vibrations or an impact load or in a special environment such as a clean room, vacuum and low/high temperature, contact THK in advance.

(2) Entrance of foreign material such as dust may cause damage or functional loss. Prevent foreign material, such as dust and cutting chips, from entering the product.

(3) Roller Followers are designed for use under a radial load. Do not use the product under a thrust load.

[Storage]

When storing the Roller Follower, enclose it in a package designated by THK and store it while avoiding high temperature, low temperature and high humidity.

Spherical Plain Bearing

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Spherical Plain Bearing

Structure and Features

Spherical Bearings models SB and SA1 are self-aligning plain bearings designed for heavy loads. The inner and outer rings of these models use high-carbon chromium bearing steel that is hardened and ground, are treated with phosphate coating, which is highly resistant to corrosion and wear, and seized with molybdenum disulfide (MoS_2).

The Spherical Plain Bearing is capable of receiving a large radial load and thrust loads in both directions. Furthermore, because of its high resistance to impact loads, the Spherical Plain Bearing is optimal for low speed, heavy load rocking components such as the cylinder clevises or hinges of construction and civil-engineering machinery and the suspensions of trucks.

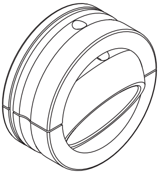
Types of the Spherical Plain Bearing

Types and Features

Model SB

Specification Table⇒B-828

The most popular type of Spherical Plain Bearing in Japan, model SB has wide spherical contact areas and is used as a bearing for heavy loads. The outer ring is split at two points, enabling the inner ring to be accommodated.

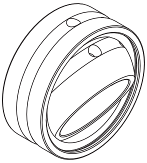


Model SB

Model SA1

Specification Table⇒B-830

This type of Spherical Plain Bearing is widely used in Europe. The outer ring is split at one point (outer rings with diameter of ϕ100 or thicker are split at two points), and the width and thickness are smaller than model SB. Thus, this model can be used in small spaces. Types attached with highly dust-preventive dust seals on both ends (model SA1···UU) are also available.



Model SA1

Selecting a Spherical Plain Bearing

When selecting a Spherical Plain Bearing, follow the instructions below while referring to the basic dynamic load rating (C) and the basic static load rating (C_0) indicated in the corresponding specification table, as a measuring stick.

[Spherical Plain Bearing Service Life G]

The basic dynamic load rating (C) is used to calculate the service life when the bearing oscillates under a load.

The basic dynamic load rating is calculated based on the contact surface pressure of the spherical sliding section.

The Spherical Plain Bearing service life G is expressed in the total number of rocking motions until it becomes impossible for the bearing to perform normal operation due to the increase in the radial clearance or in the temperature of the bearing as a result of wear on the spherical sliding section.

Since the bearing service life is affected by various factors such as the material of the bearing, magnitude and direction of the load, lubrication conditions and sliding speed, the calculated value can be used as an empirical, practical value.

$$G = b_1 \cdot b_2 \cdot b_3 \cdot b_4 \cdot b_5 \, \frac{3}{Da \cdot \beta} \cdot \frac{C}{P} \times 10^8$$

G : Bearing service life
(total number of rocking motions or total number of revolutions)
C : Basic dynamic load rating (N)
P : Equivalent radial load (N)
b_1 : Load direction factor (see Table1)
b_2 : Lubrication factor (see Table1)
b_3 : Temperature factor (see Table1)
b_4 : Dimension factor (see Fig.1)
b_5 : Material factor (see Fig.2)
Da : Spherical diameter (mm)
(see the specification table)
β : Oscillation half angle (degree)
(for rotary motion, β=90°)

Table1

Type		b_1		b_2		b_3		
		Load direction		Regular lubrication		Temperature ℃		
		Fixed	Alternating	Not provided	Provided	−30 +80	+80 +150	+150 +180
Spherical Plain Bearing	Without seal	1	5	0.08	1	1	1	0.7
	With seal	1	5	0.08	1	1	—	—

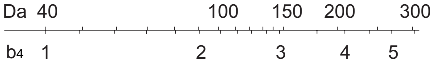


Fig.1 Dimension Factor

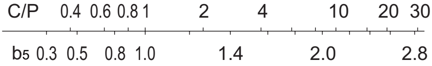


Fig.2 Material Factor

[Equivalent Radial Load]

The Spherical Plain Bearing is capable of receiving a radial load and a thrust load simultaneously. If the magnitude and direction of the load applied are constant, the equivalent radial load is obtained from the following equation.

$$P = Fr + YFa$$

P : Equivalent radial load (N)
Fr : Radial load (N)
Fa : Trust load (N)
Y : Thrust load factor (see Table2)

Table2 Thrust Load Factor

Fa/Fr≦	0.1	0.2	0.3	0.4	0.5
Thrust load factor (Y)	0.8	1	1.5	2.5	3

[Static Safety Factor f_S]

If the Spherical Plain Bearing is to be used under a stationary load or in slight rocking motion, select a model using the basic static load rating (C_0) as a guide. The basic static load rating refers to the stationary load that the bearing can receive without damaging the bearing and without causing permanent deformation that would prevent smooth motion.

In general, set the safety factor at three or greater taking into account the rigidity of the shaft and the housing.

$$f_S = \frac{C_0}{P} \geqq 3$$

f_S : Static safety factor
C_0 : Basic static load rating
P : Equivalent radial load

[pV Value]

The permissible sliding speed at which the Spherical Plain Bearing can be used varies depending on the load, lubrication conditions and cooling status. The recommended pV value for continuous motion under a load applied in a constant direction is calculated as follows.

$$pV \leqq 400\ \mathrm{N/mm^2 \cdot mm/sec}$$

If the Spherical Plain Bearing performs adiabatic operation or the load direction changes, the heat produced on the sliding surface easily radiates. Therefore, it is possible to set a higher pV value.
The contact surface pressure (p) of the Spherical Plain Bearing is obtained from the following equation.

$$p = \frac{P}{Da \cdot B}$$

p : Contact surface pressure (N/mm^2)
P : Equivalent radial load (N)
Da : Spherical diameter (see the specification table) (mm)
B : Outer ring width (see the specification table) (mm)

The sliding speed is calculated as follows.

$$V = \frac{\pi \cdot Da \cdot \beta \cdot f}{90 \times 60}$$

V : Sliding speed (mm/sec)
β : Oscillation half angle (degree)
f : Number of rocking motions per minute (min^{-1})

The Spherical Plain Bearing can be used at sliding speed of up to 100 mm/sec in oscillating motion, or up to 300 mm/sec in rotary motion in favorable lubrication status.

[Example of Calculating a pV Value]

Assuming that model SB25 is used in a location where the shaft rotates 60 turns per minute at an angle of 40° (oscillation half angle : 20°) and the maximum varying load of 1,500 N is applied, determine whether the model number is appropriate and calculate the service life under these conditions. Assume that the bearing temperature is +80 ℃ or less and the product is regularly provided with sufficient lubrication. Calculate the pV value and examine if the bearing size is appropriate.
The contact surface pressure (p) is calculated as follows.

$$p = \frac{P}{Da \cdot B} = \frac{1500}{36 \times 18} = 2.31\ \mathrm{N/mm^2} \quad \left(\begin{array}{l}\text{B: outer ring width of model SB25} = 18 \\ \text{Da: spherical diameter of model SB25} = 36\end{array}\right)$$

The sliding speed (V) is obtained from the following equation.

$$V = \frac{\pi \cdot Da \cdot \beta \cdot f}{90 \times 60} = \frac{3.14 \times 36 \times \left(\frac{40}{2}\right) \times 60}{90 \times 60} = 25.12\ \mathrm{mm/sec}$$

The pV value is calculated as follows.
$pV = 58.0\,\mathrm{N/mm^2 \cdot mm/sec}$
Since both the pV value and the sliding speed (V) meet the requirements, model SB25 can be used.
Next, calculate the service life of the bearing (G) as follows.

$$G = b_1 \cdot b_2 \cdot b_3 \cdot b_4 \cdot b_5 \frac{3}{Da \cdot \beta} \cdot \frac{C}{P} \times 10^8$$

$$= 5 \times 1 \times 1 \times 1 \times 2.2 \times \frac{3}{36 \times 20} \times \frac{15300}{1500} \times 10^8 = 4.7 \times 10^7\ (\mathrm{min^{-1}})$$

Accuracy Standards

The dimensional tolerances of the Spherical Plain Bearing are defined as indicated in Table3.

Table3 Accuracy of the Spherical Plain Bearing

Unit: µm

Nominal dimension of the inner diameter (d) and outer diameter (D) (mm)		Tolerance in inner diameter (dm)		Tolerance in outer diameter (Dm)		Tolerance of the inner outer ring in width (B_1, B)	
Above	Or less	Upper	Lower	Upper	Lower	Upper	Lower
10	18	0	-8	—	—	0	-120
18	30	0	-10	0	-9	0	-120
30	50	0	-12	0	-11	0	-120
50	80	0	-15	0	-13	0	-150
80	120	0	-20	0	-15	0	-200
120	150	0	-25	0	-18	0	-250
150	180	0	-25	0	-25	0	-250
180	250	0	-30	0	-30	0	-300
250	315	—	—	0	-35	0	-350
315	400	—	—	0	-40	0	-400

Note1) "dm" and "Dm" represent the arithmetic averages of the maximum and minimum diameters obtained in measuring the inner and outer diameters at two points.
Note2) The dimensional tolerances of the inner and outer diameters are the values before they are surface treated.
Note3) The dimensional tolerance of the outer ring is the value before it is split.
Note4) Tolerances of the inner and outer diameters in width (B_1, B) are assumed to be equal, and obtained from the nominal dimension of the inner diameter of the inner ring.

Radial Clearance

Table4 shows radial clearances of the Spherical Plain Bearing.

Table4 Radial Clearances of the Spherical Plain Bearing

Unit: µm

Berring inner diameter (d) (mm)		Radial clearance	
Above	Or less	Min.	Max.
—	17	70	125
17	30	75	140
30	50	85	150
50	65	90	160
65	80	95	170
80	100	100	185
100	120	110	200
120	150	120	215
150	240	130	230

Note1) The radial clearance indicates the value before the outer ring is split.
Note2) The axial clearance is approximately twice the radial clearance.

Fit

The fitting between the Spherical Plain Bearing and the shaft or the housing is selected according to the conditions. Table1 shows recommended values.

Table1 Recommended Fitting Values

Service condition		Shaft	Housing
Inner ring rotational load	Normal load	k6	H7
	Indeterminate load	m6	H7
Outer ring rotational load	Normal load	g6	M7
	Indeterminate load	h6	N7

Note1) If the product is to be installed so that the inner ring rotates and the fitting with the shaft is to be clearance fitting, harden the surface of the shaft in advance.
Note2) "N7" is recommended for light alloy housings.

[Shaft Designing]

If the inner ring is to be fit onto the shaft in loose fitting and the product is to be used under a heavy load, the shaft may slip on the inner circumference of the inner ring. To prevent the slippage, the shaft hardness must be 58 HRC or higher and the surface roughness must be 0.80 a or below.

Permissible Tilt Angles

The permissible tilt angle of the Spherical Plain Bearing varies according to the shaft shape as indicated in Table2.

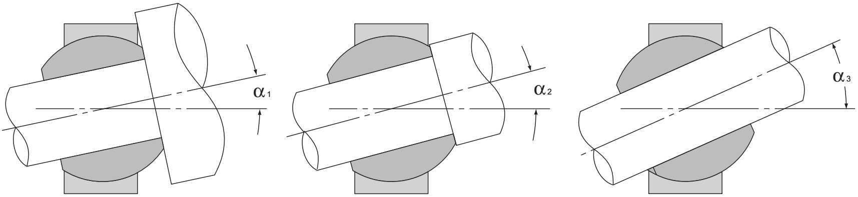


Table2 Permissible Tilt Angles

Unit: degree

Model No.	Permissible tilt angles		
	α_1	α_2	α_3
SB 12	5	7	18
SB 15	4	6	18
SB 20	3	4	14
SB 22	4	6	16
SB 25	4	5	16
SB 30	4	6	17
SB 35	4	5	14
SB 40	4	6	12
SB 45	4	5	13
SB 50	4	5	16
SB 55	4	6	16
SB 60	4	6	18
SB 65	4	5	16
SB 70	4	5	15
SB 75	4	5	18
SB 80	4	5	18
SB 85	4	6	16
SB 90	4	5	16
SB 95	4	5	17
SB 100	4	5	18
SB 110	4	5	16
SB 115	4	5	14
SB 120	4	6	15
SB 130	4	5	14
SB 150	4	5	12

Unit: degree

Model No.	Permissible tilt angles		
	α_1	α_2^{Note}	α_3
SA1 12	8	11 (6)	25
SA1 15	6	8 (5)	18
SA1 17	7	10 (7)	23
SA1 20	6	9 (6)	21
SA1 25	6	7 (4)	18
SA1 30	4	6 (4)	16
SA1 35	5	6 (4)	16
SA1 40	5	7 (4)	16
SA1 45	6	7 (4)	16
SA1 50	5	6 (4)	15
SA1 60	5	6 (3)	14
SA1 70	5	6 (4)	14
SA1 80	4	6 (4)	14
SA1 90	4	5 (3)	12
SA1 100	5	7 (5)	14
SA1 110	5	6 (4)	15
SA1 120	4	6 (4)	15
SA1 140	5	7 (5)	16
SA1 160	6	8 (6)	13
SA1 180	5	6 (5)	16
SA1 200	6	7 (6)	13
SA1 220	6	8 (6)	15
SA1 240	6	8 (6)	17

Note) The values in the parentheses apply to types attached with a seal.

Installation

(1) Do not use the product in the manner that the permissible tilting angle is exceeded since doing so may damage the product.

(2) The Spherical Plain Bearing is designed for use under a radial load. Do not use the product if the trust load component or the load component in the thrust direction exceeds 50% of the resultant force consisting of the radial load and the thrust load.

(3) When installing the Spherical Plain Bearing, pay attention to the mounting orientation so that the slit of the outer ring receives a minimum load.

[Temperature Range]

The permissible temperature range of the Spherical Plain Bearing is limited between -30℃ and 80℃ depending on the seal material and determined by the permissible temperature range of the grease used.

Lubrication

The spherical sliding surface of the Spherical Plain Bearing is seized with a solid lubricant film of molybdenum disulfide. This enables the Spherical Plain Bearing to be used over a relatively long period without further lubrication under a static load, in low-speed rocking motion or in intermittent rotary motion. However, it is generally necessary to replenish grease on a regular basis. If a heavy load is applied, consider using lithium soap group grease containing molybdenum disulfide. The inner and outer rings of the Spherical Plain Bearing have greasing holes as a means to facilitate the flow of the lubricant inside the bearing.

[Lubrication Interval]

Since the Spherical Plain Bearing is delivered without being applied with a lubricant, it is necessary to replenish an appropriate amount of grease after installing the Spherical Plain Bearing. We recommend filling grease also to the space surrounding the Spherical Plain Bearing. It is also recommendable to shorten the lubrication interval in the start-up period in order to lighten the initial wear and extend the service life.

The lubrication interval varies according to the magnitude of the load, frequency of the vibrations and other conditions. Provide lubrication while referring to the values in Table1 as a guide.

Table1 Lubrication Interval

Type of load	Required minimum lubrication interval
Unilateral load	G/ 40
Fluctuating load	G/ 180

G: Service life of the bearing (total number of rocking motions or total number of revolutions)

Contamination Protection

Spherical Bearing model SA1 is provided with a seal designed to prevent humidity or other deleterious material from entering the bearing. This seal is effective in increasing the service life of the bearing. The seal for Spherical Bearing model SA1 is made of oil-resistant synthetic rubber and has double lips as the sealing element. These lips closely contact the spherical inner ring. The seal can be used within the temperature range between -30℃ and 80℃, and is highly resistant to wear and capable of operating for a long period of time. If the product is used in an environment where sand or soil matter may enter the bearing, the service life of the seal is shortened. We recommend lubricating the product on a regular basis.

[Handling]

(1) When installing model SA1 or model SB, they must not be disassembled before installation.

(2) Dropping or hitting the Spherical Plain Bearing may damage it.
Giving an impact to it could also cause damage to its function even if the product looks intact.

[Lubrication]

(1) For details of the lubrication, see A-918.

(2) Do not mix lubricants of different physical properties.

[Precautions on Use]

(1) When using the product in locations exposed to vibrations or an impact load or in a special environment such as a clean room, vacuum and low/high temperature, contact THK in advance.

(2) Entrance of foreign material such as dust between the outer and inner rings may cause damage or functional loss. Prevent foreign material, such as dust and cutting chips, from entering the product.

[Storage]

When storing the Spherical Plain Bearing, avoid high temperature, low temperature and high humidity.

Link Ball®

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Link Ball

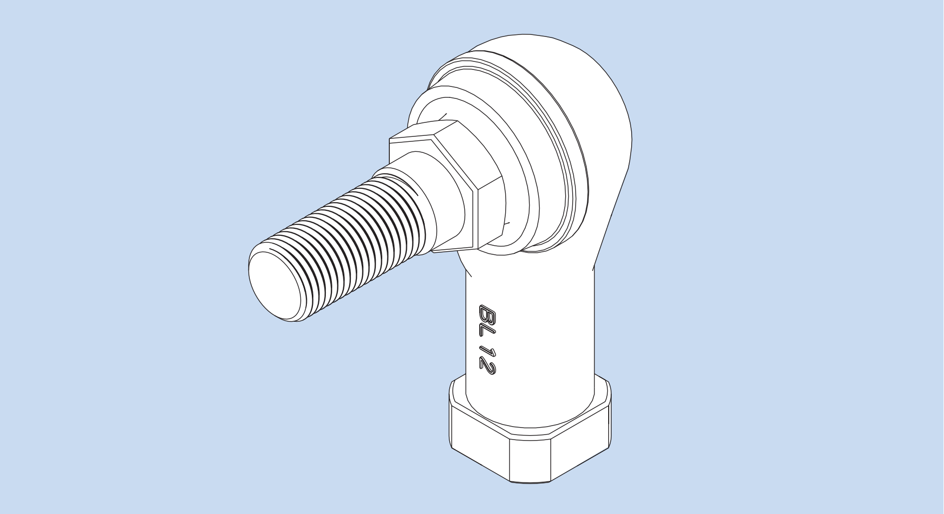


Fig.1 Structure of Link Ball Model BL

Structure and Features

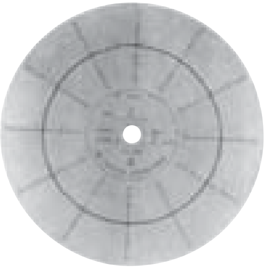
With the Link Ball, a highly accurate bearing steel ball used in the spherical area is first encased in the holder by die cast molding, and then is specially welded with the shank. This unique process enables the mirror surface of the steel ball to be transferred or duplicated on the spherical surface inside the holder to ensure full contact between the ball and the holder. As a result, smooth motion is achieved with a minimum clearance.

[Compact Design]

Model AL has an adequately firm and yet extremely compact shape because of a highly balanced design. Together with use of an A-1 alloy, a light-weight, compact design has been achieved. Thus, this model is optimal for use in an automobile height sensor or transmission control.

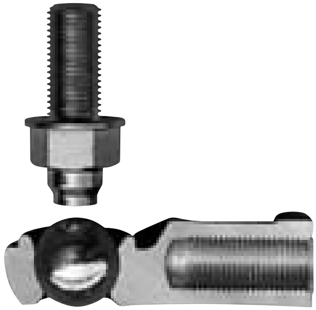
[Achieves Sphericity of 0.001 mm]

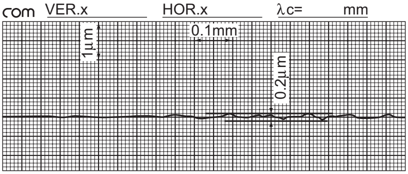
The spherical surface of the shank ball is transferred on the inner surface of the holder while maintaining the sphericity of the bearing steel ball. This allows smooth motion to be achieved with a minimum clearance and provides favorable operability and feel to the link motion.



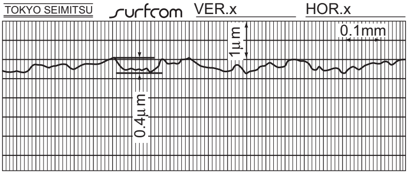
Sphericity: 0.001 mm

Sphericity of the spherical surface of the ball shank

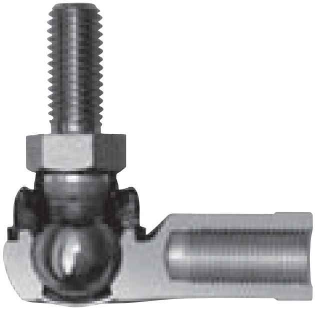




Roughness of the spherical surface of the ball shank



Roughness of the spherical surface of the holder



Cut sample of the spherical area of model BL

[Two Types of Holder Material]

Model AL uses the newly developed high strength aluminum alloy “A-1 Alloy” (see A-925), which is light and highly resistant to wear. Models BL, RBL and RBI use the proven, high strength zinc alloy (see A-926).

[High Lubricity]

Since models AL and BL and those models attached with boots contain grease, they have high lubricity and increased wear resistance.

[Large Hexagonal Bolt Seat]

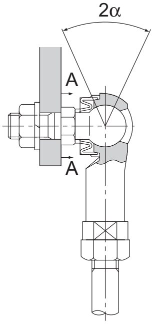
The hexagonal bolt seat of the shank has the same dimensions as the seating surface for small hexagon head bolts in accordance with automotive specifications. This prevents the seating surface from sinking and ensures a stable link motion mechanism.

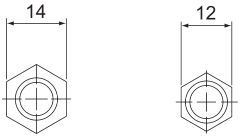
[Lightweight, High Strength]

Use of the A-1 Alloy enables the Link Ball to achieve mechanical strength approximately twice that of the commonly used aluminum die cast material ADC 12, or almost equal to the high strength zinc alloy, while maintaining aluminum alloys' advantages: lightweight and corrosion resistance.

[Equipped with a Boot for Protection against Muddy Water]

Use of a boot with high trackability in the ball shank prevents muddy water from entering the spherical area even in a muddy atmosphere. Accordingly, those types equipped with boots are used also in outdoor applications and automobile parts under the chassis. For details, see the muddy water test data (A-930 and A-931).





Model AL10
Model BL10

Model equivalent to similar product

A-A cross section

Jaw Span for Wrenching

Alloy

[High Strength Aluminum Alloy “A-1 Alloy”]

“A-1 Alloy,” a newly developed high strength aluminum alloy, is an alloy with Aℓ-Zn-Si3 being the main components, is used in the holder of model AL.

● Features of the A-1 Alloy

- Achieves one of the highest strengths among the existing aluminum die cast alloys.
- Has yield strength approximately twice that of the commonly used aluminum die cast alloy (ADC 12).
- Has hardness equal to the high strength zinc alloy and achieves high wear resistance.
- Achieves specific gravity less than a half of the high strength zinc alloy to allow significant weight saving.
- Highly corrosion resistance and can be used as an automotive part related to wheel control.

● Mechanical Properties

Tensile strength	: 343 to 392 N/mm^2
Tensile yield strength (0.2%)	: 245 to 294 N/mm^2
Compressive strength	: 490 to 637 N/mm^2
Compressive yield strength (0.2%)	: 294 to 343 N/mm^2
Charpy impact	: 0.098 to 0.196 N-m/mm^2
Elongation	: 2 to 3 %
Hardness	: 140 to 160 HV

● Physical Properties

Specific gravity	: 3
Melting point	: 570℃
Specific heat	: 793 J/(kg･k)
Linear expansion rate	: 22×10^{-6}

● Wear Resistance

The result of our test has proven that the wear resistance of the A-1 alloy is equivalent to the high strength zinc alloy.

Rotation-and-rocking durability test between model AL10D (A-1 alloy) and model BL10D (high strength zinc alloy)

<Test conditions>

Item	Description	
Environment temperature	Normal temperature	
Applied load	±1.9kN (perpendicular to the axis)(note)	
Loading frequency	0.6Hz	
Kinematic angle	Rotation ±20°	Rocking ±20°
No. of cycles	40 times/min.	40 times/min.
Total No. of cycles	1,000,000 cycles	

Note) For the load direction, see A-927.

<Test result: change in clearance (mm)> Unit: mm

Model No.	AL10D (A-1 alloy)	BL10D (high strength zinc alloy)
Perpendicular to the axis	0.036	0.033
Axial direction	0.052	0.045

[High Strength Zinc Alloy]

The high strength zinc alloy used in the holders of models BL, RBL, RBI and TBS has been developed as a bearing alloy by mixing Aℓ, Cu, Mg, Be and Ti as well as zinc as the base component. It is excellent in mechanical properties, seizure resistance and wear resistance.

● Composition

Table1 Composition of the High Strength Zinc Alloy

Unit: %

Item	Description
Aℓ	3 to 4
Cu	3 to 4
Mg	0.03 to 0.06
Be	0.02 to 0.06
Ti	0.04 to 0.12
Zn	Remaining portion

● Mechanical Properties

Tensile strength	: 275 to 314 N/mm²
Tensile yield strength (0.2%)	: 216 to 245 N/mm²
Compressive strength	: 539 to 686 N/mm²
Compressive yield strength (0.2%)	: 294 to 343 N/mm²
Fatigue strength	: 132 N/mm² × 10^7 (Schenk bending test)
Charpy impact	: 0.098 to 0.49 N-m/mm²
Elongation	: 1 to 5%
Hardness	: 120 to 145 HV

● Physical Properties

Specific gravity	: 6.8
Melting point	: 390℃
Specific heat	: 460 J/(kg・k)
Linear expansion rate	: 24×10^{-6}

● Wear Resistance

The wear resistance of the high strength zinc alloy is superior to that of class-3 brass and class-3 bronze, almost equal to that of class-2 phosphor bronze.

Amsler wear-tester

Test piece rotation speed	: 185 min⁻¹
Load	: 392 N
Lubricant	: Dynamo oil

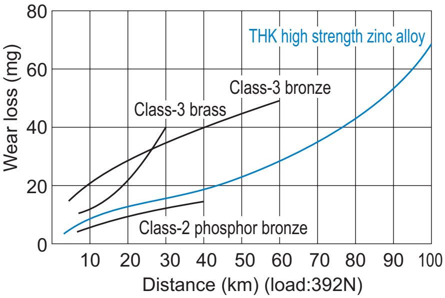


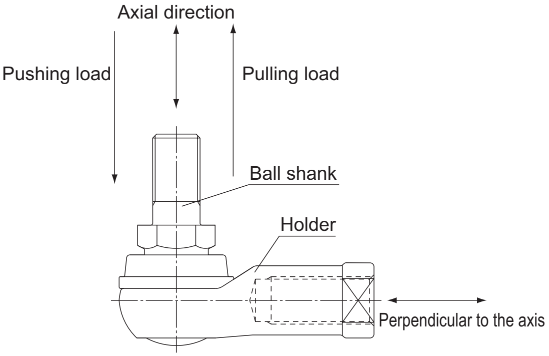
Fig.2 Wear Resistance of the High Strength Zinc Alloy

How Load Directions Are Called

Regardless of the shape, the direction of the load applied to the Link Ball is called "axial direction" if it is parallel to the axis of the ball shank, and "perpendicular-to-axis direction" if it is perpendicular to the axis.

Pushing Load and Pulling Load

Of the loads applied in the axial direction, the load in the direction of the ball shank being pressed toward the holder is called "pushing load" and the load in the direction of the ball shank being pulled from the holder is called "pulling load."



Performance Tests with the Link Ball

Tensile Strength Test with Model AL10D

[Test Method]

Place model AL10D on an Amsler universal testing machine as shown in Fig.3, then apply a load perpendicular to the axis to measure the tensile break load.

[Test Result]

All samples are broken in the shank, indicating that the holder has sufficient strength.

Sample No.	Breaking load (kN)	Broken point
1	18.82	A
2	18.72	A
3	18.6	A
4	18.78	A
5	18.45	A
6	18.95	A
7	18.65	A
8	18.91	A
9	18.55	A
10	18.5	A
$\overline{X}$	18.693	—
R	0.5	—

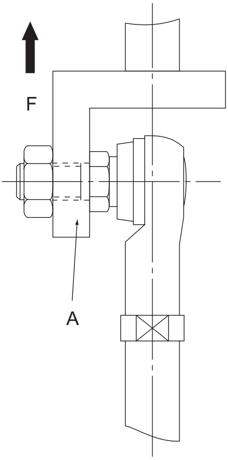


Fig.3

Durability Tests with Link Ball Model AL

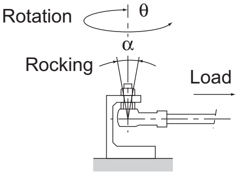
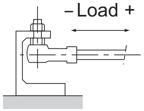
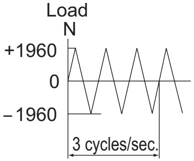
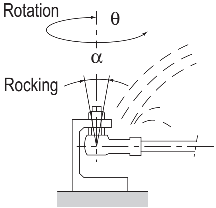
[Purpose of the Tests]

The tests were conducted to identify the durability of Link Ball model AL while assuming that it is used for automobile suspensions.

[Tested Product]

Link Ball model AL10D

[Test Items, Test Conditions and Test Results]

Test item	Test conditions					
	Applied load	Rotation or rocking angle	Frequency	Total number of revolutions or time	Service environment	Load conditions, etc.
Rotation-and-rocking durability	1960N Load direction: Perpendicular to the axis (one direction)	Rotation angle: θ=±5° Rocking angle: θ=±10°	Rotation: 25 times/min. Rocking: 75 times/min.	500,000 cycles (rocking)	Normal temperature	
Fatigue durability test	±1960N Load direction: Perpendicular to the axis (both directions)	—	180 times/min.	1 million cycles (rocking)	Normal temperature	 
Muddy-water rotation-and-rocking durability (identify sealability of the boot)	—	Rotation angle: θ=±12° Rocking angle: θ=±12°	Rotation: 25 times/min. Rocking: 75 times/min.	500,000 cycles (rocking)	Normal temperature	Discharge muddy water to the boot ● Discharge rate: 1 ℓ/min. ● Contaminates 10% of JIS Class-8 Kanto loamy layer powder 
Boot weathering test	—	—	—	96 hours	−30℃	Left standing
				96 hours	70℃	Left standing
		Rotation angle: θ=±10°	60 times/min.	144 hours	40℃	● Ozone concentration: 80pphm
Salt-water spray resistance test	—	—	—	200 hours	35℃	● Salt-water concentration: 5% ● Spray solution temperature: 33 to 37℃ ● Spray pressure: 0.098MPa ● Following spray test, apply pushing load to measure strength

[Comprehensive Evaluation]

The results of the durability tests indicate that Link Ball model AL has sufficient strength, wear resistance, corrosion resistance and boot sealability.

This is attributable to the superb characteristics of the newly developed alloy A-1 and the effect of THK's unique manufacturing process. Thus,THK Link Ball model AL provides a high level of performance as a lightweight component.

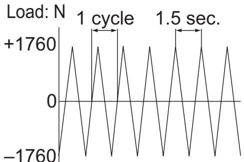
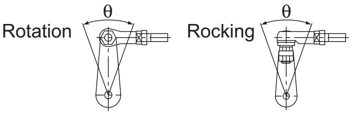
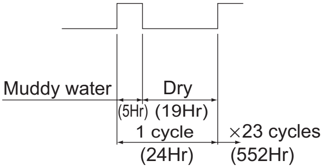
<table>
<tr><th colspan="3">Test Result</th><th>Evaluation</th></tr>
<tr><td rowspan="2">Sample No.</td><td colspan="2">Change in clearance (mm)</td><td rowspan="6">● Despite harsh test conditions where complex link motion was required under an axial load, no anomaly was observed in the samples after the test, and the abrasion loss was minimal and consistent among the samples. This indicates that the Link Ball has superb wear resistance and stable quality.</td></tr>
<tr><td>Perpendicular to the axis</td><td>Axial direction</td></tr>
<tr><td>(1)</td><td>0.038</td><td>0.02</td></tr>
<tr><td>(2)</td><td>0.04</td><td>0.03</td></tr>
<tr><td>(3)</td><td>0.042</td><td>0.04</td></tr>
<tr><td>(4)</td><td>0.038</td><td>0.03</td></tr>
<tr><td colspan="3">● Appearance
No anomaly was observed including fracture of the samples.
● Motion
The ball shank was capable of smoothly oscillating after the test, without any anomaly such as heavy and jerky motion.</td><td>● No anomaly in appearance or function was observed in the sample after the fatigue durability test involving 1 million cycles of rocking. This indicates that the product is sufficiently capable of continuously operating and has superb wear resistance.</td></tr>
<tr><td colspan="3">● Motion
The ball shank was capable of smoothly oscillating after the test, without any anomaly such as heavy and jerky motion.
● Muddy water penetration
No muddy water penetration was observed in visual inspection with the boot removed.
● Boot status
No breakage of the boot or abnormal wear of the lip was observed.</td><td>● No anomaly in motion was observed in the sample, and no muddy water penetration into the boot or no grease deterioration was found after the test. This verifies that the boot has reliable sealability.</td></tr>
<tr><td colspan="3">● Boot status
The boot showed no harmful ozone crack and maintained its pre-test status, including softness, after the test.</td><td>● No anomaly was observed in the sample after the test. The fact that no muddy water penetration into the boot or no grease deterioration was found in the sample after the above durability test verifies that the boot has reliable weatherability.</td></tr>
<tr><td colspan="3">● Appearance
No erosion was observed in the holder, and no other anomaly including breakage was found either.
● Appearance
The ball shank was capable of smoothly oscillating after the test.</td><td>● No erosion-based deterioration of the sample was observed in function and performance.
This demonstrates that the A-1 alloy has superb corrosion resistance.</td></tr>
</table>

Durability Tests with Link Ball Model BL

[Purpose of the Tests]

The tests were conducted to identify the performance difference between THK Link Ball model BL and an equivalent product of a competitor. As a result, model BL has been used in joints for transmission control units of automobiles, trucks and buses and for steering mechanisms of agricultural tractors.

[Tested Product, Test Items, Test Conditions and Test Results]

Test item	Tested model No.	Test conditions					
		Applied load	Rotation or rocking angle	Frequency	Total number of revolutions or time	Service environment	Load conditions, etc.
Rotation-and-rocking durability	Comparison of THK Link Ball model BL10D and competitor's product	±1760N (load direction: perpendicular to the axis)	Rotation angle: θ=±20° Rocking angle: α=±20°	40 times/min.	1,000,000 cycles	Normal temperature	The loading diagram is as follows.  The motion direction is as follows: 
Low-temperature rotation durability	THK Link Ball model BL10D only	±1225N (load direction: perpendicular to the axis)	Rotation angle: θ=±30°	60 times/min.		–30℃	Low-temperature retention time: 280 hours Motion in the rotational direction
High temperature rotation durability						100℃	High temperature retention time: 280 hours Motion in the rotational direction
Muddy-water rotation durability						Normal temperature	Motion: rotational direction and oscillation on a separate basis Muddy water discharge pattern Muddy water concentration: 5 Wt% of salt and dust each in 1 liter of water Discharge direction: against the boot lip Discharge pressure: 5 kg/cm^3 
Muddy-water rocking durability	Comparison of THK Link Ball model BL10D and competitor's product		Rocking angle: α=±20°				

[Comprehensive Evaluation]

As a result of comparing THK Link Ball model BL10D and a competitor's product in representative durability tests, it is demonstrated that model BL10D is superior in strength and wear resistance of the holder and sealability of the boot.

These features are achieved through THK's unique manufacturing process for the holder and the shank, the material used, the structure of upper and lower grease pockets on the spherical area and the development of a highly sealable boot.

Test Result					Evaluation
	Sample No.	Change in clearance (µm)		Conditions of the holder, etc.	
		Perpendicular to the axis	Axial direction		
THK model BL10D	(1)	26	42	The shank was capable of smoothly rotating after the 1-million cycle test, and capable of continuously operating.	● Even in complex link motion, THK model BL10D demonstrated higher durability and wear resistance of the holder than competitor's product.
	(2)	25	40		
Competitor's product	(1)	Broke in the holder neck after 8,600 cycles 154	60	Wear and damage were observed in the holder's spherical area in approx. 150,000-cycle operation.	● The abrasion loss of the competitor's product immediately before the breakage of the holder was 6 times greater than THK model BL10D (perpendicular to the axis).
	(2)	Broke in the holder neck after 151,300 cycles 62	20		
THK model BL10D	(1)	63	65	The boot did not show a crack or the like at low temperature	● This indicates that THK model BL10D is sufficiently capable of operating in outdoor applications in cold climates.
	(2)	56	59		
	(1)	79	84	The holder did not show abnormal wear and the boot did not show thermal deterioration at high temperature.	● This indicates that THK model BL10D is sufficiently capable of operating in hot areas of a truck engine.
	(2)	74	78		
	(1)	48	51	No muddy-water penetration that may cause wear was observed.	● This indicates that THK model BL10D is sufficiently capable of operating in environments subject to muddy water such as trucks, construction vehicles and agricultural machines since the sealing effect of the boot prevents penetration of muddy water.
	(2)	57	63		
	(1)	32	38		
	(2)	35	42		
Competitor's product	(1)	240	105	Muddy water penetrated the boot, the spherical area showed chipping and the boot had cuts.	● The competitor's product cannot be used in environments subject to muddy water since chipping or the like may occur in such environments. In addition, wear of the spherical area reached 0.24 mm, 7.4 times greater than THK model BL10D.
	(2)	246	107		

Types of the Link Ball

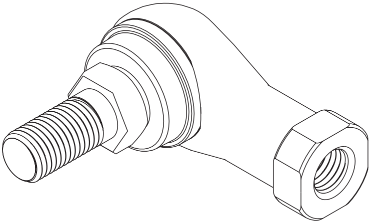
Types and Features

Model AL

Specification Table⇒B-834

The holder is connected in perpendicular to the shank, which comprises a male thread specially welded with a highly accurate steel ball. With a grease pocket formed on the top and bottom of the spherical area, this model achieves high lubricity and high wear resistance.

Use of the A-1 alloy in the holder significantly reduces the weight.



Model AL

"A-1 Alloy," a high strength aluminum alloy newly developed for the Link Ball, has yield strength approximately twice that of the commonly used aluminum die cast material ADC 12, and its strength and wear resistance are equivalent to the high strength zinc alloy.

With its specific gravity less than that of the high strength zinc alloy, model AL is optimal as an automotive part that requires lightweight, high strength, high corrosion resistance and high wear resistance.

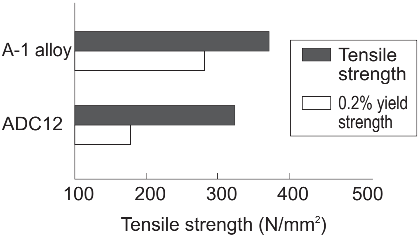


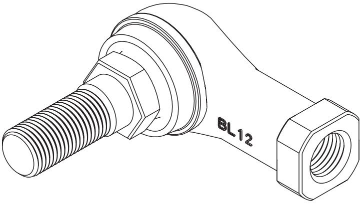
Fig.4 Tensile Strength and Yield Strength of THK A-1 Alloy and ADC 12

Model BL

Specification Table⇒B-836

A compact type of model RBL, this model's holder made of the high strength-zinc alloy is connected in perpendicular to the shank, which is incorporated with a ball.

With a grease pocket formed on the top and bottom of the spherical area, this model achieves high lubricity and high wear resistance.

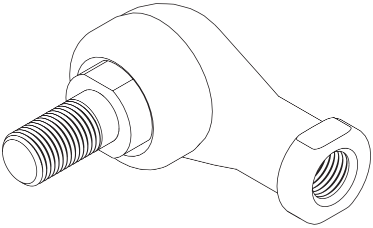


Model BL

Model RBL

Specification Table⇒B-838

The holder made of the high strength zinc alloy is connected in perpendicular to the shank, which is incorporated with a ball.
Since grease is contained in the boot, this model achieves high lubricity and high wear resistance.

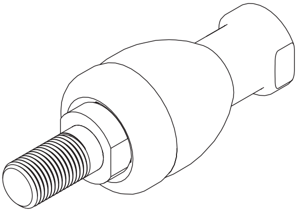


Model RBL

Model RBI

Specification Table⇒B-840

With this Link Ball model, the high strength zinc alloy is used in its holder and the mounting bolt and the holder are arranged on the same axis, allowing this model to receive both a compressive load and a pulling load.
Since grease is contained in the boot, this model achieves high lubricity and high wear resistance.

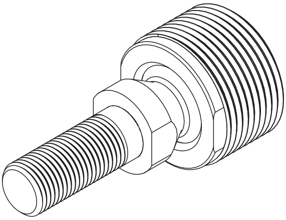


Model RBI

Model TBS

Specification Table⇒B-842

The rolled thread on the circumference of the outer ring allows this model to easily be mounted on the housing. Simply by tightening the screw, the user can achieve play-free, firm installation.
Since the coating area of sphere is large, the model is capable of receiving a large axial load.



Model TBS

Selecting a Link Ball

The selected bearing must meet both the permissible load obtained from equation (1) and the dynamic load capacity obtained from equation (2).

[Permissible Load P]

The yield-point strength indicated in the specification tables refers to the mechanical strength of the bearing. With models AL, BL and RBL, the yield point strength indicates the strength when a load is applied perpendicular to the ball shank axis. With model RBI, it indicates the strength when an axial load is applied to the holder in the shank axis direction.

Table1 Safety Factor (f_S)

Type of load	Lower limit of f_S
Constant load in a constant direction	2 to 3
Fluctuating load in a constant direction	3 to 5
Load in varying directions	5 to 8

According to the type of the load, select a bearing that satisfies the following equation from a mechanical strength's viewpoint.

$$P \leqq \frac{P_k}{f_S} \quad \cdots\cdots\cdots\cdots(1)$$

P	: Permissible Load	(N)
P_k	: Yield-point strength	(N)
f_S	: Safety factor	(see Table1)

[Dynamic Load Capacity C_d]

The dynamic load capacity (C_d) refers to the upper limit of load that the spherical area of the Link Ball can receive without showing seizure while the Link Ball is rotating or oscillating. The dynamic load capacity is obtained from the following approximation formula using the static load capacity (C_S) (note) indicated in the dimensional table.

$$C_d = \frac{C_S}{\sqrt[3]{n}} \quad \cdots\cdots\cdots\cdots(2)$$

C_d	: Dynamic load capacity	(N)
C_s	: Static load capacity	(N)
n	: Rotation speed per minute	(min^{-1})

Note) Static load capacity (C_S) refers to the value obtained by multiplying the projected area on the spherical section by the permissible surface pressure, and is used to obtain the dynamic load capacity.

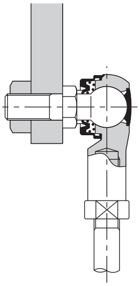
Permissible Tilt Angles

The permissible tilting angles of Link Ball models are indicated in the corresponding specification tables.

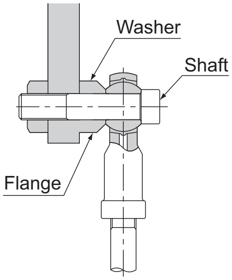
Note) If the permissible tilt angle is exceeded, it may cause serious damage to the holder or the boot. Be sure to use the Link Ball within its permissible tilt angle.

Example of Installation

[Comparison of THK Link Ball and the Conventional Rod End]



THK model BL

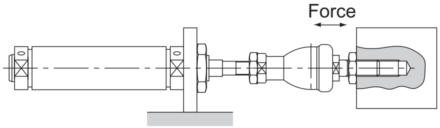


Conventional Rod End model PHS

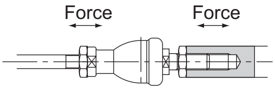
- Sine it has a shaft, model BL can easily be installed (especially useful for rod assembly).
- Because of the improved shape of the boot lip, the spherical area is protected from muddy water even in a muddy atmosphere.
- Since it contains grease, it can be used without further lubrication. (with the boot attached)
- Unlike the conventional type, which has a clearance between the shaft and the inner circumference of the inner ring and cannot be fixed completely, model BL has minimum distortion and high rigidity since the shank is integrated with the ball.

[Examples of Installing Model RBI]

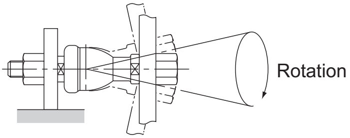
Joint for cylinder end metal fitting



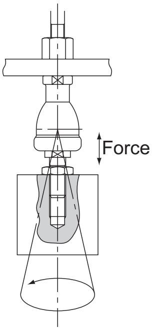
Connecting a rod in the axial direction



Rotation support



Suspending a light object



[Temperature Range]

The temperature range of the Link Ball series is basically between -20℃ and 80℃. If the service temperature exceeds this range, contact THK(see examples of testing the product at temperature other than the above temperature range on A-930 to A-933)

[Handling]

Dropping or hitting the Link Ball may damage it. Giving an impact to it could also cause functional damage to it even if the product looks intact.

[Lubrication]

(1) All Link Ball models except model TBS contain lithium soap-based grease in their boots and can be used without further greasing. For model TBS and those models without boot, apply grease to the spherical section as necessary.
(2) Do not mix lubricants of different physical properties.

[Precautions on Use]

(1) Do not use the product in the manner that the permissible tilting angle is exceeded since doing so may damage the product.
(2) When using the product in locations exposed to vibrations or an impact load or in a special environment such as a clean room, vacuum and low/high temperature, contact THK in advance.
(3) Entrance of foreign material such as dust between the holder and the inner ring may cause damage or functional loss. Prevent foreign material, such as dust and cutting chips, from entering the product.
(4) Models AL, BL and RBL are designed for use under a load in the direction perpendicular to the axis, while models RBI and TBS are designed for use under an axial load. Take this into account when selecting a model.

[Storage]

When storing the Link Ball, avoid high temperature, low temperature and high humidity.

Rod End

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

Features of the Rod End

Features

The Rod End is a self-aligning plain bearing that uses a spherical inner ring which has the same level of accuracy and hardness as bearing steel balls. With the combination of a spherical inner ring whose sliding surface is mirror-finished and a rationally designed holder, the Rod End ensures play-free, extremely smooth rotation and oscillation.

Special Bearing Alloy

[High Strength Zinc Alloy]

The high strength zinc alloy, developed as an alloy for bearings, is composed of Aℓ, Cu, Mg, Be and Ti as well as zinc as the base. It is excellent in mechanical properties, seizure resistance and wear resistance.

● Composition

Table1 Composition of the High Strength Zinc Alloy

Unit: %

Item	Description
Aℓ	3 to 4
Cu	3 to 4
Mg	0.03 to 0.06
Be	0.02 to 0.06
Ti	0.04 to 0.12
Zn	Remaining portion

● Mechanical Properties

Tensile strength	: 275 to 314 N/mm^2
Tensile yield strength (0.2%)	: 216 to 245 N/mm^2
Compressive strength	: 539 to 686 N/mm^2
Compressive yield strength (0.2%)	: 294 to 343 N/mm^2
Fatigue strength	: 132 N/mm^2×10^7 (Schenk bending test)
Charpy impact	: 0.098 to 0.49 N-m/mm^2
Elongation	: 1 to 5%
Hardness	: 120 to 145 HV

● Physical Properties

Specific gravity : 6.8
Melting point : 390℃
Specific heat : 460 J/ (kg・k)
Linear expansion rate : 24×10^{-6}

● Wear Resistance

The wear resistance of the high strength zinc alloy is superior to that of class-3 brass and class-3 bronze, almost equal to that of class-2 phosphor bronze.

Amsler wear-tester
Test piece rotation speed : 185 min^{-1}
Load : 392 N
Lubricant : Dynamo oil

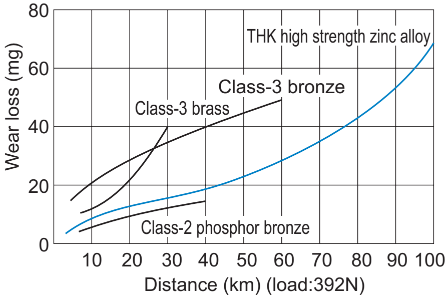


Fig.1 Wear Resistance of the High Strength Zinc Alloy

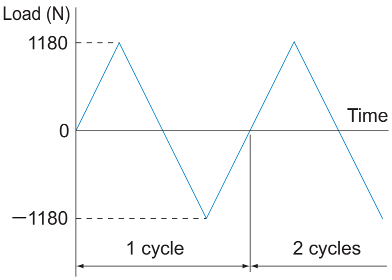
Performance Test with the Rod End

This test has been conducted to identify the difference in performance between THK Rod End model HS and an equivalent product by a competitor.

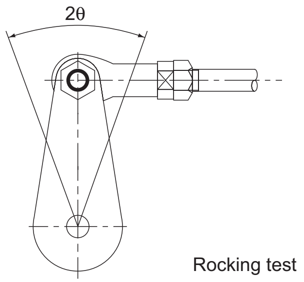
[Wear Test Conditions]

Item	Description
Subject Rod End	THK: Model HS8
	Stainless steel model equivalent of the above
Type of test	Rocking test
Applied load	±1,180 N in the radial direction
Kinematic angle	Oscillation angle: $2\theta=40°(\pm 20°)$
Lubrication	No lubrication
Number of cycles per minute	60opm
Total number of cycles	1 million cycles
Testing equipment	Bench testing machine (normal temperature)

The applied load diagram is shown below.



The kinematic angle is shown below.



[Result of the Wear Test]

Table2 Change in the Spherical Clearance Unit: mm

Abrasion loss after 1-million-cycle test			
Model No.	Number of times	Rocking test	
		Radial direction	Axial direction
HS 8	Initial stage (at start-up)	0.008	0.01
	1 million cycles	0.035	0.075
	Change	0.027	0.065
Stainless steel model equivalent of the above	Initial stage (at start-up)	0.005	0.005
	40,000 cycles	0.22	0.2
	Change after 40,000 cycles	0.215	0.065
	Note: The holder is elongated and fractured after 76,300 cycles.		

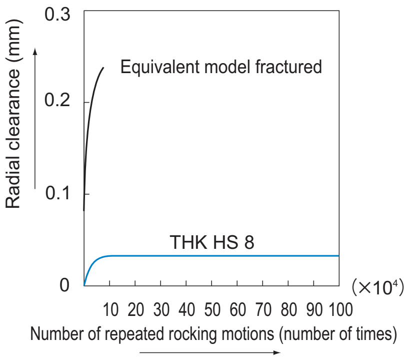


Fig.2 Wear Diagram

(1) Although model HS8 withstood the repeated durability test with an applied load of ±1,180 N and the total number of cycles being 1 million, the holder of the stainless steel equivalent model was elongated and fractured after only 76,300 cycles.

(2) The result shows that the increase in wear of model HS8 in the radial direction since the initial wear (approximately 100,000 cycles) was minimal.

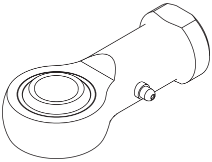
Types of the Rod End

Types and Features

Type Provided with a Female Threading - Model PHS

Specification Table⇒B-846

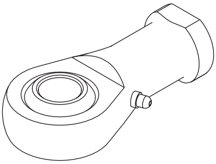
With model PHS, a special copper alloy with high conformability is inserted between the chromate treatment steel holder and the spherical inner ring in which only the circumference of the spherical area is hard chrome plated. This structure ensures high rigidity, high wear resistance and high corrosion resistance.
The grease nipple on the holder allows grease to be applied to the sliding surface as necessary.


Model PHS

Die Cast, Low Price Type - Model RBH

Specification Table⇒B-848

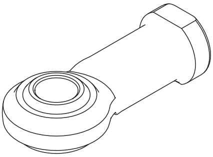
This model is a high-accuracy, low cost rod end in which the spherical inner ring serves as the core and the holder is formed by die casting.
The holder is made of a high strength zinc alloy (see A-942), which is superb in mechanical properties and bearing characteristics.


Model RBH

No Lubrication Type - Model NHS-T

Specification Table⇒B-850

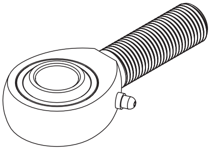
This no lubrication rod end uses self-lubricating synthetic resin formed between the steel holder and the spherical inner ring.
Since the clearance on the sliding surface is minimized, an accurate link motion is achieved.


Model NHS-T

Male thread Type - Model POS

Specification Table⇒B-852

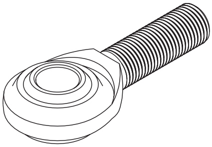
This model is a highly rigid rod end that is basically the same as the female threading type model PHS, but has a male thread on the holder end.


Model POS

No Lubrication, Male thread Type - Model NOS-T

Specification Table⇒B-854

This model is a no lubrication rod end that is basically the same as the female threading type model NHS-T, but has a male thread on the holder end.



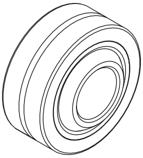
Model NOS-T

Standard Type - Model PB

Specification Table⇒B-856

With model PB, a special copper alloy with high conformability is inserted between the steel outer ring and the spherical inner ring in which only the spherical area is hard chrome plated. This structure makes this model a high rigid Spherical Plain Bearing with high corrosion resistance and high wear resistance.

The oil groove and the greasing hole on the outer ring allow grease to be applied to the sliding surface as necessary.



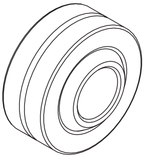
Model PB

Die Cast Type - Model PBA

Specification Table⇒B-857

This model is a high-accuracy, low cost Spherical Plain Bearing in which the spherical inner ring serves as the core and the outer ring is formed by die casting.

The outer ring is made of a high strength zinc alloy (see A-942), which is superb in bearing characteristics.

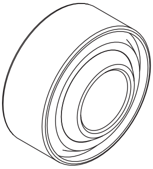


Model PBA

No Lubrication Type - Model NB-T

Specification Table⇒B-858

This no lubrication bearing uses self-lubricating synthetic resin formed between the steel outer ring and the spherical inner ring.



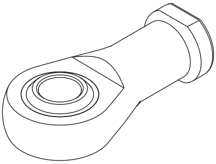
Model NB-T

[Build to Order]

No Lubrication, Corrosion-resistant Type - Model HS

Specification Table⇒B-860

This no lubrication Spherical Plain Bearing uses a special fluorine sheet adhering to the holder's spherical area. The holder is made of an aluminum alloy.
This product is built to order. Contact THK for details.



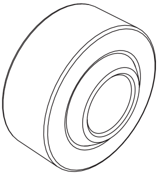
Model HS

[Build to Order]

No Lubrication Type - Model HB

Specification Table⇒B-862

This no lubrication Spherical Plain Bearing uses a special fluorine sheet adhering to the outer ring's spherical area.
This product is built to order. Contact THK for details.



Model HB

Selecting a Rod End

[Permissible Load P]

The static load capacity (C_s) indicated in the specification tables, is presented as a guide for the mechanical strength of the Rod End. Select a bearing while taking into account the safety factor (f_S) indicated in Table1 according to the type of the load.

Table1 Safety Factor (f_S)

Type of load	Lower limit of f_S
Constant load in a constant direction	2 to 3
Fluctuating load in a constant direction	3 to 5
Load in varying directions	5 to 8

According to the type of load, select a bearing that satisfies the following equation from a mechanical strength's viewpoint.

$$P \leq \frac{C_S}{f_S} \quad \cdots\cdots\cdots(1)$$

P : Permissible Load (N)
C_S : Static load capacity (N)
f_S : Safety factor (see Table1)

[Dynamic Load Capacity C_d]

The dynamic load capacity refers to the upper limit of load that the spherical area can receive without showing seizure while the Rod End is rotating or oscillating. The dynamic load capacity is obtained from the following approximation formula using the static load capacity (C_S) (note 1) indicated in the specification table.

$$C_d = \frac{C_s}{\sqrt[3]{n}} \quad \cdots\cdots\cdots(2)$$

C_d : Dynamic load capacity (N)
C_S : Static load capacity (N)
n : Rotation speed per minute (min^{-1})

The selected bearing must meet both the permissible load obtained from equation (1) and the dynamic load capacity obtained from equation (2).

Note1) Static load capacity (C_s) refers to the value obtained by multiplying the projected area on the spherical section by the permissible surface pressure, and is used to obtain the dynamic load capacity.

Permissible Tilt Angles

The permissible tilt angles α_1, α_2 and α_3 of the Rod End are indicated in Table1.

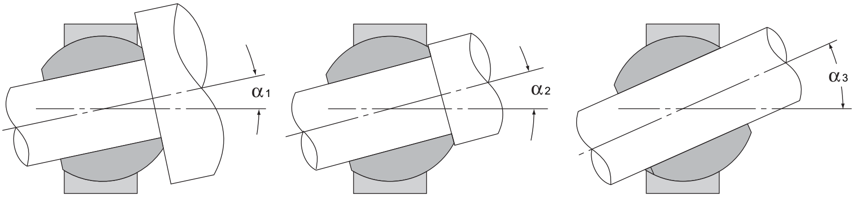


Table1 Permissible Tilt Angles

Model No.	Permissible tilt angles		
	α_1	α_2	α_3
NHS 3T, NOS 3T	8	10	42
NHS 4T, NOS 4T	9	11	35
PHS 5, RBH 5, NHS 5T, POS 5, NOS 5T, PB 5, PBA 5	8	13	30
PHS 6, RBH 6, NHS 6T, POS 6, NOS 6T, PB 6, PBA 6	8	13	30
PHS 8, RBH 8, NHS 8T, POS 8, NOS 8T, PB 8, PBA 8	8	14	25
PHS 10, RBH 10, NHS 10T, POS 10, NOS 10T, PB 10, PBA 10	8	14	25
PHS 12, RBH 12, NHS 12T, POS 12, NOS 12T, PB 12, PBA 12	8	13	25
PHS 14, RBH 14, NHS 14T, POS 14, NOS 14T, PB 14, PBA 14, NB 14T	10	16	24
PHS 16, RBH 16, NHS 16T, POS 16, NOS 16T, PB 16, PBA 16, NB 16T	9	15	24
PHS 18, RBH 18, NHS 18T, POS 18, NOS 18T, PB 18, PBA 18, NB 18T	9	15	24
PHS 20, RBH 20, NHS 20T, POS 20, NOS 20T, PB 20, PBA 20, NB 20T	9	15	24
PHS 22, RBH 22, NHS 22T, POS 22, NOS 22T, PB 22, PBA 22, NB 22T	10	15	23
PHS 25, POS 25, PB 25	9	15	23
PHS 30, POS 30, PB 30	10	17	23

Installation

Please note that the Rod End is not capable of receiving a thrust load indicated in Fig.1.

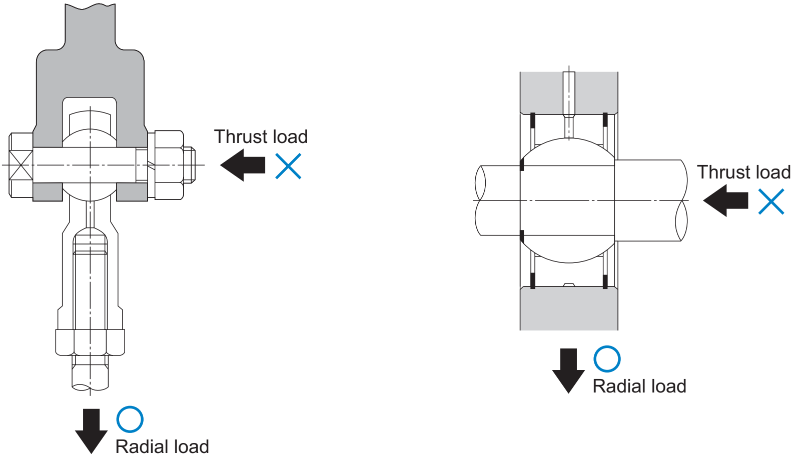


Fig.1 Examples of Installing the Rod End

[Service Temperature]

If any of models RBH, PBA, HS and HB, all of which use the high strength zinc alloy and an aluminum alloy in the holder and the outer ring, and of models NHS-T, NOS-T and NB-T, which use synthetic-resin bushes, is to be used at temperature of 80 ℃ or higher, or receives an impact at low temperature, contact THK.

[Handling]

Dropping or hitting the Rod End may damage it. Giving an impact to it could also cause damage to its function even if the product looks intact.

[Lubrication]

All Rod End models except lubrication-free types must be greased before being used (lithium soap-based grease No. 2 is recommended). When greasing the Rod End before using it, do not mix lubricants of different physical properties. In addition, replenish a lubricant also during operation as necessary.

[Precautions on Use]

(1) Do not use the product in the manner that the permissible tilting angle is exceeded since doing so may damage the product.
(2) When using the product in locations exposed to vibrations or an impact load or in a special environment such as a clean room, vacuum and low/high temperature, contact THK in advance.
(3) Entrance of foreign material such as dust between the holder and the inner ring may cause damage or functional loss. Prevent foreign material, such as dust and cutting chips, from entering the product.
(4) The Rod End is designed for use under a radial load. Do not use the product under a thrust load.

[Storage]

When storing the Rod End, avoid high temperature, low temperature and high humidity.

Accessories for Lubrication

THK General Catalog

A Technical Descriptions of the Products

B Product Specifications (Separate)

* Please see the separate "B Product Specifications".

When using an LM system, it is necessary to provide effective lubrication. Without lubrication, the rolling elements or the raceway may be worn faster and the service life may be shortened.
A lubricant has effects such as the following.

(1) Minimizes friction in moving elements to prevent seizure and reduce wear.
(2) Forms an oil film on the raceway to decrease stress acting on the surface and extend rolling fatigue life.
(3) Covers the metal surface to prevent rust formation.

To fully bring out an LM system's functions, it is necessary to provide lubrication according to the conditions.
Even with an LM system with seals, the internal lubricant gradually seeps out during operation. Therefore, the system needs to be lubricated at an appropriate interval according to the conditions.

Types of Lubricants

LM systems mainly use grease or sliding surface oil for their lubricants.
The requirements that lubricants need to satisfy generally consist of the following.

(1) High oil film strength
(2) Low friction
(3) High wear resistance
(4) High thermal stability
(5) Non-corrosive
(6) Highly anti-corrosive
(7) Minimal dust/water content
(8) Consistency of grease must not be altered to a significant extent even after it is repeatedly stirred.

For lubricants that meet these requirements, see A-955.

Grease Lubrication

Greasing intervals vary depending on the conditions and environments. For normal use, we recommend greasing the system approximately every 100 km of travel distance.
Normally, replenish grease of the same group from the grease nipple or greasing hole provided on the LM system. Mixing different types of grease may deteriorate the system's performance, such as increased consistency.

Lubricant	Type	Brand name
Grease	Lithium-based grease (JIS No. 2) Urea-based grease (JIS No. 2)	AFA Grease (THK) see A-959 AFB-LF Grease (THK) see A-960 AFC Grease (THK) see A-961 AFE-CA Grease (THK) see A-963 AFF Grease (THK) see A-965 AFG Grease (THK) see A-968 Albania Grease No.2 (Showa Shell Sekiyu) Daphne Exponex Grease No.2 (Idemitsu) or equivalent

* Recommended greases vary according to the conditions and environment. See A-958 to A-969 for details.

Oil Lubrication

LM systems that require oil lubrication are shipped with only anti-rust oil applied. When placing an order, specify the required lubricant oil. If the LM system is to be mounted other than in horizontal orientation, part of the raceway may be poorly lubricated. Therefore, be sure to inform us of the mounting orientation of the LM system. (For details on mounting orientations, see A-58.)

- The amount of oil to be supplied varies with stroke length. For a long stroke, increase the lubrication frequency or the amount of oil so that an oil film reaches the stroke end of the raceway.
- In environments where a liquid coolant is spattered, the lubricant will be mixed with the coolant, and this can result in the lubricant being emulsified or washed away, causing significantly degraded lubrication performance. In such settings, apply a lubricant with high viscosity (kinematic viscosity: approx. 68 cst) and high emulsification-resistant, and adjust the lubrication frequency or the amount of the feed lubricant.
  For machine tools and similar devices that are subject to heavy loads and require high rigidity and operate at high speed, it is advisable to apply oil lubrication.
- Make sure that lubrication oil normally discharges from the ends of your lubrication piping, i.e., the oiling ports that connect to your LM system.

Lubricant	Type	Brand name
Oil	Sliding surface oil or turbine oil ISOVG32 to 68	Super Multi 32 to 68 (Idemitsu) Vactra No.2S (ExxonMobile) DT Oil (ExxonMobile) Tonner Oil (Showa Shell Sekiyu) or equivalent

Lubrication under Special Environments

For use under special conditions, such as continual vibrations, clean room, vacuum, low temperature and high temperature, normal grease may not be used in some cases. For lubricants that meet such conditions, contact THK.

Table1 Lubricants Used under Special Environments

Service environment	Lubricant characteristics	Brand name
High-speed moving parts	Grease with low torque and low heat generation	AFG Grease(THK) see A-968 AFA Grease(THK) see A-959 NBU15(NOK Kluba) Multemp (Kyodo Yushi) or equivalent
Vacuum	Fluorine based vacuum grease or oil (vapor pressure varies by brand) Note 1	Fomblin Grease (Solvay Solexis) Fomblin Oil (Solvay Solexis) Barrierta IEL/V (NOK Kluba) Isoflex(NOK Kluba) Krytox (Dupont)
Clean room	Grease with very low dust generation	AFE-CA Grease(THK) see A-963 AFF Grease(THK) see A-965
Environments subject to microvibrations or microstrokes, which may cause fretting corrosion	Grease that easily forms an oil film and has high fretting resistance	AFC Grease(THK) see A-961
Environments subject to a spattering coolant such as machine tools	Highly anti-corrosive, refined mineral oil or synthetic oil that forms a strong oil film and is not easily emulsified or washed away by coolant Water-resistant grease Note 2	Super Multi 68 (Idemitsu) Vactra No.2S (ExxonMobile) or equivalent

Note1) When using a vacuum grease, be sure that some brands have starting resistances several times greater than ordinary lithium-based greases.

Note2) In an environment subject to a spattering water-soluble coolant, some brands of intermediate viscosity significantly decrease their lubricity or do not properly form an oil film. Check the compatibility between the lubricant and the coolant.

Note3) Do not mix greases with different physical properties.

Lubrication Methods

There are roughly three methods of lubricating LM systems: manual lubrication using a grease gun or manual pump; forced oiling with the aid of an automatic pump; and oil-bath lubrication.

Manual Lubrication

Generally, grease is replenished periodically, fed through a grease nipple provided on the LM system, using a grease gun. (Fig.1)
For systems that have many locations to be lubricated, establish a centralized piping system and periodically provide grease from a single point using a manual pump. (Fig.2)

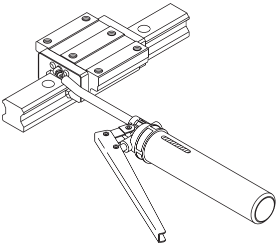


Fig.1 Lubrication Using a Grease Gun

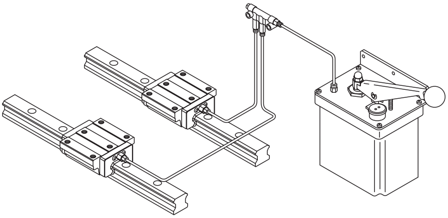


Fig.2 Lubrication through a Centralized Piping System

Note) When a centralized piping system is used, lubricant may not reach the pipe end due to the viscous resistance inside the pipe. Select the right type of grease while taking into account the consistency of the grease and the pipe diameter.

Forced Lubrication Method

In this method, a given amount of lubricant is forcibly fed at a given interval. Normally, the lubricant is not collected after use. (Fig.3)
Although a special lubrication system using a piping or the like needs to be designed, this method reduces the likelihood of forgetting to replenish lubricant.
This method is used mainly for oil lubrication. If using grease, it is necessary to examine the appropriate piping diameter and the required grease consistency.

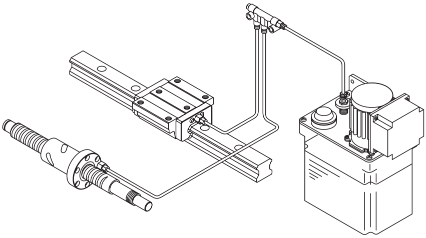


Fig.3 Forced Lubrication Method

Lubrication Accessory Series for LM Systems

THK provides a wide array of lubrication accessories such as grease, grease guns, grease nipples and plumbing fixtures available for various applications. (A-959 to A-970)

THK Original Grease

THK provides various types of THK original greaseneeded for the lubrication of LM systems. They are available for various conditions and environments.

[Table for Grease Selection]

Refer to the table below that allows you to select a type of grease according to the application of the LM system.

Also note that the color of the decorative package varies according to the type (both 70 g and 400 g).

Name of grease		AFA Grease	AFB-LF Grease	AFC Grease	AFE-CA Grease	AFF Grease	AFG Grease
Features		Long service life	All-purpose grease	High-speed/ micro-vibration grease	Grease for clean environment	Grease for clean environment	Grease for heat of Ball Screw
Base oil		high-grade synthetic oil	refined mineral oil	high-grade synthetic oil	high-grade synthetic oil	high-grade synthetic oil	high-grade synthetic oil
Consistency enhancer		Urea-based	Lithium-based	Urea-based	Urea-based	Lithium-based	Urea-based
Service Temperature Range (℃)		−45 to 160	−15 to 100	−54 to 177	−40 to 160 (200)	−40 to 120	−45 to 160
Applications	General industrial machinery	●	●	—	—	—	—
	Machine tool	—	●	●	—	—	●
	Semiconductor manufacturing equipment	—	●	●	●	●	—
	Special environments	—	—	●	●	●	●
Capacity	70g	●	●	●	●	●	●
	400g	●	●	●	●	●	●
Color of decorative package		Green	Orange	Mazarine	Lime green	Light blue	Blue
Reference page		A-959	A-960	A-961	A-963	A-965	A-968

Model number coding

- ●Type of packing···bellows cartridge

AFC + 70

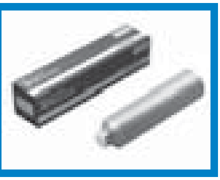
70: Cartridge capacity (70 g / 400 g)

AFC: Type of grease (AFA Grease, AFB-LF Grease, AFC Grease, AFE Grease, AFF Grease, AFG Grease)

THK Original Grease

AFA Grease

- **Base oil: high-grade synthetic oil**
- **Consistency enhancer: urea-based**



AFA Grease is a high-grade, long-life grease developed with a urea-based consistency enhancer using a high-grade synthetic oil as the base oil.

[Features]

(1) Long service life

Unlike ordinary soap based grease for metal lubrication, AFA Grease excels in antioxidation stability and therefore can be used for a long period of time.

(2) Wide temperature range

The lubricating performance remains high over a wide range of temperatures from -45℃ to +160℃.

Even at low temperatures, AFA Grease requires only a low starting torque.

(3) High water resistance

AFA Grease is less vulnerable to moisture penetration than other types of grease because of its high water resistance.

(4) High mechanical stability

AFA Grease is not easily softened and demonstrates excellent mechanical stability even when used for a long period of time.

[Representative Physical Properties]

Test item		Representative value	Test method
Worked penetration (25℃, 60W)		285	JIS K 2220 7
Dropping point: ℃		261	JIS K 2220 8
Copper plate corrosion (B method, 100℃, 24h)		Accepted	JIS K 2220 9
Evaporation amount: mass% (99℃, 22h)		0.2	JIS K 2220 10
Oil separation rate: mass% (100℃, 30h)		0.5	JIS K 2220 11
Stability of oxidation: kPa (99℃, 100h)		80	JIS K 2220 12
Mixing stability (100,000 W)		329	JIS K 2220 15
Grease removal resistance during water rinse: mass% (38℃, 1h)		0.6	JIS K 2220 16
Low temperature torque: N-m (-20℃)	Start	0.17	JIS K 2220 18
	(revolutions)	0.07	
Anticorrosive test: (52℃, 48h)		Accepted	ASTM D1743-73
Service Temperature Limit (℃)		−45 to 160	—

[Rotation Torque Testing with Ball Screw Grease]

<Test method>

Apply 1 cc of grease to the LM Guide of KR4620A+640L and 2 cc to the Ball Screw (initial lubrication only), and then measure the torque at each motor rotation speed.
In torque measurement, output values on the driver torque monitor are used.

Comparative Table of Rotation Torque of Ball Screws by Grease

Unit: N-cm

Grease	Central value of dynamic viscosity CST (mm^2/S)(40℃)	Dynamic viscosity range CST (mm^2/S)(40℃)	Rotational speed			
			$100min^{-1}$	$1000min^{-1}$	$2000min^{-1}$	$4000min^{-1}$
AFA Grease	25	22.5 to 27.5	11.27	11.27	12.25	14.6
Grease of manufacturer I	130	117 to 143	14.6	23.13	31.16	43.12
Grease of manufacturer K	15.3	13.8 to 16.8	12.64	12.05	13.03	14.41
Lubricant VG32	32	28.8 to 35.2	11.17	10.78	13.43	14.7

Note) The values of the competitors' greases are that of low-torque greases.

THK Original Grease

AFB-LF Grease

- Base oil: refined mineral oil
- Consistency enhancer: lithium-based

AFB-LF Grease is a general-purpose grease developed with a lithium-based consistency enhancer using refined mineral oil as the base oil. It excels in extreme pressure resistance and mechanical stability.

[Features]

(1) High extreme pressure resistance
Compared with lithium-based greases available on the market, AFB-LF Grease has higher wear resistance and outstanding resistance to extreme pressure.

(2) High mechanical stability
AFB-LF Grease is not easily softened and demonstrates excellent mechanical stability even when used for a long period of time.

(3) High water resistance
AFB-LF Grease is a highly water resistant grease that is less vulnerable to moisture penetration and little decreases resistance to extreme pressure.

[Representative Physical Properties]

Test item	Representative value	Test method
Worked penetration (25℃, 60W)	275	JIS K 2220 7
Dropping point: ℃	193	JIS K 2220 8
Copper plate corrosion (B method, 100℃, 24h)	Accepted	JIS K 2220 9
Evaporation amount: mass% (99℃, 22h)	0.36	JIS K 2220 10
Oil separation rate: mass% (100℃, 24h)	0.6	JIS K 2220 11
Stability of oxidation: kPa (99℃, 100h)	15	JIS K 2220 12
Mixing stability (100,000 W)	345	JIS K 2220 15
Timken load capacity: N	200	JIS K 2220 20
Grease removal resistance during water rinse: mass% (38℃, 1h)	1.8	JIS K 2220 16
Anticorrosive test: (52℃, 48h)	Accepted	ASTM D1743-73
Service Temperature Limit (℃)	−15 to 100	—

THK Original Grease

AFC Grease

- Base oil: high-grade synthetic oil
- Consistency enhancer: urea-based

AFC Grease has high fretting-corrosion resistance due to a special additive and a urea-based consistency enhancer using a high-grade synthetic oil as the base oil.

[Features]

(1) High fretting-corrosion resistance
AFC Grease is designed to be highly effective in preventing fretting corrosion.

(2) Long service life
Unlike ordinary soap based grease for metal lubrication, AFC Grease excels in antioxidation stability and therefore can be used for a long period of time. As a result, maintenance work is reduced.

(3) Wide temperature range
Since a high-grade synthetic oil is used as the base oil, the lubricating performance remains high over a wide range of temperatures from -54 ℃ to +177 ℃.

[Representative Physical Properties]

Test item		Representative value	Test method
Worked penetration (25℃, 60W)		288	JIS K 2220 7
Dropping point: ℃		269	JIS K 2220 8
Copper plate corrosion (B method, 100℃, 24h)		Accepted	JIS K 2220 9
Evaporation amount: mass% (177℃, 22h)		7.9	JIS K 2220 10
Oil separation rate: mass% (177℃, 30h)		2	JIS K 2220 11
Stability of oxidation: MPa (99℃, 100h)		0.065	JIS K 2220 12
No. of contaminants: pieces/cm^3 25 to 75 µm 75µm or more		370 0	JIS K 2220 13
Mixing stability (100,000 W)		341	JIS K 2220 15
Grease removal resistance during water rinse: mass% (38℃, 1h)		0.6	JIS K 2220 16
Low temperature torque: N-m (−54℃)	Start	0.63	JIS K 2220 18
	(revolutions)	0.068	
Anticorrosive test: (52℃, 48h)		Accepted	ASTM D1743-73
Vibration test (200h)		Accepted	—
Service Temperature Limit (℃)		−54 to 177	—

[Test Data on Fretting-corrosion Resistance]

● Test Data on AFC Grease (Comparison of Raceway Conditions)

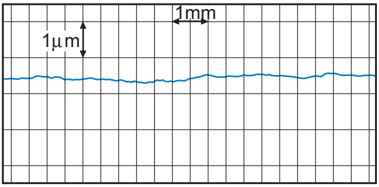
The test data in the figure shows the result of comparing AFC Grease with an ordinary bearing grease.

<Test conditions>

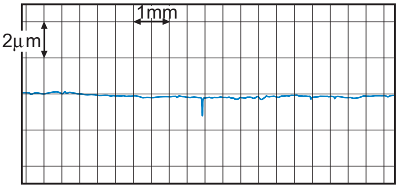
Item	Description
Stroke	3mm
Number of strokes per minute	200min^{-1}
Total number of strokes	2.88×10^{5} (24 hours)
Surface pressure	1118MPa
Grease quantity	12g/1LM block (replenished every 8 hours)

AFC Grease

Before travel

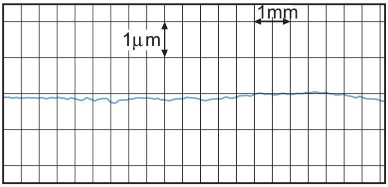


After travel (no fretting corrosion observed)

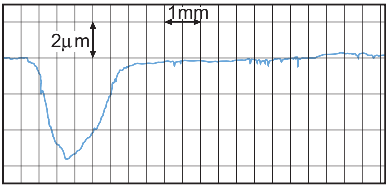


General-purpose bearing grease

Before travel



After travel (fretting corrosion observed)



THK Original Grease

AFE-CA Grease

- Base oil: high-grade synthetic oil
- Consistency enhancer: urea-based

AFE-CA Grease uses urea as a consistency enhancer and a high-grade synthetic oil as the base oil. It has low dust generative characteristics and is therefore a suitable grease for clean room environments.

[Features]

(1) Low dust generation
Compared with vacuum greases in conventional use, AFE-CA Grease generates less dust and therefore is ideal for use in clean rooms.

(2) Long service life
Unlike ordinary soap based grease for metal lubrication, AFE-CA Grease excels in antioxidation stability and therefore can be used for a long period of time. As a result, maintenance work is reduced.

[Representative Physical Properties]

Test item		Representative value	Test method
Worked penetration (25℃, 60W)		260	JIS K 2220 7
Dropping point: ℃		240<	JIS K 2220 8
Copper plate corrosion (100℃, 24h)		Accepted	JIS K 2220 9
Evaporation amount: mass% (99℃, 22h)		0.1	JIS K 2220 10
Oil separation rate: mass% (100℃, 24h)		0.8	JIS K 2220 11
Stability of oxidation: kPa (99℃, 100h)		20	JIS K 2220 12
No. of contaminants: pieces/cm^3	75µm or more	0	JIS K 2220 13
	125µm or more	0	
Mixing stability (100,000 W)		311	JIS K 2220 15
Low temperature torque: N-m (-20℃)	Start	0.130	JIS K 2220 18
	(revolutions)	0.078	
Apparent viscosity: Pa•s (-10℃, 10S^{-1})		230	JIS K 2220 19
Bearing rust prevention: (52℃, 48h)		#1	ASTM D1743-73
Service Temperature Limit (℃)		−40 to 180	—

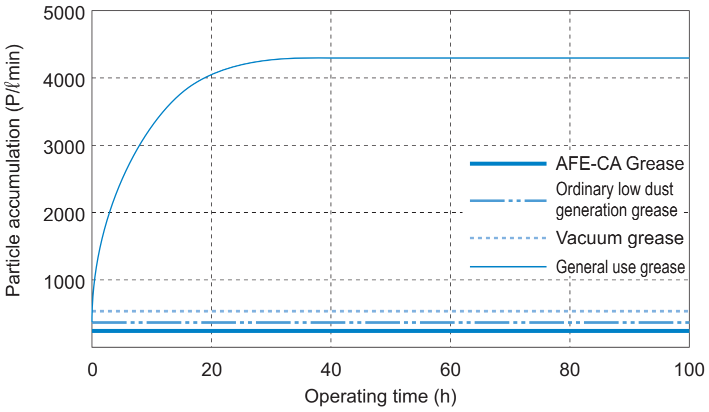
[Test Data on Low Dust Generative Characteristics]

● Test Data on AFE-CA Grease (Comparison of Particle Accumulation)

The test data in the figure shows the result of comparing particle accumulation between AFE-CA Grease with another grease.

<Test conditions>

Item	Description
Sample model No.	THK KR4610
Screw Ball rotational speed	1000min^{-1}
Stroke	210mm
Grease quantity	2 cc in both the Ball Screw and the LM Guide
Flow rate during measurement	1ℓ/min
Measuring instrument	Dust counter
Particle size	0.5μm



THK Original Grease

AFF Grease

- **Base oil: high-grade synthetic oil**
- **Consistency enhancer: lithium-based**

AFF Grease uses a high-grade synthetic oil, lithium-based consistency enhancer and a special additive. It achieves stable rolling resistance, low dust generation and high fretting resistance, at a level that conventional vacuum greases or low dust generation greases have not reached.

[Features]

(1) Stable rolling resistance
Since the viscous resistance is low, the rolling resistance fluctuation is also low. Thus, superb conformity is achieved at low speed.

(2) Low dust generation
AFF Grease generates little dust, making itself an ideal grease for use in clean rooms.

(3) Fretting resistance
Since AFF Grease is highly resistant to wear from microvibrations, it allows the greasing interval to be extended.

[Representative Physical Properties]

Test item		Representative value	Test method
Worked penetration (25℃, 60W)		315	JIS K 2220 7
Dropping point: ℃		216	JIS K 2220 8
Copper plate corrosion (100℃, 24h)		Accepted	JIS K 2220 9
Evaporation amount: mass% (99℃, 22h)		0.43	JIS K 2220 10
Oil separation rate: mass% (100℃, 24h)		0.57	JIS K 2220 11
Stability of oxidation: kPa (99℃, 100h)		39	JIS K 2220 12
No. of contaminants: pieces/cm^3 25µm or more 75µm or more 125µm or more		 0 0 0	JIS K 2220 13
Mixing stability (100,000 W)		329	JIS K 2220 15
Low temperature torque: N-m (-20℃)	Start	0.22	JIS K 2220 18
	(revolutions)	0.04	
Apparent viscosity: Pa•s (-10℃, 10S^{-1})		3400	JIS K 2220 19
Timken load capacity: N		88.2	JIS K 2220 20
4-ball testing (burn-in load): N		3089	ASTM D2596
Fretting resistance: mg		3.8	ASTM D4170 compliant
Bearing rust prevention: (52℃, 48h)		#1	ASTM D1743-73
Service Temperature Limit (℃)		−40 to 120	—

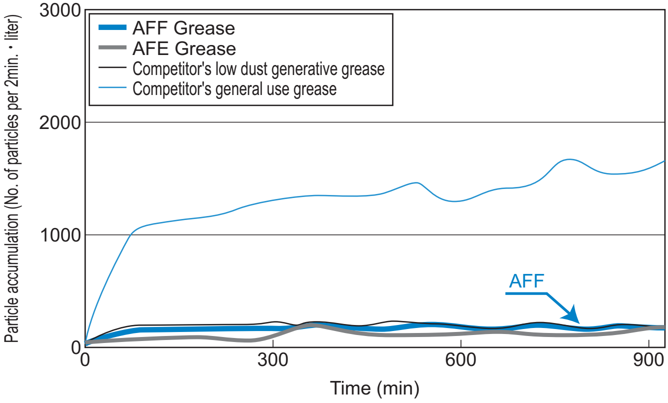
[Test Data on Low Dust Generative Characteristics]

● Test Data on AFF Grease (Comparison of Particle Accumulation)

The test data in the figure shows the result of comparing particle accumulation between AFF Grease with another grease.

<Test conditions>

Item	Description
Model No.	SR20W1+280LP
Grease quantity	1cm³/ LM block (initial lubrication only)
Amount of air supplied	500cm³/min
[Measurement instrument]	Particle counter
Diameter of particle measured	0.3µm or more
Feeding speed	30m/min
Stroke	200mm



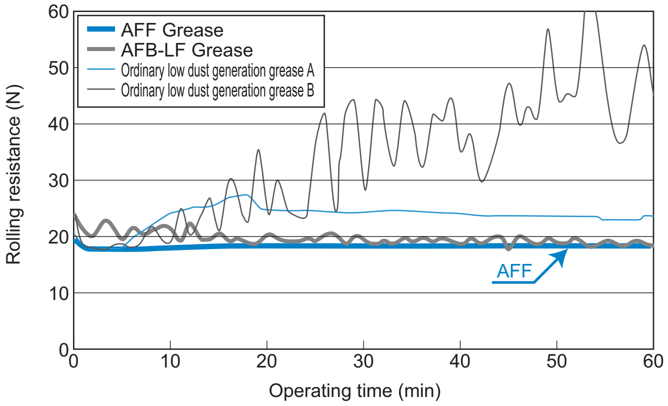
[Rolling Resistance Characteristics at Low Speed]

● Rolling Resistance at Low Speed

The data in the figure represent the test results of comparing rolling resistances at low speed between AFF Grease and other greases.

<Test conditions>

Item	Description
Model No.	HSR35RC0+440LP
Grease quantity	4cm^3/ LM block (initial lubrication only)
Feeding speed	1mm/s
Stroke	3mm



THK Original Grease

AFG Grease

- Base oil: high-grade synthetic oil
- Consistency enhancer: urea-based

AFG Grease is a high-grade grease for Ball Screws that uses a high-grade synthetic oil as the base oil and a urea-based consistency enhancer. It excels in low heat generation and supports a wide temperature range from low to high temperature.

[Features]

(1) Low heat generation

Since the viscous resistance is low, the grease generates only a minimal level of heat even during high-speed operation.

(2) Low viscosity

Since the viscosity is low, a stable rotational torque is achieved.

(3) Wide temperature range

Maintains a high level of lubricity in a wide temperature range of -45℃ to +160℃.

(4) Long service life

AFG Grease is not easily softened and excels in antioxidation stability even after a long-term operation.

(5) Water resistance

AFG Grease is a highly water resistant grease that is less vulnerable to moisture penetration and little decreases resistance to extreme pressure.

[Representative Physical Properties]

Test item		Representative value	Test method
Worked penetration (25℃, 60W)		285	JIS K 2220 5.3
Dropping point: ℃		261	JIS K 2220 5.4
Copper plate corrosion (100℃, 24h)		Accepted	JIS K 2220 5.5
Evaporation amount: mass% (99℃, 22h)		0.2	JIS K 2220 5.6
Oil separation rate: mass% (100℃, 24h)		0.5	JIS K 2220 5.7
Stability of oxidation: MPa (99℃, 100h)		0.029	JIS K 2220 5.8
Mixing stability (100,000 W)		329	JIS K 2220 5.11
Grease removal resistance during water rinse: mass% (38℃, 1h)		0.6	JIS K 2220 5.12
Low temperature torque: N-m (-20℃)	Start	0.439	JIS K 2220 5.14
	(revolutions)	0.049	
Anticorrosive test: (52℃, 48h)		1,1,1	ASTM D1743
Service Temperature Range (℃)		−45 to 160	—

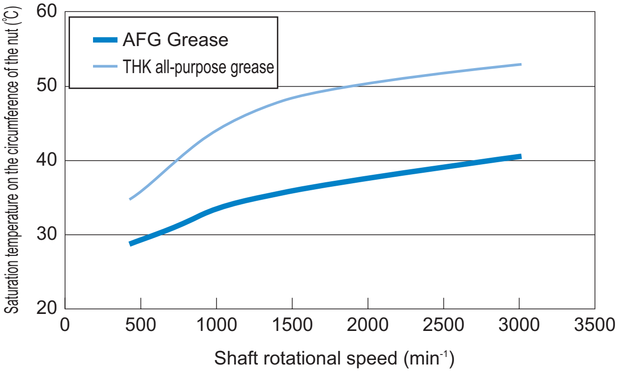
[Test Data on Low Heat Generation Characteristics]

● Test Data on AFG Grease (Comparison of Heat Generation)

The test data in the figure represent the results of comparing heat generation between AFG Grease and other greases.

<Test conditions>

Item	Description
Shaft diameter/lead	32/10mm
Feeding speed	67 to 500mm/s
Shaft rotation speed	400 to 3000 min^{-1}
Stroke	400mm
Grease quantity	12cm^3
Temperature measurement point	Nut circumference



Lubrication Equipment

Grease Gun Unit MG70

●For detailed dimensions, see B-864.

Grease Gun Unit MG70 is capable of lubricating small to large types of LM Guides by replacing dedicated nozzles (attached). For small LM Guides, MG70 is provided with dedicated attachments. The user can select from these attachments according to the model number and the installation space. MG70 has a slit window, allowing the user to check the remaining amount of grease.
It is equipped with a bellows cartridge that can hold 70 g of grease and is replaceable without smirching your hand. It supports a wide range of grease products, including AFA Grease, AFB-LF Grease, AFC Grease and AFE-CA Grease, to meet varied conditions. This enables you to make a selection according to the area requiring grease. (See A-959 to A-969.)
Since the grease to be used is sold separately, you must purchase it separately.

Accessories for Lubrication

Special Plumbing Fixtures

●For detailed dimensions, see B-865.

For centralized greasing and oil lubrication, special plumbing fixtures are available from THK. When ordering an LM system, specify the model number, mounting orientation and piping direction. We will ship the LM system attached with the corresponding fixture.

Accessories for Lubrication

Grease Nipple

●For detailed dimensions, see B-866.

THK provides various types of grease nipples needed for the lubrication of LM systems.

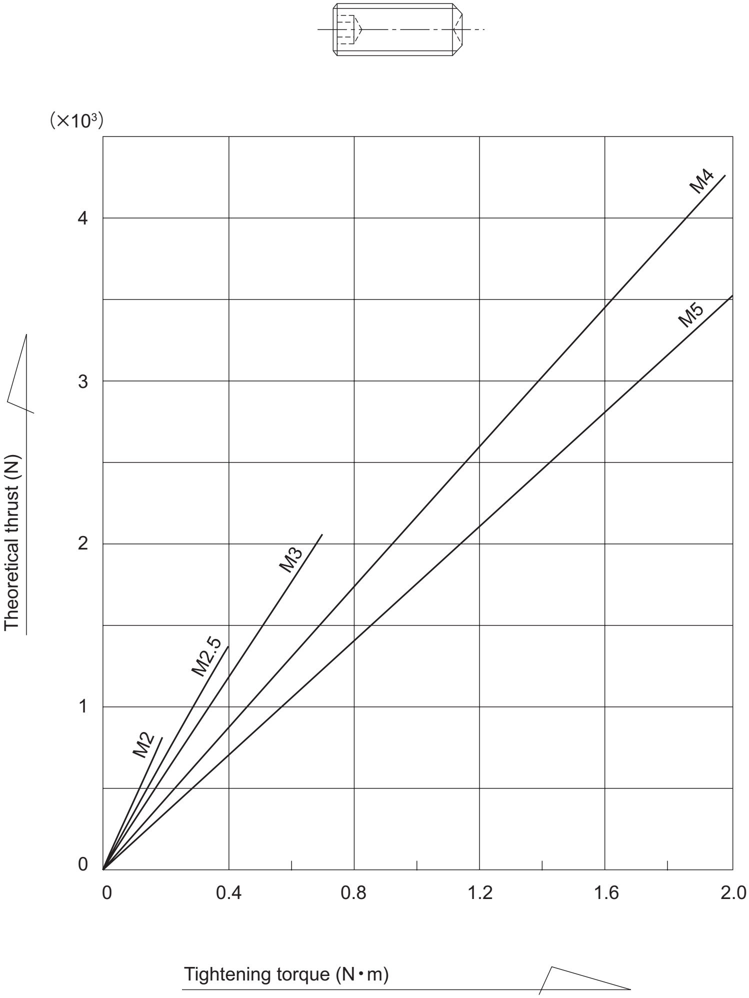
Appendix

THK General Catalog

Appendix Tables

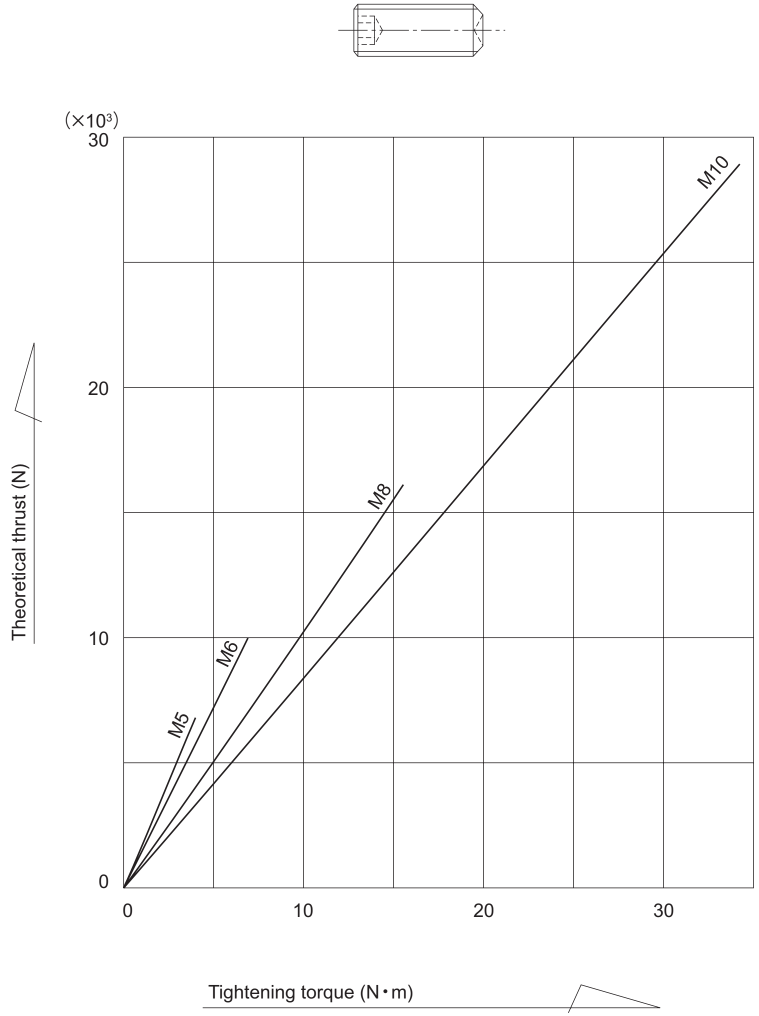
Tightening Torques and Theoretical Thrusts for Hexagonal Socket-head Setscrew

[M2 to M5, Cut-point]



Note) The theoretical thrust may vary depending on the lubrication and the conditions of the surfaces of the setscrew or the reference surface (μ = 0.13).

[M5 to M10, Cut-point]



Note) The theoretical thrust may vary depending on the lubrication and the conditions of the surfaces of the setscrew or the reference surface (μ = 0.13).

Dimensional Tolerances of the Shafts

Dimension classification (mm)		e	f		g		h						js		
Above	Or less	e6	f5	f6	g5	g6	h5	h6	h7	h8	h9	h10	js5	js6	js7
3	6	−20 −28	−10 −15	−10 −18	−4 −9	−4 −12	0 −5	0 −8	0 −12	0 −18	0 −30	0 −48	±2.5	±4	±6
6	10	−25 −34	−13 −19	−13 −22	−5 −11	−5 −14	0 −6	0 −9	0 −15	0 −22	0 −36	0 −58	±3	±4.5	±7.5
10	14	−32 −43	−16 −24	−16 −27	−6 −14	−6 −17	0 −8	0 −11	0 −18	0 −27	0 −43	0 −70	±4	±5.5	±9
14	18														
18	24	−40 −53	−20 −29	−20 −33	−7 −16	−7 −20	0 −9	0 −13	0 −21	0 −33	0 −52	0 −84	±4.5	±6.5	±10.5
24	30														
30	40	−50 −66	−25 −36	−25 −41	−9 −20	−9 −25	0 −11	0 −16	0 −25	0 −39	0 −62	0 −100	±5.5	±8	±12.5
40	50														
50	65	−60 −79	−30 −43	−30 −49	−10 −23	−10 −29	0 −13	0 −19	0 −30	0 −46	0 −74	0 −120	±6.5	±9.5	±15
65	80														
80	100	−72 −94	−36 −51	−36 −58	−12 −27	−12 −34	0 −15	0 −22	0 −35	0 −54	0 −87	0 −140	±7.5	±11	±17.5
100	120														
120	140	−85 −110	−43 −61	−43 −68	−14 −32	−14 −39	0 −18	0 −25	0 −40	0 −63	0 −100	0 −160	±9	±12.5	±20
140	160														
160	180														
180	200	−100 −129	−50 −70	−50 −79	−15 −35	−15 −44	0 −20	0 −29	0 −46	0 −72	0 −115	0 −185	±10	±14.5	±23
200	225														
225	250														
250	280	−110 −142	−56 −79	−56 −88	−17 −40	−17 −49	0 −23	0 −32	0 −52	0 −81	0 −130	0 −210	±11.5	±16	±26
280	315														
315	355	−125 −161	−62 −87	−62 −98	−18 −43	−18 −54	0 −25	0 −36	0 −57	0 −89	0 −140	0 −230	±12.5	±18	±28.5
355	400														
400	450	−135 −175	−68 −95	−68 −108	−20 −47	−20 −60	0 −27	0 −40	0 −63	0 −97	0 −155	0 −250	±13.5	±20	±31.5
450	500														
500	560	−145 −189	−76 −106	−76 −120	−22 −52	−22 −66	0 −30	0 −44	0 −70	0 −110	0 −175	0 −280	±15	±22	±35
560	630														
630	710	−160 −210	−80 −115	−80 −130	−24 −59	−24 −74	0 −35	0 −50	0 −80	0 −125	0 −200	0 −320	±17.5	±25	±40
710	800														
800	900	−170 −226	−86 −126	−86 −142	−26 −66	−26 −82	0 −40	0 −56	0 −90	0 −140	0 −230	0 −360	±20	±28	±45
900	1000														
1000	1120	−195 −261	−98 −144	−98 −164	−28 −74	−28 −94	0 −46	0 −66	0 −105	0 −165	0 −260	0 −420	±23	±33	±52.5
1120	1250														
1250	1400	−220 −298	−110 −164	−110 −188	−30 −84	−30 −108	0 −54	0 −78	0 −125	0 −195	0 −310	0 −500	±27	±39	±62.5
1400	1600														

Unit: μm=0.001mm

j		k			m		n		p		Dimension classification (mm)	
j5	j6	k5	k6	k7	m5	m6	n5	n6	p5	p6	Above	Or less
+3 −2	+6 −2	+6 +1	+9 +1	+13 +1	+9 +4	+12 +4	+13 +8	+16 +8	+17 +12	+20 +12	3	6
+4 −2	+7 −2	+7 +1	+10 +1	+16 +1	+12 +6	+15 +6	+16 +10	+19 +10	+21 +15	+24 +15	6	10
+5 −3	+8 −3	+9 +1	+12 +1	+19 +1	+15 +7	+18 +7	+20 +12	+23 +12	+26 +18	+29 +18	10	14
											14	18
+5 −4	+9 −4	+11 +2	+15 +2	+23 +2	+17 +8	+21 +8	+24 +15	+28 +15	+31 +22	+35 +22	18	24
											24	30
+6 −5	+11 −5	+13 +2	+18 +2	+27 +2	+20 +9	+25 +9	+28 +17	+33 +17	+37 +26	+42 +26	30	40
											40	50
+6 −7	+12 −7	+15 +2	+21 +2	+32 +2	+24 +11	+30 +11	+33 +20	+39 +20	+45 +32	+51 +32	50	65
											65	80
+6 −9	+13 −9	+18 +3	+25 +3	+38 +3	+28 +13	+35 +13	+38 +23	+45 +23	+52 +37	+59 +37	80	100
											100	120
+7 −11	+14 −11	+21 +3	+28 +3	+43 +3	+33 +15	+40 +15	+45 +27	+52 +27	+61 +43	+68 +43	120	140
											140	160
											160	180
+7 −13	+16 −13	+24 +4	+33 +4	+50 +4	+37 +17	+46 +17	+51 +31	+60 +31	+70 +50	+79 +50	180	200
											200	225
											225	250
+7 −16	+16 −16	+27 +4	+36 +4	+56 +4	+43 +20	+52 +20	+57 +34	+66 +34	+79 +56	+88 +56	250	280
											280	315
+7 −18	+18 −18	+29 +4	+40 +4	+61 +4	+46 +21	+57 +21	+62 +37	+73 +37	+87 +62	+98 +62	315	355
											355	400
+7 −20	+20 −20	+32 +5	+45 +5	+68 +5	+50 +23	+63 +23	+67 +40	+80 +40	+95 +68	+108 +68	400	450
											450	500
—	—	+30 0	+44 0	+70 0	+56 +26	+70 +26	+74 +44	+88 +44	+108 +78	+122 +78	500	560
											560	630
—	—	+35 0	+50 0	+80 0	+65 +30	+80 +30	+85 +50	+100 +50	+123 +88	+138 +88	630	710
											710	800
—	—	+40 0	+56 0	+90 0	+74 +34	+90 +34	+96 +56	+112 +56	+140 +100	+156 +100	800	900
											900	1000
—	—	+46 0	+66 0	+105 0	+86 +40	+106 +40	+112 +66	+132 +66	+166 +120	+186 +120	1000	1120
											1120	1250
—	—	+54 0	+78 0	+125 0	+102 +48	+126 +48	+132 +78	+156 +78	+194 +140	+218 +140	1250	1400
											1400	1600

Dimensional Tolerances of Housing Holes

Dimension classification (mm)		E		F			G		H					
Above	Or less	E6	E7	F6	F7	F8	G6	G7	H5	H6	H7	H8	H9	H10
3	6	+28 +20	+32 +20	+18 +10	+22 +10	+28 +10	+12 +4	+16 +4	+5 0	+8 0	+12 0	+18 0	+30 0	+48 0
6	10	+34 +25	+40 +25	+22 +13	+28 +13	+35 +13	+14 +5	+20 +5	+6 0	+9 0	+15 0	+22 0	+36 0	+58 0
10	14	+43 +32	+50 +32	+27 +16	+34 +16	+48 +16	+17 +6	+24 +6	+8 0	+11 0	+18 0	+27 0	+43 0	+70 0
14	18													
18	24	+53 +40	+61 +40	+33 +20	+41 +20	+53 +20	+20 +7	+28 +7	+9 0	+13 0	+21 0	+33 0	+52 0	+84 0
24	30													
30	40	+66 +50	+75 +50	+41 +25	+50 +25	+64 +25	+25 +9	+34 +9	+11 0	+16 0	+25 0	+39 0	+62 0	+100 0
40	50													
50	65	+79 +60	+90 +60	+49 +30	+60 +30	+76 +30	+29 +10	+40 +10	+13 0	+19 0	+30 0	+46 0	+74 0	+120 0
65	80													
80	100	+94 +72	+107 +72	+58 +36	+71 +36	+90 +36	+34 +12	+47 +12	+15 0	+22 0	+35 0	+54 0	+87 0	+140 0
100	120													
120	140	+110 +85	+125 +85	+68 +43	+83 +43	+106 +43	+39 +14	+54 +14	+18 0	+25 0	+40 0	+63 0	+100 0	+160 0
140	160													
160	180													
180	200	+129 +100	+146 +100	+79 +50	+96 +50	+122 +50	+44 +15	+61 +15	+20 0	+29 0	+46 0	+72 0	+115 0	+185 0
200	225													
225	250													
250	280	+142 +110	+162 +110	+88 +56	+108 +56	+137 +56	+49 +17	+69 +17	+23 0	+32 0	+52 0	+81 0	+130 0	+210 0
280	315													
315	355	+161 +125	+182 +125	+98 +62	+119 +62	+151 +62	+54 +18	+75 +18	+25 0	+36 0	+57 0	+89 0	+140 0	+230 0
355	400													
400	450	+175 +135	+198 +135	+108 +68	+131 +68	+165 +68	+60 +20	+83 +20	+27 0	+40 0	+63 0	+97 0	+155 0	+250 0
450	500													
500	560	+189 +145	+215 +145	+120 +76	+146 +76	+186 +76	+66 +22	+92 +22	+30 0	+44 0	+70 0	+110 0	+175 0	+280 0
560	630													
630	710	+210 +160	+240 +160	+130 +80	+160 +80	+205 +80	+74 +24	+104 +24	+35 0	+50 0	+80 0	+125 0	+200 0	+320 0
710	800													
800	900	+226 +170	+260 +170	+142 +86	+176 +86	+226 +86	+82 +26	+116 +26	+40 0	+56 0	+90 0	+140 0	+230 0	+360 0
900	1000													
1000	1120	+261 +195	+300 +195	+164 +98	+203 +98	+263 +98	+94 +28	+133 +28	+46 0	+66 0	+105 0	+165 0	+260 0	+420 0
1120	1250													
1250	1400	+298 +220	+345 +220	+188 +110	+235 +110	+305 +110	+108 +30	+155 +30	+54 0	+78 0	+125 0	+195 0	+310 0	+500 0
1400	1600													

Unit: µm=0.001mm

Js		J		K		M		N		P		Dimension classification (mm)	
Js6	Js7	J6	J7	K6	K7	M6	M7	N6	N7	P6	P7	Above	Or less
±4	±6	+5 −3	+6 −6	+2 −6	+3 −9	−1 −9	0 −12	−5 −13	−4 −16	−9 −17	−8 −20	3	6
±4.5	±7.5	+5 −4	+8 −7	+2 −7	+5 −10	−3 −12	0 −15	−7 −16	−4 −19	−12 −21	−9 −24	6	10
±5.5	±9	+6 −5	+10 −8	+2 −9	+6 −12	−4 −15	0 −18	−9 −20	−5 −23	−15 −26	−11 −29	10	14
												14	18
±6.5	±10.5	+8 −5	+12 −9	+2 −11	+6 −15	−4 −17	0 −21	−11 −24	−7 −28	−18 −31	−14 −35	18	24
												24	30
±8	±12.5	+10 −6	+14 −11	+3 −13	+7 −18	−4 −20	0 −25	−12 −28	−8 −33	−21 −37	−17 −42	30	40
												40	50
±9.5	±15	+13 −6	+18 −12	+4 −15	+9 −21	−5 −24	0 −30	−14 −33	−9 −39	−26 −45	−21 −51	50	65
												65	80
±11	±17.5	+16 −6	+22 −13	+4 −18	+10 −25	−6 −28	0 −35	−16 −38	−10 −45	−30 −52	−24 −59	80	100
												100	120
±12.5	±20	+18 −7	+26 −14	+4 −21	+12 −28	−8 −33	0 −40	−20 −45	−12 −52	−36 −61	−28 −68	120	140
												140	160
												160	180
±14.5	±23	+22 −7	+30 −16	+5 −24	+13 −33	−8 −37	0 −46	−22 −51	−14 −60	−41 −70	−33 −79	180	200
												200	225
												225	250
±16	±26	+25 −7	+36 −16	+5 −27	+16 −36	−9 −41	0 −52	−25 −57	−14 −66	−47 −79	−36 −88	250	280
												280	315
±18	±28.5	+29 −7	+39 −18	+7 −29	+17 −40	−10 −46	0 −57	−26 −62	−16 −73	−51 −87	−41 −98	315	355
												355	400
±20	±31.5	+33 −7	+43 −20	+8 −32	+18 −45	−10 −50	0 −63	−27 −67	−17 −80	−55 −95	−45 −108	400	450
												450	500
±22	±35	—	—	—	—	−26 −70	−26 −96	−44 −88	−44 −114	−78 −122	−78 −148	500	560
												560	630
±25	±40	—	—	—	—	−30 −80	−30 −110	−50 −100	−50 −130	−88 −138	−88 −168	630	710
												710	800
±28	±45	—	—	—	—	−34 −90	−34 −124	−56 −112	−56 −146	−100 −156	−100 −190	800	900
												900	1000
±33	±52.5	—	—	—	—	−40 −106	−40 −145	−66 −132	−66 −171	−120 −186	−120 −225	1000	1120
												1120	1250
±39	±62.5	—	—	—	—	−48 −126	−48 −173	−78 −156	−78 −203	−140 −218	−140 −265	1250	1400
												1400	1600

SI Unit Conversion Table

[Conversion to SI Units]

Amount	Name of unit	Symbol	Factor of conversion to SI	Name of SI unit	Symbol
Angle	Degree Minute Second	° ′ ″	π/180 π/10800 π/648000	Radian	rad
Length	Meter Angstrom X-ray unit Nautical mile	m Å n mile	1 10^{-10} $\approx 1.00208 \times 10^{-13}$ 1852	Meter	m
Area	Square meter Are Hectare	m^2 a ha	1 10^2 10^4	Square meter	m^2
Volume	Cubic meter Liter	m^3 ℓ (L)	1 10^{-3}	Cubic meter	m^3
Mass	Kilogram Ton Atomic-mass unit	kg t u	1 10^3 $\approx 1.66057 \times 10^{-27}$	Kilogram	kg
Time	Second Minute Hour Day	s min h d	1 60 3600 86400	Second	S
Speed	Meter per second Knot	m/s kn	1 1852/3600	Meter per second	m/s
Frequency	cycle	s^{-1}	1	Hertz	Hz
Rotational speed	Revolution per minute	rpm	1	Per minute	min^{-1}
Angular velocity	Radian per minute	rad/s	1	Radian per minute	rad/s
Acceleration	Meter per second per second G	m/s^2 G	1 9.80665	Meter per second per second	m/s^2
Force	Weight kilogram Weight ton Dyne	kgf tf dyn	9.80665 9806.65 10^{-5}	Newton	N
Moment of force	Weight kilogram meter	kgf-m	9.80665	Newton meter	N-m
Stress and pressure	Weight kilogram per square meter Weight kilogram per square centimeter Weight kilogram per square millimeter	kgf/m^2 kgf/cm^2 kgf/mm^2	9.80665 9.80665×10^4 9.80665×10^6	Pascal	Pa
Pressure	Water column meter Mercury column meter Torr Atmosphere Bar	mH_2O mmHg Torr atm bar	9806.65 101325/760 101325/760 101325 10^5	Pascal	Pa
Energy	Erg IT calorie Weight kilogram meter Kilowatt hour Metric Horsepower hour Electron volt	erg cal_{IT} kgf-m kW・h PS・h eV	10^{-7} 4.1868 9.80665 3.600×10^6 $\approx 2.64779 \times 10^6$ $\approx 1.60219 \times 10^{-19}$	Joule	J
Power	Watt Metric Horsepower Kilogram force-meter	W PS kgf-m/s	1 ≈735.5 9.80665	Watt	W

Amount	Name of unit	Symbol	Factor of conversion to SI	Name of SI unit	Symbol
Viscosity	Poise	P	10^{-1}	Pascal second	Pa-s
	Centipoise	cP	10^{-3}		
	Kilogram force-second per square meter	$kgf\text{-}s/m^2$	9.80665		
Kinematic viscosity	Stokes	St	10^{-1}	Square meter per second	m^2/s
	Centistokes	cSt	10^{-6}		
Temperature	Degree	℃	+273.15	Kelvin	K
Radioactivity	Curie	Ci	3.7×10^{10}	Becquerel	Bq
Dose	Roentgen	R	2.58×10^{-4}	Coulomb per kilogram	C/kg
Absorbed dose	Rad	rad	10^{-2}	Gray	Gy
Equivalent dose	Rem	rem	10^{-2}	Sievert	Sv
Magnetic flux	Maxwell	Mx	10^{-8}	Weber	Wb
Magnetic flux density	Gamma	γ	10^{-9}	Tesla	T
	Gauss	Gs	10^{-4}		
Magnetic-field intensity	Oersted	Oe	$10^3/4\pi$	Ampere per meter	A/m
Quantity of electricity	Coulomb	C	1	Coulomb	C
Voltage potentialdifference	bolt	V	1	bolt	V
Electrostatic capacity	Farad	F	1	Farad	F
(Electric) resistance	Ohm	Ω	1	Ohm	Ω
(Electric) conductance	Siemens	S	1	Siemens	S
Inductance	Henry	H	1	Henry	H
Current	Ampere	A	1	Ampere	A

[Comparative Table of SI, CGS System and Gravitational System Units]

Amount	Length	Mass	Time	Acceleration	Force	Stress	Pressure	Energy
Unit system	L	M	T					
SI CGS system Gravitational system	m cm m	kg g kgf-s^2/m	s s s	m/s^2 Gal m/s^2	N dyn kgf	Pa dyn/cm^2 kgf/m^2	Pa dyn/cm^2 kgf/m^2	J erg kgf-cm

Amount / Unit system	Power	Temperature	Viscosity	Kinematic viscosity	Magnetic flux	Magnetic flux density	Magnetic-field intensity
SI CGS system Gravitational system	W erg/s kgf-m/s	K ℃ ℃	Pa-s P kgf-s/m^2	m^2/s St m^2/s	Wb Mx —	T Gs —	A/m Oe —

[Integer Multipliers of 10 of SI Units]

Number of digits multiplied to unit	Prefix		Number of digits multiplied to unit	Prefix	
	Name	Symbol		Name	Symbol
10^{18}	Exa	E	10^{-1}	Deci	d
10^{15}	Peta	P	10^{-2}	Centi	c
10^{12}	Tera	T	10^{-3}	Milli	m
10^{9}	Giga	G	10^{-6}	Micro	μ
10^{6}	Mega	M	10^{-9}	Nano	n
10^{3}	Kilo	k	10^{-12}	Pico	p
10^{2}	Hecto	h	10^{-15}	Femto	f
10	Deca	da	10^{-18}	Atto	a

[Hardness Conversion Table]

Rockwell	Vickers hardness	Brinell hardness HB		Rockwell hardness		Shore hardness
C-scale hardness HRC (load: 1471 N)	Hardness HV	Standard ball	Tungsten carbide ball	HRA A scale Load: 588.4N Brale indenter	HRB B scale Load: 980.7N Ball with diam of 1/16 in.	Hardness HS
68	940	—	—	85.6	—	97
67	900	—	—	85.0	—	95
66	865	—	—	84.5	—	92
65	832	—	739	83.9	—	91
64	800	—	722	83.4	—	88
63	772	—	705	82.8	—	87
62	746	—	688	82.3	—	85
61	720	—	670	81.8	—	83
60	697	—	654	81.2	—	81
59	674	—	634	80.7	—	80
58	653	—	615	80.1	—	78
57	633	—	595	79.6	—	76
56	613	—	577	79.0	—	75
55	595	—	560	78.5	—	74
54	577	—	543	78.0	—	72
53	560	—	525	77.4	—	71

Rockwell	Vickers hardness	Brinell hardness HB		Rockwell hardness		Shore hardness
C-scale hardness HRC (load: 1471 N)	Hardness HV	Standard ball	Tungsten carbide ball	HRA A scale Load: 588.4N Brale indenter	HRB B scale Load: 980.7N Ball with diam of 1/16 in.	Hardness HS
52	544	500	512	76.8	—	69
51	528	487	496	76.3	—	68
50	513	475	481	75.9	—	67
49	498	464	469	75.2	—	66
48	484	451	455	74.7	—	64
47	471	442	443	74.1	—	63
46	458	432	432	73.6	—	62
45	446	421	421	73.1	—	60
44	434	409	409	72.5	—	58
43	423	400	400	72.0	—	57
42	412	390	390	71.5	—	56
41	402	381	381	70.9	—	55
40	392	371	371	70.4	—	54
39	382	362	362	69.9	—	52
38	372	353	353	69.4	—	51
37	363	344	344	68.9	—	50
36	354	336	336	68.4	(109.0)	49
35	345	327	327	67.9	(108.5)	48
34	336	319	319	67.4	(108.0)	47
33	327	311	311	66.8	(107.5)	46
32	318	301	301	66.3	(107.0)	44
31	310	294	294	65.8	(106.0)	43
30	302	286	286	65.3	(105.5)	42
29	294	279	279	64.7	(104.5)	41
28	286	271	271	64.3	(104.0)	41
27	279	264	264	63.8	(103.0)	40
26	272	258	258	63.3	(102.5)	38
25	266	253	253	62.8	(101.5)	38
24	260	247	247	62.4	(101.0)	37
23	254	243	243	62.0	100.0	36
22	248	237	237	61.5	99.0	35
21	243	231	231	61.0	98.5	35
20	238	226	226	60.5	97.8	34
(18)	230	219	219	—	96.7	33
(16)	222	212	212	—	95.5	32
(14)	213	203	203	—	93.9	31
(12)	204	194	194	—	92.3	29
(10)	196	187	187	—	90.7	28
(8)	188	179	179	—	89.5	27
(6)	180	171	171	—	87.1	26
(4)	173	165	165	—	85.5	25
(2)	166	158	158	—	83.5	24
(0)	160	152	152	—	81.7	24

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THK

General Catalog

Linear Motion Systems

B Product Specifications

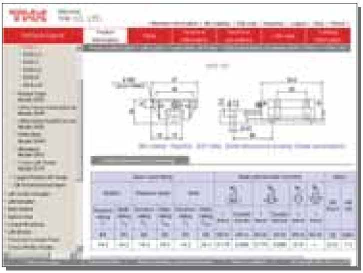
THK Technical Support Site

The THK Technical Support Site lets you access product information and technical support online. You will also find a search feature for locating desired products and a calculation feature for calculating service life. 2D CAD and 3D CAD data are also downloadable.

http://www.thk.com/ ◀ **Enter here.**

Product Information

View information on our products.
Search by model number, description, or any other criteria.

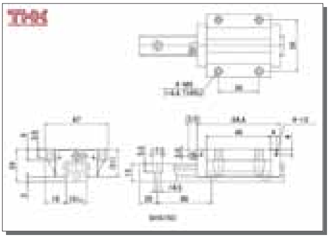


Detailed Dimensional Drawings

Check detailed product dimensions according to model number.

Detailed Specifications

Check detailed product specifications according to model number.



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You can search by an entire inquiry or answer.

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3D CAD Data Downloads

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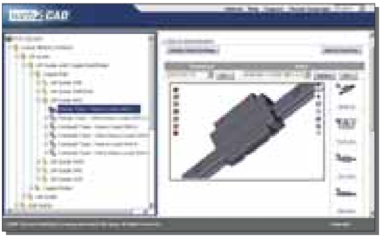

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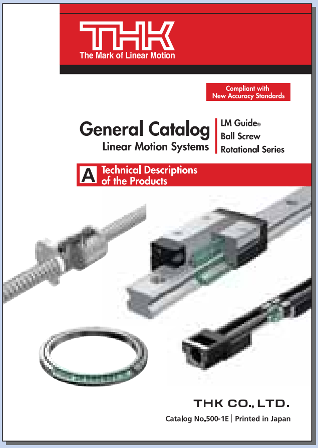
Guide to the General Catalog

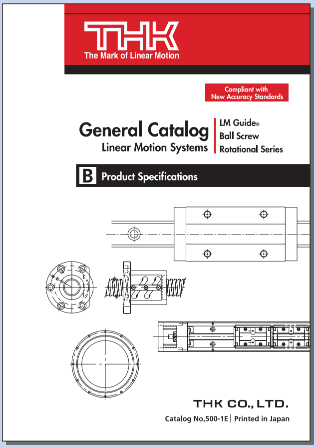
The THK General Catalog is in two volumes, A Technical Descriptions of the Products, and B Product Specifications.


THK
The Mark of Linear Motion
Compliant with New Accuracy Standards
General Catalog
Linear Motion Systems
LM Guide®
Ball Screw
Rotational Series
A Technical Descriptions of the Products
THK CO., LTD.
Catalog No.500-1E | Printed in Japan

A Product Technical Descriptions

A Technical Descriptions of the Products mainly contains product
■Features and Structure
■Point of Selection
■Point of Design
■Mounting Procedure and Maintenance
■Options
■Precautions on Use

■Point of Selection include test data and service life calculation formulas for use when considering technical features in detail. Further, information relating generally to lubrication and grease-type products in special environments can be found conveniently together in Accessories for Lubrication


THK
The Mark of Linear Motion
Compliant with New Accuracy Standards
General Catalog
Linear Motion Systems
LM Guide®
Ball Screw
Rotational Series
B Product Specifications
THK CO., LTD.
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B Product Specifications

B Product Specifications contains dimensional drawings and tables according to product and model number.

All information containing product dimensional elements is given.

With two volumes, you can compare a page of product technical information with the product's dimensional drawings and tables to aid when considering specifications.

We at THK are sure you will be pleased in finding products among our abundant selection in the General Catalog that fit your needs.

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Medium Torque Type Ball Spline

Rotary Ball Spline With Geared type

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Die-setting Ball Cage Models KS and BS

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LM Guide®

THK General Catalog

LM Guide

THK General Catalog

B Product Specifications

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Caged Ball LM Guide

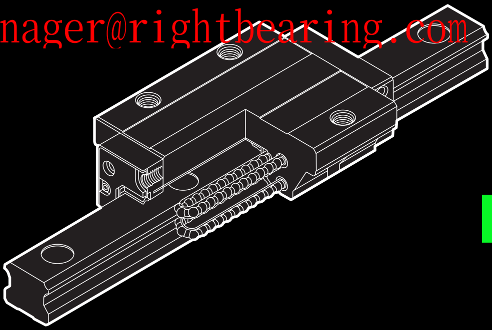
LM Guide

Caged Roller LM Guide

A Technical Descriptions of the Products (Separate)

Dimensions of Each Model with an Option Attached

*** Please see the separate "A Technical Descriptions of the Products".**



SHS

Caged Ball LM Guides

B Product Specifications

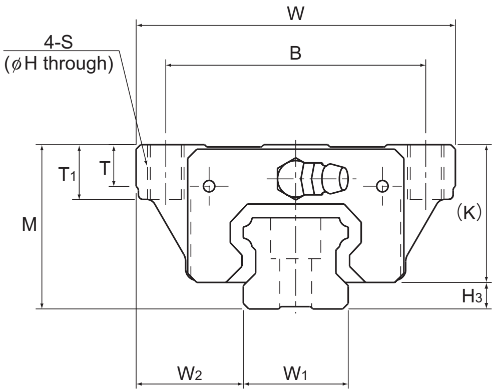
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SHS-C and SHS-LC



Model No.	Outer dimensions			LM block dimensions											Pilot hole for side nipple**		
	Height M	Width W	Length L	B	C	S	H	L_1	T	T_1	K	N	E	Grease nipple	e_0	f_0	D_0
SHS 15C SHS 15LC	24	47	64.4 79.4	38	30	M5	4.4	48 63	5.9	8	21	5.5	5.5	PB1021B	4	4	3
SHS 20C SHS 20LC	30	63	79 98	53	40	M6	5.4	59 78	7.2	10	25.4	6.5	12	B-M6F	4.3	5.3	3
SHS 25C SHS 25LC	36	70	92 109	57	45	M8	6.8	71 88	9.1	12	30.2	7.5	12	B-M6F	6	5.5	3
SHS 30C SHS 30LC	42	90	106 131	72	52	M10	8.5	80 105	11.5	15	35	8	12	B-M6F	5.5	6	5.2
SHS 35C SHS 35LC	48	100	122 152	82	62	M10	8.5	93 123	11.5	15	40.5	8	12	B-M6F	6.5	5.5	5.2
SHS 45C SHS 45LC	60	120	140 174	100	80	M12	10.5	106 140	14.1	18	51.1	10.5	16	B-PT1/8	8	8	5.2
SHS 55C SHS 55LC	70	140	171 213	116	95	M14	12.5	131 173	16	21	57.3	11	16	B-PT1/8	10	8	5.2
SHS 65C SHS 65LC	90	170	221 272	142	110	M16	14.5	175 226	18.8	24	71	19	16	B-PT1/8	10	12	5.2

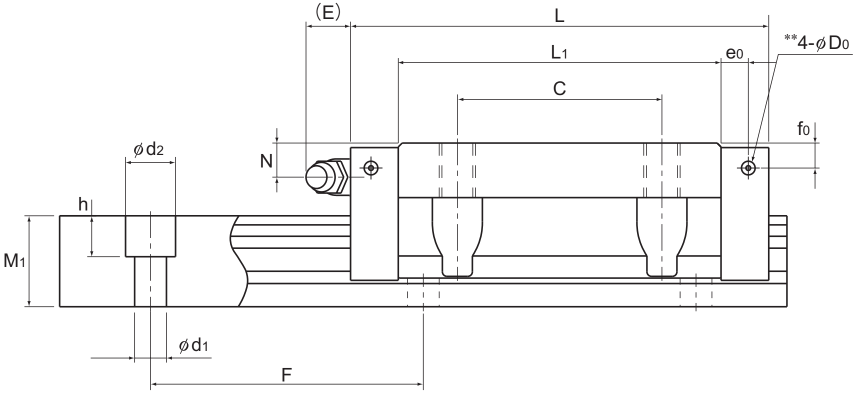
Model number coding

SHS25 LC 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SHS25: Model number
- LC: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With steel tape
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



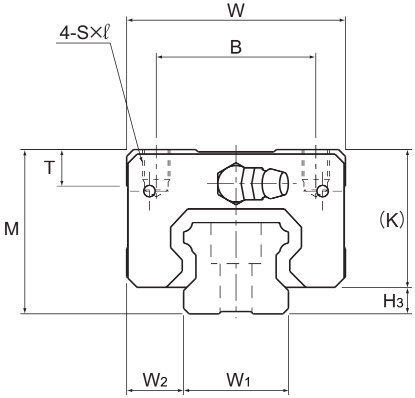
Unit: mm

		LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
		Width		Height	Pitch		Length*	C	C0	MA		MB		MC	LM block	LM rail
	H3	W1 0 -0.05	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	3	15	16	13	60	4.5×7.5×5.3	2500	14.2 17.2	24.2 31.9	0.175 0.296	0.898 1.43	0.175 0.296	0.898 1.43	0.16 0.212	0.23 0.29	1.3
	4.6	20	21.5	16.5	60	6×9.5×8.5	3000	22.3 28.1	38.4 50.3	0.334 0.568	1.75 2.8	0.334 0.568	1.75 2.8	0.361 0.473	0.46 0.61	2.3
	5.8	23	23.5	20	60	7×11×9	3000	31.7 36.8	52.4 64.7	0.566 0.848	2.75 3.98	0.566 0.848	2.75 3.98	0.563 0.696	0.72 0.89	3.2
	7	28	31	23	80	9×14×12	3000	44.8 54.2	66.6 88.8	0.786 1.36	4.08 6.6	0.786 1.36	4.08 6.6	0.865 1.15	1.34 1.66	4.5
	7.5	34	33	26	80	9×14×12	3000	62.3 72.9	96.6 127	1.36 2.34	6.76 10.9	1.38 2.34	6.76 10.9	1.53 2.01	1.9 2.54	6.2
	8.9	45	37.5	32	105	14×20×17	3090	82.8 100	126 166	2.05 3.46	10.1 16.3	2.05 3.46	10.1 16.3	2.68 3.53	3.24 4.19	10.4
	12.7	53	43.5	38	120	16×23×20	3060	128 161	197 259	3.96 6.68	19.3 31.1	3.96 6.68	19.3 31.1	4.9 6.44	5.35 6.97	14.5
	19	63	53.5	53	150	18×26×22	3000	205 253	320 408	8.26 13.3	40.4 62.6	8.26 13.3	40.4 62.6	9.4 11.9	10.7 13.7	23.7

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-12.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 **Dimensions⇒B-223**

Models SHS-V and SHS-LV



Model No.	Outer dimensions			LM block dimensions									Pilot hole for side nipple**		
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple	e_0	f_0	D_0
SHS 15V SHS 15LV	24	34	64.4 79.4	26	26 34	M4×4	48 63	5.9	21	5.5	5.5	PB1021B	4	4	3
SHS 20V SHS 20LV	30	44	79 98	32	36 50	M5×5	59 78	8	25.4	6.5	12	B-M6F	4.3	5.3	3
SHS 25V SHS 25LV	36	48	92 109	35	35 50	M6×6.5	71 88	8	30.2	7.5	12	B-M6F	6	5.5	3
SHS 30V SHS 30LV	42	60	106 131	40	40 60	M8×8	80 105	8	35	8	12	B-M6F	5.5	6	5.2
SHS 35V SHS 35LV	48	70	122 152	50	50 72	M8×10	93 123	14.7	40.5	8	12	B-M6F	6.5	5.5	5.2
SHS 45V SHS 45LV	60	86	140 174	60	60 80	M10×15	106 140	14.9	51.1	10.5	16	B-PT1/8	8	8	5.2
SHS 55V SHS 55LV	70	100	171 213	75	75 95	M12×15	131 173	19.4	57.3	11	16	B-PT1/8	10	8	5.2
SHS 65V SHS 65LV	90	126	221 272	76	70 120	M16×20	175 226	19.5	71	19	16	B-PT1/8	10	12	5.2

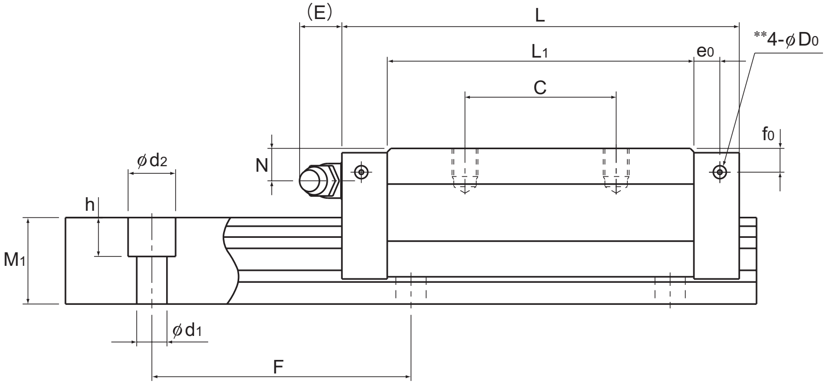
Model number coding

SHS30 V 2 QZ KKHH C1 +1240L P T Z -Ⅱ

- SHS30: Model number
- V: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1240L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With steel tape
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Unit: mm

		LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
		Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
										1 block	Double blocks	1 block	Double blocks	1 block		
	H_3	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN						kg	kg/m
	3	15	9.5	13	60	4.5×7.5×5.3	2500	14.2 17.2	24.2 31.9	0.175 0.296	0.898 1.43	0.175 0.296	0.898 1.43	0.16 0.212	0.19 0.22	1.3
	4.6	20	12	16.5	60	6×9.5×8.5	3000	22.3 28.1	38.4 50.3	0.334 0.568	1.75 2.8	0.334 0.568	1.75 2.8	0.361 0.473	0.35 0.46	2.3
	5.8	23	12.5	20	60	7×11×9	3000	31.7 36.8	52.4 64.7	0.566 0.848	2.75 3.98	0.566 0.848	2.75 3.98	0.563 0.696	0.54 0.67	3.2
	7	28	16	23	80	9×14×12	3000	44.8 54.2	66.6 88.8	0.786 1.36	4.08 6.6	0.786 1.36	4.08 6.6	0.865 1.15	0.94 1.16	4.5
	7.5	34	18	26	80	9×14×12	3000	62.3 72.9	96.6 127	1.38 2.34	6.76 10.9	1.38 2.34	6.76 10.9	1.53 2.01	1.4 1.84	6.2
	8.9	45	20.5	32	105	14×20×17	3090	82.8 100	126 166	2.05 3.46	10.1 16.3	2.05 3.46	10.1 16.3	2.68 3.53	2.54 3.19	10.4
	12.7	53	23.5	38	120	16×23×20	3060	128 161	197 259	3.96 6.68	19.3 31.1	3.96 6.68	19.3 31.1	4.9 6.44	4.05 5.23	14.5
	19	63	31.5	53	150	18×26×22	3000	205 253	320 408	8.26 13.3	40.4 62.6	8.26 13.3	40.4 62.6	9.4 11.9	8.41 10.7	23.7

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
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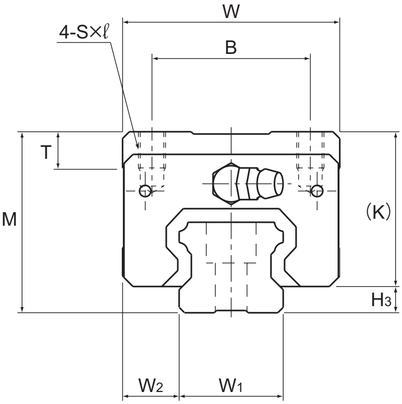
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SHS-R and SHS-LR



<table>
<tr><th rowspan="2">Model No.</th><th colspan="3">Outer dimensions</th><th colspan="9">LM block dimensions</th><th colspan="3">Pilot hole for side nipple**</th></tr>
<tr><th>Height
M</th><th>Width
W</th><th>Length
L</th><th>B</th><th>C</th><th>S×ℓ</th><th>L1</th><th>T</th><th>K</th><th>N</th><th>E</th><th>Grease nipple</th><th>e0</th><th>f0</th><th>D0</th></tr>
<tr><td>SHS 15R</td><td>28</td><td>34</td><td>64.4</td><td>26</td><td>26</td><td>M4×5</td><td>48</td><td>5.9</td><td>25</td><td>9.5</td><td>5.5</td><td>PB1021B</td><td>4</td><td>8</td><td>3</td></tr>
<tr><td>SHS 25R
SHS 25LR</td><td>40</td><td>48</td><td>92
109</td><td>35</td><td>35
50</td><td>M6×8</td><td>71
88</td><td>8</td><td>34.2</td><td>11.5</td><td>12</td><td>B-M6F</td><td>6</td><td>9.5</td><td>3</td></tr>
<tr><td>SHS 30R
SHS 30LR</td><td>45</td><td>60</td><td>106
131</td><td>40</td><td>40
60</td><td>M8×10</td><td>80
105</td><td>8</td><td>38</td><td>11</td><td>12</td><td>B-M6F</td><td>5.5</td><td>9</td><td>5.2</td></tr>
<tr><td>SHS 35R
SHS 35LR</td><td>55</td><td>70</td><td>122
152</td><td>50</td><td>50
72</td><td>M8×12</td><td>93
123</td><td>14.7</td><td>47.5</td><td>15</td><td>12</td><td>B-M6F</td><td>6.5</td><td>12.5</td><td>5.2</td></tr>
<tr><td>SHS 45R
SHS 45LR</td><td>70</td><td>86</td><td>140
174</td><td>60</td><td>60
80</td><td>M10×17</td><td>106
140</td><td>14.9</td><td>61.1</td><td>20.5</td><td>16</td><td>B-PT1/8</td><td>8</td><td>18</td><td>5.2</td></tr>
<tr><td>SHS 55R
SHS 55LR</td><td>80</td><td>100</td><td>171
213</td><td>75</td><td>75
95</td><td>M12×18</td><td>131
173</td><td>19.4</td><td>67.3</td><td>21</td><td>16</td><td>B-PT1/8</td><td>10</td><td>18</td><td>5.2</td></tr>
</table>

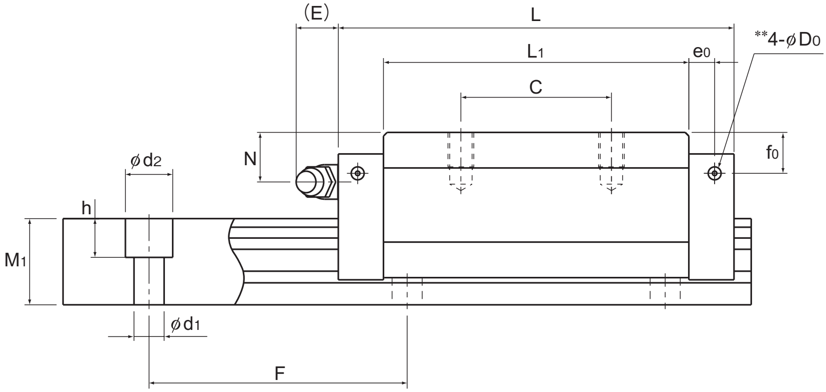
Model number coding

SHS45 LR 2 QZ KKHH C0 +1200L P T -Ⅱ

- SHS45: Model number
- LR: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Unit: mm

		LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
		Width		Height	Pitch		Length*	C	C0	MA		MB		MC	LM block	LM rail
	H3	W1 0 -0.05	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	3	15	9.5	13	60	4.5×7.5×5.3	2500	14.2	24.2	0.175	0.898	0.175	0.898	0.16	0.22	1.3
	5.8	23	12.5	20	60	7×11×9	3000	31.7 36.8	52.4 64.7	0.556 0.848	2.75 3.98	0.566 0.848	2.75 3.98	0.563 0.696	0.66 0.8	3.2
	7	28	16	23	80	9×14×12	3000	44.8 54.2	66.6 88.8	0.786 1.36	4.08 6.6	0.786 1.36	4.08 6.6	0.865 1.15	1.04 1.36	4.5
	7.5	34	18	26	80	9×14×12	3000	62.3 72.9	96.6 127	1.38 2.34	6.76 10.9	1.38 2.34	6.76 10.9	1.53 2.01	1.8 2.34	6.2
	8.9	45	20.5	32	105	14×20×17	3090	82.8 100	126 166	2.05 3.46	10.1 16.3	2.05 3.46	10.1 16.3	2.68 3.53	3.24 4.19	10.4
	12.7	53	23.5	38	120	16×23×20	3060	128 161	197 259	3.96 6.68	19.3 31.1	3.96 6.68	19.3 31.1	4.9 6.44	5.05 6.57	14.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-12.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SHS variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

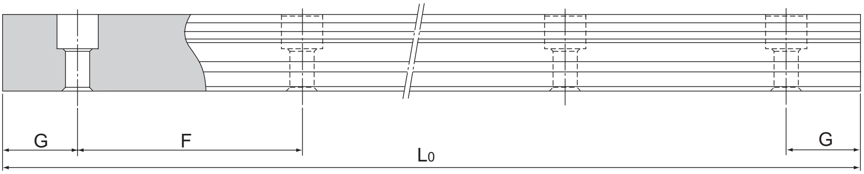


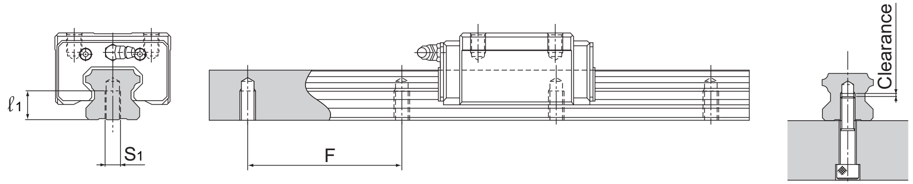
Table1 Standard Length and Maximum Length of the LM Rail for Model SHS Unit: mm

Model No.	SHS 15	SHS 20	SHS 25	SHS 30	SHS 35	SHS 45	SHS 55	SHS 65
LM rail standard length (L_0)	160	220	220	280	280	570	780	1270
	220	280	280	360	360	675	900	1570
	280	340	340	440	440	780	1020	2020
	340	400	400	520	520	885	1140	2620
	400	460	460	600	600	990	1260	
	460	520	520	680	680	1095	1380	
	520	580	580	760	760	1200	1500	
	580	640	640	840	840	1305	1620	
	640	700	700	920	920	1410	1740	
	700	760	760	1000	1000	1515	1860	
	760	820	820	1080	1080	1620	1980	
	820	940	940	1160	1160	1725	2100	
	940	1000	1000	1240	1240	1830	2220	
	1000	1060	1060	1320	1320	1935	2340	
	1060	1120	1120	1400	1400	2040	2460	
	1120	1180	1180	1480	1480	2145	2580	
	1180	1240	1240	1560	1560	2250	2700	
	1240	1360	1300	1640	1640	2355	2820	
	1360	1480	1360	1720	1720	2460	2940	
	1480	1600	1420	1800	1800	2565	3060	
	1600	1720	1480	1880	1880	2670		
		1840	1540	1960	1960	2775		
		1960	1600	2040	2040	2880		
		2080	1720	2200	2200	2985		
		2200	1840	2360	2360	3090		
			1960	2520	2520			
			2080	2680	2680			
			2200	2840	2840			
			2320	3000	3000			
			2440					
Standard pitch F	60	60	60	80	80	105	120	150
G	20	20	20	20	20	22.5	30	35
Max length	2500	3000	3000	3000	3000	3090	3060	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.

Tapped-hole LM Rail Type of Model SHS

The model SHS variations include a type with its LM rail bottom tapped. This type is useful when desiring to mount the LM Guide from the bottom of the base and when desiring to increase the contamination protection effect.



(1) Determine the bolt length so that a clearance of 2 to 5 mm is secured between the bolt end and the bottom of the tap (effective tap depth). (See figure above.)
(2) For standard pitches of the taps, see Table1 on B-12.

Table2 Dimensions of the LM Rail Tap

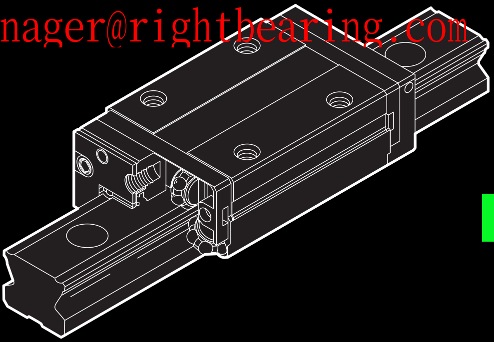
Unit: mm

Model No.	S_1	Effective tap depth ℓ_1
SHS 15	M5	8
SHS 20	M6	10
SHS 25	M6	12
SHS 30	M8	15
SHS 35	M8	17
SHS 45	M12	24
SHS 55	M14	24
SHS 65	M20	30

Model number coding

SHS35 LC2UU +1000LH K

Symbol for
tapped-hole LM rail type



SSR

Caged Ball LM Guides

B Product Specifications

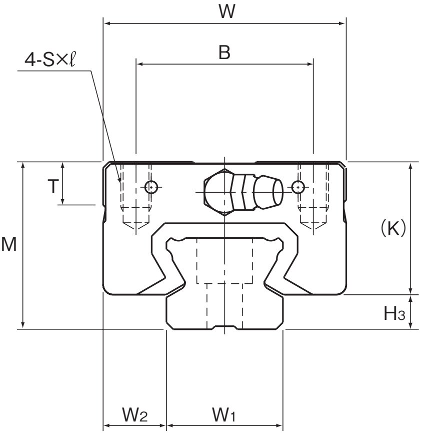
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SSR-XW and SSR-XWM



Model No.	Outer dimensions			LM block dimensions												
	Height	Width	Length												Grease nipple	
	M	W	L	B	C	S×ℓ	L_1	T	K	N	E	f_0	e_0	D_0		H_3
SSR 15XWY SSR 15XWMY	24	34	56.9	26	26	M4×7	39.9	6.5	19.5	4.5	5.5	2.7	4.5	3	PB1021B	4.5
SSR 20XW SSR 20XWM	28	42	66.5	32	32	M5×8	46.6	8.2	22	5.5	12	2.8	5.2	3	B-M6F	6
SSR 25XWY SSR 25XWMY	33	48	83	35	35	M6×9	59.8	8.4	26.2	6	12	3.3	7	3	B-M6F	6.8
SSR 30XW SSR 30XWM	42	60	97	40	40	M8×12	70.7	11.3	32.5	8	12	4.5	7.6	4	B-M6F	9.5
SSR 35XW	48	70	110.9	50	50	M8×12	80.5	13	36.5	8.5	12	4.7	8.8	4	B-M6F	11.5

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

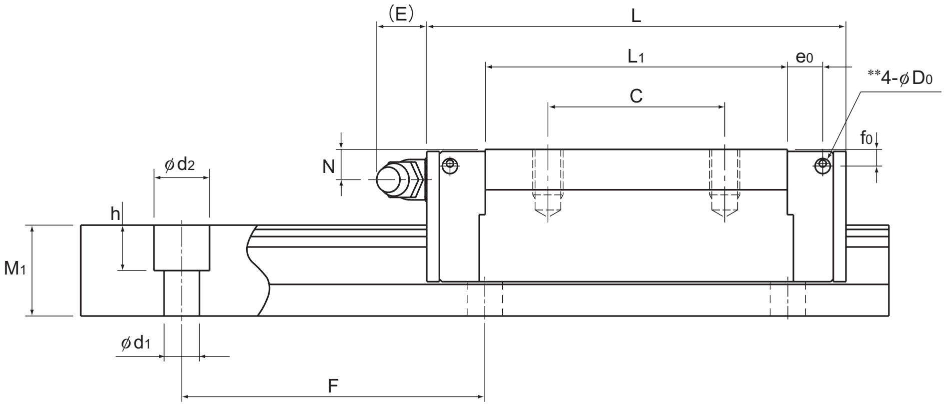
Model number coding

SSR25X W 2 UU C1 M +1200L Y P T M -Ⅱ

- SSR25X: Model number
- W: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- M: Stainless steel LM block
- +1200L: LM rail length (in mm)
- Y: Applied to only 15 and 25
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)/Precision grade (P)
  - Super precision grade (SP)/Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Unit: mm

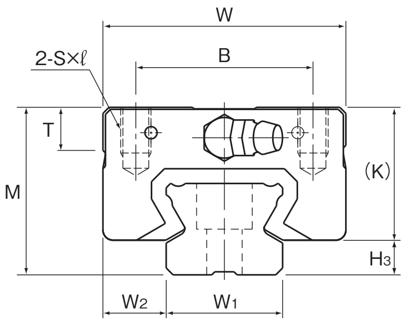
	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 ±0.05	W_2	Height M_1	Pitch F	d_1×d_2×h	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	15	9.5	12.5	60	4.5×7.5×5.3	2500 (1240)	14.7	16.5	0.0792	0.44	0.0486	0.274	0.0962	0.15	1.2
	20	11	15.5	60	6×9.5×8.5	3000 (1480)	19.6	23.4	0.138	0.723	0.0847	0.448	0.18	0.25	2.1
	23	12.5	18	60	7×11×9	3000 (2020)	31.5	36.4	0.258	1.42	0.158	0.884	0.33	0.4	2.7
	28	16	23	80	7×11×9	3000 (2520)	46.5	52.7	0.446	2.4	0.274	1.49	0.571	0.8	4.3
	34	18	27.5	80	9×14×12	3000	64.6	71.6	0.711	3.72	0.437	2.31	0.936	1.1	6.4

Note1) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-22.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Note2) The LM rail mounting hole of SSR15X is drilled for M4 screws as standard (with Y indication). If you order the hole to be drilled for M3 screws (without Y indication), contact THK. When replacing this model with model SR, pay attention to the dimension of the rail mounting hole.

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models SSR-XV and SSR-XVM



Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	S×ℓ	L_1	T	K	N	E	f_0	e_0	D_0	Grease nipple	H_3
SSR 15XVY SSR 15XVMY	24	34	40.3	26	M4×7	23.3	6.5	19.5	4.5	5.5	2.7	4.5	3	PB1021B	4.5
SSR 20XV SSR 20XVM	28	42	47.7	32	M5×8	27.8	8.2	22	5.5	12	2.8	5.2	3	B-M6F	6
SSR 25XVY SSR 25XVMY	33	48	60	35	M6×9	36.8	8.4	26.2	6	12	3.3	7	3	B-M6F	6.8

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

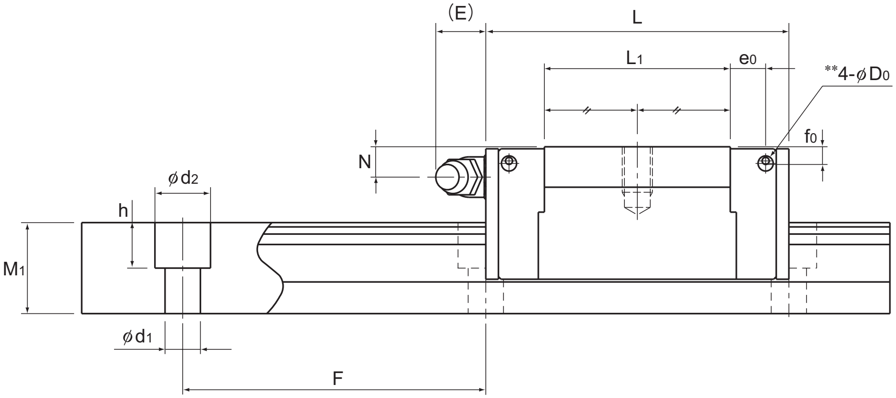
Model number coding

SSR25X V 2 UU C1 M +1200L Y P T M -Ⅲ

- SSR25X: Model number
- V: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- M: Stainless steel LM block
- +1200L: LM rail length (in mm)
- Y: Applied to only 15 and 25
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)/Precision grade (P)
  - Super precision grade (SP)/Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- M: Stainless steel LM rail
- -Ⅲ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 3 rails are used in parallel is 3 at a minimum.)



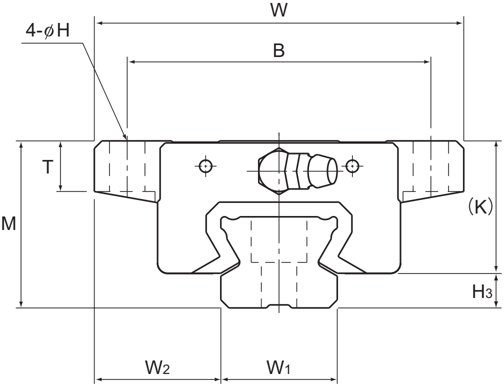
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	9.5	12.5	60	4.5×7.5×5.3	2500 (1240)	9.1	9.7	0.0303	0.192	0.0189	0.122	0.0562	0.08	1.2
	20	11	15.5	60	6×9.5×8.5	3000 (1480)	13.4	14.4	0.0523	0.336	0.0326	0.213	0.111	0.14	2.1
	23	12.5	18	60	7×11×9	3000 (2020)	21.7	22.5	0.104	0.661	0.0652	0.419	0.204	0.23	2.7

Note1) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-22.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Note2) The LM rail mounting hole of SSR15X is drilled for M4 screws as standard (with Y indication). If you order the hole to be drilled for M3 screws (without Y indication), contact THK. When replacing this model with model SR, pay attention to the dimension of the rail mounting hole.

Model SSR-XTB



Model No.	Outer dimensions			LM block dimensions												
	Height M	Width W	Length L	B	C	H	L_1	T	K	N	E	f_0	e_0	D_0	Grease nipple	H_3
SSR 15XTBY	24	52	56.9	41	26	4.5	39.9	6.1	20	4.5	5.5	2.7	4.5	3	PB1021B	4.5
SSR 20XTB	28	59	66.5	49	32	5.5	46.6	9	22	5.5	12	2.8	5.2	3	B-M6F	6
SSR 25XTBY	33	73	83	60	35	7	59.8	10	26.2	6	12	3.3	7	3	B-M6F	6.8

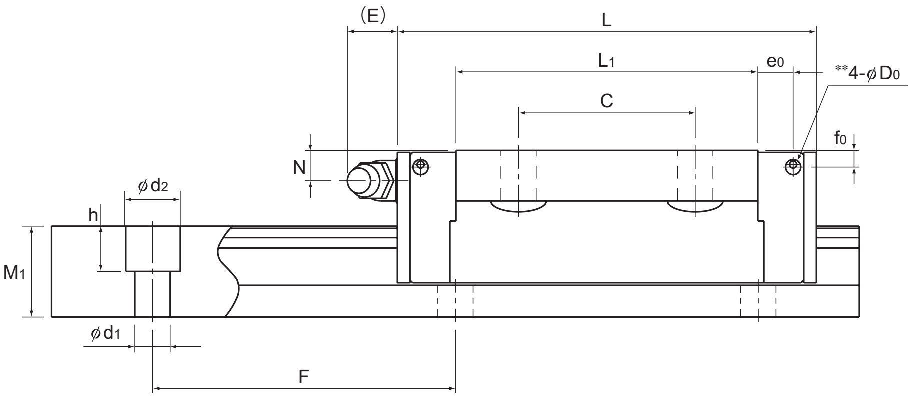
Model number coding

SSR15X TB 2 SS C1 +820L Y T -Ⅱ

- SSR15X: Model number
- TB: Type of LM block
- 2: No. of LM blocks used on the same rail
- SS: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
- +820L: LM rail length (in mm)
- Y: Applied to only 15 and 25
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*3)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1\times d_2\times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	18.5	12.5	60	4.5×7.5×5.3	2500 (1240)	14.7	16.5	0.0792	0.44	0.0486	0.274	0.0962	0.19	1.2
	20	19.5	15.5	60	6×9.5×8.5	3000 (1480)	19.6	23.4	0.138	0.723	0.0847	0.448	0.18	0.31	2.1
	23	25	18	60	7×11×9	3000 (2020)	31.5	36.4	0.258	1.42	0.158	0.884	0.33	0.53	2.7

Note1) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes** for purposes other than mounting a grease nipple.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-22.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Note2) The LM rail mounting hole of SSR15X is drilled for M4 screws as standard (with Y indication). If you order the hole to be drilled for M3 screws (without Y indication), contact THK. When replacing this model with model SR, pay attention to the dimension of the rail mounting hole.

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SSR variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

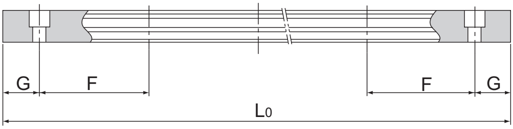


Table1 Standard Length and Maximum Length of the LM Rail

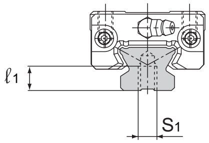
Unit: mm

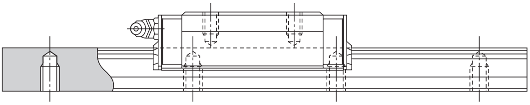
Model No.	SSR 15X	SSR 20X	SSR 25X	SSR 30X	SSR 35X
LM rail standard length (L_0)	160	220	220	280	280
	220	280	280	360	360
	280	340	340	440	440
	340	400	400	520	520
	400	460	460	600	600
	460	520	520	680	680
	520	580	580	760	760
	580	640	640	840	840
	640	700	700	920	920
	700	760	760	1000	1000
	760	820	820	1080	1080
	820	940	940	1160	1160
	940	1000	1000	1240	1240
	1000	1060	1060	1320	1320
	1060	1120	1120	1400	1400
	1120	1180	1240	1480	1480
	1180	1240	1300	1640	1640
	1240	1300	1360	1720	1720
	1300	1360	1420	1800	1800
	1360	1420	1480	1880	1880
	1420	1480	1540	1960	1960
	1480	1540	1600	2040	2040
	1540	1600	1660	2120	2120
		1660	1720	2200	2200
		1720	1780	2280	2280
		1780	1840	2360	2360
		1840	1900	2440	2440
		1900	1960	2520	2520
		1960	2020	2600	2600
		2020	2080	2680	2680
		2080	2140	2760	2760
		2140	2200	2840	2840
			2260	2920	2920
			2320		
			2380		
			2440		
Standard pitch F	60	60	60	80	80
G	20	20	20	20	20
Max length	2500 (1240)	3000 (1480)	3000 (2020)	3000 (2520)	3000

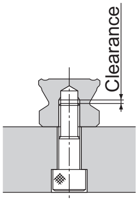
Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note3) The values in the parentheses indicate the maximum lengths of stainless steel types.

Tapped-hole LM Rail Type of Model SSR

The model SSR variations include a type with its LM rail bottom tapped. This type is useful when desiring to mount the LM Guide from the bottom of the base and when desiring to increase the contamination protection effect.







(1) A tapped-hole LM rail type is available only for high accuracy or lower grades.

(2) Determine the bolt length so that a clearance of 2 to 5 mm is secured between the bolt end and the bottom of the tap (effective tap depth). (See figure above.)

(3) For standard pitches of the taps, see Table1 on B-22.

Table2 Dimensions of the LM Rail Tap

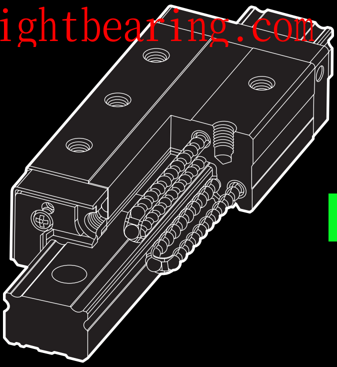
Unit: mm

Model No.	S_1	Effective tap depth ℓ_1
SSR 15X	M5	7
SSR 20X	M6	9
SSR 25X	M6	10
SSR 30X	M8	14
SSR 35X	M8	16

Model number coding

SSR20X W2UU +1200LH K

Symbol for
tapped-hole LM rail type



SNR/SNS

Caged Ball LM Guides

B Product Specifications

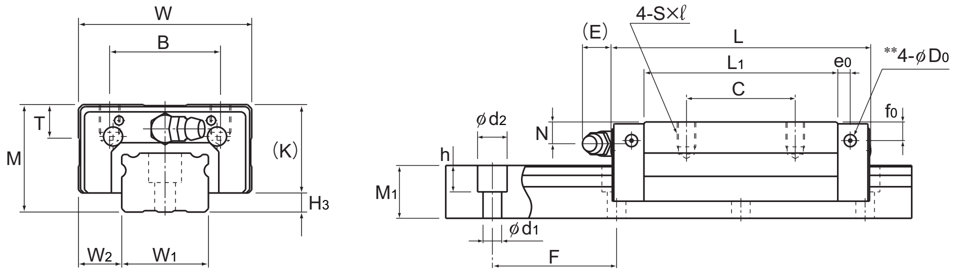
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SNR-R and SNR-LR



Model SNR-R

Model No.	Outer dimensions			LM block dimensions												
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
SNR 25R SNR 25LR	31	50	83.6 102.8	32	35 50	M6×8	62.4 81.6	9.7	25.5	7	6	12	4	3.9	B-M6F	5.5
SNR 30R SNR 30LR	38	60	98 120.5	40	40 60	M8×10	72.1 94.6	9.7	31	7	7	12	6.5	3.9	B-M6F	7
SNR 35R SNR 35LR	44	70	110.3 135.8	50	50 72	M8×12	79 104.5	11.7	35	8	8	12	6	5.2	B-M6F	9
SNR 45R SNR 45LR	52	86	139 171.8	60	60 80	M10×17	105 137.8	14.7	40.4	10	8	16	8.5	5.2	B-PT1/8	11.5
SNR 55R SNR 55LR	63	100	163.3 200.5	65	75 95	M12×18	123.6 160.8	17.7	49	11	10	16	10	5.2	B-PT1/8	14
SNR 65R SNR 65LR	75	126	186.4 246.4	76	70 110	M16×20	143.6 203.6	21.6	60	16	15	16	9	8.2	B-PT1/8	15
SNR 85LR	90	156	302.8	100	140	M18×25	251	27.3	73	20	20	16	10	8.2	B-PT1/8	17

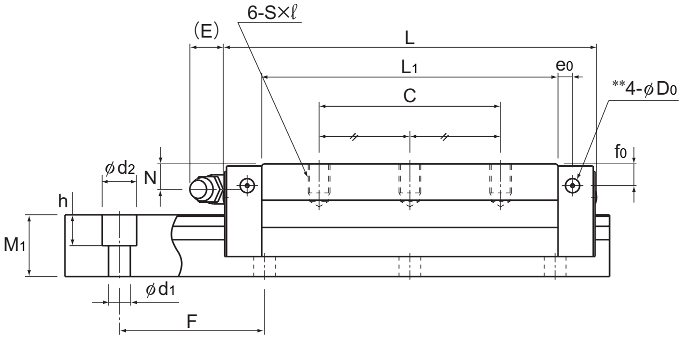
Model number coding

SNR45 LR 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SNR45: Model number
- LR: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)/Precision grade (P)
  - Super precision grade (SP)/Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5)See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Model SNR-LR

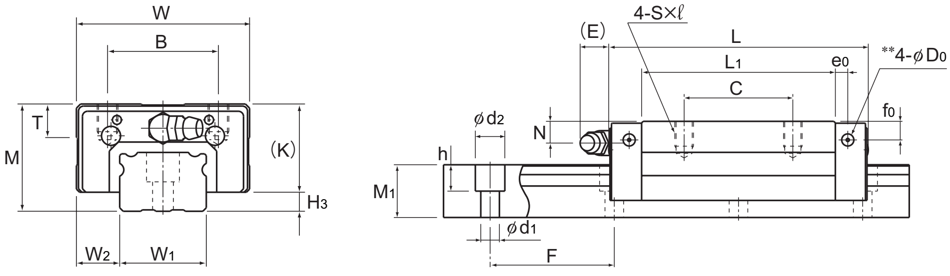
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
									1 block	Double blocks	1 block	Double blocks	1 block		
	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN						kg	kg/m
	25	12.5	17	40	6×9.5×8.5	2500	48 57	79 101	0.682 1.14	3.62 5.55	0.427 0.708	2.25 3.4	0.868 1.1	0.4 0.6	3.1
	28	16	21	80	7×11×9	3000	68 81	106 138	1.04 1.81	5.7 8.89	0.653 1.12	3.56 5.47	1.3 1.69	0.7 0.9	4.4
	34	18	24.5	80	9×14×12	3000	90 108	144 188	1.61 2.68	8.64 13.6	1.01 1.67	5.39 8.49	2.13 2.79	1 1.4	6.2
	45	20.5	29	105	14×20×17	3090	132 161	216 288	3.29 5.4	16 26.2	2.03 3.35	9.86 16.2	4.21 5.64	1.9 2.4	9.8
	53	23.5	36.5	120	16×23×20	3060	177 214	292 383	4.99 8.41	25.7 40.9	3.11 5.22	16 25.3	6.69 8.78	3.1 4	14.5
	63	31.5	43	150	18×26×22	3000	260 340	409 572	8.05 15.9	41.2 74.5	5.03 9.84	25.6 45.7	11 15.4	5.6 8	20.5
	85	35.5	48	180	24×35×28	3000	550	887	30.3	142	18.7	87.6	31.9	14.8	29.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models SNS-R and SNS-LR



Model SNS-R

Model No.	Outer dimensions			LM block dimensions													
	Height	Width	Length													Grease nipple	
	M	W	L	B	C	S×ℓ	L_1	T	K	N	f_0	E	e_0	D_0			H_3
SNS 25R SNS 25LR	31	50	83.6 102.8	32	35 50	M6×8	62.4 81.6	9.7	25.5	7	6	12	4	3.9		B-M6F	5.5
SNS 30R SNS 30LR	38	60	98 120.5	40	40 60	M8×10	72.1 94.6	9.7	31	7	7	12	6.5	3.9		B-M6F	7
SNS 35R SNS 35LR	44	70	110.3 135.8	50	50 72	M8×12	79 104.5	11.7	35	8	8	12	6	5.2		B-M6F	9
SNS 45R SNS 45LR	52	86	139 171.8	60	60 80	M10×17	105 137.8	14.7	40.4	10	8	16	8.5	5.2		B-PT1/8	11.5
SNS 55R SNS 55LR	63	100	163.3 200.5	65	75 95	M12×18	123.6 160.8	17.7	49	11	10	16	10	5.2		B-PT1/8	14
SNS 65R SNS 65LR	75	126	186.4 246.4	76	70 110	M16×20	143.6 203.6	21.6	60	16	15	16	9	8.2		B-PT1/8	15
SNS 85LR	90	156	302.8	100	140	M18×25	251	27.3	73	20	20	16	10	8.2		B-PT1/8	17

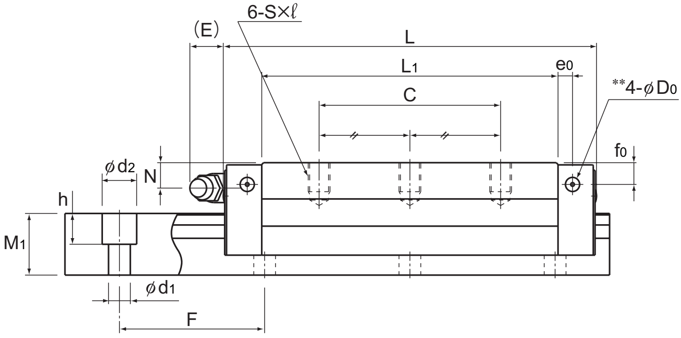
Model number coding

SNS45 LR 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SNS45: Model number
- LR: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



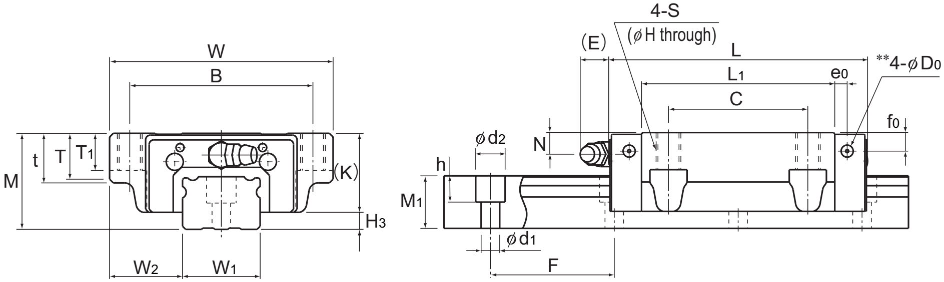
Model SNS-LR

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	25	12.5	17	40	6×9.5×8.5	2500	37 44	61 78	0.544 0.915	2.88 4.41	0.504 0.847	2.67 4.09	0.648 0.826	0.4 0.6	3.1
	28	16	21	80	7×11×9	3000	52 62	81 106	0.821 1.43	4.5 7.04	0.761 1.33	4.17 6.53	0.962 1.25	0.7 0.9	4.4
	34	18	24.5	80	9×14×12	3000	69 83	110 144	1.27 2.11	6.81 10.7	1.17 1.96	6.32 10	1.56 2.05	1 1.4	6.2
	45	20.5	29	105	14×20×17	3090	101 123	167 222	2.63 4.29	12.7 20.8	2.43 3.97	11.8 19.3	3.15 4.21	1.9 2.4	9.8
	53	23.5	36.5	120	16×23×20	3060	136 164	225 295	3.96 6.66	20.4 32.4	3.67 6.17	19 30	4.97 6.52	3.1 4	14.5
	63	31.5	43	150	18×26×22	3000	199 261	315 441	6.4 12.7	32.7 59.1	5.93 11.7	30.3 54.8	8.24 11.5	5.6 8	20.5
	85	35.5	48	180	24×35×28	3000	422	679	23.9	112	22.1	104	23.7	14.8	29.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SNR-C and SNR-LC



Model SNR-C

Model No.	Outer dimensions			LM block dimensions															H3
	Height M	Width W	Length L	B	C	S	H	L_1	t	T	T_1	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
SNR 25C SNR 25LC	31	72	83.6 102.8	59	45	M8	6.8	62.4 81.6	16	14.8	12	25.5	7	6	12	4	3.9	B-M6F	5.5
SNR 30C SNR 30LC	38	90	98 120.5	72	52	M10	8.5	72.1 94.6	18	16.8	14	31	7	7	12	6.5	3.9	B-M6F	7
SNR 35C SNR 35LC	44	100	110.3 135.8	82	62	M10	8.5	79 104.5	20	18.8	16	35	8	8	12	6	5.2	B-M6F	9
SNR 45C SNR 45LC	52	120	139 171.8	100	80	M12	10.5	105 137.8	22	20.5	20	40.4	10	8	16	8.5	5.2	B-PT1/8	11.5
SNR 55C SNR 55LC	63	140	163.3 200.5	116	95	M14	12.5	123.6 160.8	24	22.5	22	49	11	10	16	10	5.2	B-PT1/8	14
SNR 65C SNR 65LC	75	170	186.4 246.4	142	110	M16	14.5	143.6 203.6	28	26	25	60	16	15	16	9	8.2	B-PT1/8	15
SNR 85LC	90	215	302.8	185	140	M20	17.6	251	34	32	28	73	20	20	16	10	8.2	B-PT1/8	17

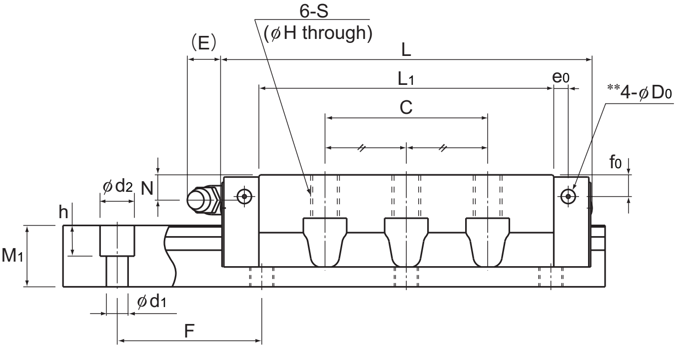
Model number coding

SNR45 LC 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SNR45: Model number
- LC: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



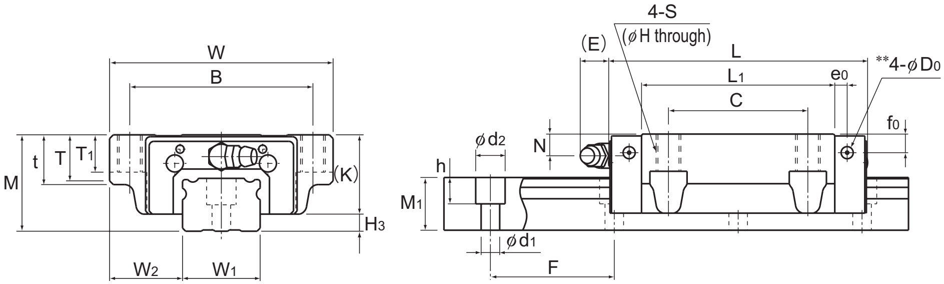
Model SNR-LC

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 0 -0.05	W_2	Height M_1	Pitch F	$d_1 \times d_2 \times h$	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	25	23.5	17	40	6×9.5×8.5	2500	48 57	79 101	0.682 1.14	3.62 5.55	0.427 0.708	2.25 3.4	0.868 1.1	0.6 0.8	3.1
	28	31	21	80	7×11×9	3000	68 81	106 138	1.04 1.81	5.7 8.89	0.653 1.12	3.56 5.47	1.3 1.69	1 1.3	4.4
	34	33	24.5	80	9×14×12	3000	90 108	144 188	1.61 2.68	8.64 13.6	1.01 1.67	5.39 8.49	2.13 2.79	1.5 2	6.2
	45	37.5	29	105	14×20×17	3090	132 161	216 288	3.29 5.4	16 26.2	2.03 3.35	9.86 16.2	4.21 5.64	2.3 3.4	9.8
	53	43.5	36.5	120	16×23×20	3060	177 214	292 383	4.99 8.41	25.7 40.9	3.11 5.22	16 25.3	6.69 8.78	3.6 5.5	14.5
	63	53.5	43	150	18×26×22	3000	260 340	409 572	8.05 15.9	41.2 74.5	5.03 9.84	25.6 45.7	11 15.4	7.4 10.5	20.5
	85	65	48	180	24×35×28	3000	550	887	30.3	142	18.7	87.6	31.9	20.0	29.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SNS-C and SNS-LC



Model SNS-C

Model No.	Outer dimensions			LM block dimensions															
	Height M	Width W	Length L	B	C	S	H	L_1	t	T	T_1	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
SNS 25C SNS 25LC	31	72	83.6 102.8	59	45	M8	6.8	62.4 81.6	16	14.8	12	25.5	7	6	12	4	3.9	B-M6F	5.5
SNS 30C SNS 30LC	38	90	98 120.5	72	52	M10	8.5	72.1 94.6	18	16.8	14	31	7	7	12	6.5	3.9	B-M6F	7
SNS 35C SNS 35LC	44	100	110.3 135.8	82	62	M10	8.5	79 104.5	20	18.8	16	35	8	8	12	6	5.2	B-M6F	9
SNS 45C SNS 45LC	52	120	139 171.8	100	80	M12	10.5	105 137.8	22	20.5	20	40.4	10	8	16	8.5	5.2	B-PT1/8	11.5
SNS 55C SNS 55LC	63	140	163.3 200.5	116	95	M14	12.5	123.6 160.8	24	22.5	22	49	11	10	16	10	5.2	B-PT1/8	14
SNS 65C SNS 65LC	75	170	186.4 246.4	142	110	M16	14.5	143.6 203.6	28	26	25	60	16	15	16	9	8.2	B-PT1/8	15
SNS 85LC	90	215	302.8	185	140	M20	17.6	251	34	32	28	73	20	20	16	10	8.2	B-PT1/8	17

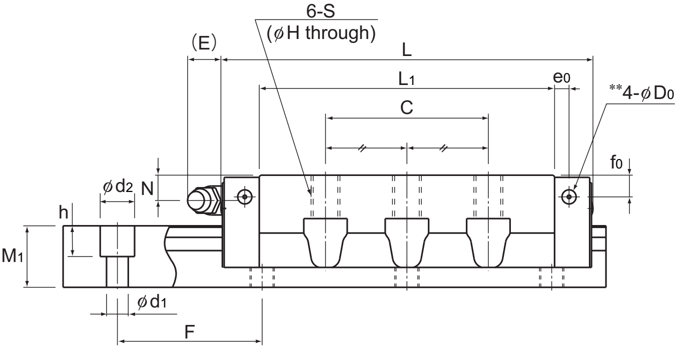
Model number coding

SNS45 LC 2 QZ KKHH C0 +1200L P T Z -Ⅱ

Model number
Type of LM block
No. of LM blocks used on the same rail
With QZ Lubricator
Contamination protection accessory symbol (*1)
Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)
LM rail length (in mm)
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)
Symbol for LM rail jointed use
With plate cover or steel tape (*4)
Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



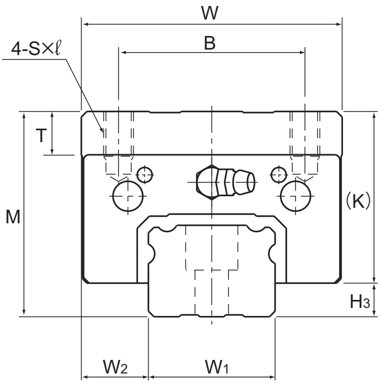
Model SNS-LC

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C0	MA		MB		MC	LM block	LM rail
	W1 0 -0.05	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	25	23.5	17	40	6×9.5×8.5	2500	37 44	61 78	0.544 0.915	2.88 4.41	0.504 0.847	2.67 4.09	0.648 0.826	0.6 0.8	3.1
	28	31	21	80	7×11×9	3000	52 62	81 106	0.821 1.43	4.5 7.04	0.761 1.33	4.17 6.53	0.962 1.25	1 1.3	4.4
	34	33	24.5	80	9×14×12	3000	69 83	110 144	1.27 2.11	6.81 10.7	1.17 1.96	6.32 10	1.56 2.05	1.5 2	6.2
	45	37.5	29	105	14×20×17	3090	101 123	167 222	2.63 4.29	12.7 20.8	2.43 3.97	11.8 19.3	3.15 4.21	2.3 3.4	9.8
	53	43.5	36.5	120	16×23×20	3060	136 164	225 295	3.96 6.66	20.4 32.4	3.67 6.17	19 30	4.97 6.52	3.6 5.5	14.5
	63	53.5	43	150	18×26×22	3000	199 261	315 441	6.4 12.7	32.7 59.1	5.93 11.7	30.3 54.8	8.24 11.5	7.4 10.5	20.5
	85	65	48	180	24×35×28	3000	422	679	23.9	112	22.1	104	23.7	20.0	29.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SNR-RH (Build to Order) and SNR-LRH (Build to Order)



Model No.	Outer dimensions			LM block dimensions												
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
SNR 35RH SNR 35LRH	55	70	110.3 135.8	50	50 72	M8×12	79 104.5	11.7	46	19	19	12	6	5.2	B-M6F	9
SNR 45RH SNR 45LRH	70	86	139 171.8	60	60 80	M10×17	105 137.8	14.7	58.4	28	26	16	8.5	5.2	B-PT1/8	11.5
SNR 55RH SNR 55LRH	80	100	163.3 200.5	75	75 95	M12×18	123.6 160.8	17.7	66	28	27	16	10	5.2	B-PT1/8	14

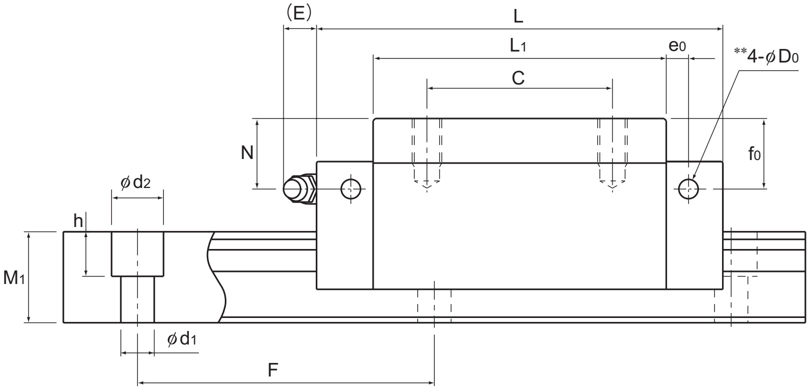
Model number coding

SNR35 RH 2 QZ KKHH C0 +920L H T Z -Ⅱ

- SNR35: Model number
- RH: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +920L: LM rail length (in mm)
- H: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	34	18	24.5	80	9×14×12	3000	90 108	144 188	1.61 2.68	8.64 13.6	1.01 1.67	5.39 8.49	2.13 2.79	1.5 2	6.2
	45	20.5	29	105	14×20×17	3090	132 161	216 288	3.29 5.4	16 26.2	2.03 3.35	9.86 16.2	4.21 5.64	3.2 4.1	9.8
	53	23.5	36.5	120	16×23×20	3060	177 214	292 383	4.99 8.41	25.7 40.9	3.11 5.22	16 25.3	6.69 8.78	4.7 6.2	14.5

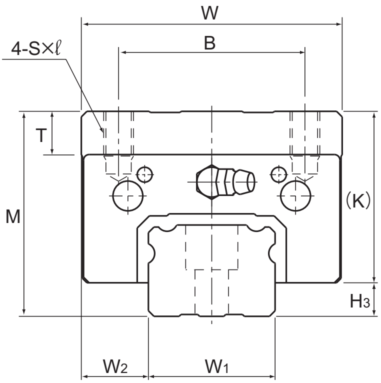
Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.

The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-42.)

Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models SNS-RH (Build to Order) and SNS-LRH (Build to Order)



Model No.	Outer dimensions			LM block dimensions												
	Height	Width	Length												Grease nipple	
	M	W	L	B	C	S×ℓ	L_1	T	K	N	f_0	E	e_0	D_0		H_3
SNS 35RH SNS 35LRH	55	70	110.3 135.8	50	50 72	M8×12	79 104.5	11.7	46	19	19	12	6	5.2	B-M6F	9
SNS 45RH SNS 45LRH	70	86	139 171.8	60	60 80	M10×17	105 137.8	14.7	58.4	28	26	16	8.5	5.2	B-PT1/8	11.5
SNS 55RH SNS 55LRH	80	100	163.3 200.5	75	75 95	M12×18	123.6 160.8	17.7	66	28	27	16	10	5.2	B-PT1/8	14

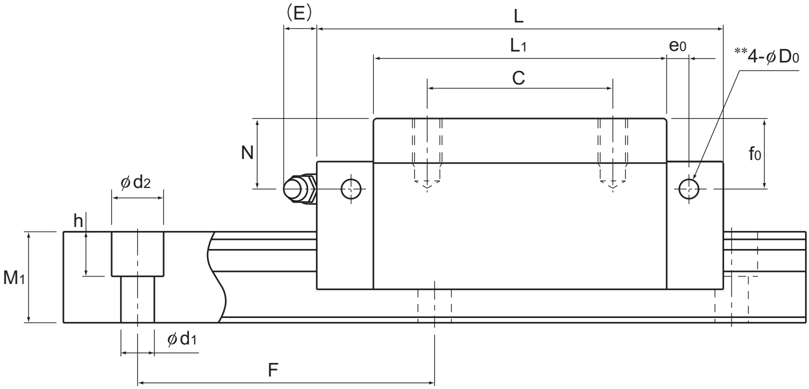
Model number coding

SNS35 RH 2 QZ KKHH C0 +920L H T Z -Ⅱ

- SNS35: Model number
- RH: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  Normal (No symbol)
  Light preload (C1)
  Medium preload (C0)
- +920L: LM rail length (in mm)
- H: Accuracy symbol (*3)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)/Super precision grade (SP)
  Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.

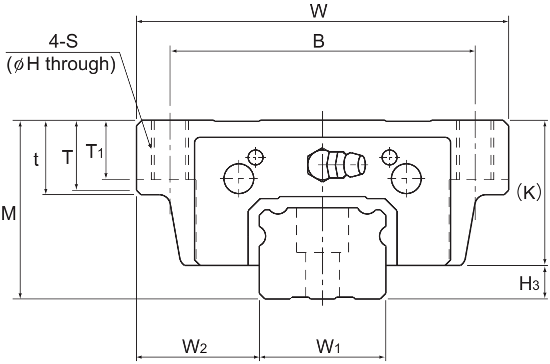


Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
									1 block	Double blocks	1 block	Double blocks	1 block		
	W_1 0 -0.05	W_2	M_1	F	d_1×d_2×h	Max	kN	kN						kg	kg/m
	34	18	24.5	80	9×14×12	3000	69 83	110 144	1.27 2.11	6.81 10.7	1.17 1.96	6.32 10	1.56 2.05	1.5 2	6.2
	45	20.5	29	105	14×20×17	3090	101 123	167 222	2.63 4.29	12.7 20.8	2.43 3.97	11.8 19.3	3.15 4.21	3.2 4.1	9.8
	53	23.5	36.5	120	16×23×20	3060	136 164	225 295	3.96 6.66	20.4 32.4	3.67 6.17	19 30	4.97 6.52	4.7 6.2	14.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SNR-CH (Build to Order) and SNR-LCH (Build to Order)



Model No.	Outer dimensions			LM block dimensions															
	Height	Width	Length															Grease nipple	
	M	W	L	B	C	S	H	L_1	t	T	T_1	K	N	f_0	E	e_0	D_0		H_3
SNR 35CH SNR 35LCH	48	100	110.3 135.8	82	62	M10	8.5	79 104.5	20	18.8	16	39	12	12	12	6	5.2	B-M6F	9
SNR 45CH SNR 45LCH	60	120	139 171.8	100	80	M12	10.5	105 137.8	22	20.5	20	48.4	18	16	16	8.5	5.2	B-PT1/8	11.5
SNR 55CH SNR 55LCH	70	140	163.3 200.5	116	95	M14	12.5	123.6 160.8	24	22.5	22	56	18	17	16	10	5.2	B-PT1/8	14

Model number coding

SNR45 LCH 2 QZ KK C0 +1000L P T Z -Ⅱ

Model number

Type of LM block

No. of LM blocks used on the same rail

With QZ Lubricator

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

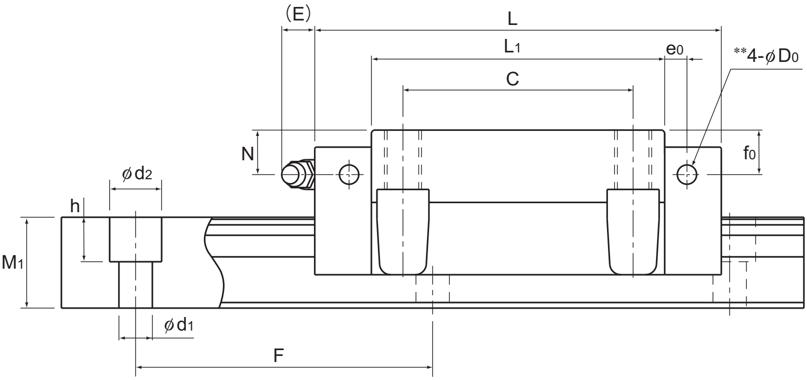
Symbol for LM rail jointed use

With plate cover or steel tape (*4)

Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.

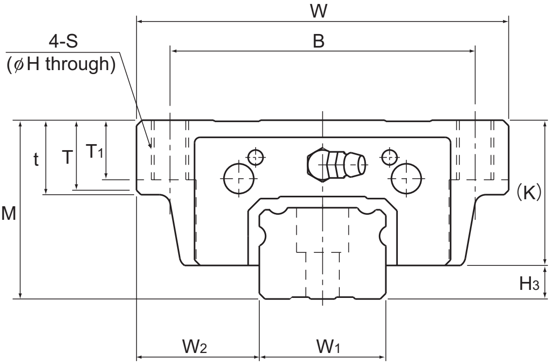


Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C₀	MA		MB		MC	LM block	LM rail
	W1 0 -0.05	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	34	33	24.5	80	9×14×12	3000	90 108	144 188	1.61 2.68	8.64 13.6	1.01 1.67	5.39 8.49	2.13 2.79	1.7 2.2	6.2
	45	37.5	29	105	14×20×17	3090	132 161	216 288	3.29 5.4	16 26.2	2.03 3.35	9.86 16.2	4.21 5.64	3 4.2	9.8
	53	43.5	36.5	120	16×23×20	3060	177 214	292 383	4.99 8.41	25.7 40.9	3.11 5.22	16 25.3	6.69 8.78	4.4 6.5	14.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SNS-CH (Build to Order) and SNS-LCH (Build to Order)



Model No.	Outer dimensions			LM block dimensions															
	Height M	Width W	Length L	B	C	S	H	L_1	t	T	T_1	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
SNS 35CH SNS 35LCH	48	100	110.3 135.8	82	62	M10	8.5	79 104.5	20	18.8	16	39	12	12	12	6	5.2	B-M6F	9
SNS 45CH SNS 45LCH	60	120	139 171.8	100	80	M12	10.5	105 137.8	22	20.5	20	48.4	18	16	16	8.5	5.2	B-PT1/8	11.5
SNS 55CH SNS 55LCH	70	140	163.3 200.5	116	95	M14	12.5	123.6 160.8	24	22.5	22	56	18	17	16	10	5.2	B-PT1/8	14

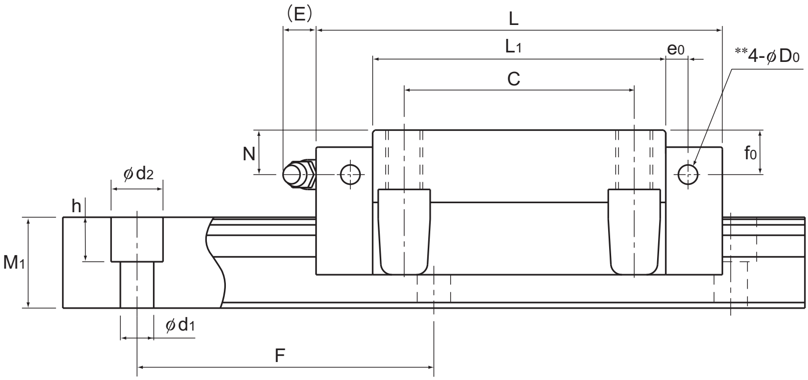
Model number coding

SNS45 LCH 2 QZ KK C0 +1000L P T Z -II

- SNS45: Model number
- LCH: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KK: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1000L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -II: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length *	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	34	33	24.5	80	9×14×12	3000	69 83	110 144	1.27 2.11	6.81 10.7	1.17 1.96	6.32 10	1.56 2.05	1.7 2.2	6.2
	45	37.5	29	105	14×20×17	3090	101 123	167 222	2.63 4.29	12.7 20.8	2.43 3.97	11.8 19.3	3.15 4.21	3 4.2	9.8
	53	43.5	36.5	120	16×23×20	3060	136 164	225 295	3.96 6.66	20.4 32.4	3.67 6.17	19 30	4.97 6.52	4.4 6.5	14.5

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-42.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SNR/SNS variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.

For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

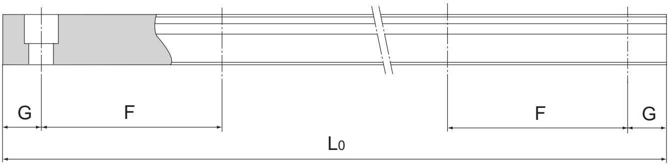
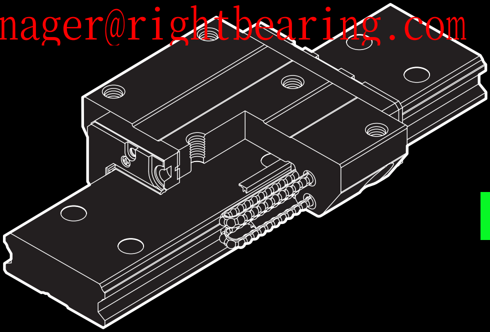


Table1 Standard Length and Maximum Length of the LM Rail for Models SNR/SNS Unit: mm

Model No.	SNR/SNS 25	SNR/SNS 30	SNR/SNS 35	SNR/SNS 45	SNR/SNS 55	SNR/SNS 65	SNR/SNS 85
LM rail standard length (L_0)	230	280	280	570	780	1270	1530
	270	360	360	675	900	1570	1890
	350	440	440	780	1020	2020	2250
	390	520	520	885	1140	2620	2610
	470	600	600	990	1260		
	510	680	680	1095	1380		
	590	760	760	1200	1500		
	630	840	840	1305	1620		
	710	920	920	1410	1740		
	750	1000	1000	1515	1860		
	830	1080	1080	1620	1980		
	950	1160	1160	1725	2100		
	990	1240	1240	1830	2220		
	1070	1320	1320	1935	2340		
	1110	1400	1400	2040	2460		
	1190	1480	1480	2145	2580		
	1230	1560	1560	2250	2700		
	1310	1640	1640	2355	2820		
	1350	1720	1720	2460	2940		
	1430	1800	1800	2565	3060		
	1470	1880	1880	2670			
	1550	1960	1960	2775			
	1590	2040	2040	2880			
	1710	2200	2200	2985			
	1830	2360	2360	3090			
	1950	2520	2520				
	2070	2680	2680				
	2190	2840	2840				
	2310	3000	3000				
	2430						
	2470						
Standard pitch F	40	80	80	105	120	150	180
G	15	20	20	22.5	30	35	45
Max length	2500	3000	3000	3090	3060	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



SHW

Caged Ball LM Guides

B Product Specifications

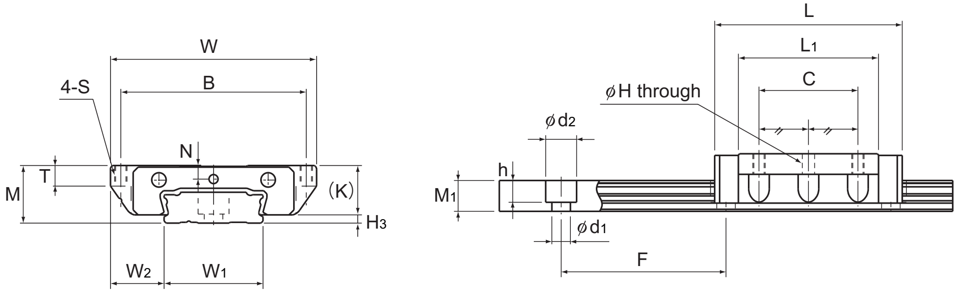
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model SHW-CA



Models SHW12CAM and SHW14CAM

Model No.	Outer dimensions			LM block dimensions								
	Height M	Width W	Length L	B	C	S	H	L_1	T	K	N	H_3
SHW 12CAM	12	40	37	35	18	M3	2.5	27	4	10	2.8	2
SHW 14CAM	14	50	45.5	45	24	M3	2.5	34	5	12	3.3	2
SHW 17CAM	17	60	51	53	26	M4	3.3	38	6	14.5	4	2.5
SHW 21CA	21	68	59	60	29	M5	4.4	43.6	8	17.7	5	3
SHW 27CA	27	80	72.8	70	40	M6	5.3	56.6	10	23.5	6	3
SHW 35CA	35	120	107	107	60	M8	6.8	83	14	31	7.6	4
SHW 50CA	50	162	141	144	80	M10	8.6	107	18	46	14	3.4

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

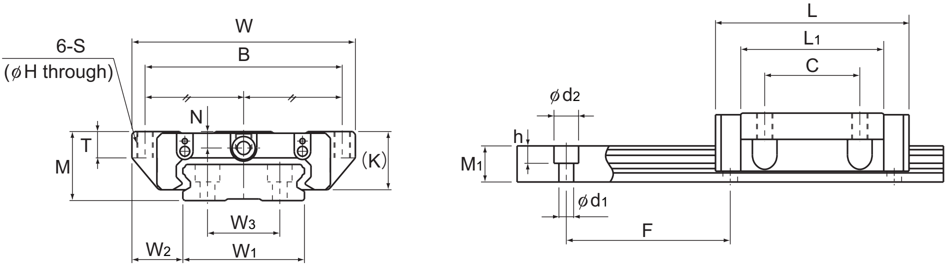
Model number coding

SHW17 CA 2 QZ UU C1 M +580L P M -Ⅱ

- SHW17: Model number
- CA: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- M: Stainless steel LM block
- +580L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



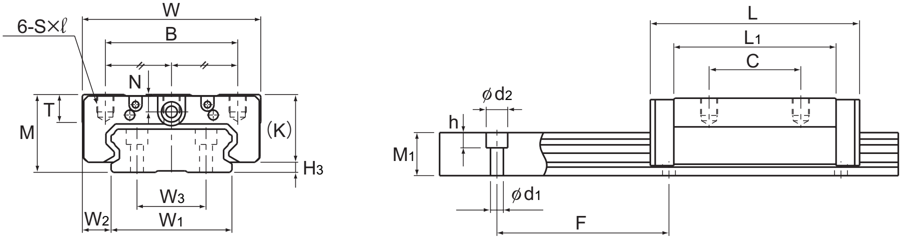
Models SHW17CAM and SHW21 to 50CA

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*					Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
										1 block	Double blocks	1 block	Double blocks	1 block		
	W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN						kg	kg/m
	18	11	—	6.6	40	4.5×7.5×5.3	1000	4.31	5.66	0.0228	0.12	0.0228	0.12	0.0405	0.05	0.8
	24	13	—	7.5	40	4.5×7.5×5.3	1430	7.05	8.98	0.0466	0.236	0.0466	0.236	0.0904	0.1	1.23
	33	13.5	18	8.6	40	4.5×7.5×5.3	1800	7.65	10.18	0.0591	0.298	0.0591	0.298	0.164	0.15	1.9
	37	15.5	22	11	50	4.5×7.5×5.3	1900	8.24	12.8	0.0806	0.434	0.0806	0.434	0.229	0.24	2.9
	42	19	24	15	60	4.5×7.5×5.3	3000	16	22.7	0.187	0.949	0.187	0.949	0.455	0.47	4.5
	69	25.5	40	19	80	7×11×9	3000	35.5	49.2	0.603	3	0.603	3	1.63	1.4	9.6
	90	36	60	24	80	9×14×12	3000	70.2	91.4	1.46	7.37	1.46	7.37	3.97	3.7	15

Note) If a grease nipple is required, indicate "with grease nipple;" if a greasing hole is required, indicate "with a tapped hole for greasing."
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-48.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SHW-CR and SHW-HR



Models SHW27 to 50CR

Model No.	Outer dimensions			LM block dimensions							
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	H_3
SHW 12CRM	12	30	37	21	12	M3×3.5	27	4	10	2.8	2
SHW 12HRM	12	30	50.4	21	24	M3×3.5	40.4	4	10	2.8	2
SHW 14CRM	14	40	45.5	28	15	M3×4	34	5	12	3.3	2
SHW 17CRM	17	50	51	29	15	M4×5	38	6	14.5	4	2.5
SHW 21CR	21	54	59	31	19	M5×6	43.6	8	17.7	5	3
SHW 27CR	27	62	72.8	46	32	M6×6	56.6	10	23.5	6	3
SHW 35CR	35	100	107	76	50	M8×8	83	14	31	7.6	4
SHW 50CR	50	130	141	100	65	M10×15	107	18	46	14	3.4

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly corrosion resistance and environment.

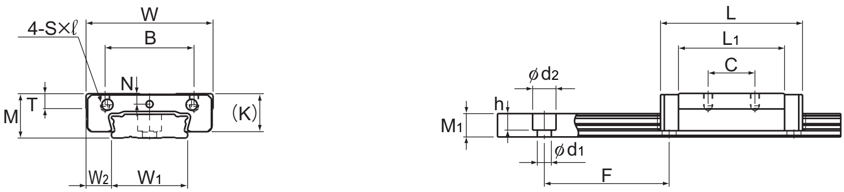
Model number coding

SHW27 CR 2 QZ KKHH C1 +820L P

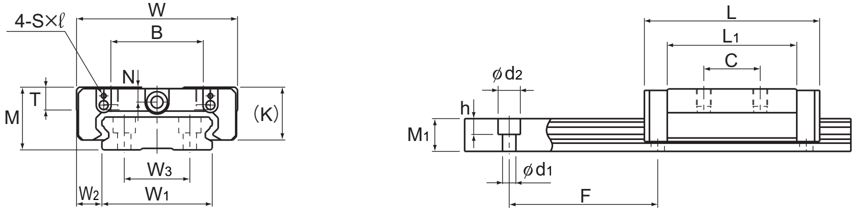
- SHW27: Model number
- CR: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +820L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)
  - Precision grade (P)
  - Super precision grade (SP)
  - Ultra precision grade (UP)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.

Note) Those models equipped with QZ Lubricator cannot have a grease nipple.



Models SHW12CRM, SHW12HRM and SHW14CRM



Models SHW17CRM and SHW21CR

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*					Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
										1 block	Double blocks	1 block	Double blocks	1 block		
	W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN						kg	kg/m
	18	6	—	6.6	40	4.5×7.5×5.3	1000	4.31	5.66	0.0228	0.12	0.0228	0.12	0.0405	0.04	0.8
	18	6	—	6.6	40	4.5×7.5×5.3	1000	5.56	8.68	0.0511	0.246	0.0511	0.246	0.0621	0.06	0.8
	24	8	—	7.5	40	4.5×7.5×5.3	1430	7.05	8.98	0.0466	0.236	0.0466	0.236	0.0904	0.08	1.23
	33	8.5	18	8.6	40	4.5×7.5×5.3	1800	7.65	10.18	0.0591	0.298	0.0591	0.298	0.164	0.13	1.9
	37	8.5	22	11	50	4.5×7.5×5.3	1900	8.24	12.8	0.0806	0.434	0.0806	0.434	0.229	0.19	2.9
	42	10	24	15	60	4.5×7.5×5.3	3000	16	22.7	0.187	0.949	0.187	0.949	0.455	0.36	4.5
	69	15.5	40	19	80	7×11×9	3000	35.5	49.2	0.603	3	0.603	3	1.63	1.2	9.6
	90	20	60	24	80	9×14×12	3000	70.2	91.4	1.46	7.37	1.46	7.37	3.97	3	15

Note) If a grease nipple is required, indicate "with grease nipple;" if a greasing hole is required, indicate "with a tapped hole for greasing."
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-48.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SHW variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

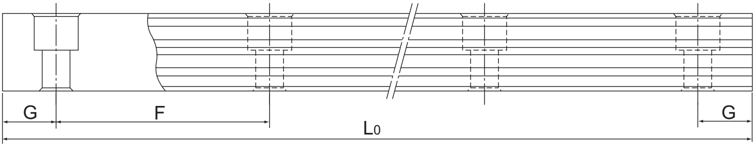
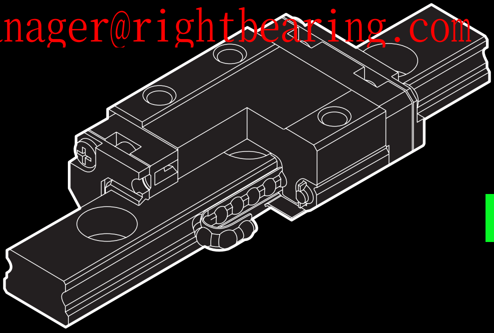


Table1 Standard Length and Maximum Length of the LM Rail for Model SHW Unit: mm

Model No.	SHW 12	SHW 14	SHW 17	SHW 21	SHW 27	SHW 35	SHW 50
LM rail standard length (L_0)	70 110 150 190 230 270 310 390 470	70 110 150 190 230 270 310 390 470 550 670	110 190 310 470 550	130 230 380 480 580 780	160 280 340 460 640 820	280 440 760 1000 1240 1560	280 440 760 1000 1240 1640 2040
Standard pitch F	40	40	40	50	60	80	80
G	15	15	15	15	20	20	20
Max length	1000	1430	1800	1900	3000	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note3) Models SHW12, 14 and 17 are made of stainless steel.



SRS

Caged Ball LM Guides

B Product Specifications

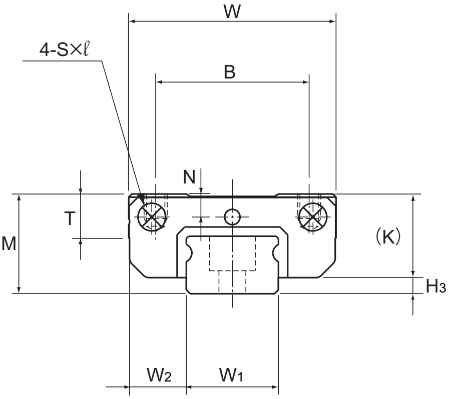
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model SRS-M



Model No.	Outer dimensions			LM block dimensions							
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	H_3
SRS 7M	8	17	23.4	12	8	M2×2.3	13.4	3.3	6.7	1.6	1.3
SRS 9M	10	20	30.8	15	10	M3×2.8	19.8	4.9	9.1	2.4	0.9
SRS 12M	13	27	34.4	20	15	M3×3.2	20.6	5.7	11	3	2
SRS 15M	16	32	43	25	20	M3×3.5	25.7	6.5	13.3	3	2.7
SRS 20M	20	40	50	30	25	M4×6	34	9	16.6	4	3.4
SRS 25M	25	48	77	35	35	M6×7	56	11	20	5	5

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

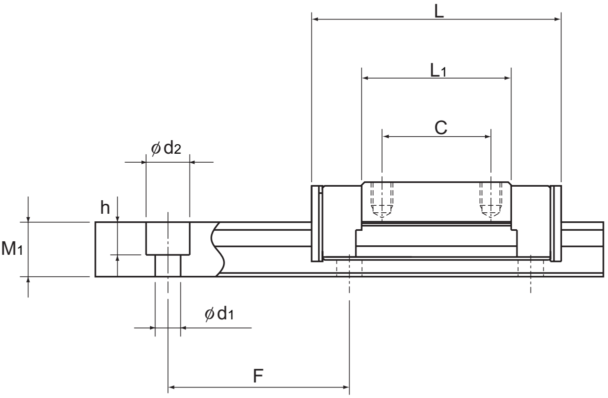
Model number coding

2 SRS20M QZ UU C1 +220L P M -Ⅱ

- 2: No. of LM blocks used on the same rail
- SRS20M: Model number
- QZ: With QZ Lubricator
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +220L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	7 $^{0}_{-0.02}$	5	4.7	15	2.4×4.2×2.3	300	1.51	1.29	3.09	—	3.69	—	5.02	0.009	0.25
	9 $^{0}_{-0.02}$	5.5	5.5	20	3.5×6×3.3	1000	2.69	2.31	7.82	43.9	9.03	50.8	10.6	0.016	0.32
	12 $^{0}_{-0.02}$	7.5	7.5	25	3.5×6×4.5	1340	4	3.53	12	78.5	12	78.5	23.1	0.027	0.65
	15 $^{0}_{-0.02}$	8.5	9.5	40	3.5×6×4.5	1430	6.66	5.7	26.2	154	26.2	154	40.4	0.047	0.96
	20 $^{0}_{-0.03}$	10	11	60	6×9.5×8	1800	7.75	9.77	54.3	296	62.4	341	104	0.11	1.68
	23 $^{0}_{-0.03}$	12.5	15	60	7×11×9	1800	16.5	20.2	177	932	177	932	248	0.24	2.6

Note) If a grease nipple is required, indicate "with grease nipple". (available for models SRS 15M/15WM/20M/25M)

If a greasing hole is required, indicate "with greasing hole". (available for models SRS 7M/7WM/9M/9WM/12M/12WM).

The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-54.)

Static Permissible Moment*

1 block: static permissible moment value with 1 LM block

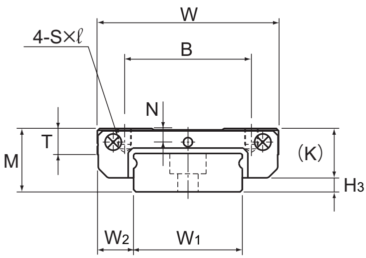
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

SRS-G Basic Load Ratings

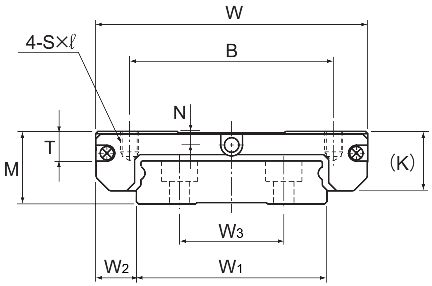
Model No.	Basic load rating	
	C kN	C_0 kN
SRS 9GM	2.07	2.32
SRS 12GM	3.36	3.55
SRS 15GM	5.59	5.72
SRS 20GM	5.95	9.40
SRS 25GM	13.3	22.3

Description of Each Option ⇒A-351 Dimensions⇒B-223

Model SRS-WM



Models SRS7WM, 9WM and 12WM



Model SRS15WM

Model No.	Outer dimensions			LM block dimensions							
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	H_3
SRS 7WM	9	25	31	19	10	M3×2.8	20.4	3.8	7.2	1.8	1.8
SRS 9WM	12	30	39	21	12	M3×2.8	27	4.9	9.1	2.3	2.9
SRS 12WM	14	40	44.5	28	15	M3×3.5	30.9	5.7	11	3	3
SRS 15WM	16	60	55.5	45	20	M4×4.5	38.9	6.5	13.3	3	2.7

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

Model number coding

2 SRS15WM QZ UU C1 +550L P M -II

No. of LM blocks used on the same rail

Model number

With QZ Lubricator

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

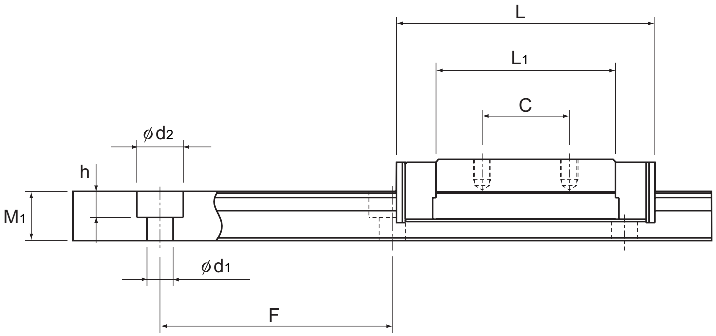
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

Stainless steel LM rail

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment N-m*					Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
										1 block	Double blocks	1 block	Double blocks	1 block		
	W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN						kg	kg/m
	14 $^{0}_{-0.02}$	5.5	—	5.2	30	3.5×6×3.2	400	2.01	1.94	6.47	—	7.71	—	14.33	0.018	0.56
	18 $^{0}_{-0.02}$	6	—	7.5	30	3.5×6×4.5	1000	3.29	3.34	14	78.6	16.2	91	31.5	0.031	1.01
	24 $^{0}_{-0.02}$	8	—	8.5	40	4.5×8×4.5	1430	5.48	5.3	26.4	143	26.4	143	66.5	0.055	1.52
	42 $^{0}_{-0.02}$	9	23	9.5	40	4.5×8×4.5	1800	9.12	8.55	51.2	290	51.2	290	176	0.13	2.87

Note) If a grease nipple is required, indicate "with grease nipple". (available for models SRS 15M/15WM/20M/25M)
If a greasing hole is required, indicate "with greasing hole". (available for models SRS 7M/7WM/9M/9WM/12M/12WM).
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-54.)
Static Permissible Moment*
1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

SRS-G Basic Load Ratings

Model No.	Basic load rating	
	C kN	C_0 kN
SRS 9WGM	2.67	3.35
SRS 12WGM	4.46	5.32
SRS 15WGM	7.43	8.59

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SRS variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

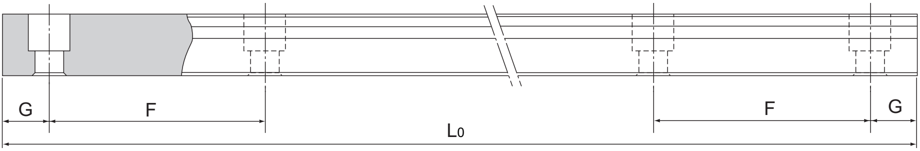
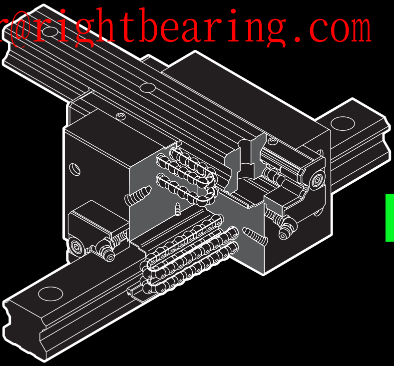


Table1 Standard Length and Maximum Length of the LM Rail for Model SRS Unit: mm

Model No.	SRS 7M	SRS 7WM	SRS 9M	SRS 9WM	SRS 12M	SRS 12WM	SRS 15M	SRS 15WM	SRS 20M	SRS 25M
LM rail standard length (L_0)	40 55 70 85 100 115 130	50 80 110 140 170 200 260 290	55 75 95 115 135 155 175 195 275 375	50 80 110 140 170 200 260 290 320	70 95 120 145 170 195 220 245 270 320 370 470 570	70 110 150 190 230 270 310 390 470 550	70 110 150 190 230 270 310 350 390 430 470 550 670 870	110 150 190 230 270 310 430 550 670 790	220 280 340 460 640 880 1000	220 280 340 460 640 880 1000
Standard pitch F	15	30	20	30	25	40	40	40	60	60
G	5	10	7.5	10	10	15	15	15	20	20
Max length	300	400	1000	1000	1340	1430	1430	1800	1800	1800

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



SCR

Caged Ball LM Guides

B Product Specifications

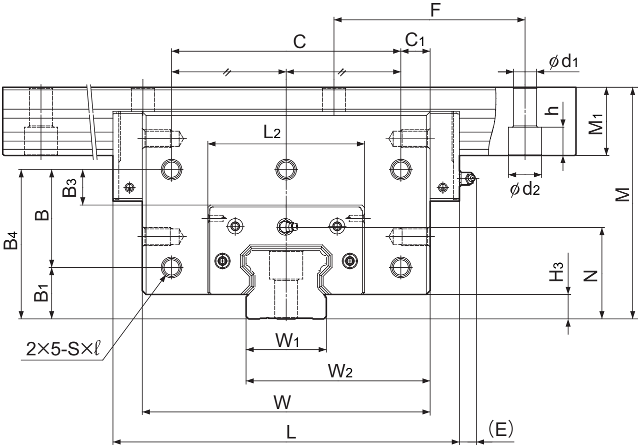
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model SCR



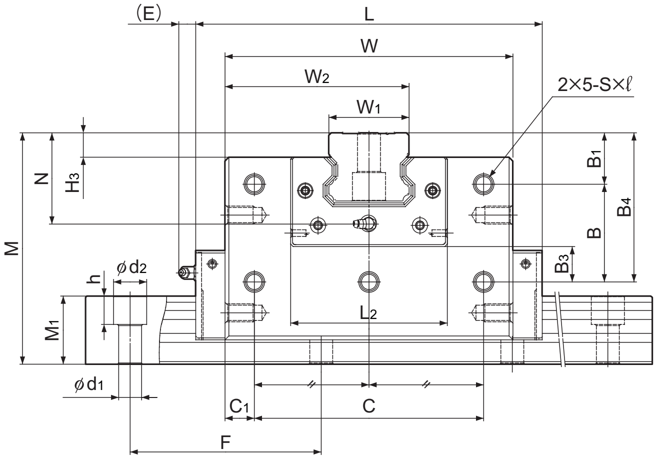
Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B_1	B_3	B_4	B	C	C_1	S×ℓ	L_2	H_3	N	E
SCR 15S	47	48	64.4	—	11.3	34.8	—	20	14	M4×6	33.4	3	18.5	5.5
SCR 20S	57	59	79	—	13	42.5	—	30	14.5	M5×8	43	4.6	23.5	12
SCR 20	57	78	98	13	7.5	37	24	56	11	M5×8	43	4.6	23.5	12
SCR 25	70	88	109	18	9	44	26	64	12	M6×10	47.4	5.8	28.5	12
SCR 30	82	105	131	21	12	53	32	76	14.5	M6×10	58	7	34	12
SCR 35	95	123	152	24	14	61	37	90	16.5	M8×14	68	7.5	40	12
SCR 45	118	140	174	30	16.5	75	45	110	15	M10×15	84.6	8.9	49.5	16
SCR 65	180	226	272	40	27.5	116	76	180	23	M14×22	123	19	71	16

Model number coding

4 SCR25 QZ KKHH C0 +1200/1000L P

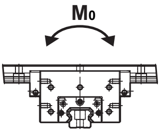
- 4: Total No. of LM blocks
- SCR25: Model number
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)/Light preload (C1)
  - Medium preload (C0)
- 1200: LM rail length on the X axis (in mm)
- 1000L: LM rail length on the Y axis (in mm)
- P: Accuracy symbol (*3)
  - Precision grade (P)
  - Super precision grade (SP)
  - Ultra precision grade (UP)

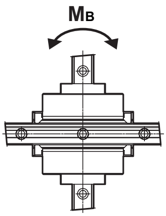
(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-122.



Unit: mm

		LM rail dimensions					Basic load rating		Static permissible moment		Mass	
	Grease nipple	Width W_1 0 −0.05	W_2	Height M_1	Pitch F	Mounting hole $d_1 \times d_2 \times h$	C kN	C_0 kN	M_0 kN-m	M_B kN-m	LM block kg	LM rail kg/m
	PB-1021B	15	31.5	13	60	4.5×7.5×5.3	14.2	24.2	0.16	0.296	0.54	1.3
	B-M6F	20	39.5	16.5	60	6×9.5×8.5	22.3	38.4	0.361	0.334	0.88	2.3
	B-M6F	20	49	16.5	60	6×9.5×8.5	28.1	50.3	0.473	0.568	1.7	2.3
	B-M6F	23	55.5	20	60	7×11×9	36.8	64.7	0.696	0.85	3.4	3.2
	B-M6F	28	66.5	23	80	9×14×12	54.2	88.8	1.15	1.36	4.6	4.5
	B-M6F	34	78.5	26	80	9×14×12	72.9	127	2.01	2.34	6.8	6.2
	B-PT1/8	45	92.5	32	105	14×20×17	100	166	3.53	3.46	10.8	10.4
	B-PT1/8	63	144.5	53	150	18×26×22	253	408	11.9	13.3	44.5	23.7





Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SCR variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.
For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table.
The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

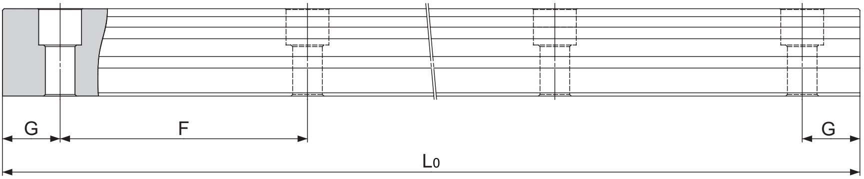


Table1 Standard Length and Maximum Length of the LM Rail for Model SCR

Unit: mm

Model No.	SCR 15	SCR 20	SCR 25	SCR 30	SCR 35	SCR 45	SCR 65
LM rail standard length (L_0)	160 220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1360 1480 1600	220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1360 1480 1600 1720 1840 1960 2080 2200	220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1300 1360 1420 1480 1540 1600 1720 1840 1960 2080 2200 2320 2440	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480 1560 1640 1720 1800 1880 1960 2040 2200 2360 2520 2680 2840 3000	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480 1560 1640 1720 1800 1880 1960 2040 2200 2360 2520 2680 2840 3000	570 675 780 885 990 1095 1200 1305 1410 1515 1620 1725 1830 1935 2040 2145 2250 2355 2460 2565 2670 2775 2880 2985 3090	1270 1570 2020 2620
Standard pitch F	60	60	60	80	80	105	150
G	20	20	20	20	20	22.5	35
Max length	2500	3000	3000	3000	3000	3090	3000

Tapped-hole LM Rail Type of Model SCR

The model SCR variations include a type with its LM rail bottom tapped. With the X-axis LM rail having tapped holes, this model can be secured with bolts from the top.

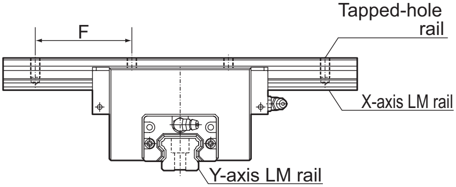


Table2 Dimensions of the LM Rail Tap

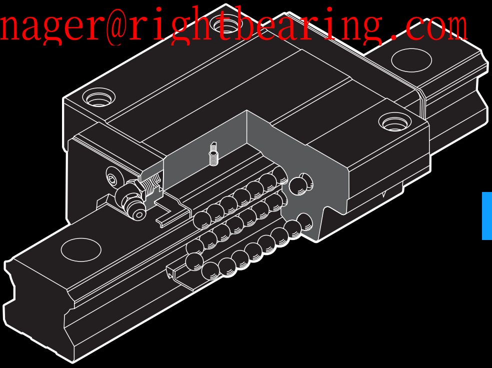
Unit: mm

Model No.	Tap diamete	Tap depth
15	M5	8
20	M6	10
25	M6	12
30	M8	15
35	M8	17
45	M12	20
65	M20	30

Model number coding

4 SCR35 KKHH C0 +1000L P K/1000L P

Symbol for tapped-hole LM rail type



HSR

LM Guide

B Product Specifications

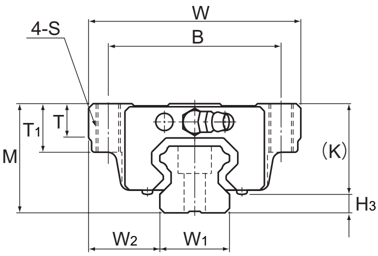
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

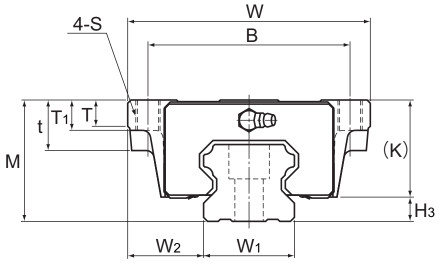
Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models HSR-A and HSR-AM, Models HSR-LA and HSR-LAM



Models HSR15 to 35A/LA/AM/LAM



Models HSR45 to 85A/LA

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	S	L_1	t	T	T_1	K	N	E	Grease nipple	H_3
HSR 15A HSR 15AM	24	47	56.6	38	30	M5	38.8	—	7	11	19.3	4.3	5.5	PB1021B	3.5
HSR 20A HSR 20AM	30	63	74	53	40	M6	50.8	—	10	9.5	26	5	12	B-M6F	4
HSR 20LA HSR 20LAM	30	63	90	53	40	M6	66.8	—	10	9.5	26	5	12	B-M6F	4
HSR 25A HSR 25AM	36	70	83.1	57	45	M8	59.5	—	11	16	30.5	6	12	B-M6F	5.5
HSR 25LA HSR 25LAM	36	70	102.2	57	45	M8	78.6	—	11	16	30.5	6	12	B-M6F	5.5
HSR 30A HSR 30AM	42	90	98	72	52	M10	70.4	—	9	18	35	7	12	B-M6F	7
HSR 30LA HSR 30LAM	42	90	120.6	72	52	M10	93	—	9	18	35	7	12	B-M6F	7
HSR 35A HSR 35AM	48	100	109.4	82	62	M10	80.4	—	12	21	40.5	8	12	B-M6F	7.5
HSR 35LA HSR 35LAM	48	100	134.8	82	62	M10	105.8	—	12	21	40.5	8	12	B-M6F	7.5
HSR 45A HSR 45LA	60	120	139 170.8	100	80	M12	98 129.8	25	13	15	50	10	16	B-PT1/8	10
HSR 55A HSR 55LA	70	140	163 201.1	116	95	M14	118 156.1	29	13.5	17	57	11	16	B-PT1/8	13
HSR 65A HSR 65LA	90	170	186 245.5	142	110	M16	147 206.5	37	21.5	23	76	19	16	B-PT1/8	14
HSR 85A HSR 85LA	110	215	245.6 303	185	140	M20	178.6 236	55	28	30	94	23	16	B-PT1/8	16

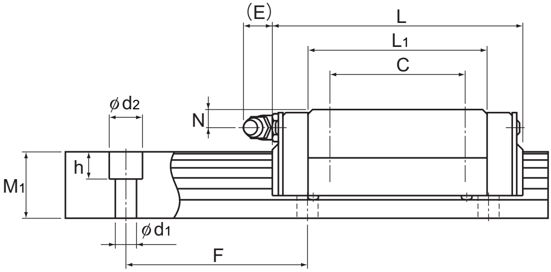
Model number coding

HSR25 A 2 QZ UU C0 M +1200L P T M -Ⅱ

- HSR25: Model number
- A: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- UU: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  Normal (No symbol)
  Light preload (C1)
  Medium preload (C0)
- M: Stainless steel LM block
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)/Super precision grade (SP)
  Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



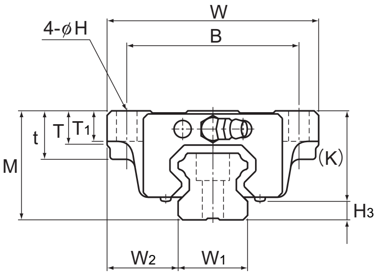
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	16	15	60	4.5×7.5×5.3	3000 (1240)	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.35	2.3
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	21.3	31.8	0.323	1.66	0.323	1.66	0.27	0.47	2.3
	23	23.5	22	60	7×11×9	3000 (2020)	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
	23	23.5	22	60	7×11×9	3000 (2020)	27.2	45.9	0.529	2.74	0.529	2.74	0.459	0.75	3.3
	28	31	26	80	9×14×12	3000 (2520)	28	46.8	0.524	2.7	0.524	2.7	0.562	1.1	4.8
	28	31	26	80	9×14×12	3000 (2520)	37.3	62.5	0.889	4.37	0.889	4.37	0.751	1.3	4.8
	34	33	29	80	9×14×12	3000 (2520)	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6
	34	33	29	80	9×14×12	3000 (2520)	50.2	81.5	1.32	6.35	1.32	6.35	1.2	2	6.6
	45	37.5	38	105	14×20×17	3090	60 80.4	95.6 127	1.42 2.44	7.92 12.6	1.42 2.44	7.92 12.6	1.83 2.43	2.8 3.3	11
	53	43.5	44	120	16×23×20	3060	88.5 119	137 183	2.45 4.22	13.2 21.3	2.45 4.22	13.2 21.3	3.2 4.28	4.5 5.7	15.1
	63	53.5	53	150	18×26×22	3000	141 192	215 286	4.8 8.72	23.5 40.5	4.8 8.72	23.5 40.5	5.82 7.7	8.5 10.7	22.5
	85	65	65	180	24×35×28	3000	210 282	310 412	8.31 14.2	45.6 72.5	8.31 14.2	45.6 72.5	11 14.7	17 23	35.2

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models HSR-B, HSR-BM, HSR-LB and HSR-LBM



Model No.	Outer dimensions			LM block dimensions											H_3
	Height	Width	Length											Grease nipple	
	M	W	L	B	C	H	L_1	t	T	T_1	K	N	E		
HSR 15B HSR 15BM	24	47	56.6	38	30	4.5	38.8	11	7	7	19.3	4.3	5.5	PB1021B	3.5
HSR 20B HSR 20BM	30	63	74	53	40	6	50.8	10	9.5	10	26	5	12	B-M6F	4
HSR 20LB HSR 20LBM	30	63	90	53	40	6	66.8	10	9.5	10	26	5	12	B-M6F	4
HSR 25B HSR 25BM	36	70	83.1	57	45	7	59.5	16	11	10	30.5	6	12	B-M6F	5.5
HSR 25LB HSR 25LBM	36	70	102.2	57	45	7	78.6	16	11	10	30.5	6	12	B-M6F	5.5
HSR 30B HSR 30BM	42	90	98	72	52	9	70.4	18	9	10	35	7	12	B-M6F	7
HSR 30LB HSR 30LBM	42	90	120.6	72	52	9	93	18	9	10	35	7	12	B-M6F	7
HSR 35B HSR 35BM	48	100	109.4	82	62	9	80.4	21	12	13	40.5	8	12	B-M6F	7.5
HSR 35LB HSR 35LBM	48	100	134.8	82	62	9	105.8	21	12	13	40.5	8	12	B-M6F	7.5
HSR 45B HSR 45LB	60	120	139 170.8	100	80	11	98 129.8	25	13	15	50	10	16	B-PT1/8	10
HSR 55B HSR 55LB	70	140	163 201.1	116	95	14	118 156.1	29	13.5	17	57	11	16	B-PT1/8	13
HSR 65B HSR 65LB	90	170	186 245.5	142	110	16	147 206.5	37	21.5	23	76	19	16	B-PT1/8	14
HSR 85B HSR 85LB	110	215	245.6 303	185	140	18	178.6 236	55	28	30	94	23	16	B-PT1/8	16

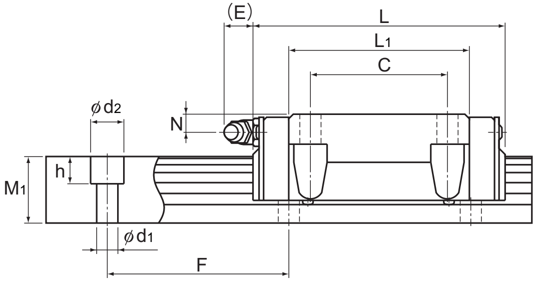
Model number coding

HSR25 B 2 QZ UU C0 M +1200L P T M -Ⅱ

Model number
Type of LM block
No. of LM blocks used on the same rail
With QZ Lubricator
Contamination protection accessory symbol (*1)
Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)
Stainless steel LM block
LM rail length (in mm)
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)
Symbol for LM rail jointed use
Stainless steel LM rail
Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



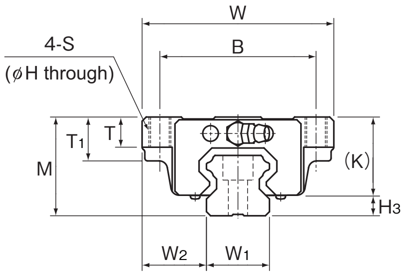
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 ±0.05	W_2	Height M_1	Pitch F	d_1×d_2×h	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	15	16	15	60	4.5×7.5×5.3	3000 (1240)	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.35	2.3
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	21.3	31.8	0.323	1.66	0.323	1.66	0.27	0.47	2.3
	23	23.5	22	60	7×11×9	3000 (2020)	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
	23	23.5	22	60	7×11×9	3000 (2020)	27.2	45.9	0.529	2.74	0.529	2.74	0.459	0.75	3.3
	28	31	26	80	9×14×12	3000 (2520)	28	46.8	0.524	2.7	0.524	2.7	0.562	1.1	4.8
	28	31	26	80	9×14×12	3000 (2520)	37.3	62.5	0.889	4.37	0.889	4.37	0.751	1.3	4.8
	34	33	29	80	9×14×12	3000 (2520)	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6
	34	33	29	80	9×14×12	3000 (2520)	50.2	81.5	1.32	6.35	1.32	6.35	1.2	2	6.6
	45	37.5	38	105	14×20×17	3090	60 80.4	95.6 127	1.42 2.44	7.92 12.6	1.42 2.44	7.92 12.6	1.83 2.43	2.8 3.3	11
	53	43.5	44	120	16×23×20	3060	88.5 119	137 183	2.45 4.22	13.2 21.3	2.45 4.22	13.2 21.3	3.2 4.28	4.5 5.7	15.1
	63	53.5	53	150	18×26×22	3000	141 192	215 286	4.8 8.72	23.5 40.5	4.8 8.72	23.5 40.5	5.82 7.7	8.5 10.7	22.5
	85	65	65	180	24×35×28	3000	210 282	310 412	8.31 14.2	45.6 72.5	8.31 14.2	45.6 72.5	11 14.7	17 23	35.2

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Model HSR-C Grade Ct



Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	S	H	L_1	T	T_1	K	N	E	Grease nipple	H_3
HSR 15C (Ct)	24	47	56.6	38	30	M5	4.4	38.8	7	11	19.3	4.3	5.5	PB1021B	3.5
HSR 20C (Ct)	30	63	74	53	40	M6	5.4	50.8	10	9.5	26	5	12	B-M6F	4
HSR 25C (Ct)	36	70	83.1	57	45	M8	6.8	59.5	11	16	30.5	6	12	B-M6F	5.5
HSR 30C (Ct)	42	90	98	72	52	M10	8.5	70.4	9	18	35	7	12	B-M6F	7
HSR 35C (Ct)	48	100	109.4	82	62	M10	8.5	80.4	12	21	40.5	8	12	B-M6F	7.5

Model number coding

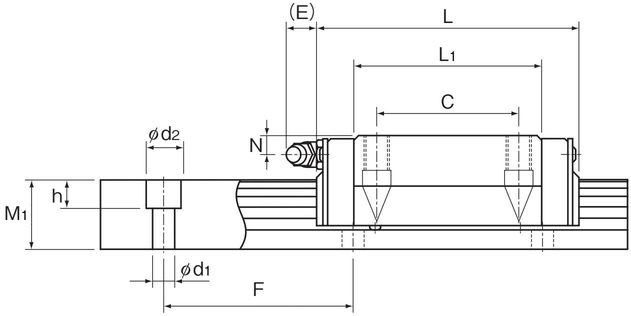
Block: **HSR25 C 1 SS Ct BLOCK**

- HSR25: Model number
- C: Type of LM block
- 1: This variant: 1
- SS: Contamination protection accessory symbol (*1)
- Ct: Accuracy symbol Indicates Ct Class
- BLOCK: Block symbol

Rail: **HSR25 -3000L Ct7 RAIL**

- -3000L: LM rail length (in mm)
- Ct7: Accuracy symbol Ct 7 Class (Ct7) / Ct 5 Class (Ct5)
- RAIL: Rail symbol

(*1) See contamination protection accessory on A-368.



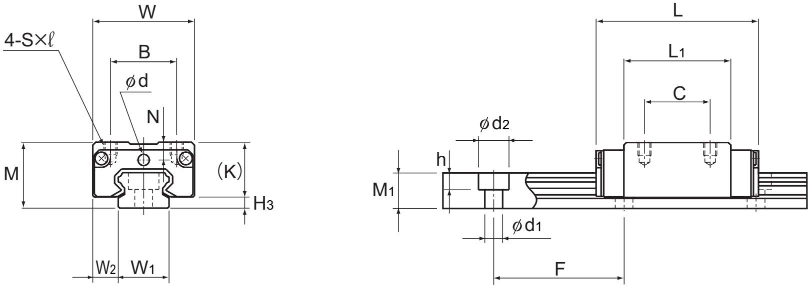
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length *	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	d_1×d_2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	16	15	60	4.5×7.5×5.3	3000	8.33	13.5	0.0805	0.457	0.085	0.457	0.0844	0.2	1.5
	20	21.5	18	60	6×9.5×8.5	3000	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.35	2.3
	23	23.5	22	60	7×11×9	3000	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
	28	31	26	80	9×14×12	3000	28	46.8	0.524	2.7	0.524	2.7	0.562	1.1	4.8
	34	33	29	80	9×14×12	3000	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (see B-82)
Static permissible moment*: static permissible moment value with 1 LM block

Description of Each Option ⇒A-351 **Dimensions⇒B-223**

Model HSR-RM



Models HSR8RM and 10RM

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greasing hole d	Grease nipple	H_3
HSR 8RM	11	16	24	10	10	M2×2.5	15	—	8.9	2.6	—	2.2	—	2.1
HSR 10RM	13	20	31	13	12	M2.6×2.5	20.1	—	10.8	3.5	—	2.5	—	2.2
HSR 12RM	20	27	45	15	15	M4×4.5	30.5	6	16.9	5.2	4	—	PB107	3.1

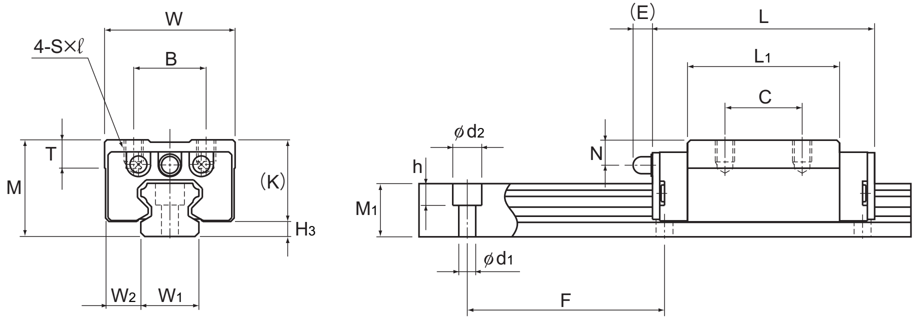
Model number coding

HSR12 R 2 UU C1 M +670L H T M -Ⅱ

- HSR12: Model number
- R: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1)
- M: Stainless steel LM block
- +670L: LM rail length (in mm)
- H: Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP)
- T: Symbol for LM rail jointed use
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Model HSR12RM

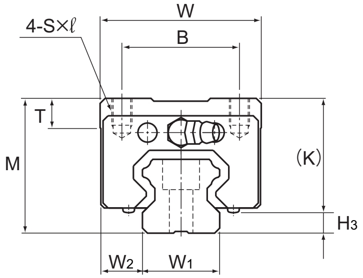
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	8	4	6	20	2.4×4.2×2.3	(275)	1.08	2.16	0.00492	0.0319	0.00492	0.0319	0.00727	0.012	0.3
	10	5	7	25	3.5×6×3.3	(470)	1.96	3.82	0.0123	0.0716	0.0123	0.0716	0.0162	0.025	0.45
	12	7.5	11	40	3.5×6×4.5	(670)	4.7	8.53	0.0409	0.228	0.0409	0.228	0.0445	0.08	0.83

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models HSR-R, HSR-RM, HSR-LR and HSR-LRM



Model No.	Outer dimensions			LM block dimensions									
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple	H_3
HSR 15R HSR 15RM	28	34	56.6	26	26	M4×5	38.8	6	23.3	8.3	5.5	PB1021B	3.5
HSR 20R HSR 20RM	30	44	74	32	36	M5×6	50.8	8	26	5	12	B-M6F	4
HSR 20LR HSR 20LRM	30	44	90	32	50	M5×6	66.8	8	26	5	12	B-M6F	4
HSR 25R HSR 25RM	40	48	83.1	35	35	M6×8	59.5	9	34.5	10	12	B-M6F	5.5
HSR 25LR HSR 25LRM	40	48	102.2	35	50	M6×8	78.6	9	34.5	10	12	B-M6F	5.5
HSR 30R HSR 30RM	45	60	98	40	40	M8×10	70.4	9	38	10	12	B-M6F	7
HSR 30LR HSR 30LRM	45	60	120.6	40	60	M8×10	93	9	38	10	12	B-M6F	7
HSR 35R HSR 35RM	55	70	109.4	50	50	M8×12	80.4	11.7	47.5	15	12	B-M6F	7.5
HSR 35LR HSR 35LRM	55	70	134.8	50	72	M8×12	105.8	11.7	47.5	15	12	B-M6F	7.5
HSR 45R HSR 45LR	70	86	139 170.8	60	60 80	M10×17	98 129.8	15	60	20	16	B-PT1/8	10
HSR 55R HSR 55LR	80	100	163 201.1	75	75 95	M12×18	118 156.1	20.5	67	21	16	B-PT1/8	13
HSR 65R HSR 65LR	90	126	186 245.5	76	70 120	M16×20	147 206.5	23	76	19	16	B-PT1/8	14
HSR 85R HSR 85LR	110	156	245.6 303	100	80 140	M18×25	178.6 236	29	94	23	16	B-PT1/8	16

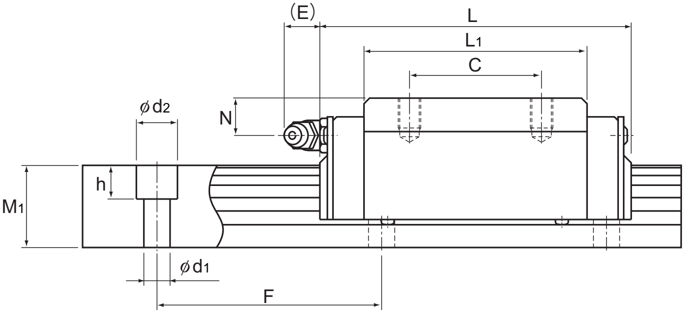
Model number coding

HSR35 R 2 QZ SS C0 M +1400L P T M -Ⅱ

Code	Meaning
HSR35	Model number
R	Type of LM block
2	No. of LM blocks used on the same rail
QZ	With QZ Lubricator
SS	Contamination protection accessory symbol (*1)
C0	Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
M	Stainless steel LM block
+1400L	LM rail length (in mm)
P	Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
T	Symbol for LM rail jointed use
M	Stainless steel LM rail
-Ⅱ	Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



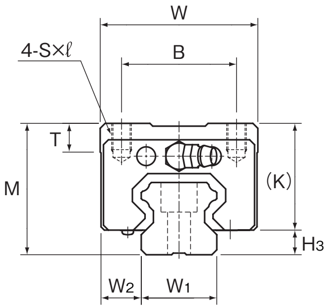
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1×d_2×h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	9.5	15	60	4.5×7.5×5.3	3000 (1240)	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.18	1.5
	20	12	18	60	6×9.5×8.5	3000 (1480)	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.25	2.3
	20	12	18	60	6×9.5×8.5	3000 (1480)	21.3	31.8	0.323	1.66	0.323	1.66	0.27	0.35	2.3
	23	12.5	22	60	7×11×9	3000 (2020)	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.54	3.3
	23	12.5	22	60	7×11×9	3000 (2020)	27.2	45.9	0.529	2.74	0.529	2.74	0.459	0.67	3.3
	28	16	26	80	9×14×12	3000 (2520)	28	46.8	0.524	2.7	0.524	2.7	0.562	0.9	4.8
	28	16	26	80	9×14×12	3000 (2520)	37.3	62.5	0.889	4.37	0.889	4.37	0.751	1.1	4.8
	34	18	29	80	9×14×12	3000 (2520)	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.5	6.6
	34	18	29	80	9×14×12	3000 (2520)	50.2	81.5	1.32	6.35	1.32	6.35	1.2	2	6.6
	45	20.5	38	105	14×20×17	3090	60 80.4	95.6 127	1.42 2.44	7.92 12.6	1.42 2.44	7.92 12.6	1.83 2.43	2.6 3.1	11
	53	23.5	44	120	16×23×20	3060	88.5 119	137 183	2.45 4.22	13.2 21.3	2.45 4.22	13.2 21.3	3.2 4.28	4.3 5.4	15.1
	63	31.5	53	150	18×26×22	3000	141 192	215 286	4.8 8.72	23.5 40.5	4.8 8.72	23.5 40.5	5.82 7.7	7.3 9.3	22.5
	85	35.5	65	180	24×35×28	3000	210 282	310 412	8.31 14.2	45.6 72.5	8.31 14.2	45.6 72.5	11 14.7	13 16	35.2

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Model HSR-R Grade Ct



Model No.	Outer dimensions			LM block dimensions									
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple	H_3
HSR 15R (Ct)	28	34	56.6	26	26	M4×5	38.8	6	23.3	8.3	5.5	PB1021B	3.5
HSR 20R (Ct)	30	44	74	32	36	M5×6	50.8	8	26	5	12	B-M6F	4
HSR 25R (Ct)	40	48	83.1	35	35	M6×8	59.5	9	34.5	10	12	B-M6F	5.5
HSR 30R (Ct)	45	60	98	40	40	M8×10	70.4	9	38	10	12	B-M6F	7
HSR 35R (Ct)	55	70	109.4	50	50	M8×12	80.4	11.7	47.5	15	12	B-M6F	7.5

Model number coding

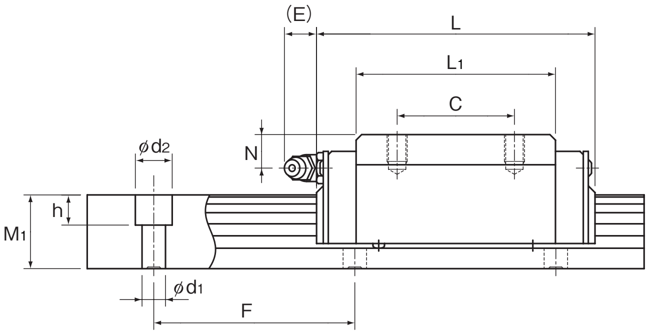
Block: **HSR35 R 1 SS Ct BLOCK**

Model number
Type of LM block
This variant: 1
Contamination protection accessory symbol (*1)
Accuracy symbol Indicates Ct Class
Block symbol

Rail: **HSR25 -3000L Ct5 RAIL**

LM rail length (in mm)
Accuracy symbol Ct 7 Class (Ct7) / Ct 5 Class (Ct5)
Rail symbol

(*1) See contamination protection accessory on A-368.

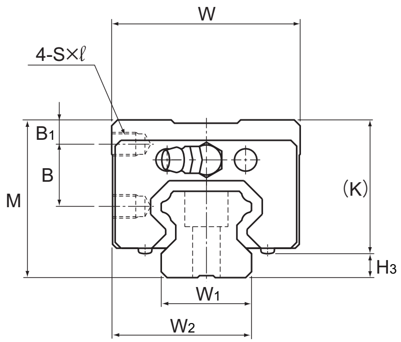


Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length *	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	9.5	15	60	4.5×7.5×5.3	3000	8.33	13.5	0.0805	0.457	0.085	0.457	0.0844	0.18	1.5
	20	12	18	60	6×9.5×8.5	3000	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.25	2.3
	23	12.5	22	60	7×11×9	3000	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.54	3.3
	28	16	26	80	9×14×12	3000	28	46.8	0.524	2.7	0.524	2.7	0.562	0.9	4.8
	34	18	29	80	9×14×12	3000	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.5	6.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (see B-82)
Static permissible moment*: static permissible moment value with 1 LM block

Models HSR-YR and HSR-YRM



Model No.	Outer dimensions			LM block dimensions									H_3
	Height M	Width W	Length L	B_1	B	C	S×ℓ	L_1	K	N	E	Grease nipple	
HSR 15YR HSR 15YRM	28	33.5	56.6	4.3	11.5	18	M4×5	38.8	23.3	8.3	5.5	PB1021B	3.5
HSR 20YR HSR 20YRM	30	43.5	74	4	11.5	25	M5×6	50.8	26	5	12	B-M6F	4
HSR 25YR HSR 25YRM	40	47.5	83.1	6	16	30	M6×6	59.5	34.5	10	12	B-M6F	5.5
HSR 30YR HSR 30YRM	45	59.5	98	8	16	40	M6×9	70.4	38	10	12	B-M6F	7
HSR 35YR HSR 35YRM	55	69.5	109.4	8	23	43	M8×10	80.4	47	15	12	B-M6F	7.5
HSR 45YR	70	85.5	139	10	30	55	M10×14	98	60	20	16	B-PT1/8	10
HSR 55YR	80	99.5	163	12	32	70	M12×15	118	67	21	16	B-PT1/8	13
HSR 65YR	90	124.5	186	12	35	85	M16×22	147	76	19	16	B-PT1/8	14

Model number coding

HSR25 YR 2 UU C0 M +1200L P T M -Ⅱ

Model number

Type of LM block

No. of LM blocks used on the same rail

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

Stainless steel LM block

LM rail length (in mm)

Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

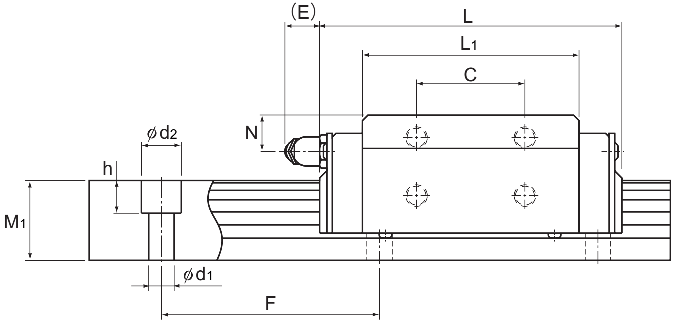
Symbol for LM rail jointed use

Stainless steel LM rail

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)

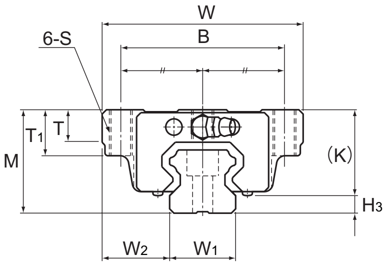


Unit: mm

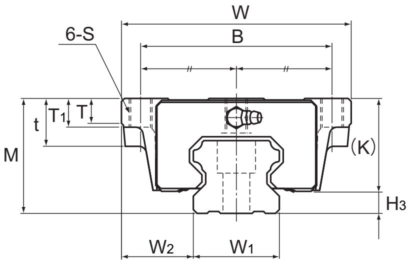
	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	24	15	60	4.5×7.5×5.3	3000 (1240)	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.18	1.5
	20	31.5	18	60	6×9.5×8.5	3000 (1480)	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.25	2.3
	23	35	22	60	7×11×9	3000 (2020)	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.54	3.3
	28	43.5	26	80	9×14×12	3000 (2520)	28	46.8	0.524	2.7	0.524	2.7	0.562	0.9	4.8
	34	51.5	29	80	9×14×12	3000 (2520)	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.5	6.6
	45	65	38	105	14×20×17	3090	60	95.6	1.42	7.92	1.42	7.92	1.83	2.6	11
	53	76	44	120	16×23×20	3060	88.5	137	2.45	13.2	2.45	13.2	3.2	4.3	15.1
	63	93	53	150	18×26×22	3000	141	215	4.8	23.5	4.8	23.5	5.82	7.3	22.5

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models HSR-CA, HSR-CAM, HSR-HA and HSR-HAM



Models HSR20 to 35CA/HA/CAM/HAM



Models HSR45 to 85CA/HA

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	S	L_1	t	T	T_1	K	N	E	Grease nipple	H_3
HSR 20CA HSR 20CAM	30	63	74	53	40	M6	50.8	—	9.5	10	26	5	12	B-M6F	4
HSR 20HA HSR 20HAM	30	63	90	53	40	M6	66.8	—	9.5	10	26	5	12	B-M6F	4
HSR 25CA HSR 25CAM	36	70	83.1	57	45	M8	59.5	—	11	16	30.5	6	12	B-M6F	5.5
HSR 25HA HSR 25HAM	36	70	102.2	57	45	M8	78.6	—	11	16	30.5	6	12	B-M6F	5.5
HSR 30CA HSR 30CAM	42	90	98	72	52	M10	70.4	—	9	18	35	7	12	B-M6F	7
HSR 30HA HSR 30HAM	42	90	120.6	72	52	M10	93	—	9	18	35	7	12	B-M6F	7
HSR 35CA HSR 35CAM	48	100	109.4	82	62	M10	80.4	—	12	21	40.5	8	12	B-M6F	7.5
HSR 35HA HSR 35HAM	48	100	134.8	82	62	M10	105.8	—	12	21	40.5	8	12	B-M6F	7.5
HSR 45CA HSR 45HA	60	120	139 170.8	100	80	M12	98 129.8	25	13	15	50	10	16	B-PT1/8	10
HSR 55CA HSR 55HA	70	140	163 201.1	116	95	M14	118 156.1	29	13.5	17	57	11	16	B-PT1/8	13
HSR 65CA HSR 65HA	90	170	186 245.5	142	110	M16	147 206.5	37	21.5	23	76	19	16	B-PT1/8	14
HSR 85CA HSR 85HA	110	215	245.6 303	185	140	M20	178.6 236	55	28	30	94	23	16	B-PT1/8	16

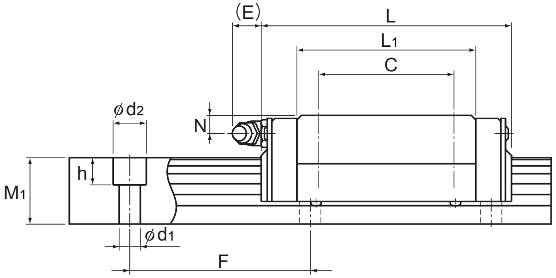
Model number coding

HSR25 HA 2 QZ KKHH C0 M +1300L P T M -Ⅱ

HSR25: Model number
HA: Type of LM block
2: No. of LM blocks used on the same rail
QZ: With QZ Lubricator
KKHH: Contamination protection accessory symbol (*1)
C0: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
M: Stainless steel LM block
+1300L: LM rail length (in mm)
P: Accuracy symbol (*3) Normal grade (No Symbol) High accuracy grade (H) Precision grade (P) Super precision grade (SP) Ultra precision grade (UP)
T: Symbol for LM rail jointed use
M: Stainless steel LM rail
-Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



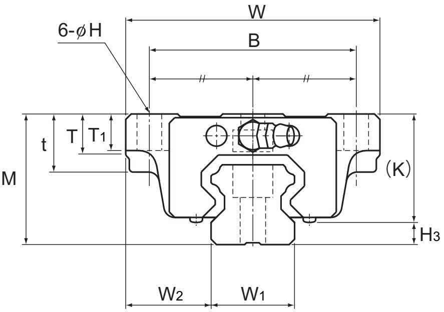
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W1 ±0.05	W2	Height M1	Pitch F	d1×d2×h	Length* Max	C kN	C0 kN	MA 1 block	MA Double blocks	MB 1 block	MB Double blocks	MC 1 block	LM block kg	LM rail kg/m
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.35	2.3
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	21.3	31.8	0.323	1.66	0.323	1.66	0.27	0.47	2.3
	23	23.5	22	60	7×11×9	3000 (2020)	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
	23	23.5	22	60	7×11×9	3000 (2020)	27.2	45.9	0.529	2.74	0.529	2.74	0.459	0.75	3.3
	28	31	26	80	9×14×12	3000 (2520)	28	46.8	0.524	2.7	0.524	2.7	0.562	1.1	4.8
	28	31	26	80	9×14×12	3000 (2520)	37.3	62.5	0.889	4.37	0.889	4.37	0.751	1.3	4.8
	34	33	29	80	9×14×12	3000 (2520)	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6
	34	33	29	80	9×14×12	3000 (2520)	50.2	81.5	1.32	6.35	1.32	6.35	1.2	2	6.6
	45	37.5	38	105	14×20×17	3090	60 80.4	95.6 127	1.42 2.44	7.92 12.6	1.42 2.44	7.92 12.6	1.83 2.43	2.8 3.3	11
	53	43.5	44	120	16×23×20	3060	88.5 119	137 183	2.45 4.22	13.2 21.3	2.45 4.22	13.2 21.3	3.2 4.28	4.5 5.7	15.1
	63	53.5	53	150	18×26×22	3000	141 192	215 286	4.8 8.72	23.5 40.5	4.8 8.72	23.5 40.5	5.82 7.7	8.5 10.7	22.5
	85	65	65	180	24×35×28	3000	210 282	310 412	8.31 14.2	45.6 72.5	8.31 14.2	45.6 72.5	11 14.7	17 23	35.2

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models HSR-CB, HSR-CBM, HSR-HB and HSR-HBM



Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	H	L_1	t	T	T_1	K	N	E	Grease nipple	H_3
HSR 20CB HSR 20CBM	30	63	74	53	40	6	50.8	10	9.5	10	26	5	12	B-M6F	4
HSR 20HB HSR 20HBM	30	63	90	53	40	6	66.8	10	9.5	10	26	5	12	B-M6F	4
HSR 25CB HSR 25CBM	36	70	83.1	57	45	7	59.5	16	11	10	30.5	6	12	B-M6F	5.5
HSR 25HB HSR 25HBM	36	70	102.2	57	45	7	78.6	16	11	10	30.5	6	12	B-M6F	5.5
HSR 30CB HSR 30CBM	42	90	98	72	52	9	70.4	18	9	10	35	7	12	B-M6F	7
HSR 30HB HSR 30HBM	42	90	120.6	72	52	9	93	18	9	10	35	7	12	B-M6F	7
HSR 35CB HSR 35CBM	48	100	109.4	82	62	9	80.4	21	12	13	40	8	12	B-M6F	7.5
HSR 35HB HSR 35HBM	48	100	134.8	82	62	9	105.8	21	12	13	40	8	12	B-M6F	7.5
HSR 45CB HSR 45HB	60	120	139 170.8	100	80	11	98 129.8	25	13	15	50	10	16	B-PT1/8	10
HSR 55CB HSR 55HB	70	140	163 201.1	116	95	14	118 156.1	29	13.5	17	57	11	16	B-PT1/8	13
HSR 65CB HSR 65HB	90	170	186 245.5	142	110	16	147 206.5	37	21.5	23	76	19	16	B-PT1/8	14
HSR 85CB HSR 85HB	110	215 110	245.6 303	185	140	18	178.6 236	55	28	30	94	23	16	B-PT1/8	16

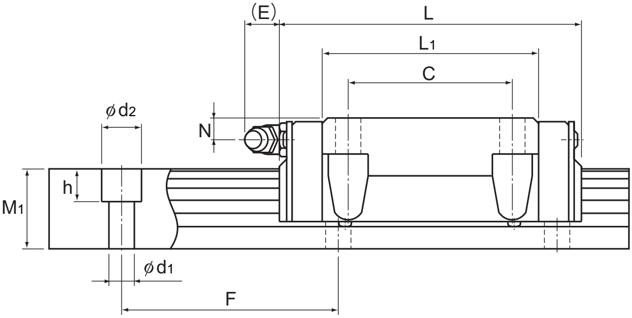
Model number coding

HSR35 CB 2 QZ ZZHH C0 M +1400L P T M -Ⅱ

HSR35	Model number
CB	Type of LM block
2	No. of LM blocks used on the same rail
QZ	With QZ Lubricator
ZZHH	Contamination protection accessory symbol (*1)
C0	Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
M	Stainless steel LM block
+1400L	LM rail length (in mm)
P	Accuracy symbol (*3) Normal grade (No Symbol) High accuracy grade (H) Precision grade (P) Super precision grade (SP) Ultra precision grade (UP)
T	Symbol for LM rail jointed use
M	Stainless steel LM rail
-Ⅱ	Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



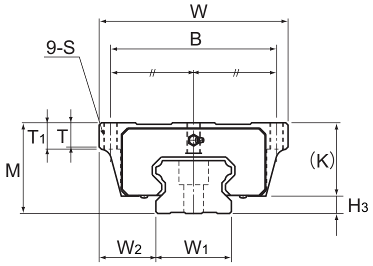
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.35	2.3
	20	21.5	18	60	6×9.5×8.5	3000 (1480)	21.3	31.8	0.323	1.66	0.323	1.66	0.27	0.47	2.3
	23	23.5	22	60	7×11×9	3000 (2020)	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
	23	23.5	22	60	7×11×9	3000 (2020)	27.2	45.9	0.529	2.74	0.529	2.74	0.459	0.75	3.3
	28	31	26	80	9×14×12	3000 (2520)	28	46.8	0.524	2.7	0.524	2.7	0.562	1.1	4.8
	28	31	26	80	9×14×12	3000 (2520)	37.3	62.5	0.889	4.37	0.889	4.37	0.751	1.3	4.8
	34	33	29	80	9×14×12	3000 (2520)	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6
	34	33	29	80	9×14×12	3000 (2520)	50.2	81.5	1.32	6.35	1.32	6.35	1.2	2	6.6
	45	37.5	38	105	14×20×17	3090	60 80.4	95.6 127	1.42 2.44	7.92 12.6	1.42 2.44	7.92 12.6	1.83 2.43	2.8 3.3	11
	53	43.5	44	120	16×23×20	3060	88.5 119	137 183	2.45 4.22	13.2 21.3	2.45 4.22	13.2 21.3	3.2 4.28	4.5 5.7	15.1
	63	53.5	53	150	18×26×22	3000	141 192	215 286	4.8 8.72	23.5 40.5	4.8 8.72	23.5 40.5	5.82 7.7	8.5 10.7	22.5
	85	65	65	180	24×35×28	3000	210 282	310 412	8.31 14.2	45.6 72.5	8.31 14.2	45.6 72.5	11 14.7	17 23	35.2

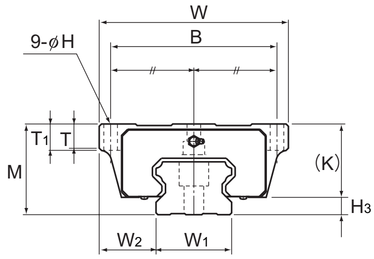
Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models HSR-HA, HSR-HB and HSR-HR



Models HSR100 to 150HA



Models HSR100 to 150HB

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	H	S×ℓ	L₁	T	T₁	K	N	E	Grease nipple	H₃
HSR 100HA HSR 100HB HSR 100HR	120	250 250 200	334	220 220 130	200	— 20 —	M18* — M18×27	261	32 32 33	35 35 —	100	23	16	B-PT1/4	20.5
HSR 120HA HSR 120HB HSR 120HR	130	290 290 220	365	250 250 146	210	— 22 —	M20* — M20×30	287	34 34 33.7	38 38 —	110	26.5	16	B-PT1/4	20
HSR 150HA HSR 150HB HSR 150HR	145	350 350 266	396	300 300 180	230	— 26 —	M24* — M24×35	314	36 36 33	40 40 —	123	29	16	B-PT1/4	22.5

Note) "*" indicates a through hole.

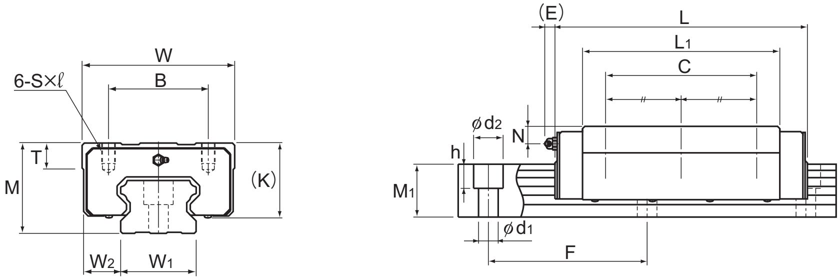
Model number coding

HSR150 HR 2 UU C1 +2350L H T -Ⅱ

- HSR150: Model number
- HR: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +2350L: LM rail length (in mm)
- H: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Models HSR100 to 150HR

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 ±0.05	W_2	Height M_1	Pitch F	d_1×d_2×h	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	100	75 75 50	70	210	26×39×32	3000	351	506	19.4	98.2	19.4	98.2	22.4	32	49
	114	88 88 53	75	230	33×48×43	3000	429	612	25.9	129	25.9	129	31.1	43	61
	144	103 103 61	85	250	39×58×46	3000	518	728	33.6	167	33.6	167	45.2	62	87

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-82.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model HSR variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

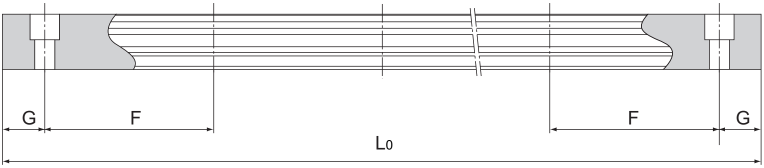


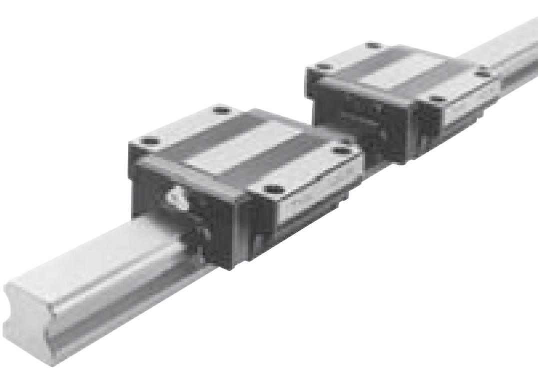
Table1 Standard Length and Maximum Length of the LM Rail for Model HSR Unit: mm

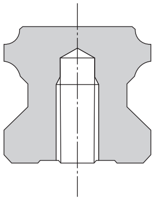
Model No.	HSR 8	HSR 10	HSR 12	HSR 15	HSR 20	HSR 25	HSR 30	HSR 35	HSR 45	HSR 55	HSR 65	HSR 85	HSR 100	HSR 120	HSR 150
LM rail standard length (L_0)	35	45	70	160	160	220	280	280	570	780	1270	1530	1340	1470	1600
	55	70	110	220	220	280	360	360	675	900	1570	1890	1760	1930	2100
	75	95	150	280	280	340	440	440	780	1020	2020	2250	2180	2390	2350
	95	120	190	340	340	400	520	520	885	1140	2620	2610	2600		
	115	145	230	400	400	460	600	600	990	1260					
	135	170	270	460	460	520	680	680	1095	1380					
	155	195	310	520	520	580	760	760	1200	1500					
	175	220	350	580	580	640	840	840	1305	1620					
	195	245	390	640	640	700	920	920	1410	1740					
	215	270	430	700	700	760	1000	1000	1515	1860					
	235	295	470	760	760	820	1080	1080	1620	1980					
	255	320	510	820	820	940	1160	1160	1725	2100					
	275	345	550	940	940	1000	1240	1240	1830	2220					
		370	590	1000	1000	1060	1320	1320	1935	2340					
		395	630	1060	1060	1120	1400	1400	2040	2460					
		420	670	1120	1120	1180	1480	1480	2145	2580					
		445		1180	1180	1240	1560	1560	2250	2700					
		470		1240	1240	1300	1640	1640	2355	2820					
				1360	1360	1360	1720	1720	2460	2940					
				1480	1480	1420	1800	1800	2565	3060					
				1600	1600	1480	1880	1880	2670						
					1720	1540	1960	1960	2775						
					1840	1600	2040	2040	2880						
					1960	1720	2200	2200	2985						
					2080	1840	2360	2360	3090						
					2200	1960	2520	2520							
						2080	2680	2680							
						2200	2840	2840							
						2320	3000	3000							
						2440									
Standard pitch F	20	25	40	60	60	60	80	80	105	120	150	180	210	230	250
G	7.5	10	15	20	20	20	20	20	22.5	30	35	45	40	45	50
Max length	(275)	(470)	(670)	3000 (1240)	3000 (1480)	3000 (2020)	3000 (2520)	3000 (2520)	3090	3060	3000	3000	3000	3000	3000

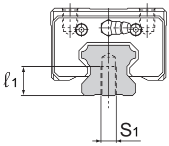
Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note3) The figures in the parentheses indicate the maximum lengths of stainless steel made models.
Note4) Ct7 and Ct5 grades are not applicable where the LM rail standard length appears in dimmed type for models HSR 15 to HSR 35.

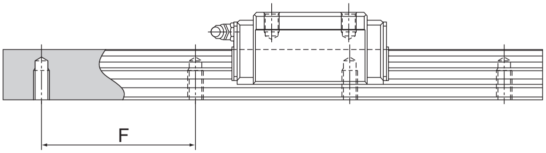
Tapped-hole LM Rail Type of Model HSR

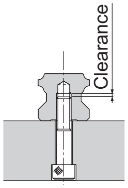
The model HSR variations include a type with its LM rail bottom tapped. This type is useful when desiring to mount the LM Guide from the bottom of the base and when desiring to increase the contamination protection effect.











(1) Determine the bolt length so that a clearance of 2 to 5 mm is secured between the bolt end and the bottom of the tap (effective tap depth). (See figure above.)

(2) A tapped-hole LM rail type is available also for model HSR-YR.

(3) For standard pitches of the taps, see Table1 on B-82.

Table2 Dimensions of the LM Rail Tap

Unit: mm

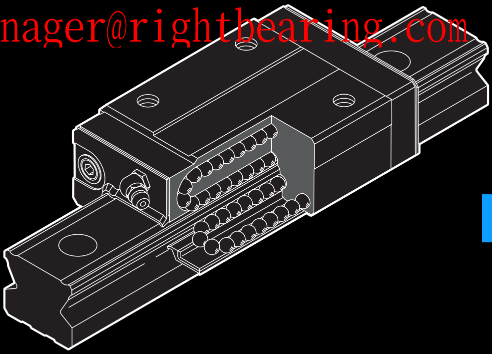
Model No.	S_1	Effective tap depth ℓ_1
HSR 15	M5	8
HSR 20	M6	10
HSR 25	M6	12
HSR 30	M8	15
HSR 35	M8	17
HSR 45	M12	24
HSR 55	M14	24
HSR 65	M20	30

Model number coding

HSR30 A2UU +1000LH K

Symbol for tapped-hole LM rail type

Note) Ct7 and Ct5 grades are not applicable.



SR

LM Guide

B Product Specifications

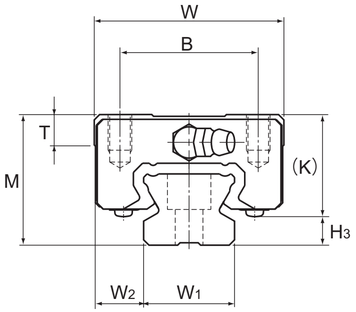
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SR-W, SR-WM, SR-V and SR-VM



Model No.	Outer dimensions			LM block dimensions									
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple	H_3
SR 15W/WM SR 15V/VM	24	34	57 40.4	26	26 —	M4×7	39.5 22.9	5.7	19.5	6	5.5	PB1021B	4.5
SR 20W/WM SR 20V/VM	28	42	66.2 47.3	32	32 —	M5×8	46.7 27.8	7.2	22	6	12	B-M6F	6
SR 25WY/WMY SR 25VY/VMY	33	48	83 59.2	35	35 —	M6×9	59 35.2	7.7	26	7	12	B-M6F	7
SR 30W/WM SR 30V/VM	42	60	96.8 67.9	40	40 —	M8×12	69.3 40.4	8.5	32.5	8	12	B-M6F	9.5
SR 35W/WM SR 35V/VM	48	70	111 77.6	50	50 —	M8×12	79 45.7	12.5	36.5	8.5	12	B-M6F	11.5
SR 45W	60	86	126	60	60	M10×15	90.5	15	47.5	11.5	16	B-PT1/8	12.5
SR 55W	68	100	156	75	75	M12×20	117	16.7	54.5	12	16	B-PT1/8	13.5
SR 70T	85	126	194.6	90	90	M16×25	147.6	24.5	70	12	16	B-PT1/8	15
SR 85T	110	156	180	100	80	M18×30	130	25.5	91.5	27	12	A-PT1/8	18.5
SR 100T	120	178	200	120	100	M20×35	150	29.5	101	32	12	A-PT1/8	19
SR 120T	110	205	235	160	120	M20×35	180	24	95	14	13.5	B-PT1/4	15
SR 150T	135	250	280	200	160	M20×35	215	24	113	17	13.5	B-PT1/4	22

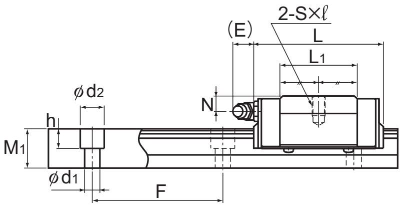
Model number coding

SR25 W 2 UU C0 M +1240L Y P T M -Ⅱ

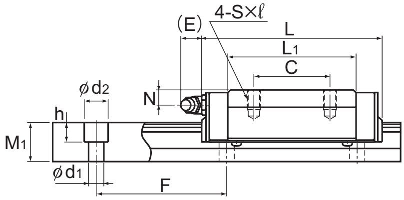
Code	Meaning
SR25	Model number
W	Type of LM block
2	No. of LM blocks used on the same rail
UU	Contamination protection accessory symbol (*1)
C0	Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
M	Stainless steel LM block
+1240L	LM rail length (in mm)
Y	Applied to only 25
P	Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
T	Symbol for LM rail jointed use
M	Stainless steel LM rail
-Ⅱ	Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Model SR-V



Model SR-W

Unit: mm

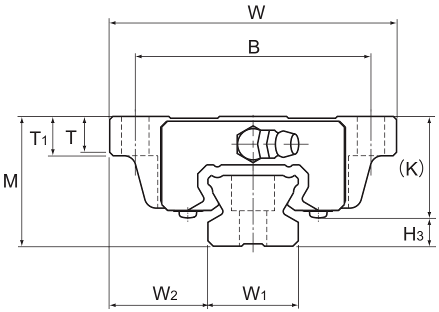
	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W₁ ±0.05	W₂	Height M₁	Pitch F	d₁×d₂×h	Length* Max	C kN	C₀ kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	15	9.5	12.5	60	3.5×6×4.5	2500 (2500)	9.51 5.39	19.3 11.1	0.0925 0.0326	0.516 0.224	0.0567 0.0203	0.321 0.143	0.113 0.0654	0.2 0.12	1.2
	20	11	15.5	60	6×9.5×8.5	4000 (3000)	12.5 7.16	25.2 14.4	0.146 0.053	0.778 0.332	0.0896 0.0329	0.481 0.21	0.194 0.11	0.3 0.2	2.1
	23	12.5	18	60	7×11×9	4000 (3000)	20.3 11.7	39.5 22.5	0.286 0.103	1.52 0.649	0.175 0.0642	0.942 0.41	0.355 0.201	0.4 0.3	2.7
	28	16	23	80	7×11×9	4000 (3000)	30 17.2	56.8 32.5	0.494 0.163	2.55 1.08	0.303 0.102	1.57 0.692	0.611 0.352	0.8 0.5	4.3
	34	18	27.5	80	9×14×12	4000 (3000)	41.7 23.8	77.2 44.1	0.74 0.259	4.01 1.68	0.454 0.161	2.49 1.07	1.01 0.576	1.2 0.8	6.4
	45	20.5	35.5	105	11×17.5×14	3500	55.3	101	1.1	5.96	0.679	3.69	1.77	2.2	11.3
	48	26	38	120	14×20×17	3000	89.1	157	2.27	11.3	1.39	6.98	2.87	3.6	12.8
	70	28	47	150	18×26×22	3000	156	266	2.54	13.2	2.18	11.3	4.14	7	22.8
	85	35.5	65.5	180	18×26×22	3000	120	224	2.54	15.1	1.25	7.47	5.74	10.1	34.9
	100	39	70.3	210	22×32×25	3000	148	283	3.95	20.9	1.95	10.3	8.55	14.1	46.4
	114	45.5	65	230	26×39×30	3000	279	377	5.83	32.9	2.87	16.2	13.7	—	—
	144	53	77	250	33×48×36	3000	411	537	9.98	55.8	4.92	27.5	24.3	—	—

Note1) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.
Those model numbers including and greater than SR85T are semi-standard models. If desiring these models, contact THK.
Models SR85T and SR100T are equipped with grease nipple on the side face of the LM block.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-90.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Note2) The LM rail mounting hole of SR15 is drilled for M3 screws as standard (without Y indication). If you order the hole to be drilled for M4 screws (with Y indication), contact THK. When replacing this model with model SSR, pay attention to the dimension of the rail mounting hole.

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models SR-TB, SR-TBM, SR-SB and SR-SBM



Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	H	L_1	T	T_1	K	N	E	Grease nipple	H_3
SR 15TB/TBM SR 15SB/SBM	24	52	57 40.4	41	26 —	4.5	39.5 22.9	6.1	7	19.5	6	5.5	PB1021B	4.5
SR 20TB/TBM SR 20SB/SBM	28	59	66.2 47.3	49	32 —	5.5	46.7 27.8	8	9	22	6	12	B-M6F	6
SR 25TBY/TBMY SR 25SBY/SBMY	33	73	83 59.2	60	35 —	7	59 35.2	9.1	10	26	7	12	B-M6F	7
SR 30TB/TBM SR 30SB/SBM	42	90	96.8 67.9	72	40 —	9	69.3 40.4	8.7	10	32.5	8	12	B-M6F	9.5
SR 35TB/TBM SR 35SB/SBM	48	100	111 77.6	82	50 —	9	79 45.7	11.2	13	36.5	8.5	12	B-M6F	11.5
SR 45TB	60	120	126	100	60	11	90.5	12.8	15	47.5	11.5	16	B-PT1/8	12.5
SR 55TB	68	140	156	116	75	14	117	15.3	17	54.5	12	16	B-PT1/8	13.5

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

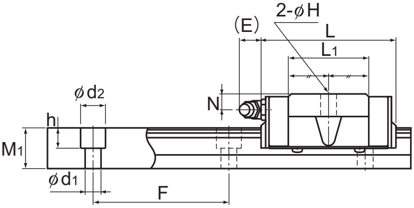
Model number coding

SR25 TB 2 UU C1 +1200L Y H T -Ⅱ

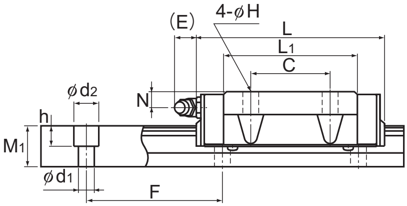
- SR25: Model number
- TB: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  Normal (No symbol)
  Light preload (C1)
  Medium preload (C0)
- +1200L: LM rail length (in mm)
- Y: Applied to only 25
- H: Accuracy symbol (*3)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)/Super precision grade (SP)
  Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Model SR-SB



Model SR-TB

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 ±0.05	W_2	Height M_1	Pitch F	d_1×d_2×h	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	15	18.5	12.5	60	3.5×6×4.5	2500 (1240)	9.51 5.39	19.3 11.1	0.0925 0.0326	0.516 0.224	0.0567 0.0203	0.321 0.143	0.113 0.0654	0.2 0.15	1.2
	20	19.5	15.5	60	6×9.5×8.5	3000 (1480)	12.5 7.16	25.2 14.4	0.146 0.053	0.778 0.332	0.0896 0.0329	0.481 0.21	0.194 0.11	0.4 0.3	2.1
	23	25	18	60	7×11×9	3000 (2020)	20.3 11.7	39.5 22.5	0.286 0.103	1.52 0.649	0.175 0.0642	0.942 0.41	0.355 0.201	0.6 0.4	2.7
	28	31	23	80	7×11×9	3000 (2520)	30 17.2	56.8 32.5	0.494 0.163	2.55 1.08	0.303 0.102	1.57 0.692	0.611 0.352	1.1 0.8	4.3
	34	33	27.5	80	9×14×12	3000 (2520)	41.7 23.8	77.2 44.1	0.74 0.259	4.01 1.68	0.454 0.161	2.49 1.07	1.01 0.576	1.5 1	6.4
	45	37.5	35.5	105	11×17.5×14	3000	55.3	101	1.1	5.96	0.679	3.69	1.77	2.5	11.3
	48	46	38	120	14×20×17	3000	89.1	157	2.27	11.3	1.39	6.98	2.87	4.2	12.8

Note1) The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-90.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Note2) The LM rail mounting hole of SR15 is drilled for M3 screws as standard (without Y indication). If you order the hole to be drilled for M4 screws (with Y indication), contact THK. When replacing this model with model SSR, pay attention to the dimension of the rail mounting hole.

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SR variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

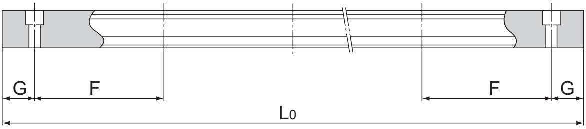


Table1 Standard Length and Maximum Length of the LM Rail for Model SR

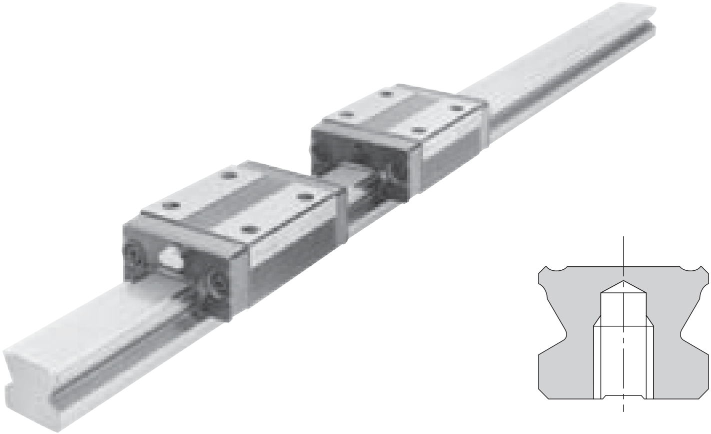
Unit: mm

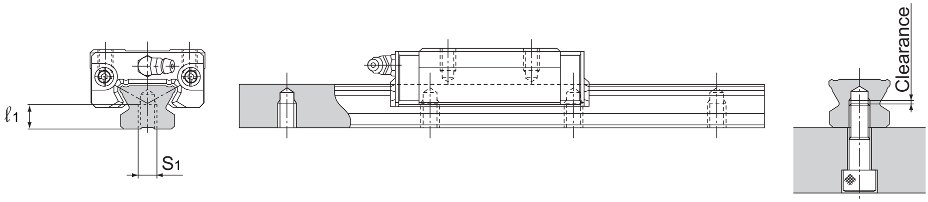
Model No.	SR 15	SR 20	SR 25	SR 30	SR 35	SR 45	SR 55	SR 70	SR 85	SR 100	SR 120	SR 150
LM rail standard length (L_0)	160	220	220	280	280	570	780	1270	1520	1550	1700	1600
	220	280	280	360	360	675	900	1570	2060	1970	2390	2100
	280	340	340	440	440	780	1020	2020	2600	2600		
	340	400	400	520	520	885	1140	2620				
	400	460	460	600	600	990	1260					
	460	520	520	680	680	1095	1380					
	520	580	580	760	760	1200	1500					
	580	640	640	840	840	1305	1740					
	640	700	700	920	920	1410	1860					
	700	760	760	1000	1000	1515	1980					
	760	820	820	1080	1080	1725	2100					
	820	940	940	1160	1160	1830	2220					
	940	1000	1000	1240	1240	1935	2340					
	1000	1060	1060	1320	1320	2040	2460					
	1060	1120	1120	1400	1400	2145	2580					
	1120	1180	1180	1480	1480	2250	2700					
	1180	1240	1240	1640	1640	2355	2820					
	1240	1300	1300	1720	1720	2460	2940					
	1300	1360	1360	1800	1800	2565						
	1360	1420	1420	1880	1880	2670						
	1420	1480	1480	1960	1960	2775						
	1480	1540	1540	2040	2040	2880						
	1540	1600	1600	2120	2120	2985						
		1660	1660	2200	2200							
		1720	1720	2280	2280							
		1780	1780	2360	2360							
		1840	1840	2440	2440							
		1900	1900	2520	2520							
		1960	1960	2600	2600							
		2020	2020	2680	2680							
		2080	2080	2760	2760							
		2140	2140	2840	2840							
			2200	2920	2920							
			2260									
			2320									
			2380									
			2440									
Standard pitch F	60	60	60	80	80	105	120	150	180	210	230	250
G	20	20	20	20	20	22.5	30	35	40	40	45	50
Max length	2500 (1240)	3000 (1480)	3000 (2020)	3000 (2520)	3000 (2520)	3000	3000	3000	3000	3000	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note3) Those model numbers including and greater than SR85T are semi-standard models. If desiring these models, contact THK.
Note4) The figures in the parentheses indicate the maximum lengths of stainless steel made models.

Tapped-hole LM Rail Type of Model SR

The model SR variations include a type with its LM rail bottom tapped. This type is useful when desiring to mount the LM Guide from the bottom of the base and when desiring to increase the contamination protection.





(1) A tapped-hole LM rail type is available only for high accuracy or lower grades.

(2) Determine the bolt length so that a clearance of 2 to 5 mm is secured between the bolt end and the bottom of the tap (effective tap depth). (See figure above.)

(3) For standard pitches of the taps, see Table1 on B-90.

Table2 Dimensions of the LM Rail Tap

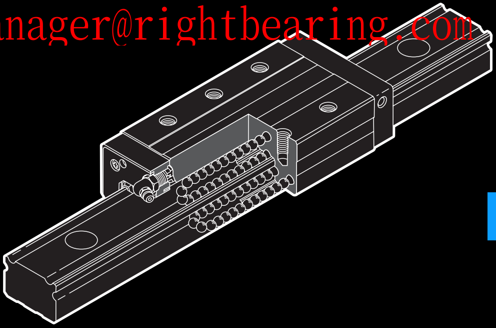
Unit: mm

Model No.	S_1	Effective tap depth ℓ_1
SR 15	M5	7
SR 20	M6	9
SR 25	M6	10
SR 30	M8	14
SR 35	M8	16
SR 45	M12	20
SR 55	M14	22

Model number coding

SR30 W2UU +1000LH K

Symbol for tapped-hole LM rail type



NR/NRS

LM Guide

B Product Specifications

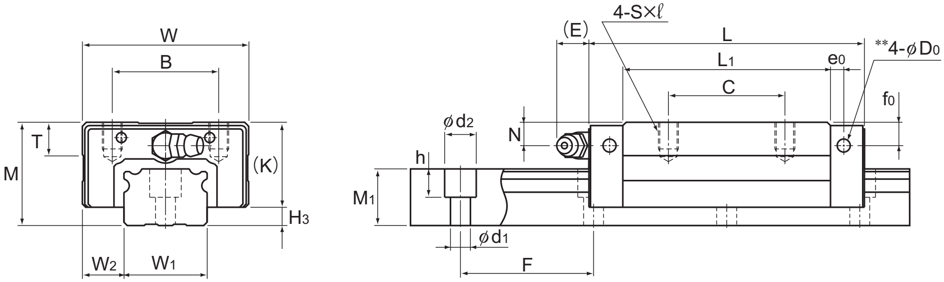
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models NR-R and NR-LR



Model NR-R

Model No.	Outer dimensions			LM block dimensions												
	Height	Width	Length												Grease nipple	
	M	W	L	B	C	S×ℓ	L1	T	K	N	f0	E	e0	D0		H3
NR 25XR NR 25XLR	31	50	82.8 102	32	35 50	M6×8	62.4 81.6	9.7	25.5	7	7	12	4	3.9	B-M6F	5.5
NR 30R NR 30LR	38	60	98 120.5	40	40 60	M8×10	70.9 93.4	9.7	31	7	7	12	5	3.9	B-M6F	7
NR 35R NR 35LR	44	70	109.5 135	50	50 72	M8×12	77.9 103.4	11.7	35	8	8	12	6	5.2	B-M6F	9
NR 45R NR 45LR	52	86	139 171	60	60 80	M10×17	105 137	14.7	40.5	10	8	16	7	5.2	B-PT1/8	11.5
NR 55R NR 55LR	63	100	162.8 200	65	75 95	M12×18	123.6 160.8	17.5	49	11	10	16	8	5.2	B-PT1/8	14
NR 65R NR 65LR	75	126	185.6 245.6	76	70 110	M16×20	143.6 203.6	21.5	60	16	15	16	9	8.2	B-PT1/8	15
NR 75R NR 75LR	83	145	218 274	95	80 130	M18×25	170.2 226.2	25.3	68	18	17	16	9	8.2	B-PT1/8	15
NR 85R NR 85LR	90	156	246.7 302.8	100	80 140	M18×25	194.9 251	27.3	73	20	20	16	10	8.2	B-PT1/8	17
NR 100R NR 100LR	105	200	288.8 328.8	130	150 200	M18×27	223.4 263.4	34.3	85	23	23	10	12	8.2	B-PT1/4	20

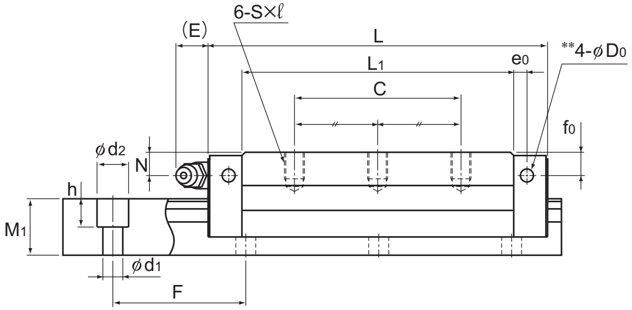
Model number coding

NR35 LR 2 QZ KKHH C0 +1240L P T Z -Ⅱ

- NR35: Model number
- LR: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1240L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



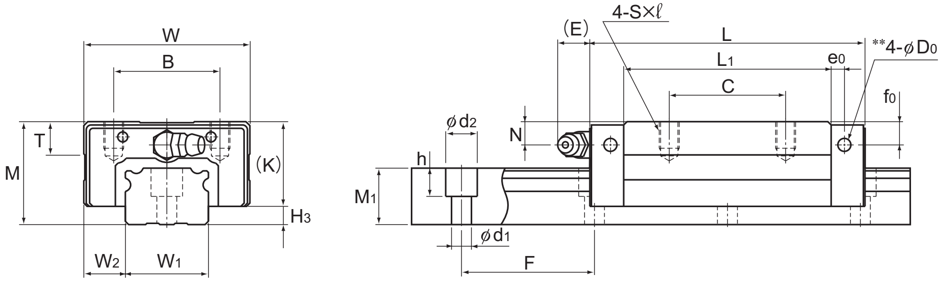
Model NR-LR

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W₁ 0 -0.05	W₂	Height M₁	Pitch F	d₁×d₂×h	Length* Max	C kN	C₀ kN	Mᴀ 1 block	Mᴀ Double blocks	Mʙ 1 block	Mʙ Double blocks	Mᴄ 1 block	LM block kg	LM rail kg/m
	25	12.5	17	40	6×9.5×8.5	2500	33 44	84.6 113	0.771 1.26	3.86 6.29	0.469 0.775	2.33 3.82	0.91 1.21	0.43 0.55	3.1
	28	16	21	80	7×11×9	3000	48.7 64.9	122 162	1.26 2.18	6.63 10.6	0.778 1.33	4.05 6.47	1.47 1.95	0.74 1	4.3
	34	18	24.5	80	9×14×12	3000	63.1 85.7	155 210	1.75 3.14	9.47 15.5	1.08 1.92	5.8 9.43	2.24 3.03	1.1 1.4	6.2
	45	20.5	29	105	14×20×17	3090	96 126	231 303	3.37 5.93	17.7 28	2.07 3.59	10.8 16.9	4.45 5.82	2 2.8	9.8
	53	23.5	36.5	120	16×23×20	3060	131 170	310 402	5.39 8.87	27.8 43.8	3.3 5.41	16.9 26.6	6.98 9.05	3.3 4.3	14.5
	63	31.5	43	150	18×26×22	3000	189 260	436 600	8.76 16.8	44.7 79.9	5.39 10.1	27.3 48	11.6 15.9	6 8.7	20.3
	75	35	44	150	22×32×26	3000	271 355	610 800	14.4 25.4	73.3 118	8.91 15.4	44.7 71.4	19.3 25.2	8.7 11.6	24.6
	85	35.5	48	180	24×35×28	3000	336 435	751 972	20.3 34.7	102 160	12.4 21	62.6 96.2	26.8 34.6	12.3 15.8	30.5
	100	50	57	210	26×39×32	2500	479 599	1040 1300	34 47.3	167 238	20.7 29.2	101 146	43.4 54.6	21.8 26.1	42.6

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-106.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models NRS-R and NRS-LR



Model NRS-R

Model No.	Outer dimensions Height M	Width W	Length L	LM block dimensions B	C	S×ℓ	L_1	T	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
NRS 25XR NRS 25XLR	31	50	82.8 102	32	35 50	M6×8	62.4 81.6	9.7	25.5	7	7	12	4	3.9	B-M6F	5.5
NRS 30R NRS 30LR	38	60	98 120.5	40	40 60	M8×10	70.9 93.4	9.7	31	7	7	12	5	3.9	B-M6F	7
NRS 35R NRS 35LR	44	70	109.5 135	50	50 72	M8×12	77.9 103.4	11.7	35	8	8	12	6	5.2	B-M6F	9
NRS 45R NRS 45LR	52	86	139 171	60	60 80	M10×17	105 137	14.7	40.5	10	8	16	7	5.2	B-PT1/8	11.5
NRS 55R NRS 55LR	63	100	162.8 200	65	75 95	M12×18	123.6 160.8	17.5	49	11	10	16	8	5.2	B-PT1/8	14
NRS 65R NRS 65LR	75	126	185.6 245.6	76	70 110	M16×20	143.6 203.6	21.5	60	16	15	16	9	8.2	B-PT1/8	15
NRS 75R NRS 75LR	83	145	218 274	95	80 130	M18×25	170.2 226.2	25.3	68	18	17	16	9	8.2	B-PT1/8	15
NRS 85R NRS 85LR	90	156	246.7 302.8	100	80 140	M18×25	194.9 251	27.3	73	20	20	16	10	8.2	B-PT1/8	17
NRS 100R NRS 100LR	105	200	288.8 328.8	130	150 200	M18×27	223.4 263.4	34.3	85	23	23	10	12	8.2	B-PT1/4	20

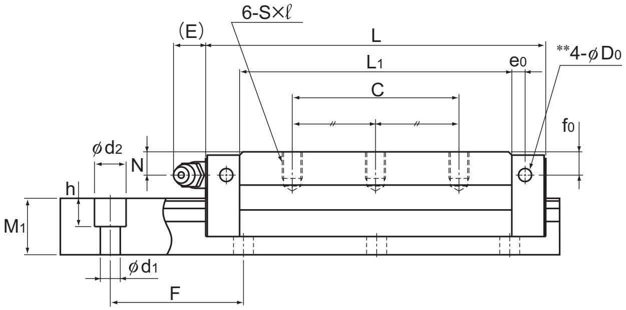
Model number coding

NRS45 LR 2 QZ ZZHH C0 +1200L P T Z -Ⅱ

NRS45: Model number
LR: Type of LM block
2: No. of LM blocks used on the same rail
QZ: With QZ Lubricator
ZZHH: Contamination protection accessory symbol (*1)
C0: Radial clearance symbol (*2)
Normal (No symbol)/Light preload (C1)
Medium preload (C0)
+1200L: LM rail length (in mm)
P: Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)
T: With plate cover or steel tape (*4)
Z: Symbol for LM rail jointed use
-Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



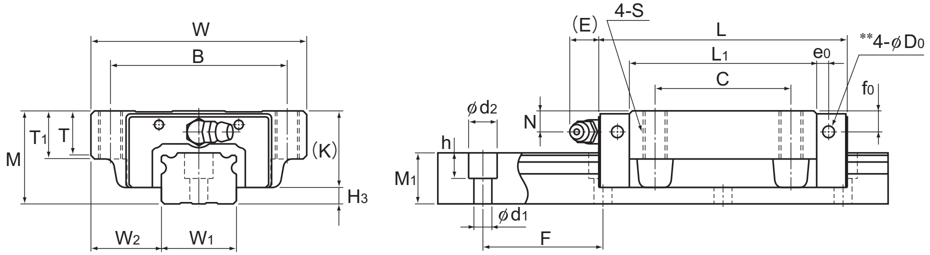
Model NRS-LR

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 0 -0.05	W_2	Height M_1	Pitch F	$d_1 \times d_2 \times h$	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	25	12.5	17	40	6×9.5×8.5	3000	25.9 34.5	59.8 79.7	0.568 0.926	2.84 4.6	0.568 0.926	2.84 4.6	0.633 0.846	0.43 0.55	3.1
	28	16	21	80	7×11×9	3000	38.2 51	86.1 115	0.926 1.6	4.86 7.83	0.926 1.6	4.86 7.83	1.02 1.36	0.74 1	4.3
	34	18	24.5	80	9×14×12	3000	49.5 67.2	109 148	1.28 2.29	6.92 11.3	1.28 2.29	6.92 11.3	1.54 2.09	1.1 1.4	6.2
	45	20.5	29	105	14×20×17	3000	75.3 98.8	163 214	2.47 4.34	13 20.5	2.47 4.34	13 20.5	3.09 4.06	2 2.8	9.8
	53	23.5	36.5	120	16×23×20	3000	103 133	220 284	3.97 6.49	20.5 32	3.97 6.49	20.5 32	4.86 6.28	3.3 4.3	14.5
	63	31.5	43	150	18×26×22	3000	148 204	309 425	6.45 12.3	32.9 58.6	6.45 12.3	32.9 58.6	8.11 11.1	6 8.7	20.3
	75	35	44	150	22×32×26	3000	212 278	431 566	10.6 18.6	53.8 87	10.6 18.6	53.8 87	13.4 17.6	8.7 11.6	24.6
	85	35.5	48	180	24×35×28	3000	264 342	531 687	14.9 25.4	75.3 117	14.9 25.4	75.3 117	18.7 24.2	12.3 15.8	30.5
	100	50	57	210	26×39×32	3000	376 470	737 920	25.1 34.6	123 174	25.1 34.6	123 174	30.4 38.1	21.8 26.1	42.6

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-106.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models NR-A and NR-LA



Model NR-A

Model No.	Outer dimensions			LM block dimensions													
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	T_1	K	N	f_0	E	e_0	D_0	Grease nipple	H_3
NR 25XA NR 25XLA	31	72	82.8 102	59	45	M8×16	62.4 81.6	14.8	16	25.5	7	7	12	4	3.9	B-M6F	5.5
NR 30A NR 30LA	38	90	98 120.5	72	52	M10×18	70.9 93.4	16.8	18	31	7	7	12	5	3.9	B-M6F	7
NR 35A NR 35LA	44	100	109.5 135	82	62	M10×20	77.9 103.4	18.8	20	35	8	8	12	6	5.2	B-M6F	9
NR 45A NR 45LA	52	120	139 171	100	80	M12×22	105 137	20.5	22	40.5	10	8	16	7	5.2	B-PT1/8	11.5
NR 55A NR 55LA	63	140	162.8 200	116	95	M14×24	123.6 160.8	22.5	24	49	11	10	16	8	5.2	B-PT1/8	14
NR 65A NR 65LA	75	170	185.6 245.6	142	110	M16×28	143.6 203.6	26	28	60	16	15	16	9	8.2	B-PT1/8	15
NR 75A NR 75LA	83	195	218 274	165	130	M18×30	170.2 226.2	28	30	68	18	17	16	9	8.2	B-PT1/8	15
NR 85A NR 85LA	90	215	246.7 302.8	185	140	M20×34	194.9 251	32	34	73	20	20	16	10	8.2	B-PT1/8	17
NR 100A NR 100LA	105	260	288.8 328.8	220	150 200	M20×38	223.4 263.4	35	38	85	23	23	10	12	8.2	B-PT1/4	20

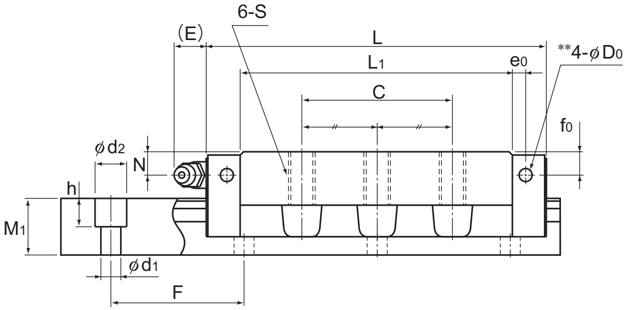
Model number coding

NR35 A 2 QZ KKHH C0 +1400L P T Z -Ⅱ

- NR35: Model number
- A: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
- +1400L: LM rail length (in mm)
- P: Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



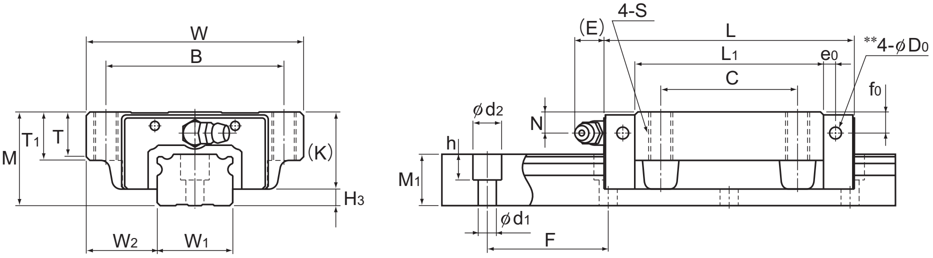
Model NR-LA

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	25	23.5	17	40	6×9.5×8.5	3000	33 44	84.6 113	0.771 1.26	3.86 6.29	0.469 0.775	2.33 3.82	0.91 1.21	0.58 0.77	3.1
	28	31	21	80	7×11×9	3000	48.7 64.9	122 162	1.26 2.18	6.63 10.6	0.778 1.33	4.05 6.47	1.47 1.95	1.1 1.4	4.3
	34	33	24.5	80	9×14×12	3000	63.1 85.7	155 210	1.75 3.14	9.47 15.5	1.08 1.92	5.8 9.43	2.24 3.03	1.5 1.9	6.2
	45	37.5	29	105	14×20×17	3000	96 126	231 303	3.37 5.93	17.7 28	2.07 3.59	10.8 16.9	4.45 5.82	2.7 3.5	9.8
	53	43.5	36.5	120	16×23×20	3000	131 170	310 402	5.39 8.87	27.8 43.8	3.3 5.41	16.9 26.6	6.98 9.05	4.4 5.7	14.5
	63	53.5	43	150	18×26×22	3000	189 260	436 600	8.76 16.8	44.7 79.9	5.39 10.1	27.3 48	11.6 15.9	7.6 10.9	20.3
	75	60	44	150	22×32×26	3000	271 355	610 800	14.4 25.4	73.3 118	8.91 15.4	44.7 71.4	19.3 25.2	11.3 15	24.6
	85	65	48	180	24×35×28	3000	336 435	751 972	20.3 34.7	102 160	12.4 21	62.6 96.2	26.8 34.6	16.2 20.7	30.5
	100	80	57	210	26×39×32	3000	479 599	1040 1300	34 47.3	167 238	20.7 29.2	101 146	43.4 54.6	26.7 31.2	42.6

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-106.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models NRS-A and NRS-LA



Model NRS-A

Model No.	Outer dimensions			LM block dimensions													
	Height	Width	Length													Grease nipple	
	M	W	L	B	C	S×ℓ	L_1	T	T_1	K	N	f_0	E	e_0	D_0		H_3
NRS 25XA NRS 25XLA	31	72	82.8 102	59	45	M8×16	62.4 81.6	14.8	16	25.5	7	7	12	4	3.9	B-M6F	5.5
NRS 30A NRS 30LA	38	90	98 120.5	72	52	M10×18	70.9 93.4	16.8	18	31	7	7	12	5	3.9	B-M6F	7
NRS 35A NRS 35LA	44	100	109.5 135	82	62	M10×20	77.9 103.4	18.8	20	35	8	8	12	6	5.2	B-M6F	9
NRS 45A NRS 45LA	52	120	139 171	100	80	M12×22	105 137	20.5	22	40.5	10	8	16	7	5.2	B-PT1/8	11.5
NRS 55A NRS 55LA	63	140	162.8 200	116	95	M14×24	123.6 160.8	22.5	24	49	11	10	16	8	5.2	B-PT1/8	14
NRS 65A NRS 65LA	75	170	185.6 245.6	142	110	M16×28	143.6 203.6	26	28	60	16	15	16	9	8.2	B-PT1/8	15
NRS 75A NRS 75LA	83	195	218 274	165	130	M18×30	170.2 226.2	28	30	68	18	17	16	9	8.2	B-PT1/8	15
NRS 85A NRS 85LA	90	215	246.7 302.8	185	140	M20×34	194.9 251	32	34	73	20	20	16	10	8.2	B-PT1/8	17
NRS 100A NRS 100LA	105	260	288.8 328.8	220	150 200	M20×38	223.4 263.4	35	38	85	23	23	10	12	8.2	B-PT1/4	20

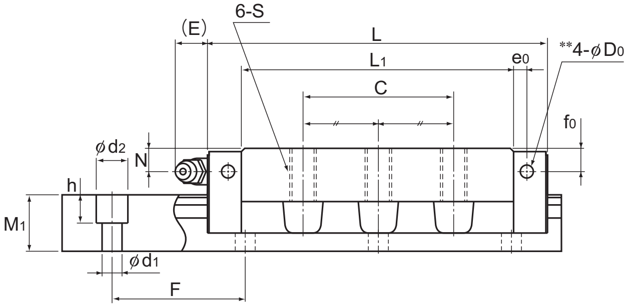
Model number coding

NRS45 LA 2 QZ SSHH C0 +2040L P T Z -Ⅱ

Code	Meaning
NRS45	Model number
LA	Type of LM block
2	No. of LM blocks used on the same rail
QZ	With QZ Lubricator
SSHH	Contamination protection accessory symbol (*1)
C0	Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
+2040L	LM rail length (in mm)
P	Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
T	Symbol for LM rail jointed use
Z	With plate cover or steel tape (*4)
-Ⅱ	Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Model NRS-LA

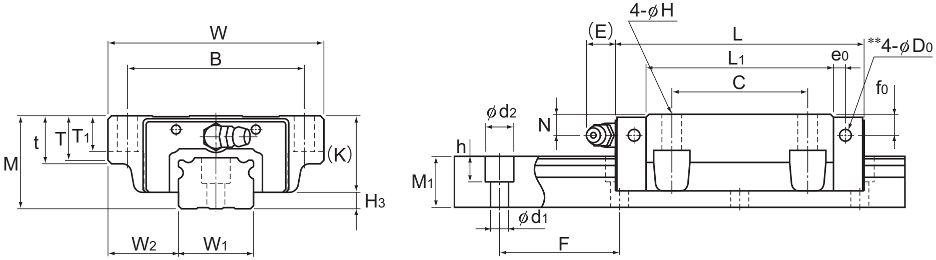
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 $^{0}_{-0.05}$	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	25	23.5	17	40	6×9.5×8.5	3000	25.9 34.5	59.8 79.7	0.568 0.926	2.84 4.6	0.568 0.926	2.84 4.6	0.633 0.846	0.58 0.77	3.1
	28	31	21	80	7×11×9	3000	38.2 51	86.1 115	0.926 1.6	4.86 7.83	0.926 1.6	4.86 7.83	1.02 1.36	1.1 1.4	4.3
	34	33	24.5	80	9×14×12	3000	49.5 67.2	109 148	1.28 2.29	6.92 11.3	1.28 2.29	6.92 11.3	1.54 2.09	1.5 1.9	6.2
	45	37.5	29	105	14×20×17	3000	75.3 98.8	163 214	2.47 4.34	13 20.5	2.47 4.34	13 20.5	3.09 4.06	2.7 3.5	9.8
	53	43.5	36.5	120	16×23×20	3000	103 133	220 284	3.97 6.49	20.5 32	3.97 6.49	20.5 32	4.86 6.28	4.4 5.7	14.5
	63	53.5	43	150	18×26×22	3000	148 204	309 425	6.45 12.3	32.9 58.6	6.45 12.3	32.9 58.6	8.11 11.1	7.6 10.9	20.3
	75	60	44	150	22×32×26	3000	212 278	431 566	10.6 18.6	53.8 87	10.6 18.6	53.8 87	13.4 17.6	11.3 15	24.6
	85	65	48	180	24×35×28	3000	264 342	531 687	14.9 25.4	75.3 117	14.9 25.4	75.3 117	18.7 24.2	16.2 20.7	30.5
	100	80	57	210	26×39×32	3000	376 470	737 920	25.1 34.6	123 174	25.1 34.6	123 174	30.4 38.1	26.7 31.2	42.6

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product. THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-106.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models NR-B and NR-LB



Model NR-B

Model No.	Outer dimensions			LM block dimensions														
	Height M	Width W	Length L	B	C	H	L1	t	T	T1	K	N	f0	E	e0	D0	Grease nipple	H3
NR 25XB NR 25XLB	31	72	82.8 102	59	45	7	62.4 81.6	16	14.8	12	25.5	7	7	12	4	3.9	B-M6F	5.5
NR 30B NR 30LB	38	90	98 120.5	72	52	9	70.9 93.4	18	16.8	14	31	7	7	12	5	3.9	B-M6F	7
NR 35B NR 35LB	44	100	109.5 135	82	62	9	77.9 103.4	20	18.8	16	35	8	8	12	6	5.2	B-M6F	9
NR 45B NR 45LB	52	120	139 171	100	80	11	105 137	22	20.5	20	40.5	10	8	16	7	5.2	B-PT1/8	11.5
NR 55B NR 55LB	63	140	162.8 200	116	95	14	123.6 160.8	24	22.5	22	49	11	10	16	8	5.2	B-PT1/8	14
NR 65B NR 65LB	75	170	185.6 245.6	142	110	16	143.6 203.6	28	26	25	60	16	15	16	9	8.2	B-PT1/8	15
NR 75B NR 75LB	83	195	218 274	165	130	18	170.2 226.2	30	28	26	68	18	17	16	9	8.2	B-PT1/8	15
NR 85B NR 85LB	90	215	246.7 302.8	185	140	18	194.9 251	34	32	28	73	20	20	16	10	8.2	B-PT1/8	17
NR 100B NR 100LB	105	260	288.8 328.8	220	150 200	20	223.4 263.4	38	35	32	85	23	23	10	12	8.2	B-PT1/4	20

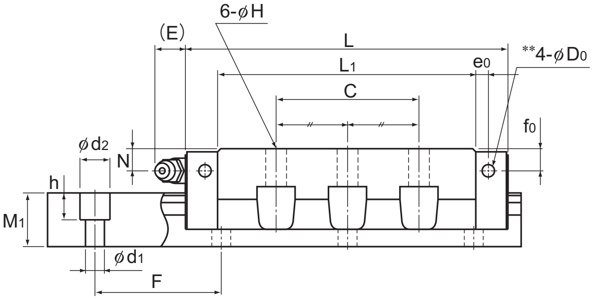
Model number coding

NR35 B 2 QZ DDHH C0 +1080L P T Z -Ⅱ

- NR35: Model number
- B: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- DDHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
- +1080L: LM rail length (in mm)
- P: Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
- T: With plate cover or steel tape (*4)
- Z: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



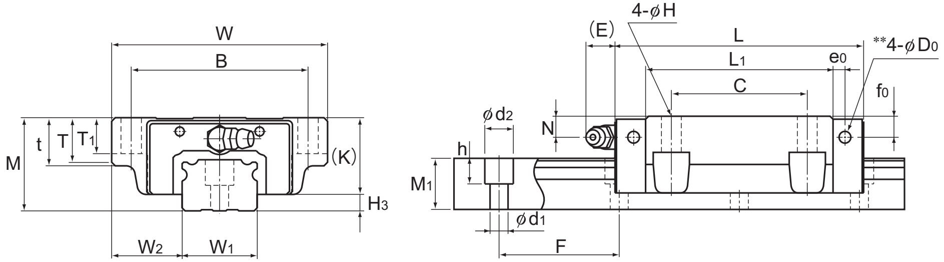
Model NR-LB

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C0	MA		MB		MC	LM block	LM rail
	W1 0 -0.05	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	25	23.5	17	40	6×9.5×8.5	3000	33 44	84.6 113	0.771 1.26	3.86 6.29	0.469 0.775	2.33 3.82	0.91 1.21	0.58 0.77	3.1
	28	31	21	80	7×11×9	3000	48.7 64.9	122 162	1.26 2.18	6.63 10.6	0.778 1.33	4.05 6.47	1.47 1.95	1.1 1.4	4.3
	34	33	24.5	80	9×14×12	3000	63.1 85.7	155 210	1.75 3.14	9.47 15.5	1.08 1.92	5.8 9.43	2.24 3.03	1.5 1.9	6.2
	45	37.5	29	105	14×20×17	3000	96 126	231 303	3.37 5.93	17.7 28	2.07 3.59	10.8 16.9	4.45 5.82	2.7 3.5	9.8
	53	43.5	36.5	120	16×23×20	3000	131 170	310 402	5.39 8.87	27.8 43.8	3.3 5.41	16.9 26.6	6.98 9.05	4.4 5.7	14.5
	63	53.5	43	150	18×26×22	3000	189 260	436 600	8.76 16.8	44.7 79.9	5.39 10.1	27.3 48	11.6 15.9	7.6 10.9	20.3
	75	60	44	150	22×32×26	3000	271 355	610 800	14.4 25.4	73.3 118	8.91 15.4	44.7 71.4	19.3 25.2	11.3 15	24.6
	85	65	48	180	24×35×28	3000	336 435	751 972	20.3 34.7	102 160	12.4 21	62.6 96.2	26.8 34.6	16.2 20.7	30.5
	100	80	57	210	26×39×32	3000	479 599	1040 1300	34 47.3	167 238	20.7 29.2	101 146	43.4 54.6	26.7 31.2	42.6

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-106.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models NRS-B and NRS-LB



Model NRS-B

Model No.	Outer dimensions			LM block dimensions														H_3
	Height M	Width W	Length L	B	C	H	L_1	t	T	T_1	K	N	f_0	E	e_0	D_0	Grease nipple	
NRS 25XB NRS 25XLB	31	72	82.8 102	59	45	7	62.4 81.6	16	14.8	12	25.5	7	7	12	4	3.9	B-M6F	5.5
NRS 30B NRS 30LB	38	90	98 120.5	72	52	9	70.9 93.4	18	16.8	14	31	7	7	12	5	3.9	B-M6F	7
NRS 35B NRS 35LB	44	100	109.5 135	82	62	9	77.9 103.4	20	18.8	16	35	8	8	12	6	5.2	B-M6F	9
NRS 45B NRS 45LB	52	120	139 171	100	80	11	105 137	22	20.5	20	40.5	10	8	16	7	5.2	B-PT1/8	11.5
NRS 55B NRS 55LB	63	140	162.8 200	116	95	14	123.6 160.8	24	22.5	22	49	11	10	16	8	5.2	B-PT1/8	14
NRS 65B NRS 65LB	75	170	185.6 245.6	142	110	16	143.6 203.6	28	26	25	60	16	15	16	9	8.2	B-PT1/8	15
NRS 75B NRS 75LB	83	195	218 274	165	130	18	170.2 226.2	30	28	26	68	18	17	16	9	8.2	B-PT1/8	15
NRS 85B NRS 85LB	90	215	246.7 302.8	185	140	18	194.9 251	34	32	28	73	20	20	16	10	8.2	B-PT1/8	17
NRS 100B NRS 100LB	105	260	288.8 328.8	220	150 200	20	223.4 263.4	38	35	32	85	23	23	10	12	8.2	B-PT1/4	20

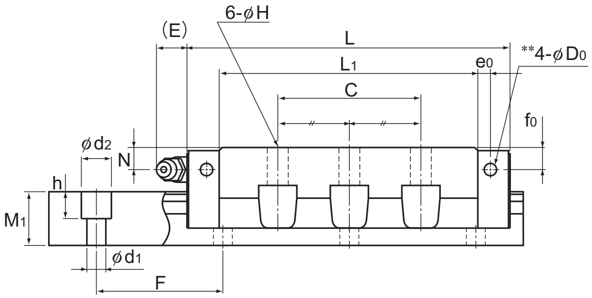
Model number coding

NRS45 B 2 QZ KKHH C0 +2040L P T Z -Ⅱ

- NRS45: Model number
- B: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +2040L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover or steel tape (*4)
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See contamination protection accessory on A-368. (*2) See A-113. (*3) See A-119.
(*4) Specify the plate cover or the steel tape. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Model NRS-LB

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	d_1×d_2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	25	23.5	17	40	6×9.5×8.5	3000	25.9 34.5	59.8 79.7	0.568 0.926	2.84 4.6	0.568 0.926	2.84 4.6	0.633 0.846	0.58 0.77	3.1
	28	31	21	80	7×11×9	3000	38.2 51	86.1 115	0.926 1.6	4.86 7.83	0.926 1.6	4.86 7.83	1.02 1.36	1.1 1.4	4.3
	34	33	24.5	80	9×14×12	3000	49.5 67.2	109 148	1.28 2.29	6.92 11.3	1.28 2.29	6.92 11.3	1.54 2.09	1.5 1.9	6.2
	45	37.5	29	105	14×20×17	3000	75.3 98.8	163 214	2.47 4.34	13 20.5	2.47 4.34	13 20.5	3.09 4.06	2.7 3.5	9.8
	53	43.5	36.5	120	16×23×20	3000	103 133	220 284	3.97 6.49	20.5 32	3.97 6.49	20.5 32	4.86 6.28	4.4 5.7	14.5
	63	53.5	43	150	18×26×22	3000	148 204	309 425	6.45 12.3	32.9 58.6	6.45 12.3	32.9 58.6	8.11 11.1	7.6 10.9	20.3
	75	60	44	150	22×32×26	3000	212 278	431 566	10.6 18.6	53.8 87	10.6 18.6	53.8 87	13.4 17.6	11.3 15	24.6
	85	65	48	180	24×35×28	3000	264 342	531 687	14.9 25.4	75.3 117	14.9 25.4	75.3 117	18.7 24.2	16.2 20.7	30.5
	100	80	57	210	26×39×32	3000	376 470	737 920	25.1 34.6	123 174	25.1 34.6	123 174	30.4 38.1	26.7 31.2	42.6

Note) Pilot holes for side nipples** are not drilled through in order to prevent foreign material from entering the product.
THK will mount grease nipples per your request. Therefore, do not use the side nipple pilot holes ** for purposes other than mounting a grease nipple.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-106.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of models NR/NRS variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.

For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

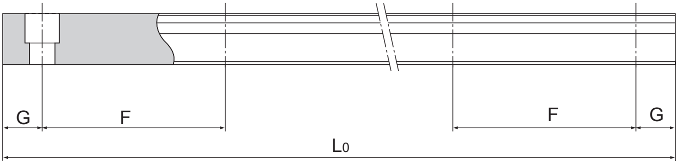
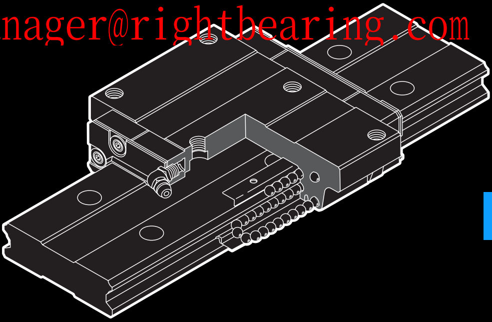


Table1 Standard Length and Maximum Length of the LM Rail for Models NR/NRS

Unit: mm

Model No.	NR/NRS25X	NR/NRS30	NR/NRS35	NR/NRS45	NR/NRS55	NR/NRS65	NR/NRS75	NR/NRS85	NR/NRS100
LM rail standard length (L_0)	230	280	280	570	780	1270	1280	1530	1340
	270	360	360	675	900	1570	1580	1890	1760
	350	440	440	780	1020	2020	2030	2250	2180
	390	520	520	885	1140	2620	2630	2610	2600
	470	600	600	990	1260				
	510	680	680	1095	1380				
	590	760	760	1200	1500				
	630	840	840	1305	1620				
	710	920	920	1410	1740				
	750	1000	1000	1515	1860				
	830	1080	1080	1620	1980				
	950	1160	1160	1725	2100				
	990	1240	1240	1830	2220				
	1070	1320	1320	1935	2340				
	1110	1400	1400	2040	2460				
	1190	1480	1480	2145	2580				
	1230	1560	1560	2250	2700				
	1310	1640	1640	2355	2820				
	1350	1720	1720	2460	2940				
	1430	1800	1800	2565					
	1470	1880	1880	2670					
	1550	1960	1960	2775					
	1590	2040	2040	2880					
	1710	2200	2200	2985					
	1830	2360	2360						
	1950	2520	2520						
	2070	2680	2680						
	2190	2840	2840						
	2310	3000	3000						
	2430								
	2470								
Standard pitch F	40	80	80	105	120	150	150	180	210
G	15	20	20	22.5	30	35	40	45	40
Max length	3000	3000	3000	3000	3000	3000	3000	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



HRW

LM Guide

B Product Specifications

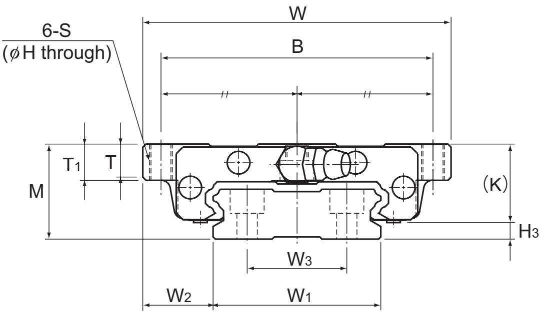
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models HRW-CA and HRW-CAM



Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	H	S	L_1	T	T_1	K	N	E	Grease nipple	H_3
HRW 17CA HRW 17CAM	17	60	50.8	53	26	3.3	M4	33.6	5.5	6	14.5	4	2	PB107	2.5
HRW 21CA HRW 21CAM	21	68	58.8	60	29	4.4	M5	40	7.3	8	18	4.5	12	B-M6F	3
HRW 27CA HRW 27CAM	27	80	72.8	70	40	5.3	M6	51.8	9.5	10	24	6	12	B-M6F	3
HRW 35CA HRW 35CAM	35	120	106.6	107	60	6.8	M8	77.6	13	14	31	8	12	B-M6F	4
HRW 50CA	50	162	140.5	144	80	8.6	M10	103.5	16.5	18	46.6	14	16	B-PT1/8	3.4
HRW 60CA	60	200	158.9	180	80	10.5	M12	117.5	23.5	25	53.5	15	16	B-PT1/8	6.5

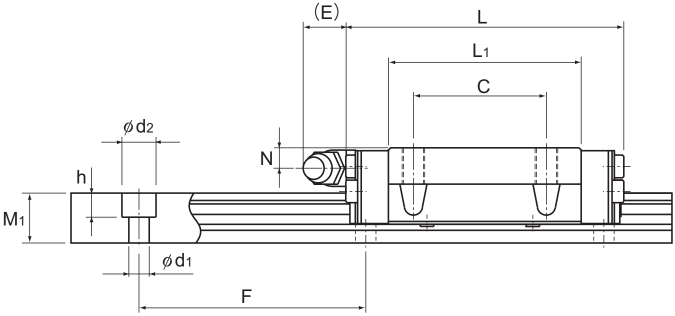
Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

Model number coding

HRW35 CA 2 UU C1 M +1000L P T M

- HRW35: Model number
- CA: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- M: Stainless steel LM block
- +1000L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- M: Stainless steel LM rail

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119.



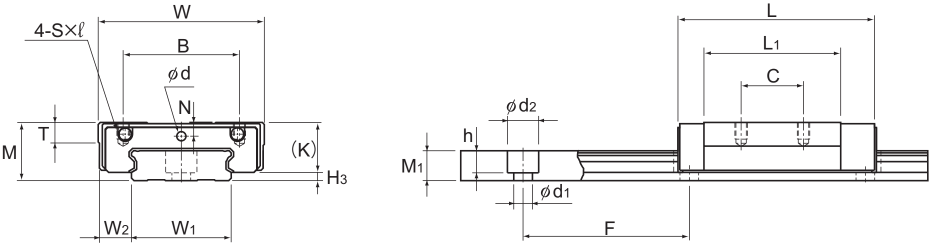
Unit: mm

LM rail dimensions							Basic load rating		Static permissible moment kN-m*					Mass	
Width			Height	Pitch		Length*	C	C0	MA		MB		MC	LM block	LM rail
W1 ±0.05	W2	W3	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
33	13.5	18	9	40	4.5×7.5×5.3	1900 (800)	4.31	8.14	0.0417	0.244	0.0417	0.244	0.128	0.15	2.1
37	15.5	22	11	50	4.5×7.5×5.3	1900 (1000)	6.18	11.5	0.0701	0.398	0.0701	0.398	0.194	0.25	2.9
42	19	24	15	60	4.5×7.5×5.3	3000 (1200)	11.5	20.4	0.156	0.874	0.156	0.874	0.398	0.5	4.3
69	25.5	40	19	80	7×11×9	3000	27.2	45.9	0.529	2.89	0.529	2.89	1.49	1.4	9.9
90	36	60	24	80	9×14×12	3000	50.2	81.5	1.25	6.74	1.25	6.74	3.46	4	14.6
120	40	80	31	105	11×17.5×14	3000	63.8	102	1.76	12.3	1.76	12.3	5.76	5.7	27.8

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-112.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models HRW-CR, HRW-CRM and HRW-LRM



Models HRW12 and 14LRM

Model No.	Outer dimensions			LM block dimensions										
	Height	Width	Length									Greas-ing hole	Grease nipple	
	M	W	L	B	C	S×ℓ	L_1	T	K	N	E	d		H_3
HRW 12LRM	12	30	37	21	12	M3×3.5	27	4	10	2.8	—	2.2	—	2
HRW 14LRM	14	40	45.5	28	15	M3×4	32.9	5	12	3.3	—	2.2	—	2
HRW 17CR HRW 17CRM	17	50	50.8	29	15	M4×5	33.6	6	14.5	4	2	—	PB107	2.5
HRW 21CR HRW 21CRM	21	54	58.8	31	19	M5×6	40	8	18	4.5	12	—	B-M6F	3
HRW 27CR HRW 27CRM	27	62	72.8	46	32	M6×6	51.8	10	24	6	12	—	B-M6F	3
HRW 35CR HRW 35CRM	35	100	106.6	76	50	M8×8	77.6	14	31	8	12	—	B-M6F	4
HRW 50 CR	50	130	140.5	100	65	M10×15	103.5	18	46.6	14	16	—	B-PT1/8	3.4

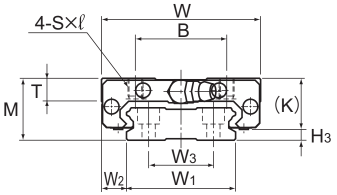
Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

Model number coding

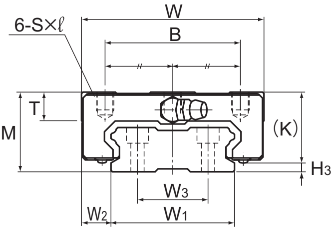
HRW27 CR 2 UU C1 M +820L P T M

- HRW27: Model number
- CR: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- M: Stainless steel LM block
- +820L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- M: Stainless steel LM rail

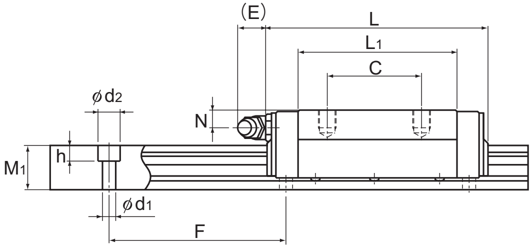
(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119.



Models HRW17 and 21CR/CRM



Models HRW27 to 50CR/CRM



Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*					Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	18	6	—	6.5	40	4.5×8×4.5	(1000)	3.29	7.16	0.0262	0.138	0.013	0.069	0.051	0.045	0.79
	24	8	—	7.2	40	4.5×7.5×5.3	(1430)	5.38	11.4	0.0499	0.273	0.025	0.137	0.112	0.08	1.2
	33	8.5	18	9	40	4.5×7.5×5.3	1900 (800)	4.31	8.14	0.0417	0.244	0.0417	0.244	0.128	0.12	2.1
	37	8.5	22	11	50	4.5×7.5×5.3	1900 (1000)	6.18	11.5	0.0701	0.398	0.0701	0.398	0.194	0.19	2.9
	42	10	24	15	60	4.5×7.5×5.3	3000 (1200)	11.5	20.4	0.156	0.874	0.156	0.874	0.398	0.37	4.3
	69	15.5	40	19	80	7×11×9	3000	27.2	45.9	0.529	2.89	0.529	2.89	1.49	1.2	9.9
	90	20	60	24	80	9×14×12	3000	50.2	81.5	1.25	6.74	1.25	6.74	3.46	3.2	14.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-112.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model HRW variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

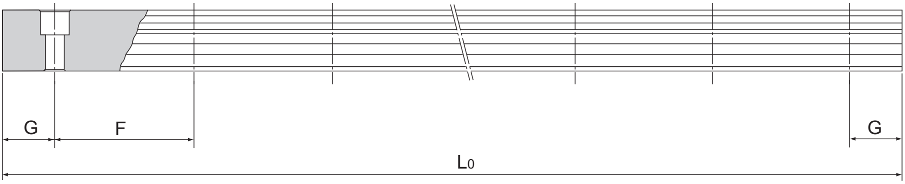
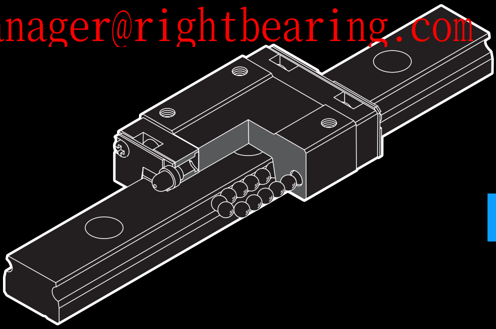


Table1 Standard Length and Maximum Length of the LM Rail for Model HRW

Unit: mm

Model No.	HRW 12	HRW 14	HRW 17	HRW 21	HRW 27	HRW 35	HRW 50	HRW 60
LM rail standard length (L_0)	70 110 150 190 230 270 310 390 470	70 110 150 190 230 270 310 390 470 550 670	110 190 310 470 550	130 230 380 480 580 780	160 280 340 460 640 820	280 440 760 1000 1240 1560	280 440 760 1000 1240 1640 2040	570 885 1200 1620 2040 2460
Standard pitch F	40	40	40	50	60	80	80	105
G	15	15	15	15	20	20	20	22.5
Max length	(1000)	(1430)	1900 (800)	1900 (1000)	3000 (1200)	3000	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note3) The figures in the parentheses indicate the maximum lengths of stainless steel made models.



RSR/RSR-W

LM Guide

B Product Specifications

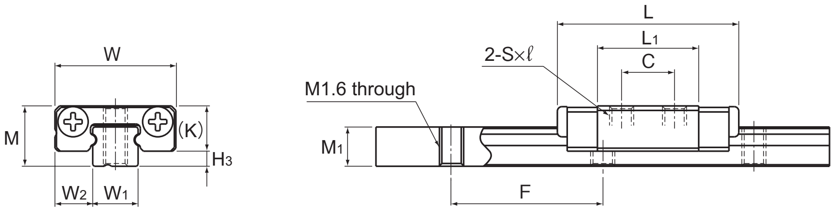
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

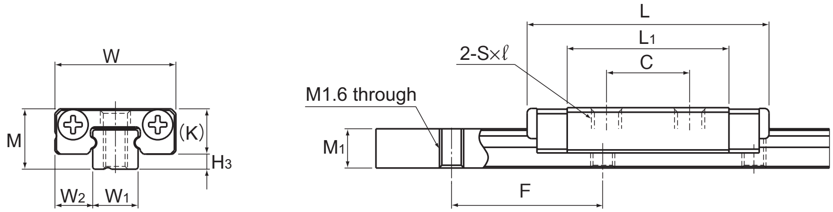
Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models RSR-M and RSR-N



Model RSR3M



Model RSR3N

Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	S×ℓ	L1	T	K	N	E	Greasing hole d	Grease nipple	H3
RSR 3M RSR 3N	4	8	12 16	—	3.5 5.5	M1.6×1.3 M2×1.3	6.7 10.7	—	3	—	—	—	—	1
RSR 5M RSR 5N	6	12	16.9 20.1	8 —	— 7	M2×1.5 M2.6×1.8	8.8 12	—	4.5	0.8	—	0.8	—	1.5

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.
Models RSR3M and 3N do not have an oil hole. When lubricating them, apply a lubricant directly to the LM rail raceways.
To secure the LM rail of models RSR5M and 5N, use cross-recessed head screws for precision equipment (No. 0 pan head screw, class 1) M2.

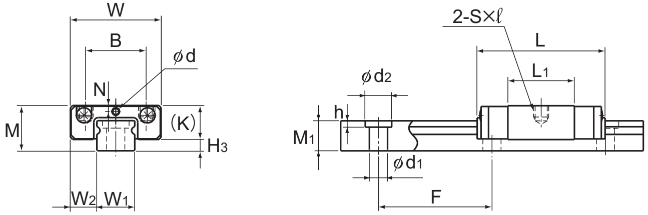
Model number coding

2 RSR5 M UU C1 +130L P M -Ⅱ

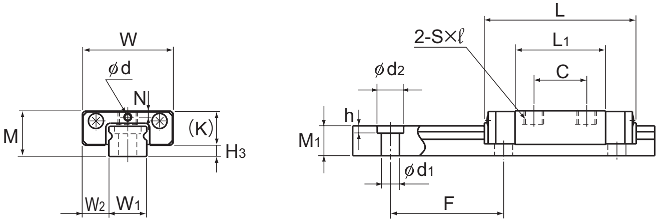
- 2: No. of LM blocks used on the same rail
- RSR5 M: Model number
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1)
- +130L: LM rail length (in mm)
- P: Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Model RSR5M



Model RSR5N

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	3 $^{0}_{-0.02}$	2.5	2.6	10	—	200	0.18 0.3	0.27 0.44	0.293 0.726	2.11 4.33	0.293 0.726	2.11 4.33	0.45 0.73	0.0011 0.0016	0.055
	5 $^{0}_{-0.02}$	3.5	4	15	2.4×3.5×1	200	0.32 0.55	0.59 0.96	0.884 1.84	6.51 11.9	0.884 1.84	6.51 11.9	1.53 2.49	0.003 0.004	0.14

Note) The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-120.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

- Recommended tightening torque when mounting the LM rail/block

Table1 shows recommended bolt tightening torques when mounting the LM block and LM rail of models RSR3M/3N.

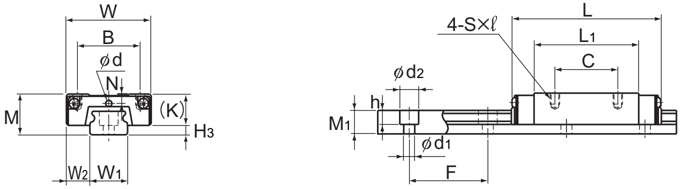
Table1 Recommended Tightening Torques of Mounting Bolts

Model No. of screw	Recommended tightening torque (N-m)
M1.6	0.09
M2	0.19

Note) Applicable to austenite stainless steel hexagonal-socket-head type bolts.

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models RSR-M, RSR-KM, RSR-VM and RSR-N



Models RSR7 to 12N/7M/9KM/12VM

Model No.	Outer dimensions Height M	Outer dimensions Width W	Outer dimensions Length L	LM block dimensions B	C	S×ℓ	L_1	T	K	N	E	Greasing hole d	Grease nipple	H_3
RSR 7M RSR 7N	8	17	23.4 33	12	8 13	M2×2.5	13.4 23	—	6.5	1.7	—	1.2	—	1.5
RSR 9KM RSR 9N	10	20	30.8 41	15	10 16	M3×3	19.8 29.8	—	7.8	2.4	—	1.5	—	2.2
RSR 12VM RSR 12N	13	27	35 47.7	20	15 20	M3×3.5	20.6 33.3	—	10	3	—	2	—	3
RSR 15VM RSR 15N	16	32	43 61	25	20 25	M3×4	25.7 43.5	—	12	3.5	3.6 3.7	—	PB107	4
RSR 20VM RSR 20N	25	46	66.5 86.3	38	38	M4×6	45.2 65	5.7	17.5	5	6.4	—	A-M6F	7.5

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

Model number coding

2 RSR15V M UU C1 +230L P M -Ⅱ

Model number

No. of LM blocks
used on the same rail

Contamination
protection
accessory
symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)

LM rail length
(in mm)

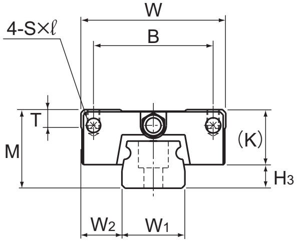
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)

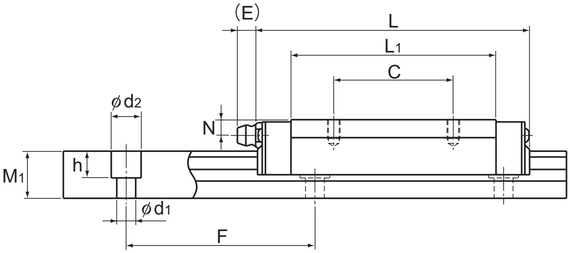
Stainless
steel
LM rail

Symbol for
No. of rails used
on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)





Models RSR15 and 20VM/N

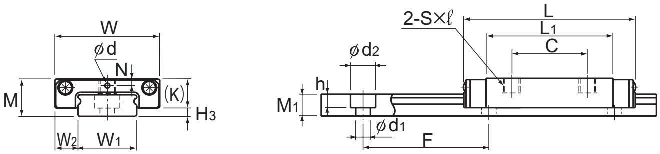
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	$7\,^{0}_{-0.02}$	5	4.7	15	2.4×4.2×2.3	300	0.88 1.59	1.37 2.5	2.93 8.68	20.8 49.9	2.93 8.68	20.8 49.9	5 9.12	0.013 0.018	0.23
	$9\,^{0}_{-0.02}$	5.5	5.5	20	3.5×6×3.3	1000	1.47 2.6	2.25 3.96	7.34 18.4	43.3 97	7.34 18.4	43.3 97	10.4 18.4	0.018 0.027	0.32
	$12\,^{0}_{-0.025}$	7.5	7.5	25	3.5×6×4.5	1340	2.65 4.3	4.02 6.65	11.4 28.9	74.9 163	10.1 25.5	67.7 145	19.2 31.8	0.037 0.055	0.58
	$15\,^{0}_{-0.025}$	8.5	9.5	40	3.5×6×4.5	1430	4.41 7.16	6.57 10.7	23.7 63.1	149 330	21.1 55.6	135 293	38.8 63	0.069 0.093	0.925
	$20\,^{0}_{-0.03}$	13	15	60	6×9.5×8.5	1800	8.82 14.2	12.7 20.6	75.4 171	435 897	66.7 151	389 795	96.6 157	0.245 0.337	1.95

Note) The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-120.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models RSR-WM (WV), RSR-WVM and RSR-WN



Models RSR3 to 7WM/WN

Model No.	Outer dimensions			LM block dimensions										H3
	Height M	Width W	Length L	B	C	S×ℓ	L1	T	K	N	E	Greas-ing hole d	Grease nipple	H3
∗ RSR 3WM ∗ RSR 3WN	4.5	12	14.9 19.9	—	4.5 8	M2×1.7	8.5 13.3	—	3.5	0.8	—	0.8	—	1
∗ RSR 5WM ∗ RSR 5WN	6.5	17	22.1 28.1	—	6.5 11	M3×2.3	13.7 19.7	—	5	1.1	—	0.8	—	1.5
∗ RSR 7WM ∗ RSR 7WN	9	25	31 40.9	—	12 18	M4×3.5	20.4 30.3	—	7	1.6	—	1.2	—	2
RSR 9WV ∗ RSR 9WVM ∗ RSR 9WN	12	30	39 39 50.7	21 21 23	12 12 24	M2.6×3 M2.6×3 M3×3	27 27 38.7	—	7.8	2	—	1.6	—	4.2
RSR 12WV ∗ RSR 12WVM ∗ RSR 12WN	14	40	44.5 44.5 59.5	28	15 15 28	M3×3.5	30.9 30.9 45.9	4.5	10	3	—	2	—	4
RSR 14WV	15	50	50	35	18	M4×4.5	34.3	6	11.5	3	4	—	PB107	3.5
RSR 15WV ∗ RSR 15WVM ∗ RSR 15WN	16	60	55.5 55.5 74.5	45	20 20 35	M4×4.5	38.9 38.9 57.9	5.6	12	3.5	3	—	PB107	4

Note) ∗indicates that since stainless steel is used in the LM block, LM rail and balls, these models are highly resistance to corrosion and environment.
To secure the LM rail of models RSR3WM and 3WN, use cross-recessed head screws for precision equipment (No. 0 pan head screw, class 1) M2.

Model number coding

2 RSR12WV M UU C1 +310L H M

2 — No. of LM blocks used on the same rail

RSR12WV M — Model number

UU — Contamination protection accessory symbol (*1)

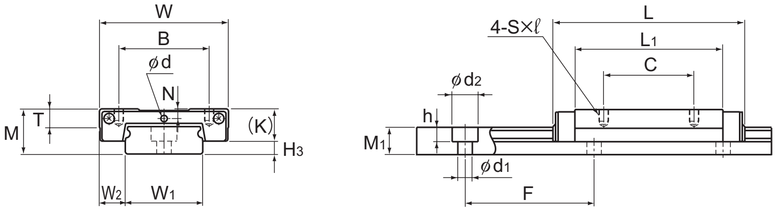
C1 — Radial clearance symbol (*2)
Normal (No symbol)/Light preload (C1)

+310L — LM rail length (in mm)

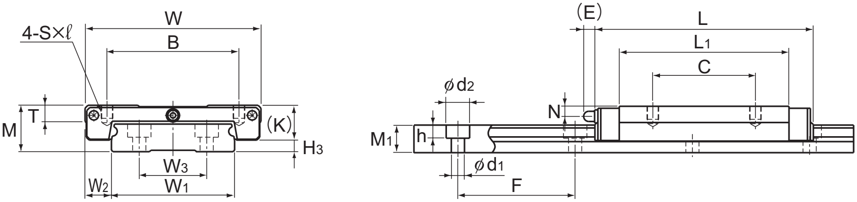
H — Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)

M — Stainless steel LM rail

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126.



Models RSR9 and 12WV/WVM/WN



Models RSR14WV and 15WV/WVM/WN

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment N-m*					Mass	
	Width			Height	Pitch		Length*	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	$6^{\;0}_{-0.02}$	3	—	2.6	15	2.4×4×1.5	100	0.25 0.39	0.47 0.75	0.668 1.57	4.44 9.06	0.668 1.57	4.44 9.06	1.48 2.36	0.002 0.003	0.12
	$10^{\;0}_{-0.025}$	3.5	—	4	20	3×5.5×3	200	0.51 0.75	0.96 1.4	1.97 4.06	13.1 23.5	1.97 4.06	13.1 23.5	4.89 7.13	0.007 0.01	0.28
	$14^{\;0}_{-0.05}$	5.5	—	5.2	30	3.5×6×3.2	400	1.37 2.04	2.16 3.21	7.02 14.7	40.7 77.6	7.02 14.7	40.7 77.6	15.4 22.9	0.021 0.026	0.51
	$18^{\;0}_{-0.05}$	6	—	7.5	30	3.5×6×4.5	1000	2.45 2.45 3.52	3.92 3.92 5.37	16 16 31	92.9 92.9 161	16 16 31	92.9 92.9 161	36 36 49.4	0.035 0.035 0.051	1.08
	$24^{\;0}_{-0.05}$	8	—	8.5	40	4.5×8×4.5	1430	4.02 4.02 5.96	6.08 6.08 9.21	24.5 24.5 53.9	138 138 274	21.7 21.7 47.3	123 123 242	59.5 59.5 90.1	0.075 0.075 0.101	1.5
	$30^{\;0}_{-0.05}$	5	—	9	40	4.5×7.5×5.3	1800	6.01	9.08	43.2	233	38.2	208	110	0.096	2
	$42^{\;0}_{-0.05}$	9	23	9.5	40	4.5×8×4.5	1800	6.66 6.66 9.91	9.8 9.8 14.9	50.3 50.3 110	278 278 555	44.4 44.4 97.3	248 248 490	168 168 255	0.17 0.17 0.21	3

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-120.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table2 shows the standard lengths and the maximum lengths of model RSR variations.

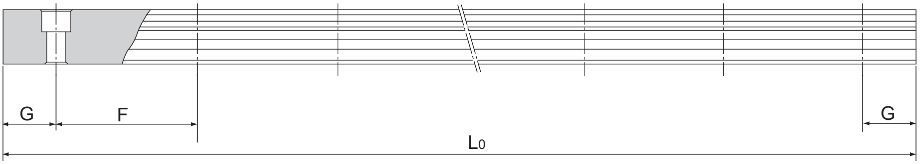
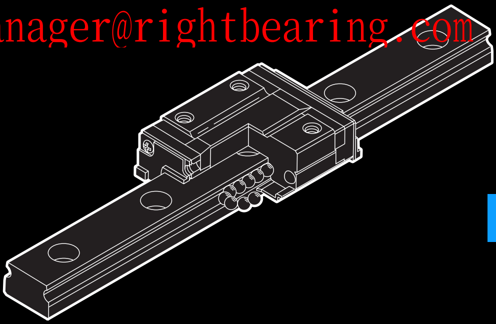


Table2 Standard Length and Maximum Length of the LM Rail for Model RSR/RSR-W Unit: mm

Model No.	RSR 3	RSR 5	RSR 7	RSR 9	RSR 12	RSR 15	RSR 20	RSR 3W	RSR 5W	RSR 7W	RSR 9W	RSR 12W	RSR 14W	RSR 15W
LM rail standard length (L_0)	30 40 60 80 100	40 55 70 100 130 160	40 55 70 85 100 130	55 75 95 115 135 155 175 195 275 375	70 95 120 145 170 195 220 245 270 320 370 470 570	70 110 150 190 230 270 310 350 390 430 470 550 670 870	220 280 340 460 640 880 1000	40 55 70	50 70 90 110 130 150 170	50 80 110 140 170 200 260 290	50 80 110 140 170 200 260 290 320	70 110 150 190 230 270 310 390 470 550	110 150 190 230 270 310 430 550 670 790	110 150 190 230 270 310 430 550 670 790
Standard pitch F	10	15	15	20	25	40	60	15	20	30	30	40	40	40
G	5	5	5	7.5	10	15	20	5	5	10	10	15	15	15
Max length	200	200	300	1000	1340	1430	1800	100	200	400	1000	1430	1800	1800

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) The LM rail mounting hole of model RSR3 is an M1.6 through hole.



RSR-Z

LM Guide

B Product Specifications

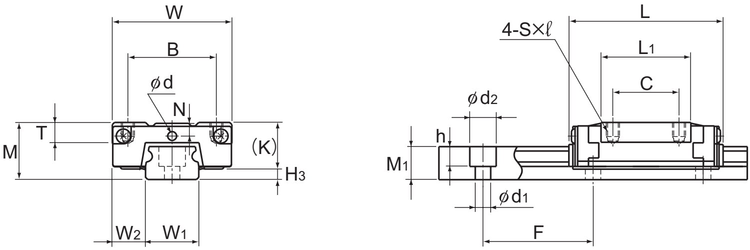
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model RSR-ZM



Models RSR7 to 12ZM

Model No.	Outer dimensions			LM block dimensions										H₃
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greasing hole d	Grease nipple	H_3
RSR 7ZM	8	17	23.4	12	8	M2×2.5	13.2	3.4	6.5	1.6	—	1.5	—	1.5
RSR 9ZM	10	20	30.8	15	10	M3×2.7	19.4	4.6	7.8	2.4	—	1.6	—	2.2
RSR 12ZM	13	27	35	20	15	M3×3.2	20.4	4.5	10.6	3.1	—	2	—	2.4
RSR 15ZM	16	32	43	25	20	M3×3.5	26.5	5.5	12.6	2.9	3.6	—	PB107	3.4

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

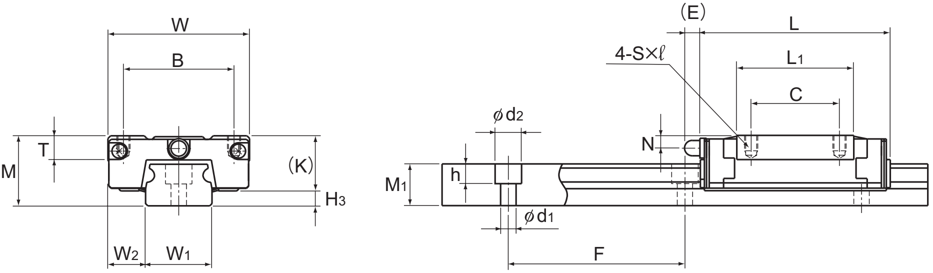
Model number coding

2 RSR15Z M UU C1 +230L P M -Ⅱ

- 2: No. of LM blocks used on the same rail
- RSR15Z M: Model number
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
- +230L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



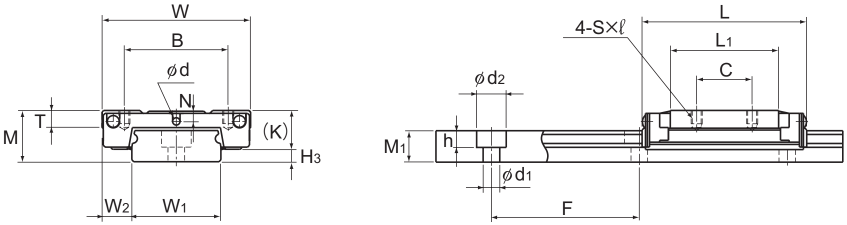
Model RSR15ZM

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	M_1	F	d_1×d_2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	7 $^{0}_{-0.02}$	5	4.7	15	2.4×4.2×2.3	300	0.88	1.37	2.93	20.7	2.93	20.7	5	0.008	0.23
	9 $^{0}_{-0.02}$	5.5	5.5	20	3.5×6×3.3	1000	1.47	2.25	7.34	43	7.34	43	10.4	0.014	0.32
	12 $^{0}_{-0.025}$	7.5	7.5	25	3.5×6×4.5	1340	2.65	4.02	11.4	74.9	10.1	67.7	19.2	0.028	0.58
	15 $^{0}_{-0.025}$	8.5	9.5	40	3.5×6×4.5	1430	4.41	6.57	23.7	149	21.1	135	38.8	0.05	0.925

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-126.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Model RSR-WZM



Models RSR7 to 12WZM

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greasing hole d	Grease nipple	H_3
RSR 7WZM	9	25	31.5	19	10	M3×2.5	19.7	3.4	7	1.8	—	1.6	—	2
RSR 9WZM	12	30	39	21	12	M3×2.8	27	3.9	9.1	2.3	—	1.6	—	2.9
RSR 12WZM	14	40	44.5	28	15	M3×3.6	29.3	4.5	10.6	3	—	2	—	3.4
RSR 15WZM	16	60	55.5	45	20	M4×4.5	39.3	5.4	12.6	3	3.6	—	PB107	3.4

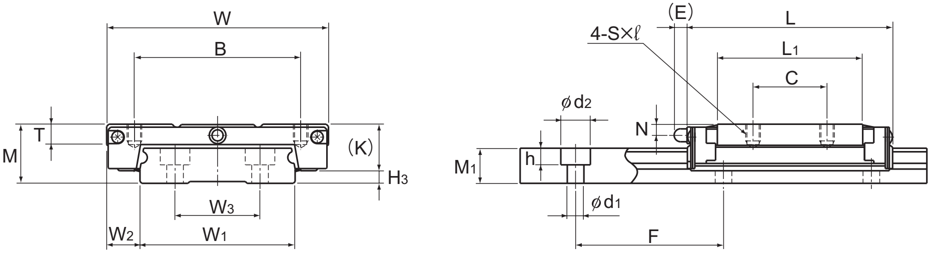
Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

Model number coding

2 RSR12WZ M SS C1 +390L H M

2: No. of LM blocks used on the same rail
RSR12WZ M: Model number
SS: Contamination protection accessory symbol (*1)
C1: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1)
+390L: LM rail length (in mm)
H: Accuracy symbol (*3) Normal grade (No Symbol) High accuracy grade (H) Precision grade (P)
M: Stainless steel LM rail

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126.



Model RSR15WZM

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment N-m*					Mass	
	Width			Height	Pitch		Length*	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	14 $^{0}_{-0.05}$	5.5	—	5.2	30	3.5×6×3.2	400	1.37	2.16	6.54	42.1	6.54	42.1	15.4	0.018	0.51
	18 $^{0}_{-0.05}$	6	—	7.5	30	3.5×6×4.5	1000	2.45	3.92	16	92.9	16	92.9	36	0.03	1.08
	24 $^{0}_{-0.05}$	8	—	8.5	40	4.5×8×4.5	1430	4.02	6.08	24.5	138	21.7	123	59.5	0.06	1.5
	42 $^{0}_{-0.05}$	9	23	9.5	40	4.5×8×4.5	1800	6.66	9.8	50.3	278	44.4	248	168	0.135	3

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-126.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model RSR-Z/WZ variations.

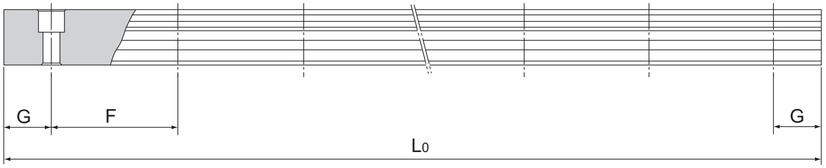
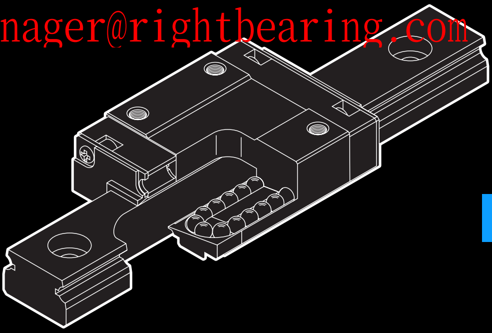


Table1 Standard Length and Maximum Length of the LM Rail for Model RSR-Z/WZ Unit: mm

Model No.	RSR 7Z	RSR 9Z	RSR 12Z	RSR 15Z	RSR 7WZ	RSR 9WZ	RSR 12WZ	RSR 15WZ
LM rail standard length (L0)	40 55 70 85 100 130	55 75 95 115 135 155 175 195 275 375	70 95 120 145 170 195 220 245 270 320 370 470 570	70 110 150 190 230 270 310 350 390 430 470 550 670 870	50 80 110 140 170 200 260 290	50 80 110 140 170 200 260 290 320	70 110 150 190 230 270 310 390 470 550	110 150 190 230 270 310 430 550 670 790
Standard pitch F	15	20	25	40	30	30	40	40
G	5	7.5	10	15	10	10	15	15
Max length	300	1000	1340	1430	400	1000	1430	1800

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) The LM rails of these models are all made of stainless steel.



RSH

LM Guide

B Product Specifications

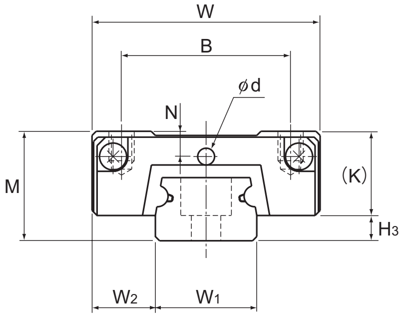
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models RSH-M, RSH-KM and RSH-VM



Model No.	Outer dimensions			LM block dimensions							
	Height M	Width W	Length L	B	C	S×ℓ	L_1	K	N	Greasing hole d	H_3
RSH 7M	8	17	23.4	12	8	M2×2.5	13.4	6.5	1.7	1.2	1.5
RSH 9KM	10	20	30.8	15	10	M3×3	19.8	7.8	2.4	1.5	2.2
RSH 12VM	13	27	35	20	15	M3×3.5	20.6	10	3	2	3

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

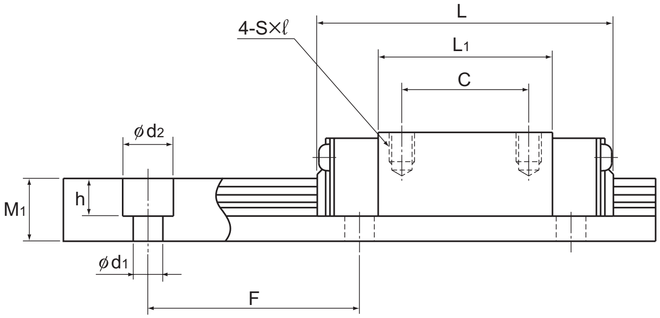
Model number coding

2 RSH9K M UU C1 +100L P M -Ⅱ

- 2: No. of LM blocks used on the same rail
- RSH9K M: Model number
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
- +100L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)
  - Precision grade (P)
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	$7^{\ 0}_{-0.02}$	5	4.7	15	2.4×4.2×2.3	300	0.88	1.37	2.93	20.8	2.93	20.8	5	0.01	0.23
	$9^{\ 0}_{-0.02}$	5.5	5.5	20	3.5×6×3.3	1000	1.47	2.25	7.34	43.3	7.34	43.3	10.4	0.018	0.32
	$12^{\ 0}_{-0.025}$	7.5	7.5	25	3.5×6×4.5	1340	2.65	4.02	11.4	74.9	10.1	67.7	19.2	0.037	0.58

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-130.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model RSH variations.

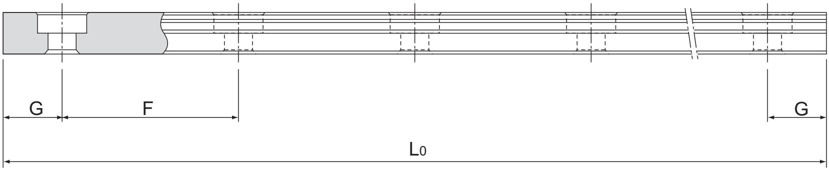
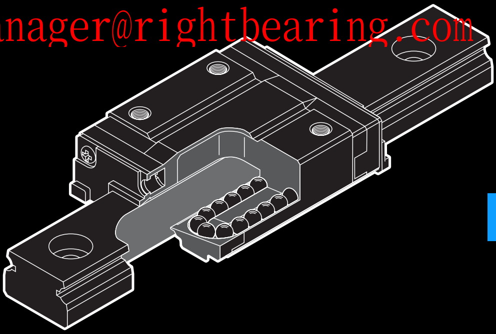


Table1 Standard Length and Maximum Length of the LM Rail for Model RSH Unit: mm

Model No.	RSH 7	RSH 9	RSH 12
LM rail standard length (L_0)	40 55 70 85 100 130	55 75 95 115 135 155 175 195 275 375	70 95 120 145 170 195 220 245 270 320 370 470 570
Standard pitch F	15	20	25
G	5	7.5	10
Max length	300	1000	1340

Note) The maximum length varies with accuracy grades. Contact THK for details.



RSH-Z

LM Guide

B Product Specifications

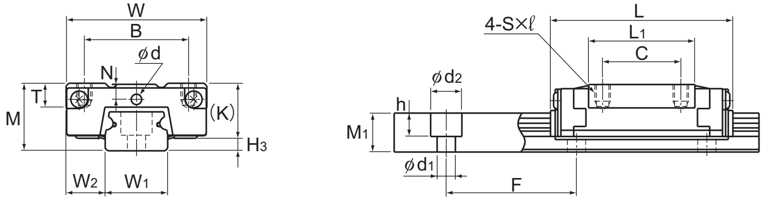
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model RSH-ZM



Models RSH7 to 12ZM

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greas-ing hole d	Grease nipple	H_3
RSH 7ZM	8	17	23.4	12	8	M2×2.5	13.2	3.4	6.5	1.6	—	1.5	—	1.5
RSH 9ZM	10	20	30.8	15	10	M3×2.8	19.4	4.6	7.8	2.4	—	1.6	—	2.2
RSH 12ZM	13	27	35	20	15	M3×3.2	20.4	4.5	10.6	3.1	—	2	—	2.4
RSH 15ZM	16	32	43	25	20	M3×3.5	26.5	5.5	12.6	2.9	3.6	—	PB107	3.4

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

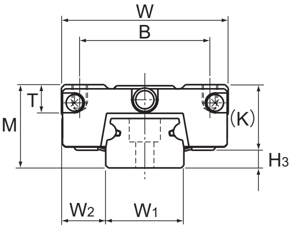
Model number coding

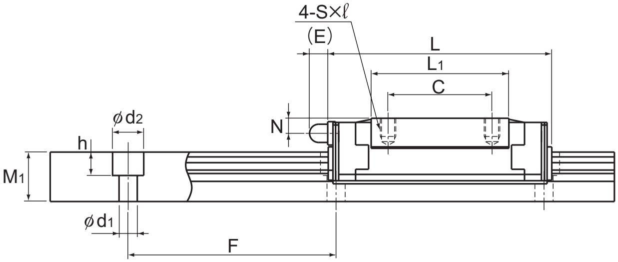
2 RSH15Z M UU C1 +230L P M -Ⅱ

- 2: No. of LM blocks used on the same rail
- RSH15Z: Model number
- M: Stainless steel LM block
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
- +230L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)
  - Precision grade (P)
- M: Stainless steel LM rail
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)





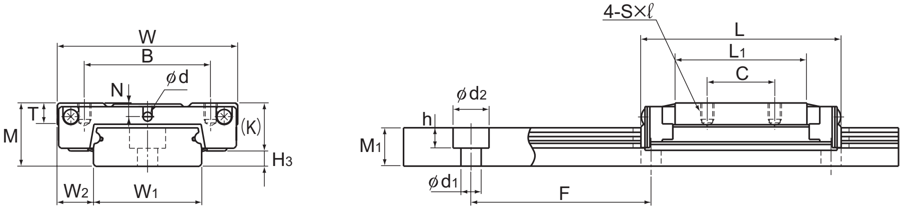
Model RSH15ZM

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	$7^{\ 0}_{-0.02}$	5	4.7	15	2.4×4.2×2.3	300	0.88	1.37	2.93	20.7	2.93	20.7	5	0.008	0.23
	$9^{\ 0}_{-0.02}$	5.5	5.5	20	3.5×6×3.3	1000	1.47	2.25	7.34	43	7.34	43	10.4	0.014	0.32
	$12^{\ 0}_{-0.025}$	7.5	7.5	25	3.5×6×4.5	1340	2.65	4.02	11.4	74.9	10.1	67.7	19.2	0.028	0.58
	$15^{\ 0}_{-0.025}$	8.5	9.5	40	3.5×6×4.5	1430	4.41	6.57	23.7	149	21.1	135	38.8	0.05	0.925

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-136.)
Static permissible moment*: 1 block: static permissible value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Model RSH-WZM



Models RSH7 to 12WZM

Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greasing hole d	Grease nipple	H_3
RSH 7WZM	9	25	31.5	19	10	M3×2.5	19.7	3.4	7	1.8	—	1.5	—	2
RSH 9WZM	12	30	39	21	12	M3×2.8	27	3.9	9.1	2.3	—	1.6	—	2.9
RSH 12WZM	14	40	44.5	28	15	M3×3.6	29.3	4.5	10.6	3	—	2	—	3.4
RSH 15WZM	16	60	55.5	45	20	M4×4.5	39.3	5.4	12.6	3	3.6	—	PB107	3.4

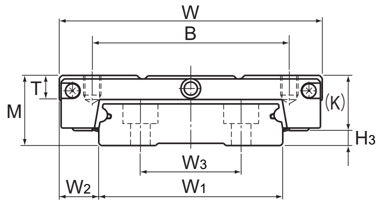
Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

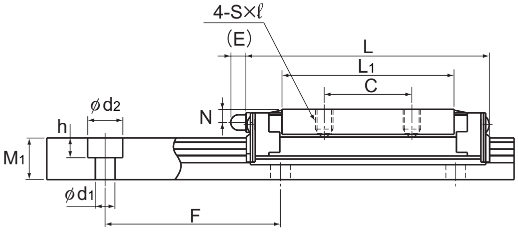
Model number coding

2 RSH9WZ M SS C1 +170L P M

2: No. of LM blocks used on the same rail
RSH9WZ M: Model number
SS: Contamination protection accessory symbol (*1)
C1: Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
+170L: LM rail length (in mm)
P: Accuracy symbol (*3)
Normal grade (No Symbol)
High accuracy grade (H)
Precision grade (P)
M: Stainless steel LM rail

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126.





Model RSH15WZM

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment N-m*					Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	14 $^{0}_{-0.05}$	5.5	—	5.2	30	3.5×6×3.2	400	1.37	2.16	6.54	42.1	6.54	42.1	15.4	0.018	0.51
	18 $^{0}_{-0.05}$	6	—	7.5	30	3.5×6×4.5	1000	2.45	3.92	16	92.9	16	92.9	36	0.03	1.08
	24 $^{0}_{-0.05}$	8	—	8.5	40	4.5×8×4.5	1430	4.02	6.08	24.5	138	21.7	123	59.5	0.06	1.5
	42 $^{0}_{-0.05}$	9	23	9.5	40	4.5×8×4.5	1800	6.66	9.8	50.3	278	44.4	248	168	0.135	3

Note) The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-136.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model RSH-Z/WZ variations.

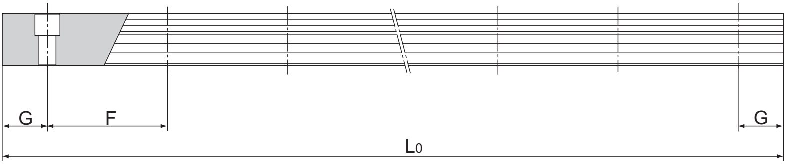
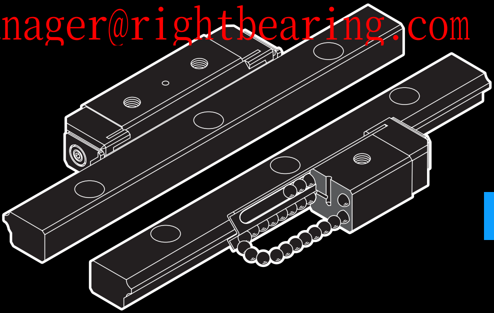


Table1 Standard Length and Maximum Length of the LM Rail for Model RSH-Z/WZ Unit: mm

Model No.	RSH 7Z	RSH 9Z	RSH 12Z	RSH 15Z	RSH 7WZ	RSH 9WZ	RSH 12WZ	RSH 15WZ
LM rail standard length (L₀)	40 55 70 85 100 130	55 75 95 115 135 155 175 195 275 375	70 95 120 145 170 195 220 245 270 320 370 470 570	70 110 150 190 230 270 310 350 390 430 470 550 670 870	50 80 110 140 170 200 260 290	50 80 110 140 170 200 260 290 320	70 110 150 190 230 270 310 390 470 550	110 150 190 230 270 310 430 550 670 790
Standard pitch F	15	20	25	40	30	30	40	40
G	5	7.5	10	15	10	10	15	15
Max length	300	1000	1340	1430	400	1000	1430	1800

Note) The maximum length varies with accuracy grades. Contact THK for details.



HR

LM Guide

B Product Specifications

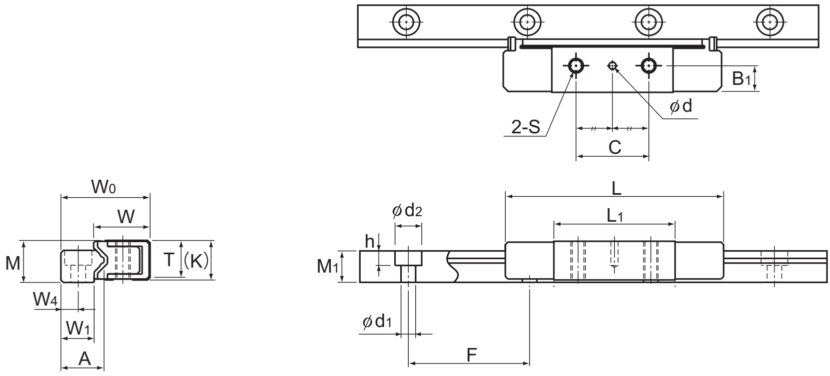
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models HR, HR-T, HR-M and HR-TM



Models HR918 and 918M

Model No.	Outer dimensions				LM block dimensions									
	Height	Width		Length									Greasing hole	
	M	W	W_0	L	B_1	C	H	S	h_2	L_1	T	K	d	D_1
HR 918 HR 918M	8.5	11.4	18	45	5.5	15	—	M3	—	25	7.5	8	1.5	—
HR 1123 HR 1123M	11	13.7	23	52	7	15	2.55	M3	3	30	9.5	10	2	5
HR 1530 HR 1530M	15	19.2	30	69	10	20	3.3	M4	3.5	40	13	14	2	6.5
HR 2042 HR 2042M	20	26.3	42	91.6	13	35	5.3	M6	5.5	56.6	17.5	19	3	10
HR 2042T HR 2042TM	20	26.3	42	110.7	13	50	5.3	M6	5.5	75.7	17.5	19	3	10
HR 2555 HR 2555M	25	33.3	55	121	16	45	6.8	M8	7	80	22.5	24	3	11
HR 2555T HR 2555TM	25	33.3	55	146.4	16	72	6.8	M8	7	105.4	22.5	24	3	11

Note) Symbol M indicates that stainless steel is used in the LM block, LM rail and balls. Those models marked with this symbol are therefore highly resistant to corrosion and environment.

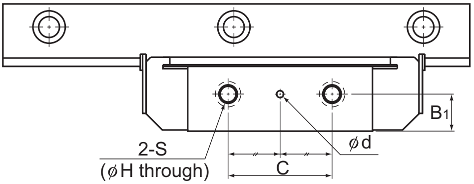
Model number coding

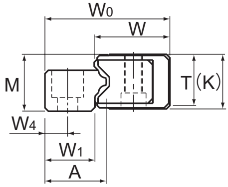
2 HR2555 UU M +1000L P T M

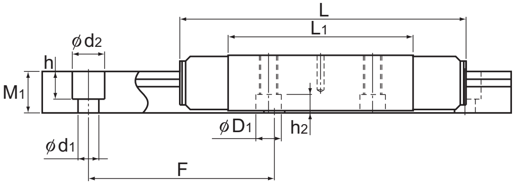
2 — No. of LM blocks used on the same rail
HR2555 — Model number
UU — Contamination protection accessory symbol (*1)
M — Stainless steel LM block
+1000L — LM rail length (in mm)
P — Accuracy symbol (*2) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
T — Symbol for LM rail jointed use
M — Stainless steel LM rail

(*1) See contamination protection accessory on A-368. (*2) See A-123.

Note) One set of model HR means a combination of two LM rails and an LM blocks used on the same plane.







Models HR1123 to 2555M/T/TM

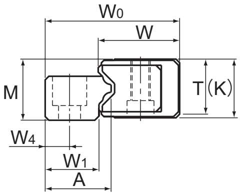
Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*				Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		LM block	LM rail
	W_1	W_4	A	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	kg	kg/m
	6.7	3.5	8.7	6.5	25	3×5.5×3	300	1.57	3.04	0.0229	0.17	0.0229	0.17	0.01	0.3
	9.5	5	11.6	8	40	3.5×6×4.5	500	2.35	4.31	0.0414	0.272	0.0414	0.272	0.03	0.5
	10.7	6	13.5	11	60	3.5×6×4.5	1600	4.31	7.65	0.0982	0.641	0.0982	0.641	0.08	1
	15.6	8	19.5	14.5	60	6×9.5×8.5	2200	9.9	17.2	0.308	1.91	0.308	1.91	0.13	1.8
	15.6	8	19.5	14.5	60	6×9.5×8.5	2200	13.6	22.9	0.53	2.99	0.53	2.99	0.26	1.8
	22	10	27	18	80	9×14×12	2600	18.6	30.5	0.783	4.41	0.783	4.41	0.43	3.2
	22	10	27	18	80	9×14×12	2600	25.1	40.8	1.33	6.95	1.33	6.95	0.5	3.2

Note) A moment in the direction M_C can be received if two rails are used in parallel. However, since it depends on the distance between the two rails, the moment in the direction M_C is omitted here.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-142.)
Static permissible moment*: Static permissible moment value with one set of model HR

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models HR, HR-T, HR-M and HR-TM



Model No.	Outer dimensions				LM block dimensions									
	Height	Width		Length									Greasing hole	
	M	W	W_0	L	B_1	C	H	S	h_2	L_1	T	K	d	D_1
HR 3065 HR 3065T	30	40.3	65	145 173.5	19	50 80	8.6	M10	9	90 118.5	27.5	29	4	14
HR 3575 HR 3575T	35	44.9	75	154.8 182.5	21.5	60 92.5	10.5	M12	12	103.8 131.5	32	34	4	18
HR 4085 HR 4085T	40	50.4	85	177.8 215.9	24	70 110	12.5	M14	13	120.8 158.9	36	38	4	20
HR 50105 HR 50105T	50	63.4	105	227 274.5	30	85 130	14.5	M16	15.5	150 197.5	45	48	5	23
HR 60125	60	74.4	125	329	35	160	18	M20	18	236	55	58	5	26

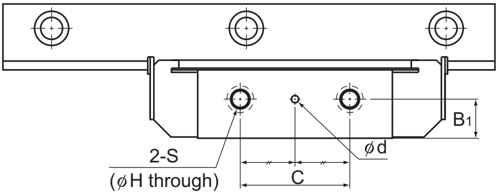
Model number coding

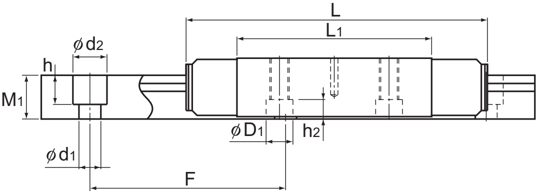
2 HR4085T UU +1500L P T

- 2: No. of LM blocks used on the same rail
- HR4085T: Model number
- UU: Contamination protection accessory symbol (*1)
- +1500L: LM rail length (in mm)
- P: Accuracy symbol (*2)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)/Super precision grade (SP)
  Ultra precision grade (UP)
- T: Symbol for LM rail jointed use

(*1) See contamination protection accessory on A-368. (*2) See A-123.

Note) One set of model HR means a combination of two LM rails and an LM blocks used on the same plane.





Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*				Mass	
	Width			Height	Pitch		Length*	C	C₀	MA		MB		LM block	LM rail
	W₁	W₄	A	M₁	F	d₁×d₂×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	kg	kg/m
	25	12	31.5	22.5	80	9×14×12	3000	24.2 32.1	38.6 51.6	1.11 1.89	6.72 10.4	1.11 1.89	6.72 10.4	0.7 0.9	4.6
	30.5	14.5	37	26	105	11×17.5×14	3000	30 40.2	47.8 63.6	1.53 2.59	8.84 13.5	1.53 2.59	8.84 13.5	1.05 1.4	6.4
	35	16	42.5	29	120	14×20×17	3000	44.1 59.5	68.6 91.7	2.64 4.48	14.4 23	2.64 4.48	14.4 23	1.53 1.7	8
	42	20	51.5	37	150	18×26×22	3000	70.7 96	107 143	5.15 8.74	28.9 45.7	5.15 8.74	28.9 45.7	3.06 3.5	12.1
	51	25	65	45	180	22×32×25	3000	141	206	14.3	79.6	14.3	79.6	7.5	19.3

Note) A moment in the direction Mc can be received if two rails are used in parallel. However, since it depends on the distance between the two rails, the moment in the direction Mc is omitted here.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-142.)
Static permissible moment*: Static permissible moment value with one set of model HR

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model HR variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

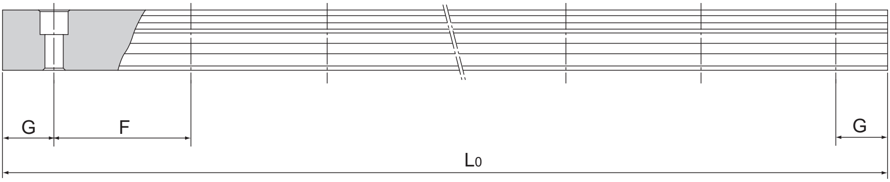


Table1 Standard Length and Maximum Length of the LM Rail for Model HR

Unit: mm

Model No.	HR 918	HR 1123	HR 1530	HR 2042	HR 2555	HR 3065	HR 3575	HR 4085	HR 50105	HR 60125
LM rail standard length (L_0)	70 120 220 295	110 230 310 390	160 280 340 460 580	220 280 340 460 640	280 440 600 760 1000 1240	280 440 600 760 1000 1240	570 885 1200 1620 2040 2460	780 1020 1260 1500 1980 2580	1270 1570 2020 2620	1530 1890 2250 2610
Standard pitch F	25	40	60	60	80	80	105	120	150	180
G	10	15	20	20	20	20	22.5	30	35	45
Max length	300	500	1600	2200	2600	3000	3000	3000	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.

Accessories

[Dedicated Mounting Bolt]

Normally, when mounting the LM block to adjust a clearance, use the tapped hole provided on the LM block to secure it as shown in Fig.1.

The holes of the bolt (d_1 and D_1) must be machined so that they are greater by the adjustment allowance.

If it is inevitable to use the mounting method as indicated by Fig.2 for a structural reason, the dedicated mounting bolt as shown in Fig.3 is required for securing the LM block. Be sure to specify that the dedicated mounting bolt is required when ordering the LM Guide.

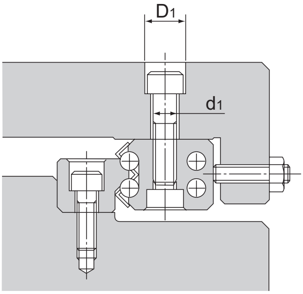


Fig.1

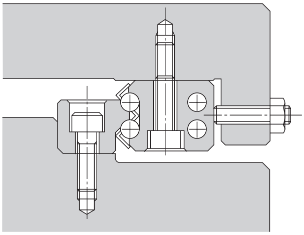


Fig.2

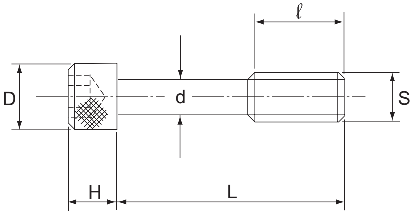
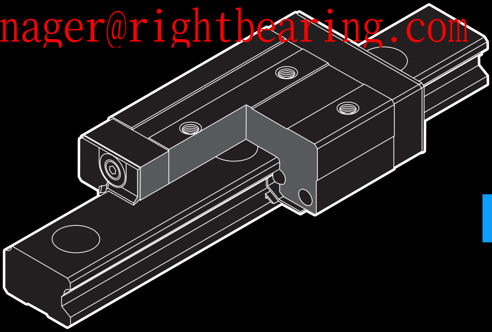


Fig.3

Table2 Dedicated Mounting Bolt Unit: mm

Model No.	S	d	D	H	L	ℓ	Supported model number
B 3	M3	2.4	5.5	3	17	5	HR 1530
B 5	M5	4.1	8.5	5	22	7	HR 2042
B 6	M6	4.9	10	6	28	9	HR 2555
B 8	M8	6.6	13	8	34	12	HR 3065
B 10	M10	8.3	16	10	39	15	HR 3575
B 12	M12	10.1	18	12	45	18	HR 4085
B 14	M14	11.8	21	14	55	21	HR 50105
B 16	M16	13.8	24	16	66	24	HR 60125



GSR

LM Guide

B Product Specifications

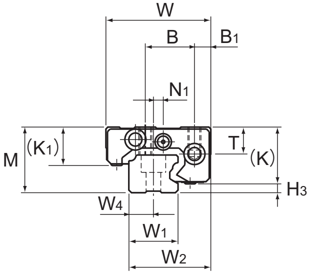
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

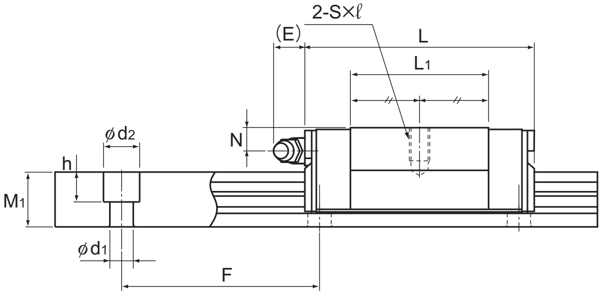
Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models GSR-T and GSR-V



Model GSR15T/V



Models GSR15 to 25V

Model No.	Outer dimensions			LM block dimensions												
	Height M	Width W	Length L	B_1	B	C	S×ℓ	L_1	T	K	K_1	N	N_1	E	Grease nipple	H_3
GSR 15T GSR 15V	20	32	59.8 47.1	5	15	26 —	M4×7	40.2 27.5	8.25	17.5	12	4.5	3	5.5	PB107	8
GSR 20T GSR 20V	24	43	74 58.1	7	20	30 —	M5×8	50.2 34.3	9.7	20.6	13.6	5	—	12	B-M6F	10.4
GSR 25T GSR 25V	30	50	88 69	7	23	40 —	M6×10	60.2 41.2	12.7	25.5	16.8	7	—	12	B-M6F	13.2
GSR 30T	33	57	103	8	26	45	M8×12	70.3	14.6	28.5	18	7	—	12	B-M6F	15
GSR 35T	38	68	117	9	32	50	M8×15	80.3	15.6	32.5	20.5	8	—	12	B-M6F	17.5

Model number coding

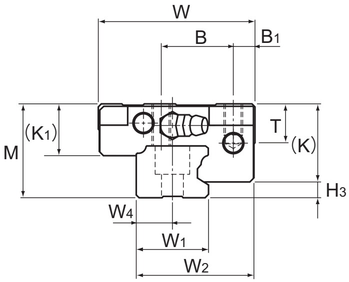
Combination of LM rail and LM block

GSR25 T 2 UU +1060L H T K

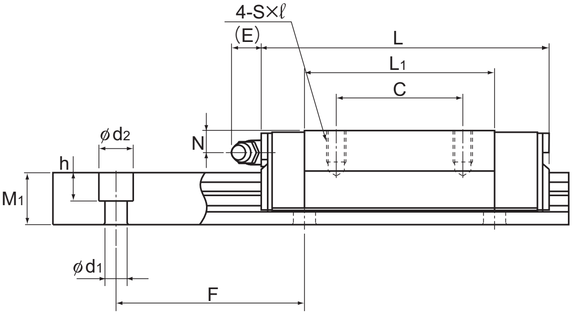
- GSR25: Model number
- T: Type of LM block
- 2: No. of LM blocks
- UU: Contamination protection accessory symbol (*1)
- +1060L: LM rail length (in mm)
- H: Accuracy symbol (*2)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)
- T: Symbol for LM rail jointed use
- K: Symbol for tapped-hole LM rail type

(*1) See contamination protection accessory on A-368. (*2) See A-124.

Note) One set of model GSR: This model number indicates that a single-rail unit constitutes one set.



Models GSR20 to 35T, Models GSR20V and 25V



Models GSR15 to 35T

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*				Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		LM block	LM rail
	W_1	W_2	W_4	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	kg	kg/m
	15	25	7.5	11.5	60	4.5×7.5×5.3	2000	5.69 4.31	8.43 5.59	0.0525 0.0252	0.292 0.158	0.0452 0.0218	0.252 0.136	0.13 0.08	1.2
	20	33	10	13	60	6×9.5×8.5	3000	9.22 7.01	13.2 8.82	0.102 0.0498	0.564 0.307	0.0885 0.0431	0.486 0.265	0.25 0.17	1.8
	23	38	11.5	16.5	60	7×11×9	3000	13.5 10.29	19 12.65	0.177 0.0858	0.965 0.522	0.152 0.0742	0.831 0.451	0.5 0.29	2.6
	28	44.5	14	19	80	9×14×12	3000	18.8	25.9	0.282	1.54	0.243	1.32	0.6	3.6
	34	54	17	22	80	11×17.5×14	3000	25.1	33.8	0.421	2.28	0.362	1.96	1	5

Note) A moment in the direction M_C can be received if two rails are used in parallel. However, since it depends on the distance between the two rails, the moment in the direction M_C is omitted here.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-148.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Model number coding

LM block

GSR25 T UU

GSR25 — Model number
T — Type of LM block
UU — Contamination protection accessory symbol (*1)

LM rail

GSR25 -1060L H K

GSR25 — Model number
-1060L — LM rail length (in mm)
H — Accuracy symbol (*2)
Normal grade (No Symbol)
High accuracy grade (H)
Precision grade (P)
K — Symbol for tapped-hole LM rail type

(*1) See contamination protection accessory on A-368. (*2) See A-124.

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model GSR variations.
In case the required quantity is large and the lengths are not the same, we recommend preparing an LM rail of the maximum length in stock. This is economical since it allows you to cut the rail to the desired length as necessary.

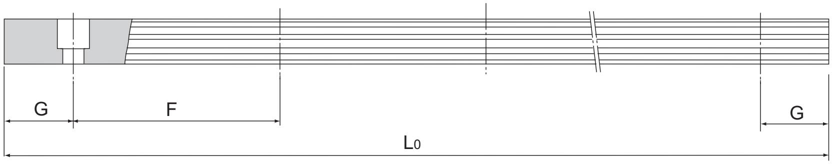


Table1 Standard Length and Maximum Length of the LM Rail for Model GSR

Unit: mm

Model No.	GSR 15	GSR 20	GSR 25	GSR 30	GSR 35
LM rail standard length (L_0)	460 820 1060 1600	460 820 1060 1600	460 820 1060 1600	1240 1720 2200 3000	1240 1720 2200 3000
Standard pitch F	60	60	60	80	80
G	20	20	20	20	20
Max length	2000	3000	3000	3000	3000

Note) The maximum length varies with accuracy grades. Contact THK for details.

Tapped-hole LM Rail Type of Model GSR

- Since the bottom of the LM rail has a tapped hole, this model can easily be installed on an H-shape steel and channel.
- Since the top face of the LM rail has no mounting hole, the sealabilitiy is increased and entrance of foreign material (e.g., cutting chips) can be prevented.

(1) Determine the bolt length so that a clearance of 2 to 3 mm is secured between the bolt end and the bottom of the tap (effective tap depth).
(2) As shown in Fig.1, a tapered washer is also available that allows GSR to be mounted on a section steel.
(3) For model number coding, see B-146 to B-147.

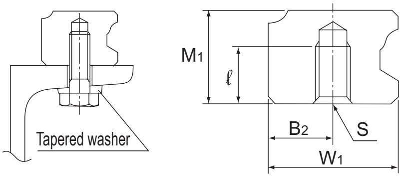
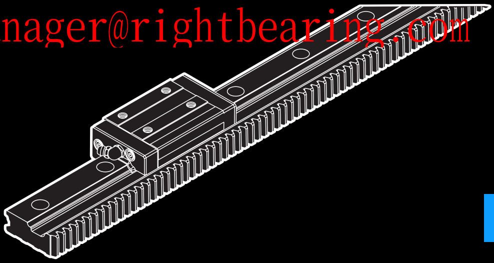


Fig.1

Table2 Tap Position and Depth Shape

Model No.	W_1	B_2	M_1	S×ℓ
GSR 15	15	7.5	11.5	M4×7
GSR 20	20	10	13	M5×8
GSR 25	23	11.5	16.5	M6×10
GSR 30	28	14	19	M8×12
GSR 35	34	17	22	M10×14



GSR-R

LM Guide

B Product Specifications

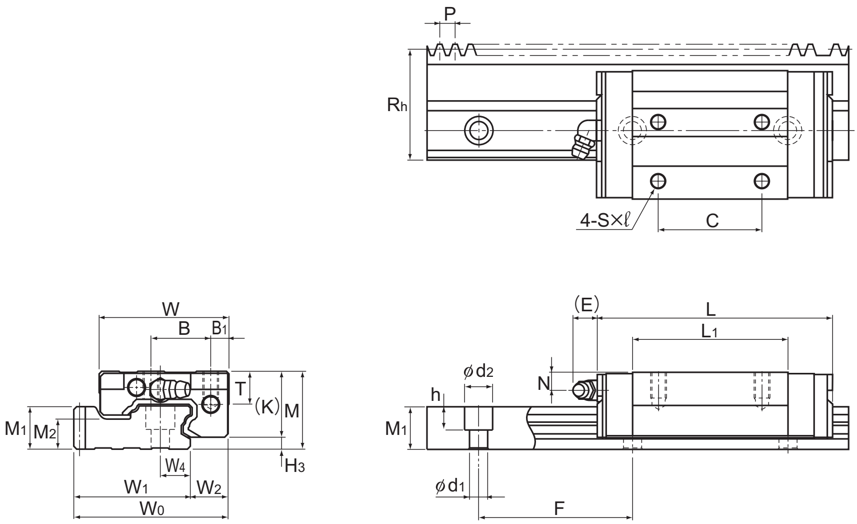
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical

Model GSR-R



Model GSR-T-R

Model No.	Rack			Outer dimensions				LM block dimensions											
	Reference pitch dimension P	Module	Pitch line height Rh	Height M	Width W	W_0	Length L	B_1	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple	H_3
GSR 25T-R GSR 25V-R	6	1.91	43	30	50	59.91	88 69	7	23	40 —	M6×10	60.2 41.2	12.7	25.5	7	12	B-M6F	4.5
GSR 30T-R	8	2.55	48	33	57	67.05	103	8	26	45	M8×12	70.3	14.6	28.5	7	12	B-M6F	4.5
GSR 35T-R	10	3.18	57	38	68	80.18	117	9	32	50	M8×15	80.3	15.6	32.5	8	12	B-M6F	5.5

Note) A special type with a module pitch is also available. Contact THK for details.
For checking the pinion strength, see A-241.

Model number coding

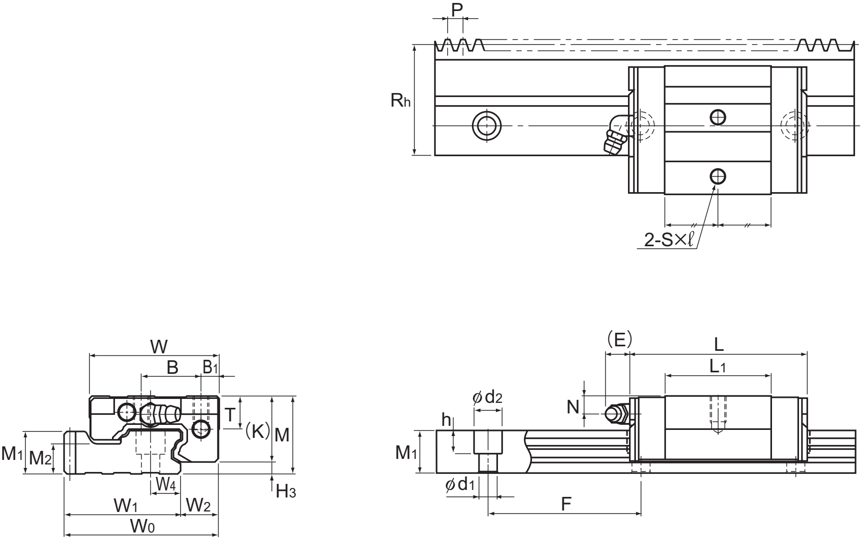
Single-rail LM Guide

GSR25T 2 UU +5000L H R T

- GSR25T: Model number
- 2: No. of LM blocks
- UU: Contamination protection accessory symbol (*1)
- +5000L: LM rail length (in mm)
- H: Accuracy symbol (*2)
  Normal grade (No Symbol)/High accuracy grade (H)
- R: Symbol for rail with rack type
  R: Symbol for rail with rack type
- T: Symbol for LM rail jointed use

(*1) See contamination protection accessory on A-368. (*2) See A-125.

Note) This model number indicates that a single-rail unit constitutes one set.



Model GSR25V-R

Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment N-m*				Mass	
	Width			Height	Pitch			C	C_0	M_A		M_B		LM block	LM rail
	W_1	W_2	W_4	M_1	F	M_2	$d_1 \times d_2 \times h$	kN	kN	1 block	Double blocks	1 block	Double blocks	kg	kg/m
	44.91	15	11.5	16.5	60	11.5	7×11×9	13.5 10.29	19 12.65	0.177 0.0858	0.965 0.522	0.152 0.0742	0.831 0.451	0.5 0.29	4.7
	50.55	16.5	14	19	80	12	9×14×12	18.8	25.9	0.282	1.54	0.243	1.32	0.6	5.9
	60.18	20	17	22	80	14.5	11×17.5×14	25.1	33.8	0.421	2.28	0.362	1.96	1	8.1

Note) A moment in the direction M_C can be received if two rails are used in parallel. However, since it depends on the distance between the two rails, the moment in the direction M_C is omitted here.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-152.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Model number coding

LM block

GSR25T UU

- GSR25T: Model number
- UU: Contamination protection accessory symbol (*1)

Rail with rack

GSR25-2004L H R

- H: Accuracy symbol (*2)
  Normal grade (No Symbol)
  High accuracy grade (H)
- R: Symbol for rail with rack type

(*1) See contamination protection accessory on A-368. (*2) See A-125.

Standard Length of the LM Rail

Table1 shows the standard LM rail lengths of model GSR-R variations.
Since both end faces of the LM rail of model GSR-R are machined, it can be joined with another rail without additional machining.

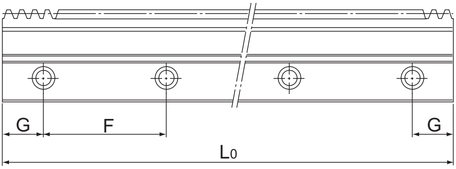
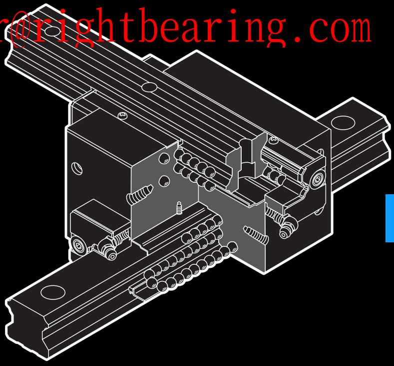


Table1 Standard Length of the LM Rail for Model GSR-R

Unit: mm

Model No.	GSR 25-R		GSR 30-R		GSR 35-R	
LM rail Standard length (L_0)	1500	2004	1504	2000	1500	2000
Standard pitch F	60	60	80	80	80	80
G	30	42	32	40	30	40



CSR

LM Guide

B Product Specifications

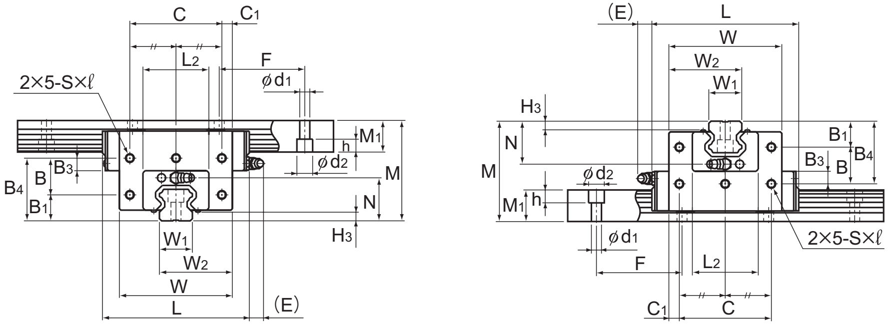
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model CSR



Models CSR20 to 45

Model No.	Outer dimensions			LM block dimensions												
	Height M	Width W	Length L	B_1	B_3	B_4	B	C	C_1	S×ℓ	L_2	H_3	N	E	Grease nipple	H_3
CSR 15	47	38.8	56.6	—	11.3	34.8	—	20	9.4	M4×6	32	3.5	19.5	5.5	PB1021B	3.5
CSR 20S CSR 20	57	50.8 66.8	74 90	— 13	13.3 7.8	42.5 37	— 24	30 56	10.4 5.4	M5×8	42	4	25	12	B-M6F	4
CSR 25S CSR 25	70	59.5 78.6	83.1 102.2	— 18	17 9	52 44	— 26	34 64	12.75 7.3	M6×10	46	5.5	30	12	B-M6F	5.5
CSR 30S CSR 30	82	70.4 93	98 120.6	— 21	20 12	61 53	— 32	40 76	15.2 8.5	M6×10	58	7	35	12	B-M6F	7
CSR 35	95	105.8	134.8	24	14	61	37	90	7.9	M8×14	68	7.5	40	12	B-M6F	7.5
CSR 45	118	129.8	170.8	30	16	75	45	110	9.9	M10×15	84	10	50	16	B-PT1/8	10

Model number coding

4 CSR25 UU C0 +1200/1000L P

Total No. of LM blocks

Model number

Contamination protection accessory symbol (*1)

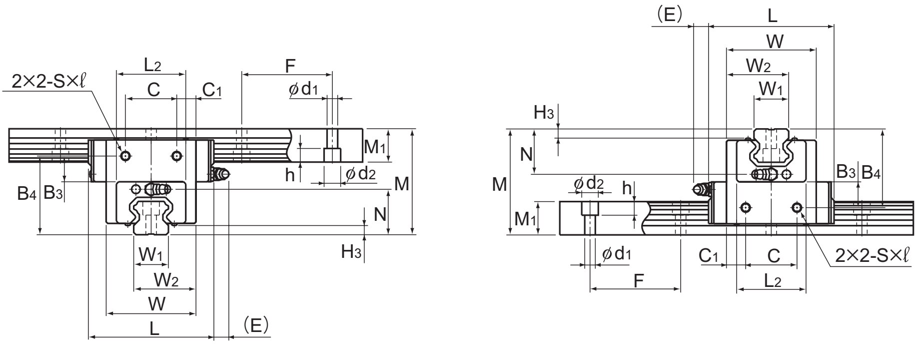
Radial clearance symbol (*2)
Normal (No symbol)/Light preload (C1)
Medium preload (C0)

LM rail length on the X axis (in mm)

LM rail length on the Y axis (in mm)

Accuracy symbol (*3)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-122.

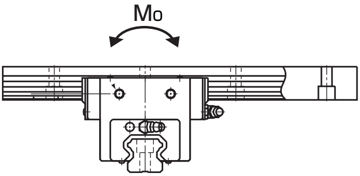


Models CSR15, 20S to 30S

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment	Mass	
	Width W1 ±0.05	W2	Height M1	Pitch F	d1×d2×h	Length* Max	C kN	C0 kN	M0 kN-m	LM block kg	LM rail kg/m
	15	26.9	15	60	4.5×7.5×5.3	2500	8.33	13.5	0.0805	0.34	1.5
	20	35.4 43.4	18	60	6×9.5×8.5	3000	13.8 21.3	23.8 31.8	0.19 0.27	0.73 1.3	2.3
	23	41.25 50.8	22	60	7×11×9	3000	19.9 27.2	34.4 45.9	0.307 0.459	1.2 2.2	3.3
	28	49.2 60.5	26	80	9×14×12	3000	28 37.3	46.8 62.5	0.524 0.751	2 3.6	4.8
	34	69.9	29	80	9×14×12	3000	50.2	81.5	1.2	5.3	6.6
	45	87.4	38	105	14×20×17	3090	80.4	127.5	2.43	9.8	11

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-156.)



Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model CSR variations.
For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

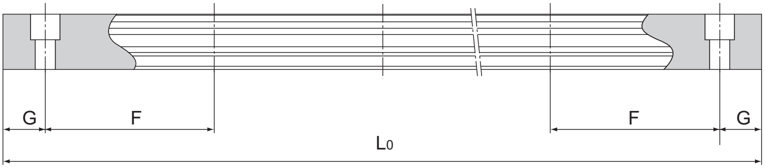


Table1 Standard Length and Maximum Length of the LM Rail for Model CSR

Unit: mm

Model No.	CSR 15	CSR 20	CSR 25	CSR 30	CSR 35	CSR 45
LM rail standard length (L_0)	160	220	220	280	280	570
	220	280	280	360	360	675
	280	340	340	440	440	780
	340	400	400	520	520	885
	400	460	460	600	600	990
	460	520	520	680	680	1095
	520	580	580	760	760	1200
	580	640	640	840	840	1305
	640	700	700	920	920	1410
	700	760	760	1000	1000	1515
	760	820	820	1080	1080	1620
	820	940	940	1160	1160	1725
	940	1000	1000	1240	1240	1830
	1000	1060	1060	1320	1320	1935
	1060	1120	1120	1400	1400	2040
	1120	1180	1180	1480	1480	2145
	1180	1240	1240	1560	1560	2250
	1240	1360	1300	1640	1640	2355
	1360	1480	1360	1720	1720	2460
	1480	1600	1420	1800	1800	2565
	1600	1720	1480	1880	1880	2670
		1840	1540	1960	1960	2775
		1960	1600	2040	2040	2880
		2080	1720	2200	2200	2985
		2200	1840	2360	2360	3090
			1960	2520	2520	
			2080	2680	2680	
			2200	2840	2840	
			2320	3000	3000	
			2440			
Standard pitch F	60	60	60	80	80	105
G	20	20	20	20	20	22.5
Max length	2500	3000	3000	3000	3000	3090

Note) The maximum length varies with accuracy grades. Contact THK for details.

Tapped-hole LM Rail Type of Model CSR

The model CSR variations include a type with its LM rail bottom tapped. With the X-axis LM rail having tapped holes, this model can be secured with bolts from the top.

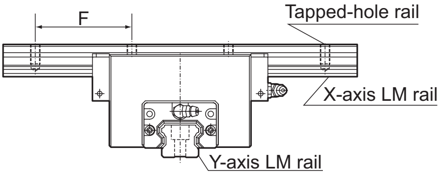


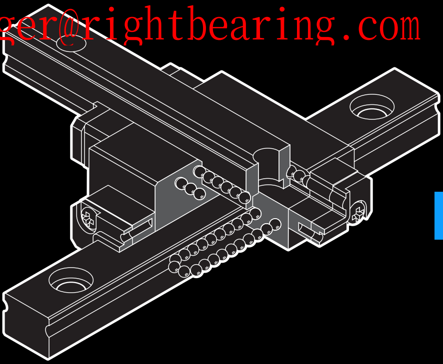
Table2 Dimensions of the LM Rail Tap Unit: mm

Model No.	S_1	Effective tap depth ℓ_1
15	M5	8
20	M6	10
25	M6	12
30	M8	15
35	M8	17
45	M12	24

Model number coding

4 CSR25 UU C0 +1200L P K/1000L P

Symbol for
tapped-hole LM rail type



MX

LM Guide

B Product Specifications

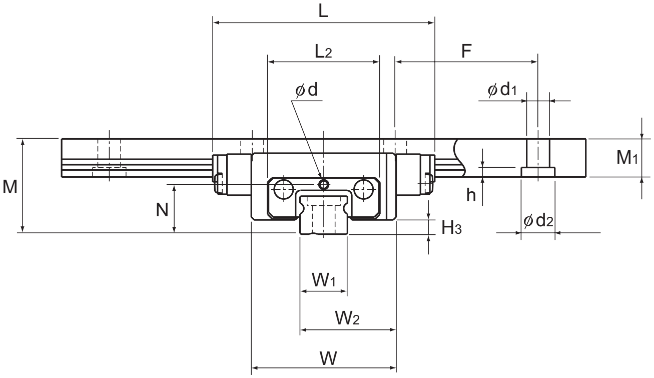
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model MX



Model No.	Outer dimensions			LM block dimensions			
	Height M	Width W	Length L	L_2	N	Greasing hole d	H_3
MX 5M	10	15.2	23.3	11.8	5.2	0.8	1.5
MX 7WM	14.5	30.2	40.8	24.6	7.4	1.2	2

Note) Since stainless steel is used in the LM block, LM rail and balls, these models are highly resistant to corrosion and environment.

Model number coding

4 MX7W M UU C1 +120 / 100L P T M

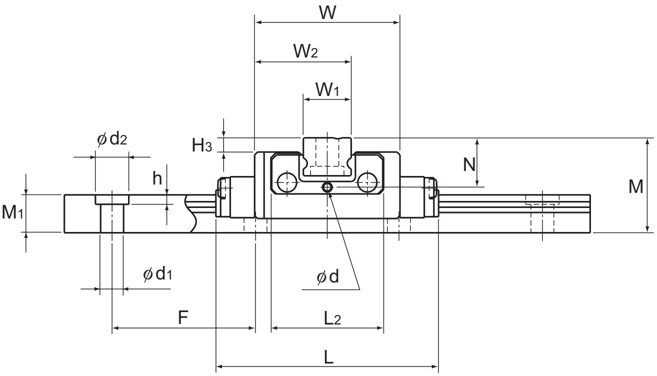
- 4: Total No. of LM blocks
- MX7W M: Model number
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1)
- +120: LM rail length on the X axis (in mm)
- 100L: LM rail length on the Y axis (in mm)
- P: Accuracy symbol (*3) Normal grade (No Symbol)/Precision grade (P)
- T: Symbol for LM rail jointed use
- M: LM rail is made of stainless steel

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-127.

Note) If the LM rail mount of a semi-standard model is of a tapped-hole LM rail type, add symbol "K" after the accuracy symbol.

Example: 4 MX7W M UU C1+120/100L P K T M

Add symbol K

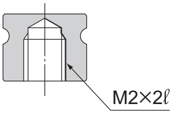


Unit: mm

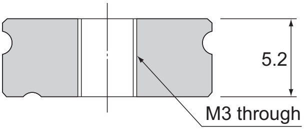
	LM rail dimensions						Basic load rating		Static Permissible Moment* N-m	Mass	
	Width W₁	W₂	Height M₁	Pitch F	d₁×d₂×h	Length* Max	C kN	C₀ kN	M₀	LM block kg	LM rail kg/m
	5 $^{0}_{-0.02}$	10.1	4	15	2.4×3.5×1	200	0.59	1.1	2.57	0.01	0.14
	14 $^{0}_{-0.025}$	22.1	5.2	30	3.5×6×3.2	400	2.04	3.21	14.7	0.051	0.51

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-162.)
Static permissible moment*: static permissible moment value with 1 LM block

For the LM rail mounting hole, a tapped-hole LM rail type is available as semi-standard.



Model MX5M



Model MX7WM

When mounting the LM rail of model MX7WM, take into account the thread length of the mounting bolt in order not to let the bolt end stick out of the top face of the LM rail.

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model MX variations.

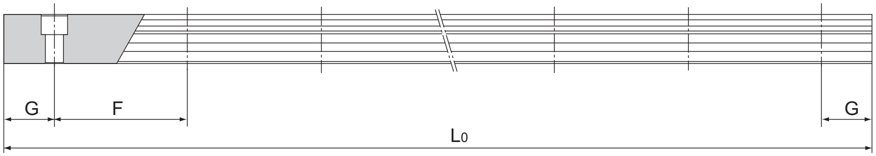
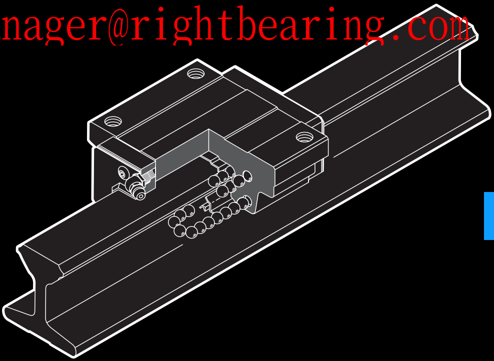


Table1 Standard Length and Maximum Length of the LM Rail for Model MX

Unit: mm

Model No.	MX 5	MX 7W
LM rail standard length (L_0)	40 55 70 100 130 160	50 80 110 140 170 200 260 290
Standard pitch F	15	30
G	5	10
Max length	200	400

Note) The maximum length varies with accuracy grades. Contact THK for details.



JR

LM Guide

B Product Specifications

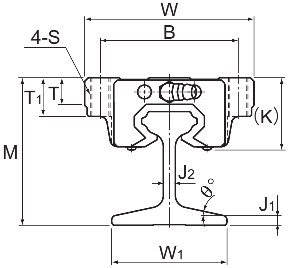
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

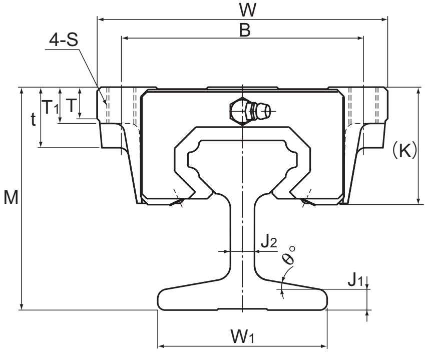
Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models JR-A, JR-B and JR-R



Models JR25 and 35-A



Models JR45 and 55-A

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	H	S×ℓ	L₁	t	T	T₁	K	N	E	Grease nipple
JR 25A	61	70	83.1	57	45	—	M8*	59.5	—	11	16	30.5	6	12	B-M6F
JR 25B	61	70		57	45	7	—		16	11	10	30.5	6		
JR 25R	65	48		35	35	—	M6×8		—	9	—	34.5	10		
JR 35A	73	100	113.6	82	62	—	M10*	80.4	—	12	21	40	8	12	B-M6F
JR 35B	73	100		82	62	9	—		21	12	13	40	8		
JR 35R	80	70		50	50	—	M8×12		—	11.7	—	47.4	15		
JR 45A	92	120	145	100	80	—	M12*	98	25	13	15	50	10	16	B-PT1/8
JR 45B	92	120		100	80	11	—		25	13	15	50	10		
JR 45R	102	86		60	60	—	M10×17		—	15	—	59.4	20		
JR 55A	114	140	165	116	95	—	M14*	118	29	13.5	17	57	11	16	B-PT1/8
JR 55B	114	140		116	95	14	—		29	13.5	17	57	11		
JR 55R	124	100		75	75	—	M12×18		—	20.5	—	67	21		

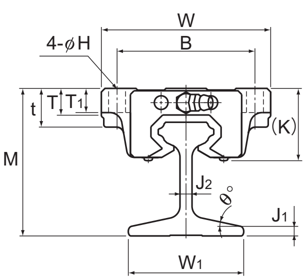
Note) "*" indicates a through hole.

Model number coding

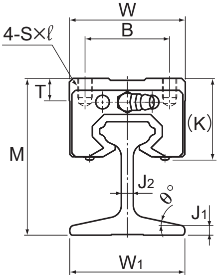
JR35 R 2 UU +1000L T

- JR35: Model number
- R: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- +1000L: LM rail length (in mm)
- T: Symbol for LM rail jointed use

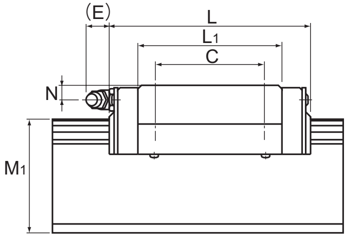
(*1) See contamination protection accessory on A-368.



Model JR-B



Model JR-R



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width				Height	Length*	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W₁	J₁	J₂	θ°	M₁	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	48	4	5	12	47	2000	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59 0.59 0.54	4.2
	54	7	8	10	54	4000	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6 1.6 1.5	8.6
	70	8	10	10	70	4000	60	95.6	1.42	7.92	1.42	7.92	1.83	2.8 2.8 2.6	15.2
	93	4.8	11.6	12	90	4000	88.5	137	2.45	13.2	2.45	13.2	3.2	4.5 4.5 4.3	18.3

Note) The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-166.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model JR variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.

Table1 Standard Length and Maximum Length of the LM Rail for Model JR

Unit: mm

Model No.	JR 25	JR 35	JR 45	JR 55
LM rail standard length (L_0)	1000 1500 2000	1000 2000 4000	1000 2000 4000	1000 2000 4000
Max length	2000	4000	4000	4000

Note1) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note2) For jointing two or more rails, a metal fitting like the one shown in Fig.1 is available. Contact THK for details.

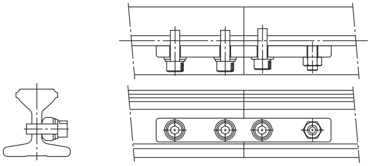
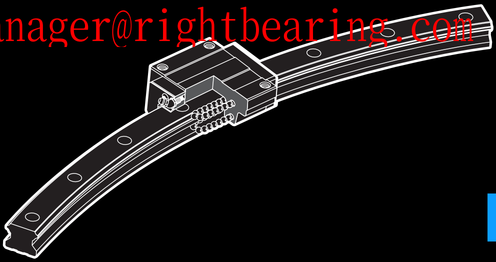


Fig.1



HCR

LM Guide

B Product Specifications

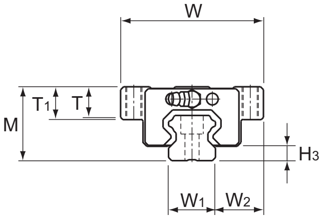
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

R Guide Model HCR



Model No.	Outer dimensions			LM block dimensions									H_3
	Height M	Width W	Length L	B	C	S	L_1	T	T_1	N	E	Grease nipple	
HCR 12A+60/100R	18	39	44.6	32	18	M4	30.5	4.5	5	3.4	3.5	PB1021B	3.1
HCR 15A+60/150R HCR 15A+60/300R HCR 15A+60/400R	24	47	56.2 56.4 56.5	38	24 28 28	M5	38.8	10.3	11	4.5	5.5	PB1021B	3.5
HCR 25A+60/500R HCR 25A+60/750R HCR 25A+60/1000R	36	70	83	57	45	M8	59.5	14.9	16	6	12	B-M6F	5.5
HCR 35A+60/600R HCR 35A+60/800R HCR 35A+60/1000R HCR 35A+60/1300R	48	100	109.2 109.3 109.3 109.3	82	58	M10	80.4	19.9	21	8	12	B-M6F	7.5
HCR 45A+60/800R HCR 45A+60/1000R HCR 45A+60/1200R HCR 45A+60/1600R	60	120	138.7 138.8 138.8 138.9	100	70	M12	98	23.9	25	10	16	B-PT1/8	10
HCR 65A+60/1000R HCR 65A+60/1500R HCR 65A+45/2000R HCR 65A+45/2500R HCR 65A+30/3000R	90	170	197.8 197.9 197.9 197.9 197.9	142	106	M16	147	34.9	37	19	16	B-PT1/8	14

Model number coding

HCR25A 2 UU +60 / 1000R T

Model number

No. of LM blocks used on the same rail

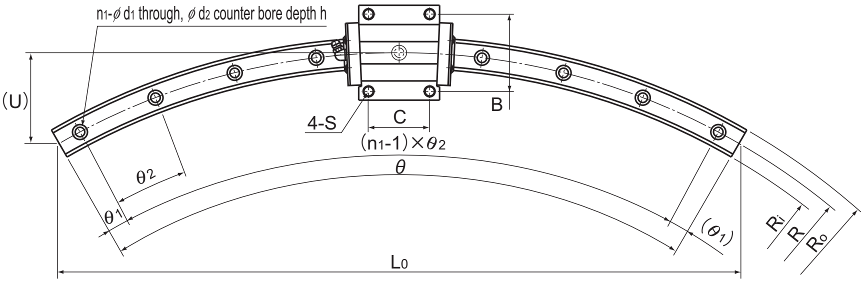
Contamination protection accessory symbol (*1)

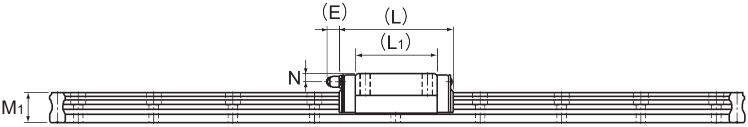
R-Guide center angle

LM rail length (in mm)

Symbol for LM rail jointed use

(*1) See contamination protection accessory on A-368.

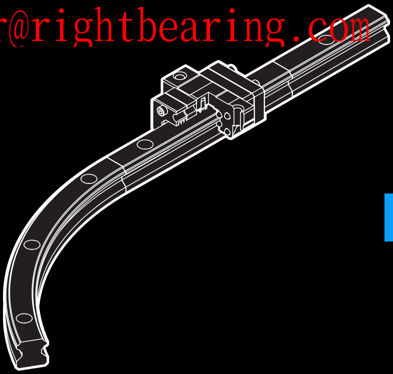




Unit: mm

	LM rail dimensions													Basic load rating		Static permissible moment kN-m*				
						Width		Height						C	C_0	M_A		M_B		M_C
	R	R_0	R_i	L_0	U	W_1	W_2	M_1	$d_1 \times d_2 \times h$	n_1	θ°	θ_1°	θ_2°	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block
	100	106	94	100	13.4	12	13.5	11	3.5×6×5	3	60	7	23	4.7	8.53	0.0409	0.228	0.0409	0.228	0.0445
	150	157.5	142.5	150	20.1	15	16	15	4.5×7.5×5.3	3	60	7	23	6.66	10.8	0.0805	0.457	0.0805	0.457	0.0844
	300	307.5	292.5	300	40					5		6	12	8.33	13.5					
	400	407.5	392.5	400	54					7		3	9	8.33	13.5					
	500	511.5	488.5	500	67	23	23.5	22	7×11×9	9	60	2	7	19.9	34.4	0.307	1.71	0.307	1.71	0.344
	750	761.5	738.5	750	100					12		2.5	5							
	1000	1011.5	988.5	1000	134					15		2	4							
	600	617	583	600	80	34	33	29	9×14×12	7	60	3	9	37.3	61.1	0.782	3.93	0.782	3.93	0.905
	800	817	783	800	107					11		2.5	5.5							
	1000	1017	983	1000	134					12		2.5	5							
	1300	1317	1283	1300	174					17		2	3.5							
	800	822.5	777.5	800	107	45	37.5	38	14×20×17	8	60	2	8	60	95.6	1.42	7.92	1.42	7.92	1.83
	1000	1022.5	977.5	1000	134					10		3	6							
	1200	1222.5	1177.5	1200	161					12		2.5	5							
	1600	1622.5	1577.5	1600	214					15		2	4							
	1000	1031.5	968.5	1000	134	63	53.5	53	18×26×22	8	60	2	8	141	215	2.45	13.2	2.45	13.2	3.2
	1500	1531.5	1468.5	1500	201					10	60	3	6							
	2000	2031.5	1968.5	1531	152					12	45	0.5	4							
	2500	2531.5	2468.5	1913	190					13	45	1.5	3.5							
	3000	3031.5	2968.5	1553	102					10	30	1.5	3							

Note) LM rail radiuses other than the radiuses in the above table are also available. Contact THK for details.
The R-Guide center angles in the table are maximum manufacturing angles. To obtain angles greater than them, rails must be additionally connected. Contact THK for details.
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other



HMG

LM Guide

B Product Specifications

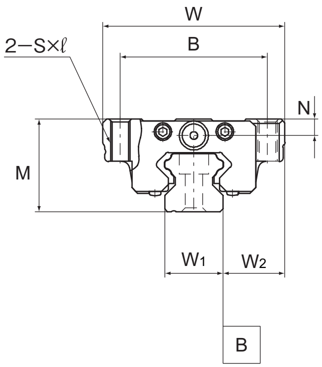
Dimensional Drawing, Dimensional Table

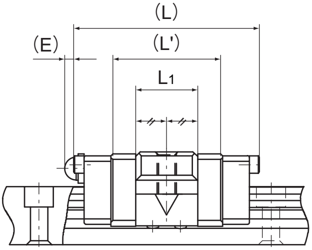
A Technical Descriptions of the Products (Separate)

Technical Descriptions

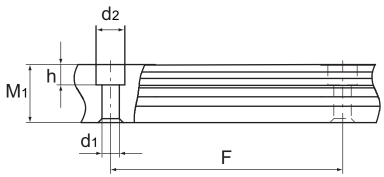
* Please see the separate "A Technical Descriptions of the Products".

Model HMG

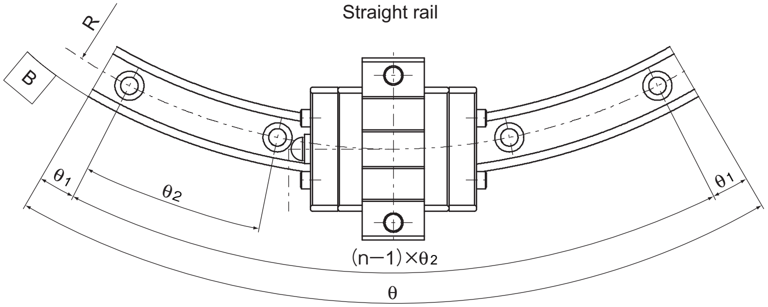




Model No.	Outer dimensions				LM block dimensions					LM rail dimensions			
										LM rail			Height
	M	W	L	L′	B	S×ℓ	L_1	N	E	W_1	W_2	F	M_1
HMG15A	25	47	48	28.8	38	M5×11	16	4.3	5.5	15	16	60	15
HMG25A	36	70	62.2	42.2	57	M8×16	25.6	6	12	23	23.5	60	22
HMG35A	48	100	80.6	54.6	82	M10×21	32.6	8	12	34	33	80	29
HMG45A	60	120	107.6	76.6	100	M12×25	42.6	10	16	45	37.5	105	38
HMG65A	90	170	144.4	107.4	142	M16×37	63.4	19	16	63	53.5	150	53



Straight rail



Curved rail

Unit: mm

	Mounting hole	Curved rail					Basic dynamic load rating (C)	Basic static load rating (C_0)	
	d₁×d₂×h	R	n	θ°	θ₁°	θ₂°	Resultant load (C) kN	Straight section (Cost) kN	Curved section (Cor) kN
	4.5×7.5×5.3	150	3	60	7	23	2.56	4.23	0.44
		300	5	60	6	12			
		400	7	60	3	9			
	7×11×9	500	9	60	2	7	9.41	10.8	6.7
		750	12	60	2.5	5			
		1000	15	60	2	4			
	9×14×12	600	7	60	3	9	17.7	19	11.5
		800	11	60	2.5	5.5			
		1000	12	60	2.5	5			
		1300	17	60	2	3.5			
	14×20×17	800	8	60	2	8	28.1	29.7	18.2
		1000	10	60	3	6			
		1200	12	60	2.5	5			
		1600	15	60	2	4			
	18×26×22	1000	8	60	2	8	66.2	66.7	36.2
		1500	10	60	3	6			
		2000	12	45	0.5	4			
		2500	13	45	1.5	3.5			
		3000	10	30	1.5	3			

With HMG, a single LM block is capable of receiving moments in all directions.
Table 1 shows the permissible moment of an LM block in the M_A, M_B and M_C directions.

Table1 Static Permissible Moments of Model HMG

Unit: kN-m

Model No.	M_A		M_B		M_C	
	Straight section	Curved section	Straight section	Curved section	Straight section	Curved section
HMG15	0.008	0.007	0.008	0.01	0.027	0.003
HMG25	0.1	0.04	0.1	0.05	0.11	0.07
HMG35	0.22	0.11	0.22	0.12	0.29	0.17
HMG45	0.48	0.2	0.48	0.22	0.58	0.34
HMG65	1.47	0.66	1.47	0.73	1.83	0.94

Description of Each Option ⇒A-351 Dimensions⇒B-223

Jointed LM rail

[Level Difference Specification for the Joint]

An accuracy error in LM rail installation has influence on the service life of the product. When installing the LM rail, take care to minimize the level difference in the joint within the specification indicated in Table2. For the joint between curved rails and another between the curved section and the joint rail, we recommend using a flushing piece like the one shown in Fig.1. When using the flushing piece, place the fixed butt piece on the outer side, push the rail against the butt piece, and then adjust the level difference in the joint section by turning the adjustment screw from the inner side.

Table2 Level Difference Specification for the Joint

Unit: mm

Model No.	Ball raceway, side face	Upper face	Maximum clearance of the joint section
15	0.01	0.02	0.6
25	0.01	0.02	0.7
35	0.01	0.02	1.0
45	0.01	0.02	1.3
65	0.01	0.02	1.3

Note) Place the pin on the outer circumference and the bolt on the inner circumference.

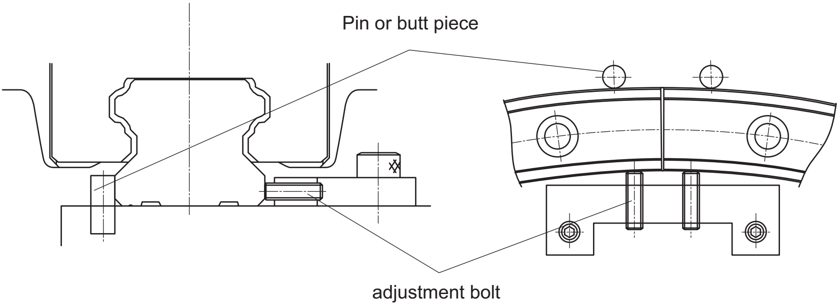


Fig.1 Flush piece

[About the Curved Section]

The curved section of model HMG has a clearance for a structural reason. Therefore, this model may not be used in applications where highly accurate feed is required. In addition, the curved section cannot withstand a large moment. When a large moment is applied, it is necessary to increase the number of LM blocks or LM rails. For permissible moment values, see Table1 on B-173.

[Jointed LM Rail]

Model HMG always requires a jointed rail where an LM block travels from the straight section to the curved section and where the curve is inverted such as an S curve. Take this into account when design the system.

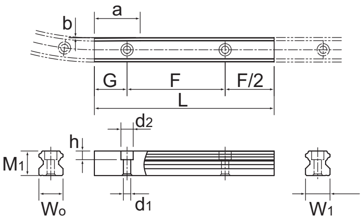


Table3 Dimension of the Jointed Rail

Unit: mm

Model No.	Dimension of the jointed rail							
	Height	Pitch	Mounting hole	Width		Taper length	Taper depth	Radius
	M_1	F	$d_1 \times d_2 \times h$	W_1	W_0	a	b	R
15A	15	60	4.5×7.5×5.3	15	14.78	28	0.22	150
					14.89		0.11	300
					14.92		0.08	400
25A	22	60	7×11×9	23	22.83	42	0.17	500
					22.89		0.11	750
					22.92		0.08	1000
35A	29	80	9×14×12	34	33.77	54	0.23	600
					33.83		0.17	800
					33.86		0.14	1000
					33.9		0.1	1300
45A	38	105	14×20×17	45	44.71	76	0.29	800
					44.77		0.23	1000
					44.81		0.19	1200
					44.86		0.14	1600
65A	53	150	18×26×22	63	62.48	107	0.52	1000
					62.66		0.34	1500
					62.74		0.26	2000
					62.8		0.2	2500
					62.83		0.17	3000

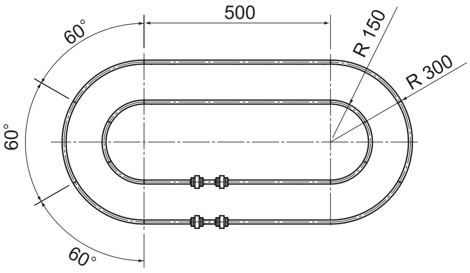


Fig.2 Examle of model No.

Model number coding

When 2 rails are used

HMG15A 2 UU C1 +1000L T + 60/150R 6T + 60/300R 6T -Ⅱ

Model number

No. of LM blocks per rail

Contamination protection accessory symbol (*1)

Radial clearance symbol
Normal (No symbol)
Light preload (C1)/Medium preload (C0)

Overall linear LM rail length per rail

Symbol for linear LM rail joint

Center angle of one inner curved rail

Radius of inner curved rail

No. of inner curved LM rails jointed

Center angle of one outer curved rail

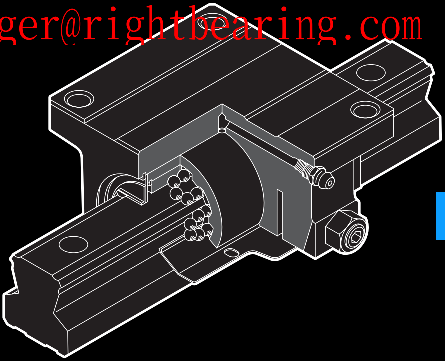
Radius of outer curved rail

No. of outer curved LM rails jointed

Symbol for No. of rails (*2)

(*1) See contamination protection accessory on A-368. (*2) See A-59.

Note) This model number indicates that an LM block and an LM rail constitute one set (i.e., the required number of sets when 2 rails are used is 2).
Model HMG does not have a seal as standard.　For the model number above, Fig.2 applies.



NSR-TBC

LM Guide

B Product Specifications

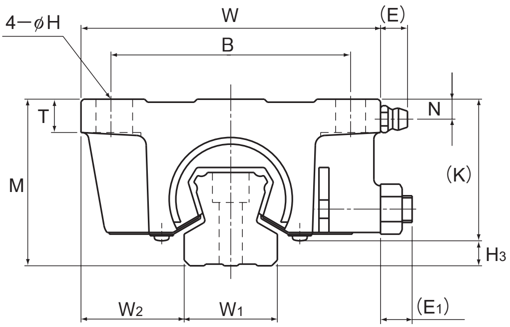
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model NSR-TBC



Model No.	Outer dimensions			LM casing dimensiones									
	Height M	Width W	Length L	B	C	H	T	K	N	E	E_1	Grease nipple	H_3
NSR 20TBC	40	70	67	55	50	6.6	8	34.5	5.5	8.5	7	A-M6F	5.5
NSR 25TBC	50	90	78	72	60	9	10	43.5	6	8.5	7.5	A-M6F	6.5
NSR 30TBC	60	100	90	82	72	9	12	51	8	8.5	9.5	A-M6F	9
NSR 40TBC	75	120	110	100	80	11	13	64	10	8.5	12	A-M6F	10.5
NSR 50TBC	82	140	123	116	95	14	15	74	9	15	15	A-PT1/8	8
NSR 70TBC	105	175	150	150	110	14	18	95.5	10	15	16.5	A-PT1/8	9.5

Model number coding

NSR50TBC 2 UU C1 +1200L P T -Ⅱ

Model number

No. of LM cases used on the same rail

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

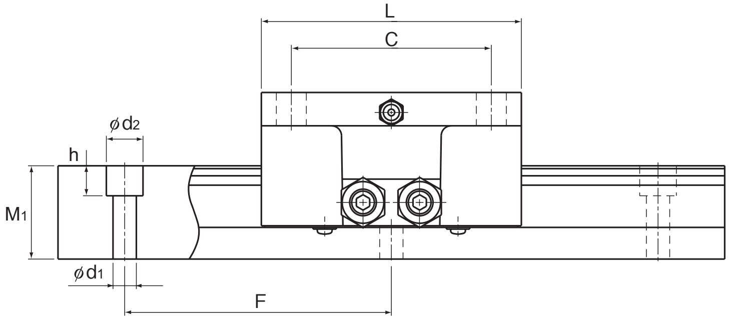
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

Symbol for LM rail jointed use

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Unit: mm

	LM rail dimensions						Basic load rating		Static Permissible Moment* kN-m		Mass	
	Width W1 ±0.05	W2	Height M1	Pitch F	d1×d2×h	Length* Max	C kN	C0 kN	MA Double casings	MB Double casings	LM casing kg	LM rail kg/m
	23	23.5	23	60	6×9.5×8.5	2200	9.41	18.6	0.31	0.27	0.62	3.1
	28	31	28	80	7×11×9	3000	14.9	26.7	0.53	0.46	1.13	4.7
	34	33	34.5	80	7×11×9	3000	22.5	38.3	0.85	0.74	1.8	7.2
	45	37.5	44.5	105	9×14×12	3000	37.1	62.2	1.7	1.5	3.5	12.2
	48	46	47.5	120	11×17.5×14	3000	55.1	87.4	2.7	2.4	5.2	14.3
	63	56	62	150	14×20×17	3000	90.8	152	9.8	4.9	9.4	27.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-180.)
Static permissible moment * : double caseings: static permissible moment value with 2 casings closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model NSR-TBC variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.

For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

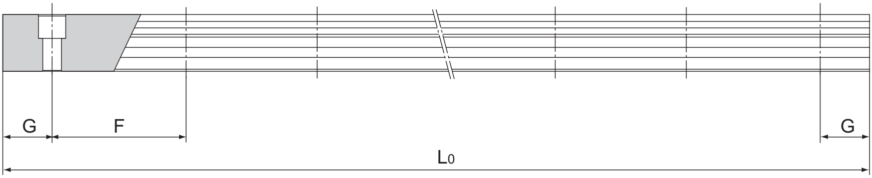
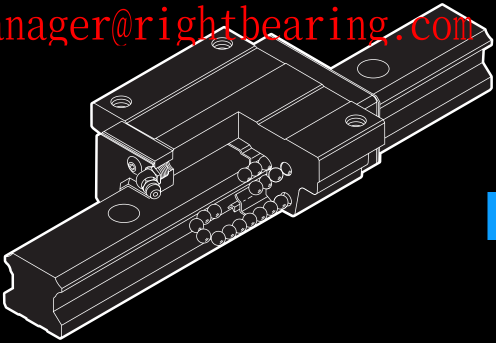


Table1 Standard Length and Maximum Length of the LM Rail for Model NSR-TBC

Unit: mm

Model No.	NSR 20TBC	NSR 25TBC	NSR 30TBC	NSR 40TBC	NSR 50TBC	NSR 70TBC
LM rail standard length (L_0)	220 280 340 460 640 820 1000 1240 1600	280 440 600 760 1000 1240 1640 2040 2520 3000	280 440 600 760 1000 1240 1640 2040 2520 3000	570 885 1200 1620 2040 2460 2985	780 1020 1260 1500 1980 2580 2940	1270 1570 2020 2620
Standard pitch F	60	80	80	105	120	150
G	20	20	20	22.5	30	35
Max length	2200	3000	3000	3000	3000	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



HSR-M1

LM Guide

B Product Specifications

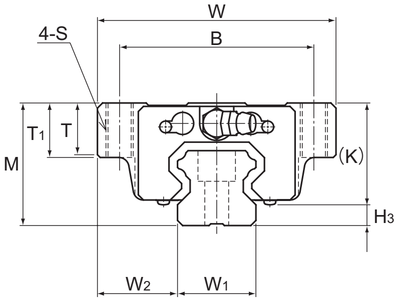
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models HSR-M1A and HSR-M1LA



Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	S	L_1	T	T_1	K	N	E	Grease nipple	H_3
HSR 15M1A	24	47	59.6	38	30	M5	38.8	6.5	11	19.3	4.3	5.5	PB1021B	3.5
HSR 20M1A HSR 20M1LA	30	63	76 92	53	40	M6	50.8 66.8	9.5	10	26	5	12	B-M6F	4
HSR 25M1A HSR 25M1LA	36	70	83.9 103	57	45	M8	59.5 78.6	11	16	30.5	6	12	B-M6F	5.5
HSR 30M1A HSR 30M1LA	42	90	98.8 121.4	72	52	M10	70.4 93	9	18	35	7	12	B-M6F	7
HSR 35M1A HSR 35M1LA	48	100	112 137.4	82	62	M10	80.4 105.8	12	21	40.5	8	12	B-M6F	7.5

Note) The length L of the high temperature type LM Guide model HSR is longer than normal type of model HSR. (Dimension L_1 is the same.)

Model number coding

HSR25 M1 A 2 UU C1 +1240L P T -Ⅱ

Model number

Symbol for high temperature type LM Guide

Type of LM block

No. of LM blocks used on the same rail

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

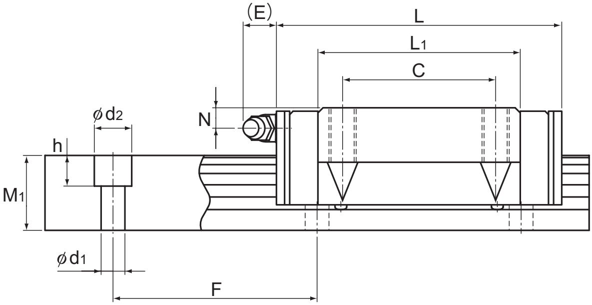
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

Symbol for LM rail jointed use

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)

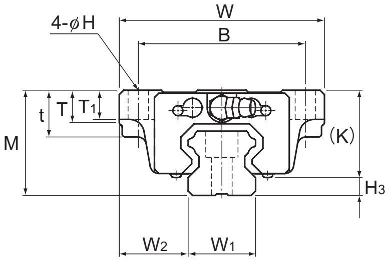


Unit: mm

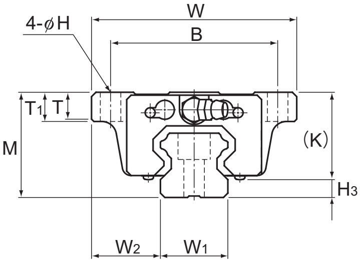
	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W1 ±0.05	W2	Height M1	Pitch F	d1×d2×h	Length* Max	C kN	C0 kN	MA 1 block	MA Double blocks	MB 1 block	MB Double blocks	MC 1 block	LM block kg	LM rail kg/m
	15	16	15	60	4.5×7.5×5.3	1240	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
	20	21.5	18	60	6×9.5×8.5	1500	13.8 21.3	23.8 31.8	0.19 0.323	1.04 1.66	0.19 0.323	1.04 1.66	0.201 0.27	0.35 0.47	2.3
	23	23.5	22	60	7×11×9	1500	19.9 27.2	34.4 45.9	0.307 0.529	1.71 2.74	0.307 0.529	1.71 2.74	0.344 0.459	0.59 0.75	3.3
	28	31	26	80	9×14×12	1500	28 37.3	46.8 62.5	0.524 0.889	2.7 4.37	0.524 0.889	2.7 4.37	0.562 0.751	1.1 1.3	4.8
	34	33	29	80	9×14×12	1500	37.3 50.2	61.1 81.5	0.782 1.32	3.93 6.35	0.782 1.32	3.93 6.35	0.905 1.2	1.6 2	6.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-190.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models HSR-M1B and HSR-M1LB



Models HSR15, 25 to 35M1B/M1LB



Models HSR20M1B/M1LB

Model No.	Outer dimensions			LM block dimensions											
	Height M	Width W	Length L	B	C	H	L_1	t	T	T_1	K	N	E	Grease nipple	H_3
HSR 15M1B	24	47	59.6	38	30	4.5	38.8	11	6.5	7	19.3	4.3	5.5	PB1021B	3.5
HSR 20M1B HSR 20M1LB	30	63	76 92	53	40	6	50.8 66.8	—	9.5	10	26	5	12	B-M6F	4
HSR 25M1B HSR 25M1LB	36	70	83.9 103	57	45	7	59.5 78.6	16	11	10	30.5	6	12	B-M6F	5.5
HSR 30M1B HSR 30M1LB	42	90	98.8 121.4	72	52	9	70.4 93	18	9	10	35	7	12	B-M6F	7
HSR 35M1B HSR 35M1LB	48	100	112 137.4	82	62	9	80.4 105.8	21	12	13	40.5	8	12	B-M6F	7.5

Note) The length L of the high temperature type LM Guide model HSR is longer than normal type of model HSR. (Dimension L_1 is the same.)

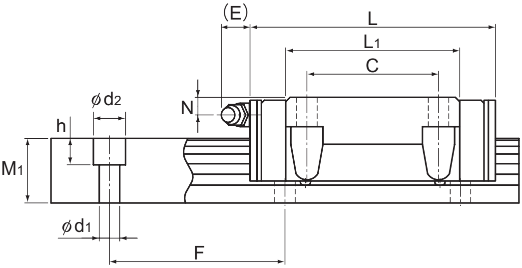
Model number coding

HSR20 M1 LB 2 UU C0 +1000L P T -Ⅱ

- HSR20: Model number
- M1: Symbol for high temperature type LM Guide
- LB: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
- +1000L: LM rail length (in mm)
- P: Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



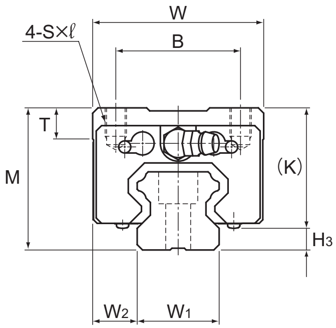
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C₀	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	16	15	60	4.5×7.5×5.3	1240	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
	20	21.5	18	60	6×9.5×8.5	1500	13.8 21.3	23.8 31.8	0.19 0.323	1.04 1.66	0.19 0.323	1.04 1.66	0.201 0.27	0.35 0.47	2.3
	23	23.5	22	60	7×11×9	1500	19.9 27.2	34.4 45.9	0.307 0.529	1.71 2.74	0.307 0.529	1.71 2.74	0.344 0.459	0.59 0.75	3.3
	28	31	26	80	9×14×12	1500	28 37.3	46.8 62.5	0.524 0.889	2.7 4.37	0.524 0.889	2.7 4.37	0.562 0.751	1.1 1.3	4.8
	34	33	29	80	9×14×12	1500	37.3 50.2	61.1 81.5	0.782 1.32	3.93 6.35	0.782 1.32	3.93 6.35	0.905 1.2	1.6 2	6.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-190.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 **Dimensions⇒B-223**

Models HSR-M1R and HSR-M1LR



Model No.	Outer dimensions			LM block dimensions										H3
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple		H_3
HSR 15M1R	28	34	59.6	26	26	M4×5	38.8	6	23.3	8.3	5.5	PB1021B		3.5
HSR 20M1R HSR 20M1LR	30	44	76 92	32	36 50	M5×6	50.8 66.8	8	26	5	12	B-M6F		4
HSR 25M1R HSR 25M1LR	40	48	83.9 103	35	35 50	M6×8	59.5 78.6	8	34.5	10	12	B-M6F		5.5
HSR 30M1R HSR 30M1LR	45	60	98.8 121.4	40	40 60	M8×10	70.4 93	8	38	10	12	B-M6F		7
HSR 35M1R HSR 35M1LR	55	70	112 137.4	50	50 72	M8×12	80.4 105.8	10	47.5	15	12	B-M6F		7.5

Note) The length L of the high temperature type LM Guide model HSR is longer than normal type of model HSR. (Dimension L_1 is the same.)

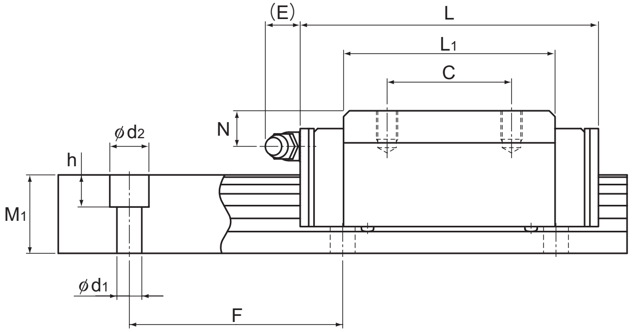
Model number coding

HSR35 M1 R 2 UU C0 +1080L P T -Ⅱ

- HSR35: Model number
- M1: Symbol for high temperature type LM Guide
- R: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1080L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)

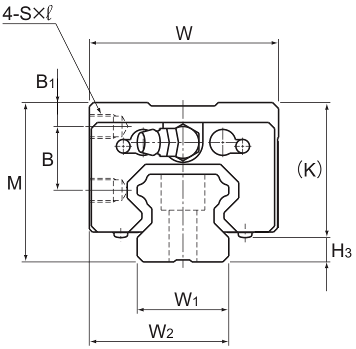


Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C₀	MA		MB		MC	LM block	LM rail
	W₁ ±0.05	W₂	M₁	F	d₁×d₂×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	9.5	15	60	4.5×7.5×5.3	1240	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
	20	12	18	60	6×9.5×8.5	1500	13.8 21.3	23.8 31.8	0.19 0.323	1.04 1.66	0.19 0.323	1.04 1.66	0.201 0.27	0.35 0.47	2.3
	23	12.5	22	60	7×11×9	1500	19.9 27.2	34.4 45.9	0.307 0.529	1.71 2.74	0.307 0.529	1.71 2.74	0.344 0.459	0.59 0.75	3.3
	28	16	26	80	9×14×12	1500	28 37.3	46.8 62.5	0.524 0.889	2.7 4.37	0.524 0.889	2.7 4.37	0.562 0.751	1.1 1.3	4.8
	34	18	29	80	9×14×12	1500	37.3 50.2	61.1 81.5	0.782 1.32	3.93 6.35	0.782 1.32	3.93 6.35	0.905 1.2	1.6 2	6.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-190.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Model HSR-M1YR



Model No.	Outer dimensions			LM block dimensions									
	Height M	Width W	Length L	B_1	B	C	S×ℓ	L_1	K	N	E	Grease nipple	H_3
HSR 15M1YR	28	33.5	59.6	4.3	11.5	18	M4×5	38.8	23.3	8.3	5.5	PB1021B	3.5
HSR 20M1YR	30	43.5	76	4	11.5	25	M5×6	50.8	26	5	12	B-M6F	4
HSR 25M1YR	40	47.5	83.9	6	16	30	M6×6	59.5	34.5	10	12	B-M6F	5.5
HSR 30M1YR	45	59.5	98.8	8	16	40	M6×9	70.4	38	10	12	B-M6F	7
HSR 35M1YR	55	69.5	112	8	23	43	M8×10	80.4	47	15	12	B-M6F	7.5

Note) The length L of the high temperature type LM Guide model HSR-YR is longer than normal type of model HSR-YR. (Dimension L_1 is the same.)

Model number coding

HSR25 M1 YR 2 UU C0 +1200L P T -Ⅱ

Model number

Symbol for high temperature type LM Guide

Type of LM block

No. of LM blocks used on the same rail

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

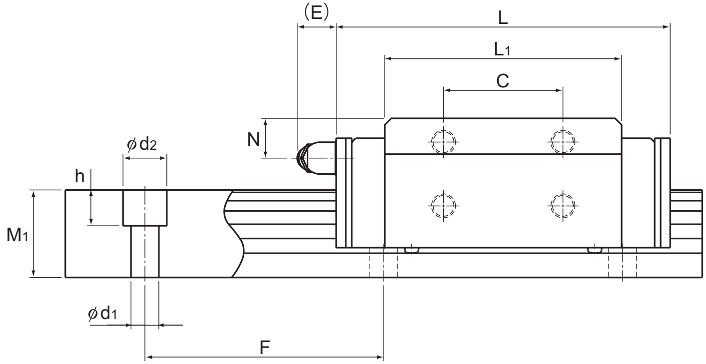
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

Symbol for LM rail jointed use

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W_1 ±0.05	W_2	Height M_1	Pitch F	d_1×d_2×h	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	15	24	15	60	4.5×7.5×5.3	1240	8.33	13.5	0.0805	0.457	0.0805	0.457	0.0844	0.2	1.5
	20	31.5	18	60	6×9.5×8.5	1500	13.8	23.8	0.19	1.04	0.19	1.04	0.201	0.35	2.3
	23	35	22	60	7×11×9	1500	19.9	34.4	0.307	1.71	0.307	1.71	0.344	0.59	3.3
	28	43.5	26	80	9×14×12	1500	37.3	62.5	0.524	2.7	0.524	2.7	0.562	1.3	4.8
	34	51.5	29	80	9×14×12	1500	37.3	61.1	0.782	3.93	0.782	3.93	0.905	1.6	6.6

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-190.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model HSR-M1 variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.

For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

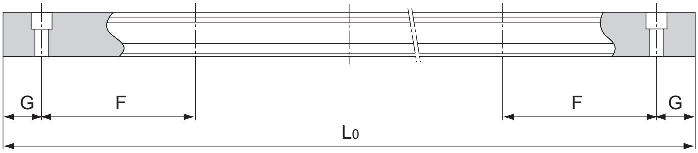
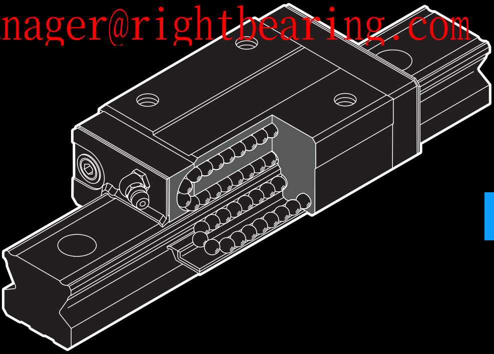


Table1 Standard Length and Maximum Length of the LM Rail for Model HSR-M1 Unit: mm

Model No.	HSR 15M1	HSR 20M1	HSR 25M1	HSR 30M1	HSR 35M1
LM rail standard length (L_0)	160 220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240	220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1360 1480	220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1300 1360 1420 1480	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480
Standard pitch F	60	60	60	80	80
G	20	20	20	20	20
Max length	1240	1500	1500	1500	1500

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.
Note3) The values for HSR-M1 also apply to HSR-M1YR.



SR-M1

LM Guide

B Product Specifications

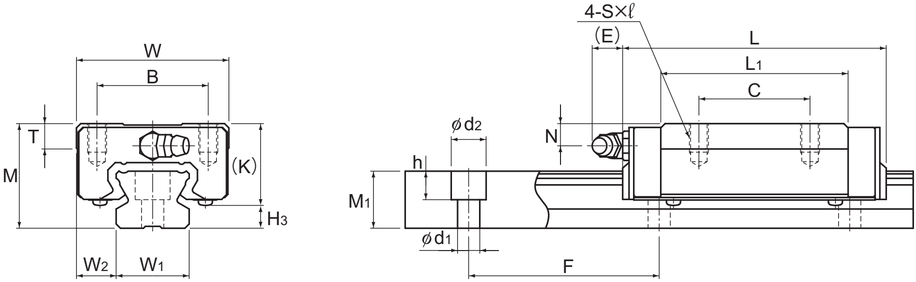
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SR-M1W and SR-M1V



Model SR-M1W

Model No.	Outer dimensions			LM block dimensions									
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Grease nipple	H_3
SR 15M1W SR 15M1V	24	34	57 40.4	26	26 —	M4×7	39.5 22.9	6	19.5	6	5.5	PB1021B	4.5
SR 20M1W SR 20M1V	28	42	66.2 47.3	32	32 —	M5×8	46.7 27.8	7.5	22	6	12	B-M6F	6
SR 25M1WY SR 25M1VY	33	48	83 59.2	35	35 —	M6×9	59 35.2	8	26	7	12	B-M6F	7
SR 30M1W SR 30M1V	42	60	96.8 67.9	40	40 —	M8×12	69.3 40.4	9	32.5	8	12	B-M6F	9.5
SR 35M1W SR 35M1V	48	70	111 77.6	50	50 —	M8×12	79 45.7	13	36.5	8.5	12	B-M6F	11.5

Model number coding

SR30 M1 W 2 UU C0 +1160L P T -Ⅱ

Model number

Symbol for high temperature type LM Guide

Type of LM block

No. of LM blocks used on the same rail

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

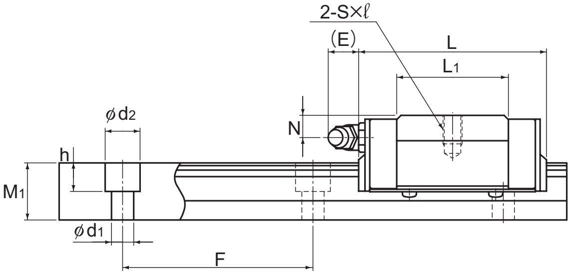
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

Symbol for LM rail jointed use

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Model SR-M1V

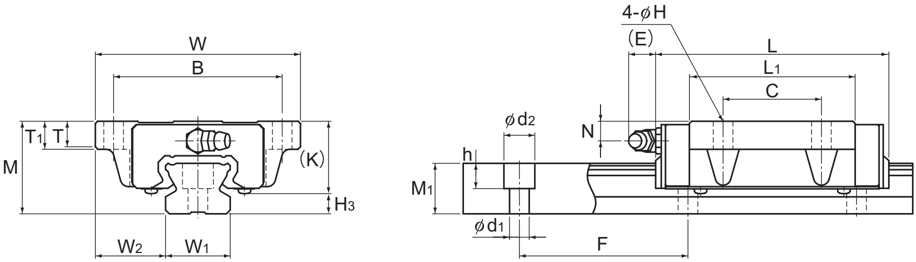
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width W₁ ±0.05	W₂	Height M₁	Pitch F	d₁×d₂×h	Length* Max	C kN	C₀ kN	Mᴀ 1 block	Mᴀ Double blocks	Mʙ 1 block	Mʙ Double blocks	Mᴄ 1 block	LM block kg	LM rail kg/m
	15	9.5	12.5	60	3.5×6×4.5	1240	9.51 5.39	19.3 11.1	0.0925 0.0326	0.516 0.224	0.0567 0.0203	0.321 0.143	0.113 0.0654	0.2 0.12	1.2
	20	11	15.5	60	6×9.5×8.5	1500	12.5 7.16	25.2 14.4	0.146 0.053	0.778 0.332	0.0896 0.0329	0.481 0.21	0.194 0.11	0.3 0.2	2.1
	23	12.5	18	60	7×11×9	1500	20.3 11.7	39.5 22.5	0.286 0.103	1.52 0.649	0.175 0.0642	0.942 0.41	0.355 0.201	0.4 0.3	2.7
	28	16	23	80	7×11×9	1500	30 17.2	56.8 32.5	0.494 0.163	2.55 1.08	0.303 0.102	1.57 0.692	0.611 0.352	0.8 0.5	4.3
	34	18	27.5	80	9×14×12	1500	41.7 23.8	77.2 44.1	0.74 0.259	4.01 1.68	0.454 0.161	2.49 1.07	1.01 0.576	1.2 0.8	6.4

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-196.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Models SR-M1TB and SR-M1SB



Model SR-M1TB

Model No.	Outer dimensions			LM block dimensions											H3
	Height M	Width W	Length L	B	C	H	L_1	T	T_1	K	N	E	Grease nipple		
SR 15M1TB SR 15M1SB	24	52	57 40.4	41	26 —	4.5	39.5 22.9	6.1	7	19.5	6	5.5	PB1021B		4.5
SR 20M1TB SR 20M1SB	28	59	66.2 47.3	49	32 —	5.5	46.7 27.8	8	9	22	6	12	B-M6F		6
SR 25M1TBY SR 25M1SBY	33	73	83 59.2	60	35 —	7	59 35.2	9	10	26	7	12	B-M6F		7
SR 30M1TB SR 30M1SB	42	90	96.8 67.9	72	40 —	9	69.3 40.4	8.7	10	32.5	8	12	B-M6F		9.5
SR 35M1TB SR 35M1SB	48	100	111 77.6	82	50 —	9	79 45.7	11.2	13	36.5	8.5	12	B-M6F		11.5

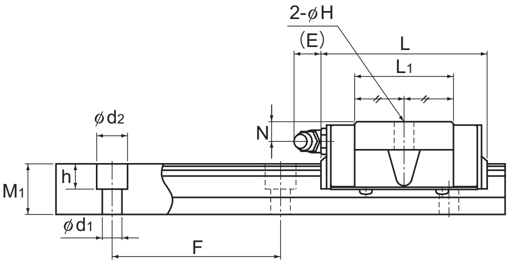
Model number coding

SR30 M1 W 2 UU C0 +1000L P T -Ⅱ

- SR30: Model number
- M1: Symbol for high temperature type LM Guide
- W: Type of LM block
- 2: No. of LM blocks used on the same rail
- UU: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1000L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Model SR-M1SB

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 ±0.05	W_2	M_1	F	d_1×d_2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	15	18.5	12.5	60	3.5×6×4.5	1240	9.51 5.39	19.3 11.1	0.0926 0.0326	0.516 0.224	0.0567 0.0203	0.321 0.143	0.113 0.0654	0.2 0.12	1.2
	20	19.5	15.5	60	6×9.5×8.5	1500	12.5 7.16	25.2 14.4	0.146 0.053	0.778 0.332	0.0896 0.0329	0.481 0.21	0.194 0.11	0.3 0.2	2.1
	23	25	18	60	7×11×9	1500	20.3 11.7	39.5 22.5	0.286 0.103	1.52 0.649	0.175 0.0642	0.942 0.41	0.355 0.201	0.4 0.3	2.7
	28	31	23	80	7×11×9	1500	30 17.2	56.8 32.5	0.494 0.163	2.55 1.08	0.303 0.102	1.57 0.692	0.611 0.352	0.8 0.5	4.3
	34	33	27.5	80	9×14×12	1500	41.7 23.8	77.2 44.1	0.74 0.259	4.01 1.68	0.454 0.161	2.49 1.07	1.01 0.576	1.2 0.8	6.4

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-196.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SR-M1 variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

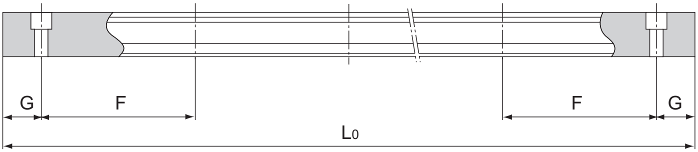
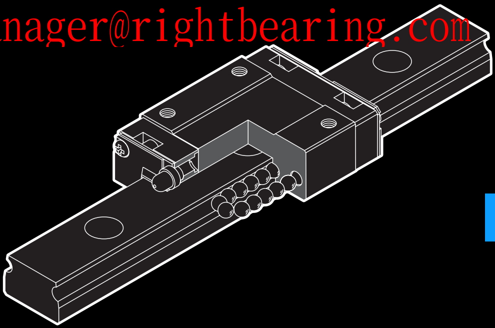


Table1 Standard Length and Maximum Length of the LM Rail for Model SR-M1

Unit: mm

Model No.	SR 15M1	SR 20M1	SR 25M1	SR 30M1	SR 35M1
LM rail standard length (L_0)	160	220	220	280	280
	220	280	280	360	360
	280	340	340	440	440
	340	400	400	520	520
	400	460	460	600	600
	460	520	520	680	680
	520	580	580	760	760
	580	640	640	840	840
	640	700	700	920	920
	700	760	760	1000	1000
	760	820	820	1080	1080
	820	940	940	1160	1160
	940	1000	1000	1240	1240
	1000	1060	1060	1320	1320
	1060	1120	1120	1400	1400
	1120	1180	1240	1480	1480
	1180	1240	1300		
	1240	1300	1360		
		1360	1420		
		1420	1480		
Standard pitch F	60	60	60	80	80
G	20	20	20	20	20
Max length	1240	1500	1500	1500	1500

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



RSR-M1

LM Guide

B Product Specifications

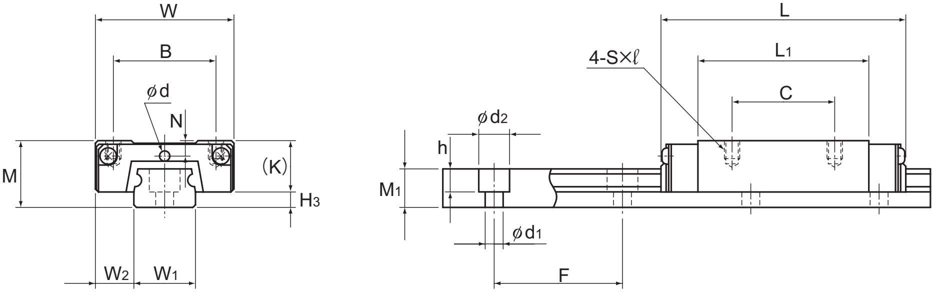
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models RSR-M1K, RSR-M1V and RSR-M1N



Models RSR9M1K/9M1N and RSR12M1V/M1N

Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greas-ing hole d	Grease nipple	H_3
RSR 9M1K RSR 9M1N	10	20	30.8 41	15	10 16	M3×3	19.8 29.8	—	7.8	—	—	—	—	2.2
RSR 12M1V RSR 12M1N	13	27	35 47.7	20	15 20	M3×3.5	20.6 33.3	—	10	3	—	2	—	3
RSR 15M1V RSR 15M1N	16	32	43 61	25	20 25	M3×4	25.7 43.5	—	12	3.5	3.6 3.7	—	PB107	4
RSR 20M1V RSR 20M1N	25	46	66.5 86.3	38	38	M4×6	45.2 65	5.7	17.5	5	6.4	—	A-M6F	7.5

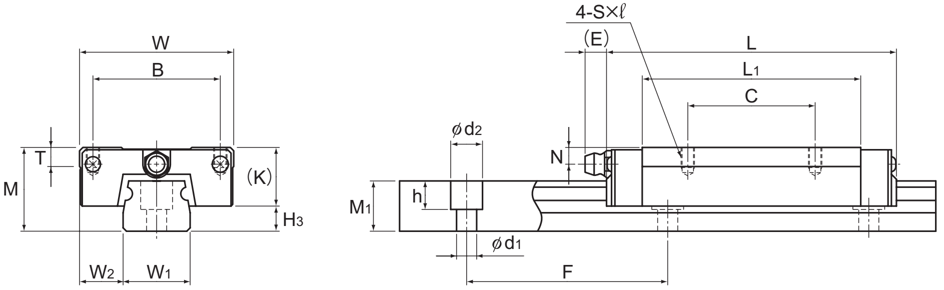
Model number coding

2 RSR15 M1 V UU C1 +230L P T -Ⅱ

- 2: No. of LM blocks used on the same rail
- RSR15: Model number
- M1: Symbol for high temperature type LM Guide
- V: Type of LM block
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +230L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Models RSR15 and 20M1V/M1N

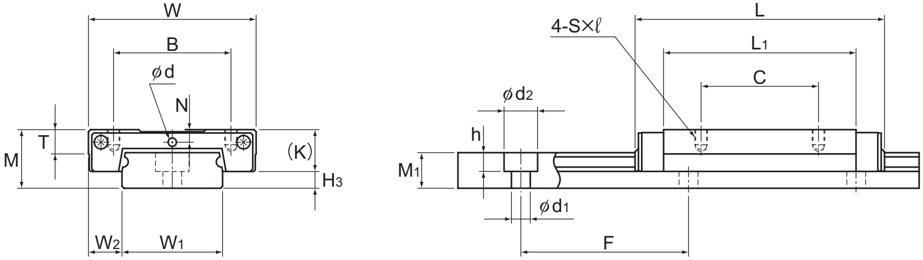
Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width		Height	Pitch		Length*	C	C₀	MA		MB		MC	LM block	LM rail
	W1	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	9 $^{0}_{-0.02}$	5.5	5.5	20	3.5×6×3.3	1000	1.47 2.6	2.25 3.96	7.34 18.4	43.3 97	7.34 18.4	43.3 97	10.4 18.4	0.018 0.027	0.32
	12 $^{0}_{-0.025}$	7.5	7.5	25	3.5×6×4.5	1340	2.65 4.3	4.02 6.65	11.4 28.9	74.9 163	10.1 25.5	67.7 145	19.2 31.8	0.037 0.055	0.58
	15 $^{0}_{-0.025}$	8.5	9.5	40	3.5×6×4.5	1430	4.41 7.16	6.57 10.7	23.7 63.1	149 330	21.1 55.6	135 293	38.8 63	0.069 0.093	0.925
	20 $^{0}_{-0.03}$	13	15	60	6×9.5×8.5	1800	8.82 14.2	12.7 20.6	75.4 171	435 897	66.7 151	389 795	96.6 157	0.245 0.337	1.95

Note) The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-202.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 **Dimensions⇒B-223**

Models RSR-M1WV and RSR-M1WN



Models RSR9 and 12M1WV/M1WN

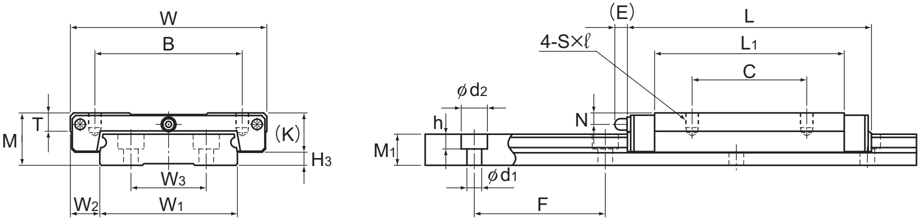
Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	S×ℓ	L_1	T	K	N	E	Greasing hole d	Grease nipple	H_3
RSR 9M1WV RSR 9M1WN	12	30	39 50.7	21 23	12 24	M2.6×3 M3×3	27 38.7	—	7.8	2	—	1.6	—	4.2
RSR 12M1WV RSR 12M1WN	14	40	44.5 59.5	28	15 28	M3×3.5	30.9 45.9	4.5	10	3	—	2	—	4
RSR 15M1WV RSR 15M1WN	16	60	55.5 74.5	45	20 35	M4×4.5	38.9 57.9	5.6	12	3.5	3	—	PB107	4

Model number coding

2 RSR12 M1 WN UU C1 +310L P T

- 2: No. of LM blocks used on the same rail
- RSR12: Model number
- M1: Symbol for high temperature type LM Guide
- WN: Type of LM block
- UU: Contamination protection accessory symbol (*1)
- C1: Radial clearance symbol (*2)
  Normal (No symbol)
  Light preload (C1)
  Medium preload (C0)
- +310L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)/Super precision grade (SP)
  Ultra precision grade (UP)
- T: Symbol for LM rail jointed use

(*1) See contamination protection accessory on A-368. (*2) See A-114. (*3) See A-126.



Models RSR15M1WV/M1WN

Unit: mm

LM rail dimensions							Basic load rating		Static permissible moment N-m*					Mass	
Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
W_1	W_2	W_3	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
18 $^{0}_{-0.05}$	6	—	7.5	30	3.5×6×4.5	1000	2.45 3.52	3.92 5.37	16 31	92.9 161	16 31	92.9 161	36 49.4	0.035 0.051	1.08
24 $^{0}_{-0.05}$	8	—	8.5	40	4.5×8×4.5	1340	4.02 5.96	6.08 9.21	24.5 53.9	138 274	21.7 47.3	123 242	59.5 90.1	0.075 0.101	1.5
42 $^{0}_{-0.05}$	9	23	9.5	40	4.5×8×4.5	1430	6.66 9.91	9.8 14.9	50.3 110	278 555	44.4 97.3	248 490	168 255	0.17 0.21	3

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-202.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model RSR-M1 variations.

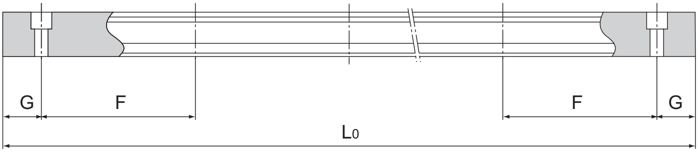
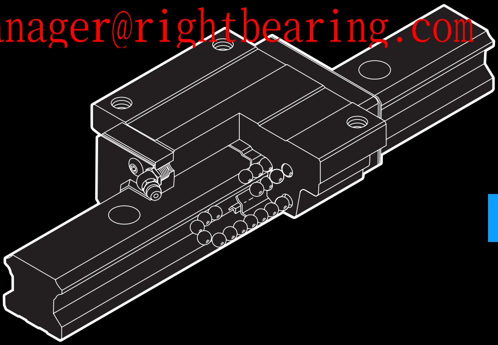


Table1 Standard Length and Maximum Length of the LM Rail for Model RSR-M1 Unit: mm

Model No.	RSR 9M1	RSR 12M1	RSR 15M1	RSR 20M1	RSR 9M1W	RSR 12M1W	RSR 15M1W
LM rail standard length (L_0)	55 75 95 115 135 155 175 195 275 375	70 95 120 145 170 195 220 245 270 320 370 470 570	70 110 150 190 230 270 310 350 390 430 470 550 670 870	220 280 340 460 640 880 1000	50 80 110 140 170 200 260 290 320	70 110 150 190 230 270 310 390 470 550	110 150 190 230 270 310 430 550 670 790
Standard pitch F	20	25	40	60	30	40	40
G	7.5	10	15	20	10	15	15
Max length	1000	1340	1430	1800	1000	1430	1800

Note) The maximum length varies with accuracy grades. Contact THK for details.



HSR-M2

LM Guide

B Product Specifications

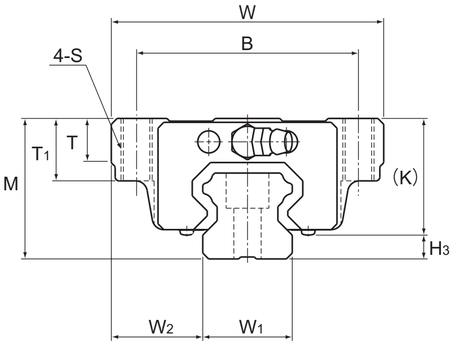
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model HSR-M2A



Model No.	Outer dimensions			LM block dimensions										
	Height M	Width W	Length L	B	C	S	L_1	T	T_1	K	N	E	Grease nipple	H_3
HSR 15M2A	24	47	56.6	38	30	M5	38.8	6.5	11	19.3	4.3	5.5	PB1021B	3.5
HSR 20M2A	30	63	74	53	40	M6	50.8	9.5	10	26	5	12	B-M6F	4
HSR 25M2A	36	70	83.1	57	45	M8	59.5	11	16	30.5	6	12	B-M6F	5.5

Note) For the high corrosion resistance type LM Guide, a stainless steel end plate is optionally available. (symbol···I)

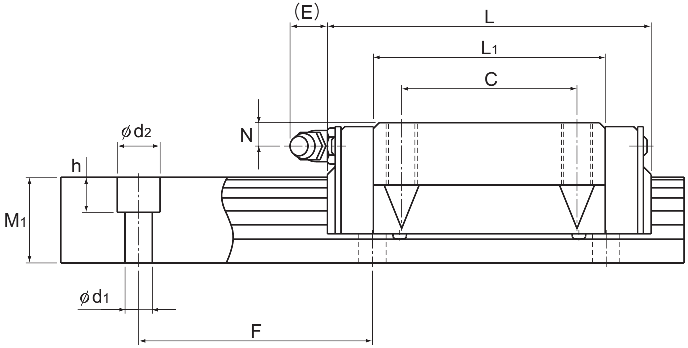
Model number coding

HSR20M2 A 2 UU C1 Ⅰ +820L P T -Ⅱ

Code	Meaning
HSR20M2	Model number (high corrosion resistance type LM Guide)
A	Type of LM block
2	No. of LM blocks used on the same rail
UU	Contamination protection accessory symbol (*1)
C1	Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
Ⅰ	End plate is made of stainless steel
+820L	LM rail length (in mm)
P	Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
T	Symbol for LM rail jointed use
-Ⅱ	Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment N-m*					Mass	
	Width W_1 ±0.05	W_2	Height M_1	Pitch F	d_1×d_2×h	Length* Max	C kN	C_0 kN	M_A 1 block	M_A Double blocks	M_B 1 block	M_B Double blocks	M_C 1 block	LM block kg	LM rail kg/m
	15	16	15	60	4.5×7.5×5.3	1000	2.33	2.03	12.3	70.3	12.3	70.3	10.8	0.2	1.5
	20	21.5	18	60	6×9.5×8.5	1000	3.86	3.57	29	160	29	160	26.5	0.35	2.3
	23	23.5	22	60	7×11×9	1000	5.57	5.16	46.9	261	46.9	261	45.1	0.59	3.3

Note) The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-206.)
The basic load rating of the high corrosion resistance type LM Guide is smaller than ordinary stainless steel LM Guides.
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model HSR-M2 variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details.

For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

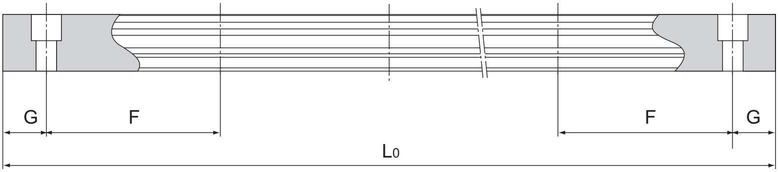
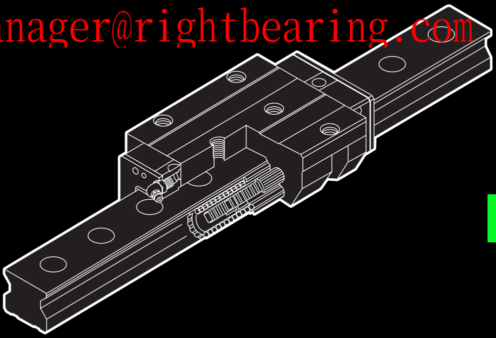


Table1 Standard Length and Maximum Length of the LM Rail for Model HSR-M2 Unit: mm

Model No.	HSR 15M2	HSR 20M2	HSR 25M2
LM rail standard length (L_0)	160 280 460 640	280 460 640 820	280 460 640 820 1000
Standard pitch F	60	60	60
G	20	20	20
Max length	1000	1000	1000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



SRG

Caged Roller LM Guide

B Product Specifications

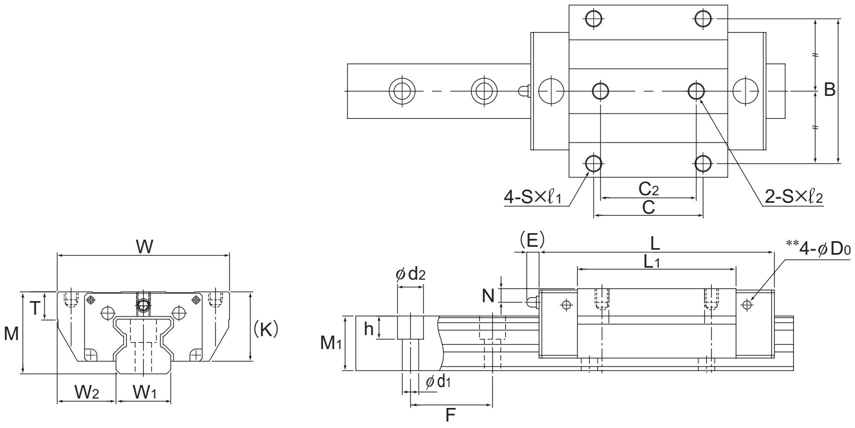
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SRG-A, SRG-LA, SRG-C and SRG-LC



Models SRG15A and 20A/LA

Model No.	Outer dimensions			LM block dimensions																
	Height	Width	Length																	Grease nipple
	M	W	L	B	C	C_2	S	H	ℓ_1	ℓ_2	L_1	T	T_1	K	N	E	e_0	f_0	D_0	
SRG 15A	24	47	69	38	30	26	M5	—	8	7.5	45	7	—	20	4	4.5	—	—	2.9	PB107
SRG 20A SRG 20LA	30	63	86 106	53	40	35	M6	—	10	9	58 78	10	—	25.4	5	4.5	—	—	2.9	PB107
SRG 25C SRG 25LC	36	70	95.5 115	57	45	40	M8	6.8	—	—	65.5 85.1	9.5	10	31.5	5.5	12	6	6.4	5.2	B-M6F
SRG 30C SRG 30LC	42	90	111 135	72	52	44	M10	8.5	—	—	75 99	12	14	37	6.5	12	6	6.2	5.2	B-M6F
SRG 35C SRG 35LC	48	100	125 155	82	62	52	M10	8.5	—	—	82.2 112.2	11.5	10	42	6.5	12	6	6.5	5.2	B-M6F
SRG 45C SRG 45LC	60	120	155 190	100	80	60	M12	10.5	—	—	107 142	14.5	15	52	10	16	7	7	5.2	B-PT1/8
SRG 55C SRG 55LC	70	140	185 235	116	95	70	M14	12.5	—	—	129.2 179.2	17.5	18	60	12	16	9	7.7	5.2	B-PT1/8
SRG 65LC	90	170	303	142	110	82	M16	14.5	—	—	229.8	19.5	20	78.5	17	16	9	12.4	5.2	B-PT1/8

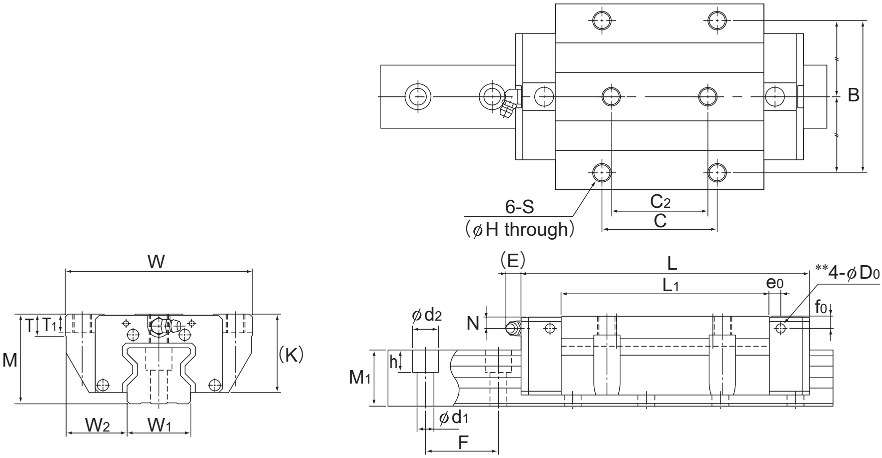
Model number coding

SRG45 LC 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SRG45: Model number
- LC: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  Normal (No symbol)
  Light preload (C1)
  Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  Normal grade (No Symbol)/High accuracy grade (H)
  Precision grade (P)/Super precision grade (SP)
  Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



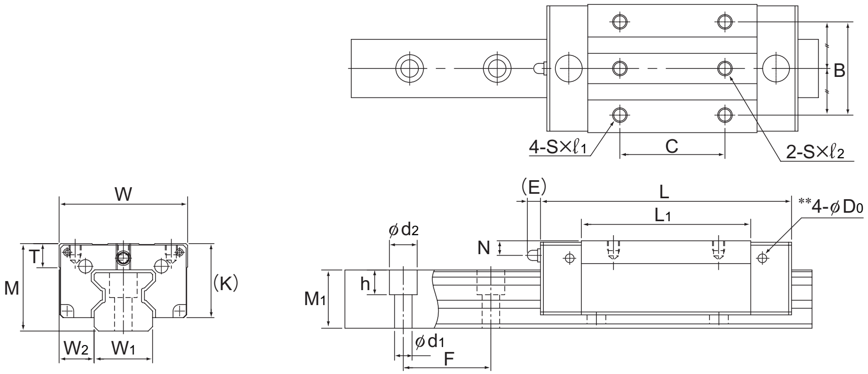
Models SRG25 to 65C/LC

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
H_3	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
4	15	16	15.5	30	4.5×7.5×5.3	2500	11.3	25.8	0.21	—	0.21	—	0.24	0.20	1.58
4.6	20	21.5	20	30	6×9.5×8.5	3000	21 26.7	46.9 63.8	0.48 0.88	—	0.48 0.88	—	0.58 0.79	0.42 0.57	2.58
4.5	23	23.5	23	30	7×11×9	3000	27.9 34.2	57.5 75	0.641 1.07	3.7 5.74	0.641 1.07	3.7 5.74	0.795 1.03	0.7 0.9	3.6
5	28	31	26	40	9×14×12	3000	39.3 48.3	82.5 108	1.02 1.76	6.21 9.73	1.02 1.76	6.21 9.73	1.47 1.92	1.2 1.6	4.4
6	34	33	30	40	9×14×12	3000	59.1 76	119 165	1.66 3.13	10.1 17	1.66 3.13	10.1 17	2.39 3.31	1.9 2.4	6.9
8	45	37.5	37	52.5	14×20×17	3090	91.9 115	192 256	3.49 6.13	20 32.2	3.49 6.13	20 32.2	4.98 6.64	3.7 4.5	11.6
10	53	43.5	43	60	16×23×20	3060	131 167	266 366	5.82 10.8	33 57	5.82 10.8	33 57	8.19 11.2	5.9 7.8	15.8
11.5	63	53.5	54	75	18×26×22	3000	278	599	22.7	120	22.7	120	22.1	16.4	23.7

Note) The greasing hole on the top face and the pilot hole of the side nipple** are not drilled through in order to prevent foreign material from entering the block.
See B-257 for details.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-212.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SRG-V, SRG-LV, SRG-R and SRG-LR



Models SRG15V and 20V/LV

Model No.	Outer dimensions			LM block dimensions														
	Height M	Width W	Length L	B	C	S	ℓ	ℓ_1	ℓ_2	L_1	T	K	N	E	e_0	f_0	D_0	Grease nipple
SRG 15V	24	34	69	26	26	M4	—	5	7.5	45	6	20	4	4.5	—	—	2.9	PB107
SRG 20V	30	44	86	32	36	M5	—	7	9	58	8	25.4	5	4.5	—	—	2.9	PB107
SRG 20LV			106		50					78								
SRG 25R	40	48	95.5	35	35	M6	9	—	—	65.5	9.5	35.5	9.5	12	6	10.4	5.2	B-M6F
SRG 25LR			115		50					85.1								
SRG 30R	45	60	111	40	40	M8	10	—	—	75	12	40	9.5	12	6	9.2	5.2	B-M6F
SRG 30LR			135		60					99								
SRG 35R	55	70	125	50	50	M8	12	—	—	82.2	18.5	49	13.5	12	6	13.5	5.2	B-M6F
SRG 35LR			155		72					112.2								
SRG 45R	70	86	155	60	60	M10	20	—	—	107	24.5	62	20	16	7	17	5.2	B-PT1/8
SRG 45LR			190		80					142								
SRG 55R	80	100	185	75	75	M12	18	—	—	129.2	27.5	70	22	16	9	22	5.2	B-PT1/8
SRG 55LR			235		95					179.2								
SRG 65LV	90	126	303	76	120	M16	20	—	—	229.8	19.5	78.5	17	16	9	12.4	5.2	B-PT1/8

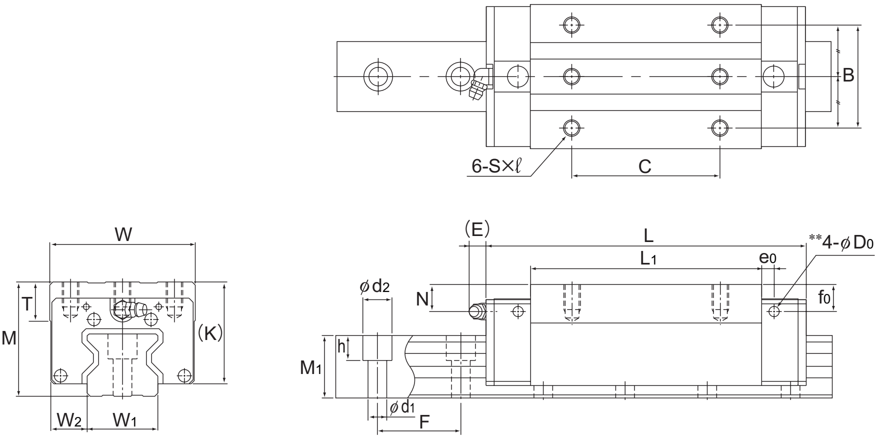
Model number coding

SRG45 LR 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SRG45: Model number
- LR: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator
- KKHH: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.



Models SRG25 to 65R/LR/LV

Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C0	MA		MB		MC	LM block	LM rail
H3	W1 0 -0.05	W2	M1	F	d1×d2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
4	15	9.5	15.5	30	4.5×7.5×5.3	2500	11.3	25.8	0.21	—	0.21	—	0.24	0.15	1.58
4.6	20	12	20	30	6×9.5×8.5	3000	21 26.7	46.9 63.8	0.48 0.88	—	0.48 0.88	—	0.58 0.79	0.28 0.38	2.58
4.5	23	12.5	23	30	7×11×9	3000	27.9 34.2	57.5 75	0.641 1.07	3.7 5.74	0.641 1.07	3.7 5.74	0.795 1.03	0.6 0.8	3.6
5	28	16	26	40	9×14×12	3000	39.3 48.3	82.5 108	1.02 1.76	6.21 9.73	1.02 1.76	6.21 9.73	1.47 1.92	0.9 1.2	4.4
6	34	18	30	40	9×14×12	3000	59.1 76	119 165	1.66 3.13	10.1 17	1.66 3.13	10.1 17	2.39 3.31	1.6 2.1	6.9
8	45	20.5	37	52.5	14×20×17	3090	91.9 115	192 256	3.49 6.13	20 32.2	3.49 6.13	20 32.2	4.98 6.64	3.2 4.1	11.6
10	53	23.5	43	60	16×23×20	3060	131 167	266 366	5.82 10.8	33 57	5.82 10.8	33 57	8.19 11.2	5 6.9	15.8
11.5	63	31.5	54	75	18×26×22	3000	278	599	22.7	120	22.7	120	22.1	12.1	23.7

Note) The greasing hole on the top face and the pilot hole of the side nipple** are not drilled through in order to prevent foreign material from entering the block.
See B-257 for details.
The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-212.)
Static permissible moment*: 1 block: static permissible value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SRG variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

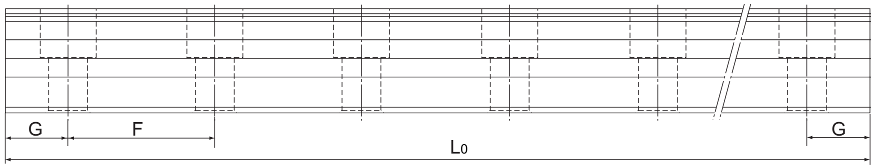
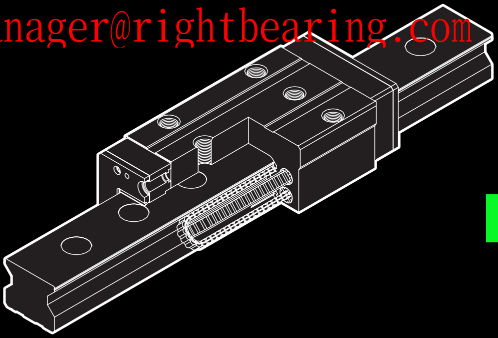


Table1 Standard Length and Maximum Length of the LM Rail for Model SRG Unit: mm

Model No.	SRG 15	SRG 20	SRG 25	SRG 30	SRG 35	SRG 45	SRG 55	SRG 65
LM rail standard length (L_0)	160 220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1360 1480 1600	220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1360 1480 1600 1720 1840 1960 2080 2200	220 280 340 400 460 520 580 640 700 760 820 940 1000 1060 1120 1180 1240 1300 1360 1420 1480 1540 1600 1720 1840 1960 2080 2200 2320 2440	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480 1560 1640 1720 1800 1880 1960 2040 2200 2360 2520 2680 2840 3000	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480 1560 1640 1720 1800 1880 1960 2040 2200 2360 2520 2680 2840 3000	570 675 780 885 990 1095 1200 1305 1410 1515 1620 1725 1830 1935 2040 2145 2250 2355 2460 2565 2670 2775 2880 2985 3090	780 900 1020 1140 1260 1380 1500 1620 1740 1860 1980 2100 2220 2340 2460 2580 2700 2820 2940 3060	1270 1570 2020 2620
Standard pitch F	30	30	30	40	40	52.5	60	75
G	20	20	20	20	20	22.5	30	35
Max length	2500	3000	3000	3000	3000	3090	3060	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



SRN

Caged Roller LM Guide

B Product Specifications

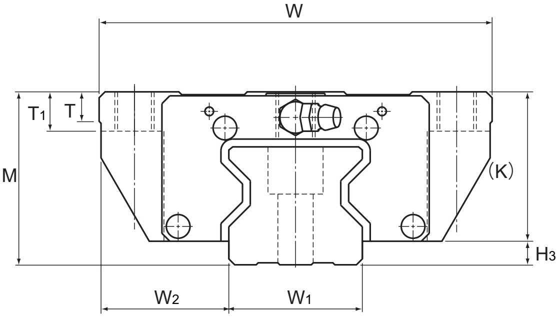
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Models SRN-C and SRN-LC



Model No.	Outer dimensions			LM block dimensions															
	Height M	Width W	Length L	B	C	C_2	S	H	L_1	T	T_1	K	N	E	e_0	f_0	D_0	Grease nipple	H_3
SRN 35C SRN 35LC	44	100	125 155	82	62	52	M10	8.5	82.2 112.2	7.5	10	38	6.5	12	8	6.5	5.2	B-M6F	6
SRN 45C SRN 45LC	52	120	155 190	100	80	60	M12	10.5	107 142	7.5	15	45	7	12	8.5	7	5.2	B-M6F	8
SRN 55C SRN 55LC	63	140	185 235	116	95	70	M14	12.5	129 179.2	10.5	18	53	8	16	10	8	5.2	PT1/8	10
SRN 65LC	75	170	303	142	110	82	M16	14.5	229.8	19.5	20	65	14	16	9	11	5.2	PT1/8	11.5

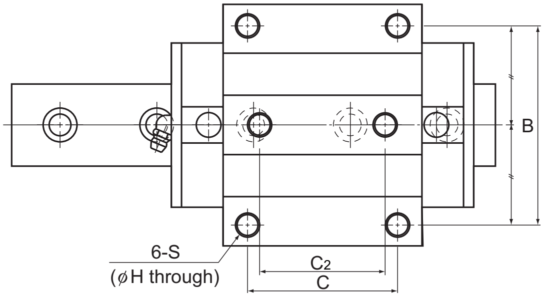
Model number coding

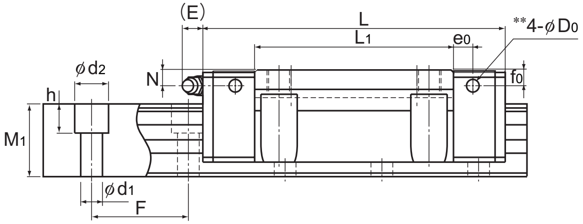
SRN45 C 2 KK C0 +1160L P T Z -Ⅱ

- SRN45: Model number
- C: Type of LM block
- 2: No. of LM blocks used on the same rail
- KK: Contamination protection accessory symbol (*1)
- C0: Radial clearance symbol (*2) Normal (No symbol) Light preload (C1) Medium preload (C0)
- +1160L: LM rail length (in mm)
- P: Accuracy symbol (*3) Normal grade (No Symbol)/High accuracy grade (H) Precision grade (P)/Super precision grade (SP) Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With plate cover
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)



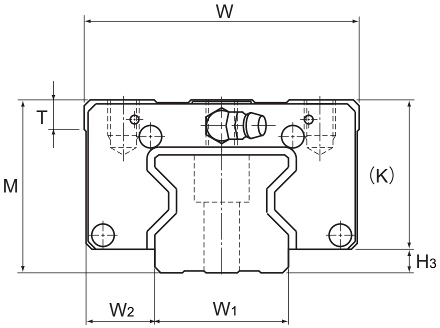


Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	$d_1 \times d_2 \times h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	34	33	30	40	9×14×12	3000	59.1 76	119 165	1.66 3.13	10.1 17	1.66 3.13	10.1 17	2.39 3.31	1.6 2	6.9
	45	37.5	36	52.5	14×20×17	3090	91.9 115	192 256	3.49 6.13	20 32.2	3.49 6.13	20 32.2	4.98 6.64	3 3.6	11.3
	53	43.5	43	60	16×23×20	3060	131 167	266 366	5.82 10.8	33 57	5.82 10.8	33 57	8.19 11.2	4.9 6.4	15.8
	63	53.5	49	75	18×26×22	3000	278	599	22.7	120	22.7	120	22.1	12.7	21.3

Note) The greasing hole on the top face and the pilot hole of the side nipple** are not drilled through in order to prevent foreign material from entering the block.
See B-258 for details.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-218.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Models SRN-R and SRN-LR



Model No.	Outer dimensions			LM block dimensions												
	Height	Width	Length												Grease nipple	
	M	W	L	B	C	S×ℓ	L_1	T	K	N	E	e_0	f_0	D_0		H_3
SRN 35R SRN 35LR	44	70	125 155	50	50 72	M8×9	82.2 112.2	7.5	38	6.5	12	8	6.5	5.2	B-M6F	6
SRN 45R SRN 45LR	52	86	155 190	60	60 80	M10×11	107 142	7.5	45	7	12	8.5	7	5.2	B-M6F	8
SRN 55R SRN 55LR	63	100	185 235	75	75 95	M12×13	129 179.2	10.5	53	8	16	10	8	5.2	PT1/8	10
SRN 65LR	75	126	303	76	120	M16×16	229.8	19.5	65	14	16	9	11	5.2	PT1/8	11.5

Model number coding

SRN45 LR 2 KK C0 +1200L P T Z -Ⅱ

Model number

Type of LM block

No. of LM blocks used on the same rail

Contamination protection accessory symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length (in mm)

Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

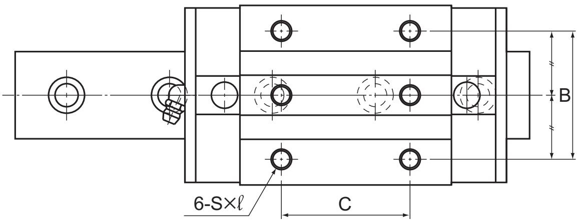
Symbol for LM rail jointed use

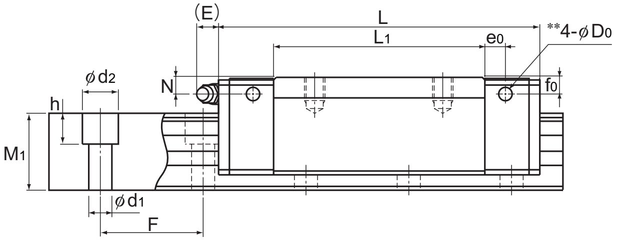
With plate cover

Symbol for No. of rails used on the same plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-119. (*4) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)





Unit: mm

	LM rail dimensions						Basic load rating		Static permissible moment kN-m*					Mass	
	Width		Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	M_1	F	d_1×d_2×h	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	34	18	30	40	9×14×12	3000	59.1 76	119 165	1.66 3.13	10.1 17	1.66 3.13	10.1 17	2.39 3.31	1.1 1.4	6.9
	45	20.5	36	52.5	14×20×17	3090	91.9 115	192 256	3.49 6.13	20 32.2	3.49 6.13	20 32.2	4.98 6.64	1.9 2.5	11.3
	53	23.5	43	60	16×23×20	3060	131 167	266 366	5.82 10.8	33 57	5.82 10.8	33 57	8.19 11.2	3.2 4.5	15.8
	63	31.5	49	75	18×26×22	3000	278	599	22.7	120	22.7	120	22.1	9.4	21.3

Note) The greasing hole on the top face and the pilot hole of the side nipple** are not drilled through in order to prevent foreign material from entering the block.
See B-258 for details.
The maximum length under "Length*" indicates the standard maximum length of an LM rail. (See B-218.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SRN variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used. Contact THK for details. For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.

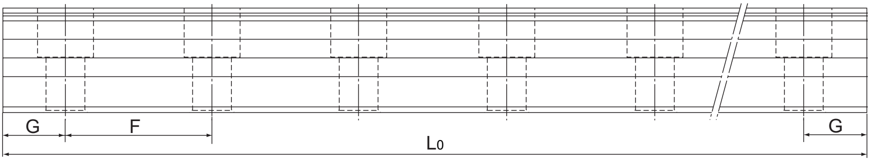
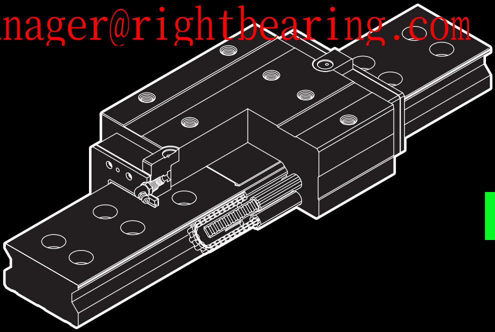


Table1 Standard Length and Maximum Length of the LM Rail for Model SRN

Unit: mm

Model No.	SRN 35	SRN 45	SRN 55	SRN 65
LM rail standard length (L_0)	280 360 440 520 600 680 760 840 920 1000 1080 1160 1240 1320 1400 1480 1560 1640 1720 1800 1880 1960 2040 2200 2360 2520 2680 2840 3000	570 675 780 885 990 1095 1200 1305 1410 1515 1620 1725 1830 1935 2040 2145 2250 2355 2460 2565 2670 2775 2880 2985 3090	780 900 1020 1140 1260 1380 1500 1620 1740 1860 1980 2100 2220 2340 2460 2580 2700 2820 2940 3060	1270 1570 2020 2620
Standard pitch F	40	52.5	60	75
G	20	22.5	30	35
Max length	3000	3090	3060	3000

Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.



SRW

Caged Roller LM Guide

B Product Specifications

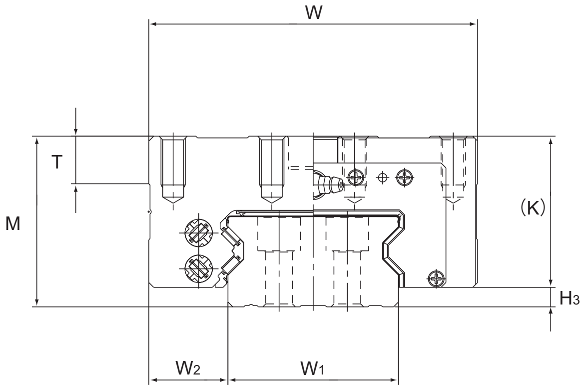
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model SRW-LR



Model No.	Outer dimensions			LM block dimensions													
	Height	Width	Length													Grease nipple	
	M	W	L	B	B_1	C	S×ℓ	L_1	T	K	N	E	e_0	f_0	D_0		H_3
SRW 70LR	70	135	190	115	34	80	M10×20	142	20	62	20	16	7	17	5.2	B-PT1/8	8
SRW 85LR	80	165	235	140	40	95	M12×19	179.2	28	70	22	16	9	17.7	5.2	B-PT1/8	10
SRW 100LR	100	200	303	172	50	110	M14×20	229.8	20	88.5	27	16	9	22.4	5.2	B-PT1/8	11.5

Model number coding

SRW70LR 2 QZ KKHH C0 +1200L P T Z -Ⅱ

Model number

No. of LM blocks
used on the same rail

With QZ
Lubricator

Contamination
protection
accessory
symbol (*1)

Radial clearance symbol (*2)
Normal (No symbol)
Light preload (C1)
Medium preload (C0)

LM rail length
(in mm)

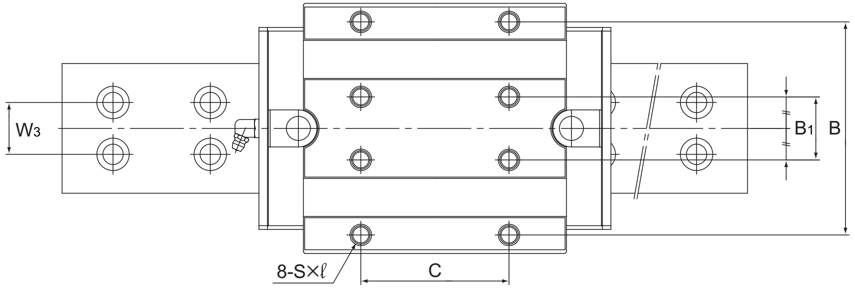
Accuracy symbol (*3)
Normal grade (No Symbol)/High accuracy grade (H)
Precision grade (P)/Super precision grade (SP)
Ultra precision grade (UP)

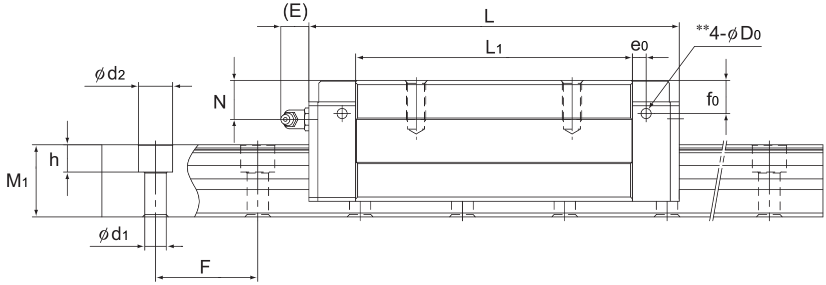
Symbol for LM rail
jointed use

With plate
cover

Symbol for
No. of rails used
on the same
plane (*4)

(*1) See contamination protection accessory on A-368. (*2) See A-115. (*3) See A-128. (*4) See A-59.





Unit: mm

	LM rail dimensions							Basic load rating		Static permissible moment kN-m*					Mass	
	Width			Height	Pitch		Length*	C	C_0	M_A		M_B		M_C	LM block	LM rail
	W_1 0 -0.05	W_2	W_3	M_1	F	$d_1×d_2×h$	Max	kN	kN	1 block	Double blocks	1 block	Double blocks	1 block	kg	kg/m
	70	32.5	28	37	52.5	11×17.5×14	3090	115	256	6.13	32.2	6.13	32.2	10.2	6.3	18.6
	85	40	32	43	60	14×20×17	3060	167	366	10.8	57	10.8	57	17.5	11.0	26.7
	100	50	38	54	75	16×23×20	3000	278	599	22.7	120	22.7	120	33.9	21.6	35.9

Note) 1. Model SRW is attached with “SS” as standard.
2. This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
3. For the standard LM rail length, see Table1 on B-222.
4. The greasing hole on the top face and the pilot hole of the side nipple** are not drilled through in order to prevent foreign material from entering the block.
For details, see B-259.
5. The removing/mounting jig is not provided as standard. When desiring to use it, contact THK.

The maximum length under “Length*” indicates the standard maximum length of an LM rail. (See B-222.)
Static permissible moment*: 1 block: static permissible moment value with 1 LM block
Double blocks: static permissible moment value with 2 blocks closely contacting with each other

Description of Each Option ⇒A-351 Dimensions⇒B-223

Standard Length and Maximum Length of the LM Rail

Table1 shows the standard lengths and the maximum lengths of model SRW variations. If the maximum length of the desired LM rail exceeds them, jointed rails will be used.
For the G dimension when a special length is required, we recommend selecting the corresponding G value from the table. The longer the G dimension is, the less stable the G area may become after installation, thus causing an adverse impact to accuracy.
If desiring connected use of this model, be sure to indicate the overall length so that we can manufacture the product without leaving a level difference in the joint.

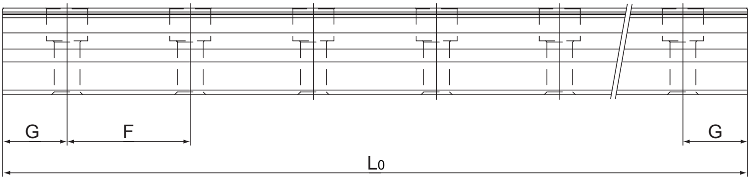


Table1 Standard Length and Maximum Length of the LM Rail for Model SRW Unit: mm

Model No.	SRW 70	SRW 85	SRW 100
LM rail standard length (L_0)	570 675 780 885 990 1095 1200 1305 1410 1515 1620 1725 1830 1935 2040 2145 2250 2355 2460 2565 2670 2775 2880 2985	780 900 1020 1140 1260 1380 1500 1620 1740 1860 1980 2100 2220 2340 2460 2580 2700 2820 2940 3060	1270 1570 2020 2620
Standard pitch F	52.5	60	75
G	22.5	30	35
Max length	3090	3060	3000

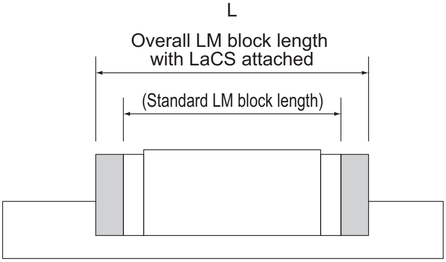
Note1) The maximum length varies with accuracy grades. Contact THK for details.
Note2) If jointed rails are not allowed and a greater length than the maximum values above is required, contact THK.

LM Guide

Options

Dimensions of Each Model with an Option Attached

The LM Block Dimension (Dimension L) with LaCS and Seals Attached



Unit: mm

Model No.		Standard overall length	L								
			UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
SHS	15C/V/R	64.4	64.4	64.4	69.8	66.8	72.2	78.6	84	79.8	85.2
	15LC/LV	79.4	79.4	79.4	84.8	81.8	87.2	93.6	99	94.8	100.2
	20C/V	79	79	79	85.4	83	89.4	93.6	100	96	102.4
	20LC/LV	98	98	98	104.4	102	108.4	112.6	119	115	121.4
	25C/V/R	92	92	92	101.6	100.4	107.6	112	119.2	114.4	121.6
	25LC/LV/LR	109	109	109	118.6	117.4	124.6	129	136.2	131.4	138.6
	30C/V/R	106	106	106	116	113.8	122.4	129.4	138	131.8	140.4
	30LC/LV/LR	131	131	131	141	138.8	147.4	154.4	163	156.8	165.4
	35C/V/R	122	122	122	134.8	132.4	142.2	148	157.8	150.4	160.2
	35LC/LV/LR	152	152	152	164.8	162.4	172.2	178	187.8	180.4	190.2
	45C/V/R	140	140	140	152.8	151.2	161	169	178.8	172.2	182
	45LC/LV/LR	174	174	174	186.8	185.2	195	203	212.8	206.2	216
	55C/V/R	171	171	171	186.6	184.2	195.4	202	213.2	205.2	216.4
	55LC/LV/LR	213	213	213	228.6	226.2	237.4	244	255.2	247.2	258.4
	65C/V	221	221	221	238.6	236.2	248.6	258	270.4	261.2	273.6
	65LC/LV	272	272	272	289.6	287.2	299.6	309	321.4	312.2	324.6
SSR	15XVY	40.3	40.3	40.3	47.3	44.9	50.7	59.5	65.3	60.7	66.5
	15XWY/XTBY	56.9	56.9	56.9	63.9	61.5	67.3	76.1	81.9	77.3	83.1
	20XV	47.7	47.7	47.7	54.6	53.4	60.3	67.7	74.6	70.1	77
	20XW/XTB	66.5	66.5	66.5	73.4	72.2	79.1	86.5	93.4	88.9	95.8
	25XVY	60	60	60	67.4	65.7	73.1	80	87.4	82.4	89.8
	25XWY/XTBY	83	83	83	90.4	88.7	96.1	103	110.4	105.4	112.8
	30XW	97	97	97	105.1	102.7	110.8	121	129.1	123.4	131.5
	35XW	110.9	110.9	110.9	119.9	117.7	126.7	136.9	145.9	139.3	148.3
SNR/ SNS	25R/C	82.8	82.8	82.8	90.4	89.2	96.8	100.1	107.7	102.5	110.1
	25LR/LC	102	102	102	109.6	108.4	116	119.3	126.9	121.7	129.3
	30R/C	98	98	98	107.8	104.4	114.2	118.5	128.3	120.9	130.7
	30LR/LC	120.5	120.5	120.5	130.3	126.9	136.7	141	150.8	143.4	153.2
	35R/C	109.5	109.5	109.5	119.7	117.1	127.3	131.1	141.3	133.5	143.7
	35LR/LC	135	135	135	145.2	142.6	152.8	156.6	166.8	159	169.2
	45R/C	138.2	138.2	138.2	148.4	146.6	156.8	163.2	173.4	166.4	176.6
	45LR/LC	171	171	171	181.2	179.4	189.6	196	206.2	199.2	209.4
	55R/C	163.3	163.3	163.3	172.7	171.1	181.3	187.8	198	191	201.2
	55LR/LC	200.5	200.5	200.5	209.9	208.3	218.5	225	235.2	228.2	238.4

Unit: mm

Model No.			L								
		Standard overall length	UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
SNR/ SNS	65R/C	186	186	186	196.2	194.2	204.8	214.3	224.9	217.5	228.1
	65LR/LC	246	246	246	256.2	254.2	264.8	274.3	284.9	277.5	288.1
	85LR/LC	302.8	302.8	302.8	313.8	311.8	322.8	—	—	—	—
SHW	12CAM/CRM	37	37	37	—	—	—	—	—	—	—
	12HRM	50.4	50.4	50.4	—	—	—	—	—	—	—
	14CAM/CRM	45.5	45.5	45.5	—	—	—	—	—	—	—
	17CAM/CRM	51	51	51	54	53.4	56.4	—	—	—	—
	21CA/CR	59	59	59	64	63.2	68.2	75.6	80.6	77.2	82.2
	27CA/CR	72.8	72.8	72.8	78.6	77.8	83.6	89.4	95.2	91.8	97.6
	35CA/CR	107	107	107	114.4	112	119.4	129	136.4	131.4	138.8
	50CA/CR	141	141	141	149.2	147.4	155.6	166	174.2	168.4	176.6
SRS	7	23.4	23.4	23.4	—	—	—	—	—	—	—
	7W	31	31	31	—	—	—	—	—	—	—
	9	30.8	30.8	30.8	—	—	—	—	—	—	—
	9W	39	39	39	—	—	—	—	—	—	—
	12	34.4	34.4	34.4	—	—	—	—	—	—	—
	12W	44.5	44.5	44.5	—	—	—	—	—	—	—
	15	43	43	43	—	—	—	—	—	—	—
	15W	55.5	55.5	55.5	—	—	—	—	—	—	—
	20	50	50	50	—	—	—	67.2	—	—	—
	25	77	77	77	—	—	—	95.2	—	—	—
SCR	15S	64.4	64.4	64.4	69.8	66.8	72.2	78.9	84.4	79.9	85.2
	20S	79	79	79	85.4	83	89.4	94	100	96	102.5
	20	98	98	98	104.4	102	108.4	113	119	115	121.5
	25	109	109	109	118.6	117.4	124.6	129	136.2	131.4	138.6
	30	131	131	131	141	138.8	147.4	154.4	163	156.8	165.4
	35	152	152	152	164.8	162.4	172.2	178	187.8	180.4	190.2
	45	174	174	174	186.8	185.2	195	203	212.8	206.2	216
	65	272	272	272	289.6	287.2	299.6	309	321.4	312.2	324.6
HSR	8RM	24	24	—	—	—	—	—	—	—	—
	10RM	31	31	—	—	—	—	—	—	—	—
	12RM	45	45	—	—	—	—	—	—	—	—
	15A/B/R/YR	56.6	56.6	56.6	61.8	58.2*	63.4*	76	81.2	77.2	82.4
	20A/B/R/CA/CB/YR	74	74	74	80.6	76.6	83.2	92	98.6	95.2	101.8
	20LA/LB/LR/HA/HB	90	90	90	96.6	92.6	99.2	108	114.6	111.2	117.8
	25A/B/R/CA/CB/YR	83.1	83.1	83.1	90.7	86.7	94.3	101	108.6	105.3	112.9
	25LA/LB/LR/HA/HB	102.2	102.2	102.2	109.8	105.8	113.4	120.1	127.7	124.4	132
	30A/B/R/CA/CB/YR	98	98	98	105.6	101.6	109.2	119.9	127.5	124.2	131.8
	30LA/LB/LR/HA/HB	120.6	120.6	120.6	128.2	124.2	131.8	142.5	150.1	146.8	154.4
	35A/B/R/CA/CB/YR	109.4	109.4	109.4	117	113	120.6	132.4	140	135.6	143.2
	35LA/LB/LR/HA/HB	134.8	134.8	134.8	142.4	138.4	146	157.8	165.4	161	168.6
	45A/B/R/CA/CB/YR	139	139	139	146.2	144.2	151.4	—	—	—	—
	45LA/LB/LR/HA/HB	170.8	170.8	170.8	178	176	183.2	—	—	—	—
	55A/B/R/CA/CB/YR	163	163	163	170.2	168.2	175.4	—	—	—	—
	55LA/LB/LR/HA/HB	201.1	201.1	201.1	208.3	206.3	213.5	—	—	—	—
	65A/B/R/CA/CB/YR	186	186	186	193.2	191.2	198.4	—	—	—	—
	65LA/LB/LR/HA/HB	245.5	245.5	245.5	252.7	250.7	257.9	—	—	—	—
	85A/B/R/CA/CB/YR	245.6	245.6	245.6	252.8	252.4	259.6	—	—	—	—
	85LA/LB/LR/HA/HB	303	303	303	310.2	309.8	317	—	—	—	—
	100HA/HB/HR	334	334	334	—	—	—	—	—	—	—
	120HA/HB/HR	365	365	365	—	—	—	—	—	—	—
	150HA/HB/HR	396	396	396	—	—	—	—	—	—	—

Unit: mm

Model No.		Standard overall length	L									
			UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
SR	15W/TB	57	57	57	62.2	58.4*	63.6*	—	—	—	—
	15V/SB	40.4	40.4	40.4	45.6	41.8*	47*	—	—	—	—
	20W/TB	66.2	66.2	66.2	72.8	70.6*	77.2*	—	—	—	—
	20V/SB	47.3	47.3	47.3	53.9	51.7*	58.3*	—	—	—	—
	25WY/TBY	83	83	83	90.6	87.4	95	—	—	—	—
	25VY/SBY	59.2	59.2	59.2	66.8	63.6	71.2	—	—	—	—
	30W/TB	96.8	96.8	96.8	104.4	99.4	107	—	—	—	—
	30V/SB	67.9	67.9	67.9	75.5	70.5	78.1	—	—	—	—
	35W/TB	111	111	111	118.6	113.6	121.2	—	—	—	—
	35V/SB	77.6	77.6	77.6	85.2	80.2	87.8	—	—	—	—
	45W/TB	126	126	126	134.6	129.4	138	—	—	—	—
	55W/TB	156	156	156	164.6	159.4	168	—	—	—	—
	70T	194.6	194.6	194.6	201.8	200.8	208	—	—	—	—
	85T	180	180	180	—	—	—	—	—	—	—
	100T	200	200	200	—	—	—	—	—	—	—
	120T	235	235	235	—	—	—	—	—	—	—
	150T	280	280	280	—	—	—	—	—	—	—
NR/ NRS	25XR/XA/XB	82.8	82.8	82.8	90.4	89.2	96.8	100.1	107.7	102.5	110.1
	25XLR/XLA/XLB	102	102	102	109.6	108.4	116	119.3	126.9	121.7	129.3
	30R/A/B	98	98	98	107	104.4	113.4	119.3	128.3	121.7	130.7
	30LR/LA/LB	120.5	120.5	120.5	129.5	126.9	135.9	141.8	150.8	144.2	153.2
	35R/A/B	109.5	109.5	109.5	119.7	117.1	127.3	131.1	141.3	133.5	143.7
	35LR/LA/LB	135	135	135	145.2	142.6	152.8	156.6	166.8	159	169.2
	45R/A/B	139	139	139	149.2	147.4	157.6	164.4	174.6	167.6	177.8
	45LR/LA/LB	171	171	171	181.2	179.4	189.6	196.4	206.6	199.6	209.8
	55R/A/B	162.8	162.8	162.8	173	171.4	181.6	188.1	198.3	191.3	201.5
	55LR/LA/LB	200	200	200	210.2	208.6	218.8	225.3	235.5	228.5	238.7
	65R/A/B	185.6	185.6	185.6	196.2	194.2	204.8	214.9	225.5	218.1	228.7
	65LR/LA/LB	245.6	245.6	245.6	256.2	254.2	264.8	274.9	285.5	278.1	288.7
	75R/A/B	218	218	218	229	226.6	237.6	—	—	—	—
	75LR/LA/LB	274	274	274	285	282.6	293.6	—	—	—	—
	85R/A/B	246.7	246.7	246.7	257.7	256.1	267.1	—	—	—	—
	85LR/LA/LB	302.8	302.8	302.8	313.8	312.2	323.2	—	—	—	—
	100R/A/B	288.8	288.8	288.8	297.8	295.6	307.2	—	—	—	—
	100LR/LA/LB	328.8	328.8	328.8	337.8	335.6	347.2	—	—	—	—
HRW	12LRM	37	37	37	—	—	—	—	—	—	—
	14LRM	45.5	45.5	45.5	—	—	—	—	—	—	—
	17CA/CR	50.8	50.8	—	54.8	54.4	60.2	—	—	—	—
	21CA/CR	58.8	58.8	—	64.2	62.8	69	—	—	—	—
	27CA/CR	72.8	72.8	72.8	79	75.6	81.8	—	—	—	—
	35CA/CR	106.6	106.6	106.6	113.8	112	119.2	—	—	—	—
	50CA/CR	140.5	140.5	140.5	147.7	143.3	150.5	—	—	—	—
	60CA	158.9	158.9	158.9	169.7	165.1	175.9	—	—	—	—
RSR/ RSR-W	3 M	12	—	—	—	—	—	—	—	—	—
	3N	16	—	—	—	—	—	—	—	—	—
	3WM	14.1	14.9	—	—	—	—	—	—	—	—
	3WN	19.1	19.9	—	—	—	—	—	—	—	—
	5 M	15.5	16.9	—	—	—	—	—	—	—	—
	5N	18.7	20.1	—	—	—	—	—	—	—	—
	5WM	20.7	22.1	—	—	—	—	—	—	—	—
	5WN	26.7	28.1	—	—	—	—	—	—	—	—
	7 M	22	23.4	—	—	—	—	—	—	—	—

Unit: mm

Model No.		Standard overall length	L								
			UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
RSR/ RSR-W	7N	31.6	33	—	—	—	—	—	—	—	—
	7WM	30	31	—	—	—	—	—	—	—	—
	7WN	39.9	40.9	—	—	—	—	—	—	—	—
	9KM	27.8	30.8	—	—	—	—	—	—	—	—
	9N	37.8	41	—	—	—	—	—	—	—	—
	9WV	36	39	—	—	—	—	—	—	—	—
	9WVM	36	39	—	—	—	—	—	—	—	—
	9WN	47.7	50.7	—	—	—	—	—	—	—	—
	12VM	31	35	—	—	—	—	—	—	—	—
	12N	43.7	47.7	—	—	—	—	—	—	—	—
	12WV	41.3	44.5	—	—	—	—	—	—	—	—
	12WVM	41.3	44.5	—	—	—	—	—	—	—	—
	12WN	56.3	59.5	—	—	—	—	—	—	—	—
	14WV	47.3	50	—	—	—	—	—	—	—	—
	15VM	38.9	43	—	—	—	—	—	—	—	—
	15N	56.5	61	—	—	—	—	—	—	—	—
	15WV	51.5	55.5	—	—	—	—	—	—	—	—
	15WVM	51.5	55.5	—	—	—	—	—	—	—	—
	15WN	70.5	74.5	—	—	—	—	—	—	—	—
	20VN	61.5	66.5	—	—	—	—	—	—	—	—
	20N	81.3	86.3	—	—	—	—	—	—	—	—
RSR-Z/ WZ	7ZM	21.6	23.4	—	—	—	—	—	—	—	—
	9ZM	29.1	30.8	—	—	—	—	—	—	—	—
	12ZM	32.6	35	35	—	—	—	—	—	—	—
	15ZM	40.2	43	43	—	—	—	—	—	—	—
	7WZM	29.2	31.5	—	—	—	—	—	—	—	—
	9WZM	37.6	39	39	—	—	—	—	—	—	—
	12WZM	42.1	44.5	44.5	—	—	—	—	—	—	—
	15WZM	53.1	55.5	55.5	—	—	—	—	—	—	—
RSH	7M	20.4	23.4	—	—	—	—	—	—	—	—
	9KM	27.8	30.8	—	—	—	—	—	—	—	—
	12VM	31	35	—	—	—	—	—	—	—	—
RSH-Z/ WZ	7ZM	20.4	23.4	—	—	—	—	—	—	—	—
	9ZM	29.1	30.8	—	—	—	—	—	—	—	—
	12ZM	32.6	35	35	—	—	—	—	—	—	—
	15ZM	40.2	43	43	—	—	—	—	—	—	—
	7WZM	28	31.5	—	—	—	—	—	—	—	—
	9WZM	37.6	39	39	—	—	—	—	—	—	—
	12WZM	42.1	44.5	44.5	—	—	—	—	—	—	—
	15WZM	53.1	55.5	55.5	—	—	—	—	—	—	—
HR	918	45	45	—	—	—	—	—	—	—	—
	1123	52	52	—	—	—	—	—	—	—	—
	1530	69	69	—	—	—	—	—	—	—	—
	2042	91.6	91.6	—	—	—	—	—	—	—	—
	2042T	110.7	110.7	—	—	—	—	—	—	—	—
	2555	121	121	—	—	—	—	—	—	—	—
	2555T	146.4	146.4	—	—	—	—	—	—	—	—
	3065	145	145	—	—	—	—	—	—	—	—
	3065T	173.5	173.5	—	—	—	—	—	—	—	—
	3575	154.8	154.8	—	—	—	—	—	—	—	—
	3575T	182.5	182.5	—	—	—	—	—	—	—	—
	4085	177.8	177.8	—	—	—	—	—	—	—	—

Unit: mm

Model No.		Standard overall length	L								
			UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
HR	4085T	215.9	215.9	—	—	—	—	—	—	—	—
	50105	227	227	—	—	—	—	—	—	—	—
	50105T	274.5	274.5	—	—	—	—	—	—	—	—
	60125	329	329	—	—	—	—	—	—	—	—
GSR	15T	59.8	59.8	59.8	65	65.8	71	—	—	—	—
	15V	47.1	47.1	47.1	52.3	53.1	58.3	—	—	—	—
	20T	74	74	74	80.6	77.6	84.2	—	—	—	—
	20V	58.1	58.1	58.1	64.7	61.7	68.3	—	—	—	—
	25T	88	88	88	95	91.6	98.6	—	—	—	—
	25V	69	69	69	76	72.6	79.6	—	—	—	—
	30T	103	103	103	110.6	107.2	114.8	—	—	—	—
	35T	117	117	117	124.6	121.2	128.8	—	—	—	—
GSR-R	25T-R	88	88	88	95	91.6	98.6	—	—	—	—
	25V-R	69	69	69	76	72.6	79.6	—	—	—	—
	30T-R	103	103	103	110.6	107.2	114.8	—	—	—	—
	35T-R	117	117	117	124.6	121.2	128.8	—	—	—	—
CSR	15	56.6	56.6	56.6	61.8	58.2*	63.4*	—	—	—	—
	20S	74	74	74	80.6	76.6	83.2	—	—	—	—
	20	90	90	90	96.6	92.6	99.2	—	—	—	—
	25S	83.1	83.1	83.1	90.7	86.7	94.3	—	—	—	—
	25	102.2	102.2	102.2	109.8	105.8	113.4	—	—	—	—
	30S	98	98	98	105.6	101.6	109.2	—	—	—	—
	30	120.6	120.6	120.6	128.2	124.2	131.8	—	—	—	—
	35	134.8	134.8	134.8	142.4	138.4	146	—	—	—	—
	45	170.8	170.8	170.8	178	176	183.2	—	—	—	—
MX	5M	22.3	23.3	—	—	—	—	—	—	—	—
	7WM	39.8	40.8	—	—	—	—	—	—	—	—
JR	25A/B/R	83.1	83.1	83.1	90.7	89.4	97	—	—	—	—
	35A/B/R	113.6	113.6	113.6	125.6	122	134*	—	—	—	—
	45A/B/R	145	145	145	159	150.8	164.8*	—	—	—	—
	55A/B/R	165	165	165	175.4	170.4	180.8*	—	—	—	—
HCR	12A+60/100R	44.6	44.6	—	—	—	—	—	—	—	—
	15A+60/150R	56.2	56.2	56.2	61.8	57.8	63	—	—	—	—
	15A+60/300R	56.4	56.4	56.4	62	58	63.2	—	—	—	—
	15A+60/400R	56.5	56.5	56.5	62.1	58.1	63.3	—	—	—	—
	25A+60/500R	83	83	83	90.6	86.6	94.2	—	—	—	—
	25A+60/750R	83	83	83	90.6	86.6	94.2	—	—	—	—
	25A+60/1000R	83	83	83	90.6	86.6	94.2	—	—	—	—
	35A+60/600R	109.2	109.2	109.2	116.7	112.7	120.3	—	—	—	—
	35A+60/800R	109.3	109.3	109.3	116.8	112.8	120.4	—	—	—	—
	35A+60/1000R	109.3	109.3	109.3	116.8	112.8	120.4	—	—	—	—
	35A+60/1300R	109.3	109.3	109.3	116.8	112.8	120.4	—	—	—	—
	45A+60/800R	138.7	138.7	138.7	145.9	143.9	151.1	—	—	—	—
	45A+60/1000R	138.8	138.8	138.8	146	144	151.2	—	—	—	—
	45A+60/1200R	138.8	138.8	138.8	146	144	151.2	—	—	—	—
	45A+60/1600R	138.9	138.9	138.9	146.1	144.1	151.3	—	—	—	—
	65A+60/1000R	197.8	197.8	197.8	204.7	202.7	209.9	—	—	—	—
	65A+60/1500R	197.9	197.9	197.9	204.8	202.8	210	—	—	—	—
	65A+60/2000R	197.9	197.9	197.9	204.8	202.8	210	—	—	—	—
	65A+60/2500R	197.9	197.9	197.9	204.9	202.9	210.1	—	—	—	—
	65A+60/3000R	197.9	197.9	197.9	204.9	202.9	210.1	—	—	—	—
HMG	15A	48	48	—	—	—	—	—	—	—	—

Unit: mm

Model No.		Standard overall length	L								
			UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
HMG	25A	62.2	62.2	—	—	—	—	—	—	—	—
	35A	80.6	80.6	—	—	—	—	—	—	—	—
	45A	107.6	107.6	—	—	—	—	—	—	—	—
	65A	144.4	144.4	—	—	—	—	—	—	—	—
NSR-TBC	20TBC	67	67	—	—	—	—	—	—	—	—
	25TBC	78	78	—	—	—	—	—	—	—	—
	30TBC	90	90	—	—	—	—	—	—	—	—
	40TBC	110	110	110	—	—	—	—	—	—	—
	50TBC	123	123	123	—	—	—	—	—	—	—
	70TBC	150	150	150	—	—	—	—	—	—	—
HSR-M1	15M1A/M1B/M1R/M1YR	59.6	59.6	59.6	—	—	—	—	—	—	—
	20M1A/M1B/M1R/M1YR	76	76	76	—	—	—	—	—	—	—
	20M1LA/M1LB/M1LR	92	92	92	—	—	—	—	—	—	—
	25M1A/M1B/M1R/M1YR	83.9	83.9	83.9	—	—	—	—	—	—	—
	25M1LA/M1LB/M1LR	103	103	103	—	—	—	—	—	—	—
	30M1A/M1B/M1R/M1YR	98.8	98.8	98.8	—	—	—	—	—	—	—
	30M1LA/M1LB/M1LR	121.4	121.4	121.4	—	—	—	—	—	—	—
	35M1A/M1B/M1R/M1YR	112	112	112	—	—	—	—	—	—	—
	35M1LA/M1LB/M1LR	137.4	137.4	137.4	—	—	—	—	—	—	—
SR-M1	15M1W/M1TB	57	57	57	—	—	—	—	—	—	—
	15M1V/M1SB	40.4	40.4	40.4	—	—	—	—	—	—	—
	20M1W/M1TB	66.2	66.2	66.2	—	—	—	—	—	—	—
	20M1V/M1SB	47.3	47.3	47.3	—	—	—	—	—	—	—
	25M1W/M1TB	83	83	83	—	—	—	—	—	—	—
	25M1V/M1SB	59.2	59.2	59.2	—	—	—	—	—	—	—
	30M1W/M1TB	96.8	96.8	96.8	—	—	—	—	—	—	—
	30M1V/M1SB	67.9	67.9	67.9	—	—	—	—	—	—	—
	35M1W/M1TB	111	111	111	—	—	—	—	—	—	—
	35M1V/M1SB	77.6	77.6	77.6	—	—	—	—	—	—	—
RSR-M1	9M1K	27.8	30.8	—	—	—	—	—	—	—	—
	9M1N	37.8	41	—	—	—	—	—	—	—	—
	9M1WV	36	39	—	—	—	—	—	—	—	—
	9M1WN	47.7	50.7	—	—	—	—	—	—	—	—
	12M1V	31	35	—	—	—	—	—	—	—	—
	12M1N	43.7	47.7	—	—	—	—	—	—	—	—
	12M1WV	41.3	44.5	—	—	—	—	—	—	—	—
	12M1WN	56.3	59.5	—	—	—	—	—	—	—	—
	15M1V	38.9	43	—	—	—	—	—	—	—	—
	15M1N	56.5	61	—	—	—	—	—	—	—	—
	15M1WV	51.5	55.5	—	—	—	—	—	—	—	—
	15M1WN	70.5	74.5	—	—	—	—	—	—	—	—
	20M1V	61.5	66.5	—	—	—	—	—	—	—	—
	20M1N	81.3	86.3	—	—	—	—	—	—	—	—
HSR-M2	15M2A	56.6	56.6	56.6	—	—	—	—	—	—	—
	20M2A	74	74	74	—	—	—	—	—	—	—
	25M2A	83.1	83.1	83.1	—	—	—	—	—	—	—
SRG	15A/V	69	69	69	71	—	—	—	—	—	—
	20A/V	86	86	86	88	91.4	93.4	106.6	108.6	109	111
	20LA/LV	106	106	106	108	111.4	113.4	126.6	128.6	129	131
	25C/R	95.5	95.5	95.5	100.5	100.5	105.5	115.3	120.3	117.7	122.7
	25LC/LR	115.1	115.1	115.1	120.1	120.1	125.1	134.9	139.9	137.6	142.3
	30C/R	111	111	111	118	116	123	130.8	137.8	133.2	140.2

Unit: mm

Model No.		Standard overall length	L								
			UU	SS	DD	ZZ	KK	SSHH	DDHH	ZZHH	KKHH
SRG	30LC/LR	135	135	135	142	140	147	154.8	161.8	157.2	164.2
	35C/R	125	125	125	132.8	133.4	141.4	148.6	151	151	159
	35LC/LR	155	155	155	162.8	163.4	171.2	178.6	181	181	188.8
	45C/R	155	155	155	164.2	164.2	173.4	182	185.2	185.5	194.5
	45LC/LR	190	190	190	199.2	199.2	208.4	217	220.2	220.2	229.4
	55C/R	185	185	185	194.2	194.2	203.4	212	215.2	215.5	224.5
	55LC/LR	235	235	235	244.2	244.2	253.4	262	265.2	265.2	274.4
	65LC/LV	303	303	303	314.2	314.2	325.4	335.4	338.6	338.6	349.8
SRN	35C/R	125	125	125	132.8	133.4	141.4	148.6	151	151	159
	35LC/LR	155	155	155	162.8	163.4	171.2	178.6	181	181	188.8
	45C/R	155	155	155	164.2	164.2	173.4	182	185.2	185.5	194.5
	45LC/LR	190	190	190	199.2	199.2	208.4	217	220.2	220.2	229.4
	55C/R	185	185	185	194.2	194.2	203.4	212	215.2	215.5	224.5
	55LC/LR	235	235	235	244.2	244.2	253.4	262	265.2	265.2	274.4
	65LC/LR	303	303	303	314.2	314.2	325.4	335.4	338.6	338.6	349.8
SRW	70LR	190	190	190	199.2	197.2	206.4	217	226.2	220.2	229.4
	85LR	235	235	235	244.2	242.2	251.4	262	271.2	265.2	274.4
	100LR	303	303	303	314.2	311.4	322.6	335.4	346.6	338.6	349.8

A grease nipple cannot be attached. Contact THK for details.

Model number coding

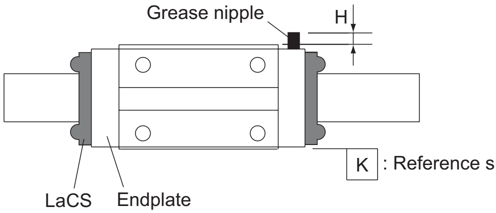
SHS25 LC 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SHS25: Model number
- LC: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator (*1)
- KKHH: Contamination protection accessory symbol (*2)
- C0: Radial clearance symbol (*3)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*4)
  - Normal grade (No Symbol)
  - High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With steel tape
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

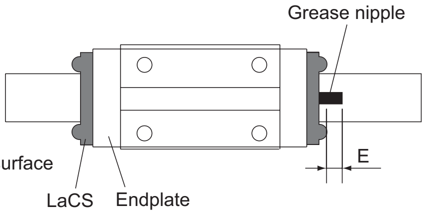
(*1) See A-361. (*2) See A-368. (*3) See A-113. (*4) See A-118. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.

Incremental Dimension with Grease Nipple (When LaCS is Attached)



Grease nipple mounting location
for models SHS, SSR, SNR/SNS, SRG and NR/NRS



Grease nipple mounting location
for models SHW, SRS and HSR

Unit: mm

Model No.		Incremental dimension with grease nipple H	Nipple type
SHS	15C/LC	—	PB107
	15R/V/LV	4.7	PB107
	20C/LC	—	PB107
	20V/LV	4.5	PB107
	25C/LC	—	PB107
	25R/LR/V/LV	4.7	PB107
	30C/LC	—	A-M6F
	30R/LR/V/LV	7.4	A-M6F
	35C/LC	—	A-M6F
	35R/LR/V/LV	7.4	A-M6F
	45C/LC	—	A-M6F
	45R/LR/V/LV	7.7	A-M6F
	55C/LC	—	A-M6F
	55R/LR/V/LV	7.4	A-M6F
	65C/LC	—	A-M6F
	65V/LV	6.9	A-M6F
SSR	15XVY/XWY	4.4	PB107
	15XTBY	—	PB107
	20XV/XW	4.6	PB107
	20XTB	—	PB107
	25XVY/XWY	4.5	PB107
	25XTBY	—	PB107
	30XW	5	PB1021B
	35XW	5	PB1021B
SNR/SNS	25C/LC	—	PB1021B
	25R/LR	4.9	PB1021B
	30C/LC	—	PB1021B
	30R/LR	4.5	PB1021B
	35C/LC	—	A-M6F
	35R/LR	7.8	A-M6F
	45C/LC	—	A-M6F
	45R/LR	7.9	A-M6F
	55C/LC	—	A-M6F
	55R/LR	7.7	A-M6F
	65C/LC	—	A-PT1/8
	65R/LR	15.8	A-PT1/8

Unit: mm

Model No.		Incremental dimension with grease nipple E	Nipple type
SHW	21CA/CR	4.2	PB1021B
	27CA/CR	10.7	B-M6F
	35CA/CR	10.0	B-M6F
	50CA/CR	21	B-PT1/8
SRS	25	4	PB1021B
HSR	15A/B/R/YR	2.9	PB1021B
	20A/B/R/CA/CB/YR	9.4	B-M6F
	20LA/LB/LR/HA/HB	9.4	B-M6F
	25A/B/R/CA/CB/YR	9	B-M6F
	25LA/LB/LR/HA/HB	9	B-M6F
	30A/B/R/CA/CB/YR	9	B-M6F
	30LA/LB/LR/HA/HB	9	B-M6F
	35A/B/R/CA/CB/YR	8	B-M6F
	35LA/LB/LR/HA/HB	8	B-M6F
NR/NRS	25A/B/LA/LB	—	PB1021B
	25R/LR	4.8	PB1021B
	30A/B/LA/LB	—	PB1021B
	30R/LR	4.5	PB1021B
	35A/B/LA/LB	—	A-M6F
	35R/LR	7.4	A-M6F
	45A/B/LA/LB	—	A-M6F
	45R/LR	7.4	A-M6F
	55A/B/LA/LB	—	A-M6F
	55R/LR	6.9	A-M6F
	65A/B/LA/LB	—	A-PT1/8
	65R/LR	15.3	A-PT1/8
SRG	35LC	—	A-M6F
	35LR	7.2	A-M6F
	45LC	—	A-M6F
	45LR	7.2	A-M6F
	55LC	—	A-M6F
	55LR	7.2	A-M6F
	65LC	—	A-M6F
	65LR	6.2	A-M6F

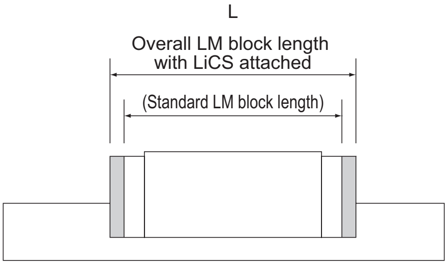
Note1) When desiring the mounting location for the grease nipple other than the above, contact THK.

Note2) Those models equipped with QZ Lubricator cannot have a grease nipple. When desiring both QZ Lubricator and a grease nipple, contact THK.

Note3) When desiring a grease nipple for model SHW or SRS without QZ Lubricator, indicate “with grease nipple” when placing an order. (If not, a grease nipple will not be attached.)

Note4) Model HSR15 attached with ZZ or KK cannot have a grease nipple. Contact THK for details.

LM Block Dimension (Dimension L) with LiCS Attached



Unit: mm

Model No.			L	
		Standard overall length	GG	PP
SSR	15XVY	40.3	48.7	48.7
	15XWY/XTBY	56.9	65.3	65.3
	20XV	47.7	55.8	55.8
	20XW/XTB	66.5	74.6	74.6
	25XVY	60	67.6	67.6
	25XWY/XTBY	83	90.6	90.6
	30XW	97	106.7	106.7
	35XW	110.9	121.7	121.7
SRG	15A	67	77	77
	15V	67	77	77

Model number coding

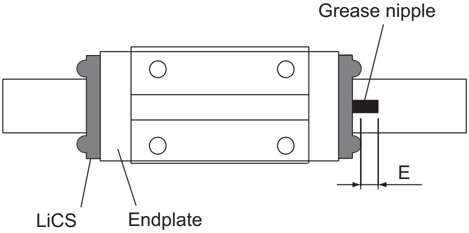
SSR20 XW 2 GG C1 +600L P T -Ⅱ

- SSR20: Model number
- XW: Type of LM block
- 2: No. of LM blocks used on the same rail
- GG: With LiCS (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +600L: LM rail length (in mm)
- P: Accuracy symbol (*3)
  - Normal grade (No Symbol)/High accuracy grade (H)
  - Precision grade (P) /Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

(*1) See A-355 (*2) See A-113 (*3) See A-118 (*4) SeeA-59

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.

Incremental Dimension with Grease Nipple (When LiCS is Attached)



Location for Mounting the Grease Nipple

Unit: mm

Model No.		Incremental dimension with grease nipple E	Nipple type
SSR	15XVY	2.9	PB1021B
	15XWY/XTBY	2.9	PB1021B
	20XV	9	B-M6F
	20XW/XTB	9	B-M6F
	25XVY	9	B-M6F
	25XWY/XTBY	9	B-M6F
	30XW	9	B-M6F
	35XW	8	B-M6F
SRG	15A	4.5	PB107
	15V	4.5	PB107

Model number coding

SSR20 XW 2 GG C1 +600L H -Ⅱ

- SSR20: Model number
- XW: Type of LM block
- 2: No. of LM blocks used on the same rail
- GG: With LiCS (*1)
- C1: Radial clearance symbol (*2)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +600L: LM rail length (in mm)
- H: Accuracy symbol (*3)
  - Normal grade (No Symbol)
  - High accuracy grade (H)/Precision grade (P)
  - Super precision grade (SP)/Ultra precision grade (UP)
- -Ⅱ: Symbol for No. of rails used on the same plane (*4)

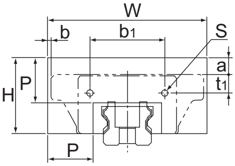
(*1) See A-355 (*2) See A-113 (*3) See A-118 (*4) SeeA-59

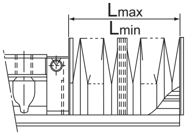
Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.

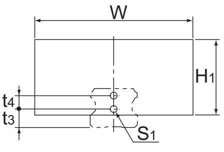
Bellows

[Dedicated Bellows JSH for Model SHS]

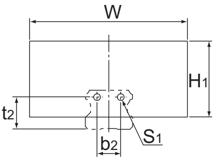
The table below shows the dimensions of dedicated bellows JSH for model SHS. Specify the corresponding model number of the desired bellows from the table.







Models SHS15 to 30



Models SHS35 to 65

Unit: mm

Model No.		Main dimensions												Supported model numbers	
		W	H	H_1	P	b_1	C	V	R	b_2	t_2	t_3	t_4		
JSH	15	53	26	26	15	22.4	4	4	8	—	—	8	—	SHS	15
	20	60	30	30	17	27.6	7.5	7.5	—	—	—	8	6		20
	25	75	36	36	20	38	9.1	9.1	13.1	—	—	9	7		25
	30	80	38	38	20	44	11	11	14	—	—	11	8		30
	35	86	40.5	40.5	20	50	11	11	18	20	21.5	—	—		35
	45	97	46	46	20	64.6	13.5	13.5	23.5	26	26.5	—	—		45
	55	105	48	48	20	68	13	13	23	30	31.5	—	—		55
	65	126	63	63	25	80	18	18	—	34	45	—	—		65

Unit: mm

Supported model numbers		Other dimensions								$A \left(\frac{Lmax}{Lmin}\right)$
		Mounting bolt		a			b			
		S	S_1	C	V	R	C	V	R	
SHS	15	M2×8ℓ	M4×8ℓ	5	5	1	3	9.5	9.5	5
	20	M2.6×8ℓ	M3×6ℓ	5	5	—	−1.5	8	—	6
	25	M3×8ℓ	M3×6ℓ	6	6	2	2.5	13.5	13.5	7
	30	M3×10ℓ	M3×6ℓ	3	3	0	−5	10	10	7
	35	M4×10ℓ	M4×8ℓ	0	0	−7	−7	8	8	7
	45	M4×12ℓ	M4×8ℓ	−5	−5	−15	−11.7	5.5	5.5	7
	55	M5×12ℓ	M5×10ℓ	−9	−9	−19	−17.5	2.5	2.5	7
	65	M6×14ℓ	M6×12ℓ	−8	−8	—	−22	0	—	9

Note1) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the dedicated bellows, contact THK.
Note3) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JSH35 - 60/420

Model number of bellows for SHS35

Dimensions of the bellows (length when compressed / length when extended)

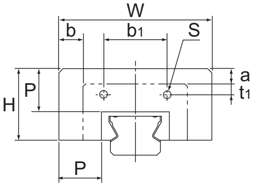
Note) The length of the bellows is calculated as follow.

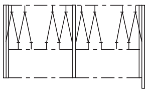
$$Lmin = \frac{S}{(A-1)}$$ S: Stroke length (mm)

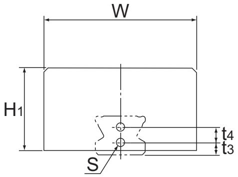
$$Lmax = Lmin \cdot A$$ A: Extension rate

[Dedicated Bellows JSSR-X for Model SSR]

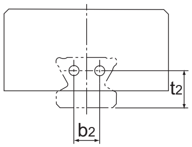
The table below shows the dimensions of dedicated bellows JSSR-X for model SSR. Specify the corresponding model number of the desired bellows from the table.







Models SSR15X to 25X



Models SSR30X and 35X

Unit: mm

Model No.		Main dimensions														A $\left(\frac{L_{max}}{L_{min}}\right)$	Supported model numbers	
		W	H	H_1	P	b_1	t_1	b_2	t_2	t_3	t_4	Mounting bolt S	a	b XW/XV	b XTB			
JSSR	15X	51	24	26	15	20.5	4.7	—	—	8	—	M3×5ℓ	5	8.5	−0.5	5	SSR	15X
	20X	58	26	30	15	25	4.2	—	—	6	6	M3×5ℓ	4	8	−0.5	5		20X
	25X	71	33	38	20	29	5	—	—	6	7	M3×5ℓ	7	11.5	−1	7		25X
	30X	76	37.5	37.5	20	35	9	12	17	—	—	M4×6ℓ	3	8	—	7		30X
	35X	84	39	39	20	44	7	14	20	—	—	M5×10ℓ	2	7	—	7		35X

Note1) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the dedicated bellows, contact THK.
Note3) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JSSR35X - 60/420

JSSR35X	60/420
Model number of bellows for SSR35X	Dimensions of the bellows (length when compressed / length when extended)

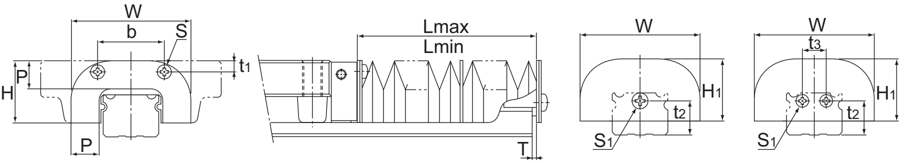
Note) The length of the bellows is calculated as follow.

$$L_{min} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$$L_{max} = L_{min} \cdot A$$ A: Extension rate

[Dedicated Bellows JSN for Models SNR and SNS]

For models SNR/SNS-C, SNR/SNS-LC, SNR/SNS-R and SNR/SNS-LR, a simplified bellows is available. Attach the simplified bellows when the LM Guide is used in locations subject to a coolant or the like. To gain a higher contamination protection effect, attach a telescopic cover outside the simplified bellows after the bellows is mounted.



Models SNR25 to 45　Models SNR55 and 65

Unit: mm

Model No.		Main dimensions											A $\left(\frac{Lmax}{Lmin}\right)$	Supported model numbers	
		W	H	H_1	P	b	t_1	t_2	t_3	Mounting bolt S	Mounting bolt S_1	T			
JSN	25	50	25.5	24.5	10	26.6	4.6	13	—	M3×5ℓ	M4×4ℓ	1.5	7	SNR/ SNS	25
	30	60	31	30	14	34	5.5	17	—	M4×8ℓ	M4×4ℓ	1.5	9		30
	35	70	35	34	15	36	6	20.5	—	M4×8ℓ	M5×4ℓ	2	10		35
	45	86	40.5	39.5	17	47	6.5	24	—	M5×10ℓ	M5×4ℓ	2	10		45
	55	100	49	48	19.5	54	10	29.5	18	M5×10ℓ	M5×4ℓ	2	13		55
	65	126	60	59	22	64	13.5	36.2	20	M6×12ℓ	M6×5ℓ	3.2	13		65
	85	156	70.5	70.5	30	110	15.5	39.5	28	M6×12ℓ	M6×5ℓ	3.2	20		85

Note1) When desiring to use the simplified bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the simplified bellows, contact THK.
Note3) For the bellows for models SNR/SNS-CH, SNR/SNS-LCH, SNR/SNS-RH and SNR/SNS-LRH, contact THK.
Note4) When using the simplified bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the simplified bellows is required when ordering the LM Guide.

Model number coding

JSN25 - 60/420

JSN25: Model number of bellows for SNR/SNS25
60/420: Dimensions of the bellows (length when compressed / length when extended)

Note) The length of the bellows is calculated as follow.

$$Lmin = \frac{S}{(A-1)}$$　S: Stroke length (mm)

$$Lmax = Lmin \cdot A$$　A: Extension rate

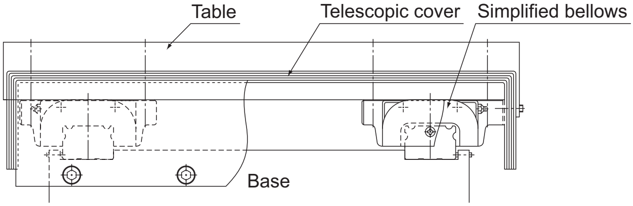
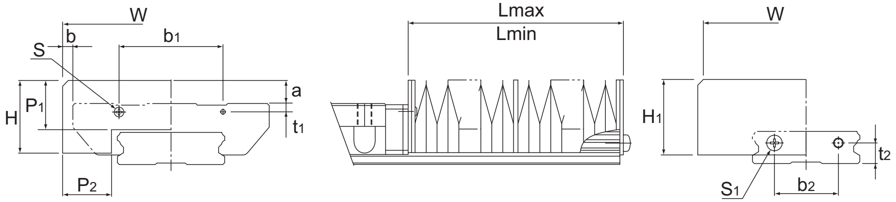


Fig.1 Example of Mounting the Simplified Bellows

[Dedicated Bellows JSHW for Model SHW]

The table below shows the dimensions of dedicated bellows JSHW for model SHW. Specify the corresponding model number of the desired bellows from the table.



Unit: mm

Model No.		Main dimensions									Supported model numbers	
		W	H	H_1	P_1	P_2	b_1	t_1	b_2	t_2		
JSHW	17	68	22	23	15	15.4	39	2.6	18	6	SHW	17
	21	75	25	26	17	17	35.8	2.9	22	7		21
	27	85	33.5	33.5	20	20	25	3.5	20	10		27
	35	120	35	35	20	20	75	7.5	40	13		35
	50	164	42	42	20	20	89.4	14	50	16		50

Unit: mm

Model No.		Other dimensions					$A\left(\frac{L\max}{L\min}\right)$
		Mounting bolt		a	b		
		*S	S_1		Model CA	Model CR	
JSHW	17	M2×4ℓ	M3×6ℓ	8	4	9	5
	21	M2×5ℓ	M3×6ℓ	8	3.5	10.5	6
	27	M2.6×6ℓ	M3×6ℓ	10	2.5	11.5	7
	35	M3×8ℓ	M3×6ℓ	6	0	10	7
	50	M4×12ℓ	M4×8ℓ	—	1	17	7

Note1) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the dedicated bellows, contact THK.
Note3) For the mounting bolts marked with "*", use tapping screws.
Note4) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JSHW21 - 60/360

Model number of bellows for SHW21

Dimensions of the bellows (length when compressed / length when extended)

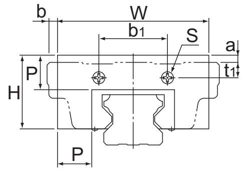
Note) The length of the bellows is calculated as follow.

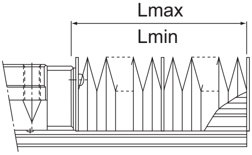
$$L\min = \frac{S}{(A-1)}$$ S: Stroke length (mm)

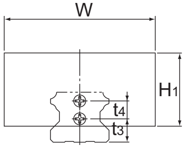
$$L\max = L\min \cdot A$$ A: Extension rate

[Dedicated Bellows JH for Model HSR]

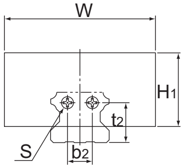
The table below shows the dimensions of dedicated bellows JH for model HSR. Specify the corresponding model number of the desired bellows from the table.







Models HSR15 to 30



Models HSR35 to 85

Unit: mm

Model No.		Main dimensions																A (Lmax/Lmin)	Supported model numbers	
		W	H	H_1	P	b_1	t_1		b_2	t_2	t_3	t_4	Mounting bolt S	a		b				
							A/B	R						A/B	R	A/B	R			
JH	15	55	27	30	15	25	2.5	6.5	—	—	10	—	*M4×8ℓ	7.5	3.5	−4	−10.5	5	HSR	15
	20	66	32	35	17	34	5	5	—	—	6	8	M3×6ℓ	7	7	−1.5	−11	6		20
	25	78	38	38	20	30	7	11	—	—	10	8	M3×6ℓ	8.5	4.5	−4	−15	7		25
	30	84	42	42	20	40	8	11	—	—	11	10	M4×8ℓ	7	4	3	−12	7		30
	35	88	43	43	20	40	9	16	14	23	—	—	M4×8ℓ	4	—	6	−9	7		35
	45	100	51	51	20	58	10	20	20	29	—	—	M5×10ℓ	—	—	10	−7	7		45
	55	108	54	54	20	66	11	21	26	35	—	—	M5×10ℓ	—	—	16	−4	7		55
	65	132	68	68	20	80	19	19	32	42	—	—	M6×12ℓ	—	—	19	−3	7		65
	85	170	88	88	30	105	23	23	44	50	—	—	M6×12ℓ	—	—	22.5	−7	10		85

Note1) For model JH15's location marked with "＊", mounting bolts are used only on the LM rail side while the LM block side uses M2 x 5 (nominal) tapping screws.
Note2) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note3) For lubrication when using the dedicated bellows, contact THK.
Note4) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JH25 - 60/420

Model number of bellows for HSR25

Dimensions of the bellows (length when compressed / length when extended)

Note) The length of the bellows is calculated as follow.

$$\text{Lmin} = \frac{S}{(A-1)}$$

S: Stroke length (mm)

$$\text{Lmax} = \text{Lmin} \cdot A$$

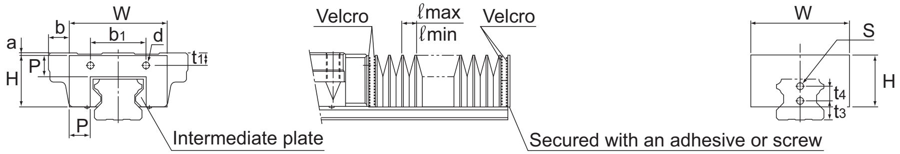
A: Extension rate

[Dedicated Bellows DH for Model HSR]

For models HSR15, 20 and 25, bellows DH, which has the following features, is also available other than the dedicated bellows JH. Specify the corresponding model number of the desired bellows from the table.

● Features

(1) Has a width and height smaller than the conventional product so that any part of the bellows does not stick out of the top face of the LM block. The extension rate is equal to or greater than that of the conventional type.
(2) Has an intermediate plate for each crest so that it will not easily lift and the bellows can be used with vertical mount, wall mount and slant mount.
(3) Operable at high speed, at up to 120 m/min.
(4) Since a Velcro tape can be used to install the bellows, a regular-size model can be cut to the desired length, or two or more regular-size bellows can be taped together.
(5) Can be installed using screws just as bellows JH.
In this case, a plate (thickness: 1.6 mm) must be placed between the bellows and the LM bock.
Contact THK for details.



Unit: mm

Model No.		Main dimensions																			Supported model numbers	
		W	H	P	b_1	t_1		t_3	t_4	d	a		b		ℓmax	ℓmin	Extension rate	E	Factor			
						A/B	R				A/B	R	A/B	R			A		k			
DH	15	35	19.5	8.5	25	2.5	6.5	10	—	3.5	0	4	6	−0.5	10	2.5	4	2	1.2	HSR	15
	20	45	25	10	34	5	5	6	8	4	0	0	9	−0.5	13	2.5	5	2	1.3		20
	25	52	29.5	12	30	7	11	10	8	4	0	4	9	−2	15	3	5	2	1.3		25

Note1) For lubrication when using the dedicated bellows, contact THK.
Note2) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

DH20 - 50/250

DH20: Model number of bellows for HSR20
50/250: Dimensions of the bellows (length when compressed / length when extended)

Note) The maximum length of the bellows itself is calculated as follows.
Lmax (Lmin) = ℓmax (ℓmim) ×200
Example of calculating bellows dimensions:
When the stroke of model HSR20 is: ℓs=530mm

$$L\min = \frac{\ell s}{(A-1)} = \frac{530}{4} = 132.5 \fallingdotseq 135$$

$$L\max = A \cdot L\min = 5 \times 135 = 675$$

Number of required crests n

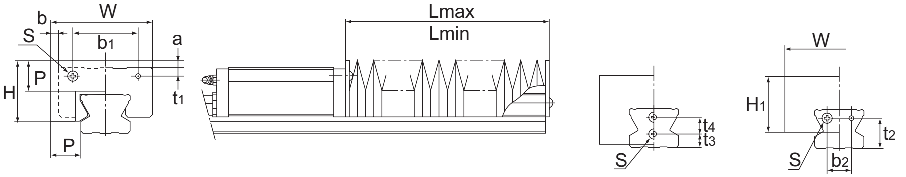
$$n = \frac{L\max}{P \cdot k} = \frac{675}{10 \times 1.3} = 51.9 \fallingdotseq 52 \text{ crests}$$

$$L\min = n \cdot \ell\min + E = 52 \times 2.5 + 2 = 132$$

(E indicates the plate thickness of 2)
Therefore, the model number of the required bellows is DH20-132/675.

[Dedicated Bellows JS for Model SR]

The table below shows the dimensions of dedicated bellows JS for model SR. Specify the corresponding model number of the desired bellows from the table.



Models SR15 to 25 Models SR30 to 70

Unit: mm

Model No.		Main dimensions														A $\left(\frac{Lmax}{Lmin}\right)$	Supported model numbers	
		W	H	H_1	P	b_1	t_1	b_2	t_2	t_3	t_4	Mounting bolt S	a	b W/V	b TB/SB			
JS	15	51	24	26	15	22	3.4	—	—	8	—	M3×6ℓ	5	8.5	−0.5	5	SR	15
	20	58	26	30	15	25	4.2	—	—	6	6	M3×6ℓ	4	8	−0.5	5		20
	25	71	33	38	20	29	5	—	—	6	7	M3×6ℓ	7	11.5	−1	7		25
	30	76	37.5	37.5	20	42	5	12	17	—	—	M4×8ℓ	3	8	−7	7		30
	35	84	39	39	20	44	6.5	14	20	—	—	M5×10ℓ	1.5	7	−8	7		35
	45	95	47.5	47.5	20	60	8	22	27	—	—	M5×10ℓ	−1.5	5	−12.5	7		45
	55	108	55.5	55.5	25	70	10	24	28	—	—	M6×12ℓ	−0.5	4	−16	9		55
	70	144	67	67	30	90	13	34	35	—	—	M6×12ℓ	−3	9	—	10		70

Note1) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the dedicated bellows, contact THK.
Note3) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JS55 - 60/540

JS55	60/540
Model number of bellows for SR55	Dimensions of the bellows (length when compressed / length when extended)

Note) The length of the bellows is calculated as follow.

$$Lmin = \frac{S}{(A-1)}$$

S: Stroke length (mm)

$$Lmax = Lmin \cdot A$$

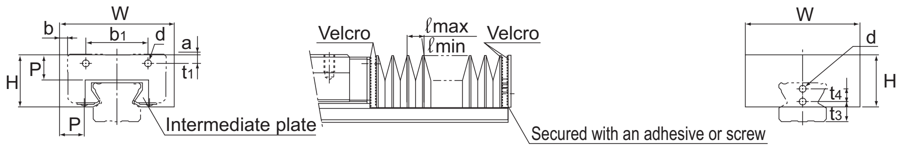
A: Extension rate

[Dedicated Bellows DS for Model SR]

For models SR15, 20 and 25, bellows DS, which has the following features, is also available other than the dedicated bellows JS. Specify the corresponding model number of the desired bellows from the table.

- **Features**

(1) Has a width and height smaller than the conventional product so that any part of the bellows does not stick out of the top face of the LM block. The extension rate is equal to or greater than that of the conventional type.
(2) Has an intermediate plate for each crest so that it will not easily lift and the bellows can be used with vertical mount, wall mount and slant mount.
(3) Operable at high speed, at up to 120 m/min.
(4) Since a Velcro tape can be used to install the bellows, a regular-size model can be cut to the desired length, or two or more regular-size bellows can be taped together.
(5) Can be installed using screws just as the conventional type.
In this case, a plate (thickness: 1.6 mm) must be placed between the bellows and the LM bock. Contact THK for details.



Unit: mm

Model No.		Main dimensions																Supported model numbers	
		W	H	P	b_1	t_1	t_3	t_4	d	a	b		ℓmax	ℓmin	Extension rate A	E	Factor k		
											W/V	TB/SB							
DS	15	38	19	10	22	3.4	8	—	3.5	0	7	2	13	2.5	5	2	1.3	SR	15
	20	49	22	10	25	4.2	6	6	4	0	5	3.5	13	2.5	5	2	1.3		20
	25	56	26	12	29	5	6	7	4	0	8.5	4	15	3	5	2	1.3		25

Note1) For lubrication when using the dedicated bellows, contact THK.
Note2) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

DS20 - 50/250

DS20	50/250
Model number of bellows for SR20	Dimensions of the bellows (length when compressed / length when extended)

Note) The maximum length of the bellows itself is calculated as follows.
Lmax (Lmin) = ℓmax (ℓmin) ×200
Example of calculating bellows dimensions:
When the stroke of model SR20 is: ℓs=530mm

$$\text{Lmin} = \frac{\ell s}{(A-1)} = \frac{530}{4} = 132.5 \fallingdotseq 135$$

$$\text{Lmax} = A \cdot \text{Lmin} = 5 \times 135 = 675$$

Number of required crests n

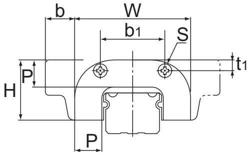
$$n = \frac{\text{Lmax}}{P \cdot k} = \frac{675}{10 \times 1.3} = 51.9 \fallingdotseq 52 \text{ crests}$$

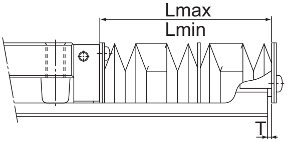
$$\text{Lmin} = n \cdot \ell\text{min} + E = 52 \times 2.5 + 2 = 132$$

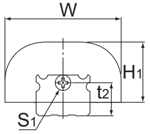
(E indicates the plate thickness of 2)
Therefore, the model number of the required bellows is DH20-132/675.

[Simplified Bellows JN Dedicated for Models NR/NRS]

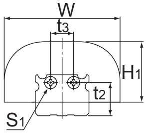
For models NR/NRS, a simplified bellows is available. To gain a higher contamination protection effect, attach a telescopic cover outside the simplified bellows after the bellows is mounted.







Models NR/NRS 25X to 45



Models NR/NRS 55 to 100

Unit: mm

Model No.		Main dimensions											T	A (Lmax / Lmin)	Supported model numbers	
		W	H	H_1	P	b_1	t_1	t_2	t_3	Mounting bolt S	Mounting bolt S_1	b A,LA B,LB				
JN	25	48	25.5	25.5	10	26.6	4.6	13	—	M3×5ℓ	M4×4ℓ	11	1.5	7	NR/ NRS	25X
	30	60	31	31	14	34	5.5	17	—	M4×8ℓ	M4×4ℓ	15	1.5	9		30
	35	70	35	35	15	36	6	20.5	—	M4×8ℓ	M5×4ℓ	15	2	10		35
	45	86	40.5	40.5	17	47	6.5	24	—	M5×10ℓ	M5×4ℓ	17	2	10		45
	55	100	49	49	20	54	10	29.5	18	M5×10ℓ	M5×4ℓ	20	2	13		55
	65	126	57.5	57.5	20	64	13.5	36.2	20	M6×12ℓ	M6×5ℓ	22	3.2	13		65
	75	145	64	64	30	80	10.5	34.2	26	M6×12ℓ	M6×5ℓ	25	3.2	20		75
	85	156	70.5	70.5	30	110	15.5	39.5	28	M6×12ℓ	M6×5ℓ	39.5	3.2	20		85
	100	200	82	82	30	140	15	40	34	M8×16ℓ	M6×5ℓ	30	3.2	20		100

Note1) When desiring to use the simplified bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the simplified bellows, contact THK.
Note3) When using the simplified bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the simplified bellows is required when ordering the LM Guide.

Model number coding

JN25 - 60/420

Model number of bellows for NR/NRS25X

Dimensions of the bellows (length when compressed / length when extended)

Note) The length of the bellows is calculated as follow.

$$L_{min} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$L_{max} = L_{min} \cdot A$ A: Extension rate

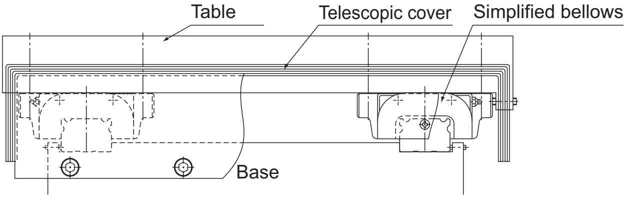
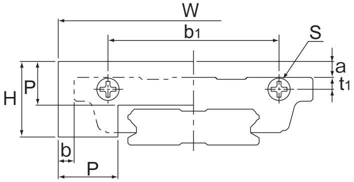
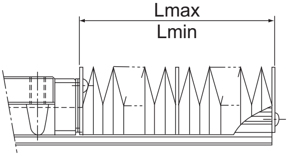


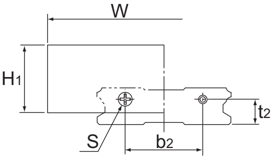
Fig.2 Example of Mounting the Simplified Bellows

[Dedicated Bellows JHRW for Model HRW]

The table below shows the dimensions of dedicated bellows JHRW for model HRW. Specify the corresponding model number of the desired bellows from the table.







Unit: mm

Model No.		Main dimensions										b		A $\left(\frac{Lmax}{Lmin}\right)$	Supported model numbers	
		W	H	H_1	P	b_1	t_1	b_2	t_2	Mounting bolt S	a	Model CA	Model CR			
JHRW	17	68	22	23	15	43	3	18	6	*M3×6ℓ	8	4	9	5	HRW	17
	21	75	25	26	17	48	3	22	7	M3×6ℓ	8	3.5	10.5	6		21
	27	85	33.5	33.5	20	48	3	20	10	M3×6ℓ	10	2.5	11.5	7		27
	35	120	35	35	20	75	3.5	40	13	M3×6ℓ	6	0	10	7		35
	50	164	42	42	20	100	9	50	16	M4×8ℓ	–3	1	17	7		50

Note1) For model JHRW17's location marked with "*", mounting bolts are used only on the LM rail side while the LM block side uses M2.5 x 8 (nominal) tapping screws.
Note2) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note3) For lubrication when using the dedicated bellows, contact THK.
Note4) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JHRW21 - 60/360

Model number of bellows for HRW21

Dimensions of the bellows (length when compressed / length when extended)

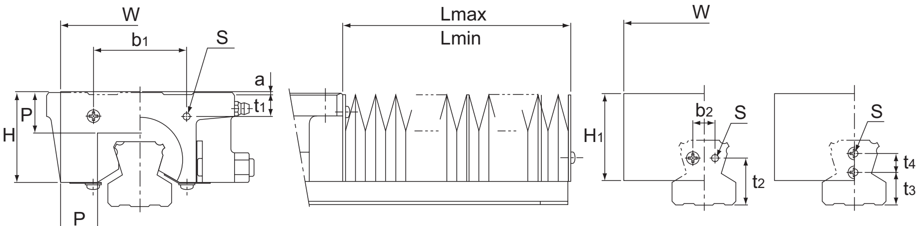
Note) The length of the bellows is calculated as follow.

$$Lmin = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$$Lmax = Lmin \cdot A$$ A: Extension rate

[Dedicated Bellows J for Model NSR-TBC]

The table below shows the dimensions of dedicated bellows J for model NSR-TBC. Specify the corresponding model number of the desired bellows from the table.



Models NSR30 to 70TBC

Models NSR20 and 25TBC

Unit: mm

Model No.		Main dimensions												A (Lmax / Lmin)	Supported model numbers	
		W	H	H_1	P	b_1	t_1	b_2	t_2	t_3	t_4	Mounting bolt S	a			
J	20	65	39	43	20	26	8	—	—	9	8	M4×8ℓ	8	7	NSR	20TBC
	25	75	43	45	20	40	11	—	—	12	8	M4×8ℓ	3	7		25TBC
	30	85	46	46	20	50	12	12	25	—	—	M4×8ℓ	—	7		30TBC
	40	115	59	59	25	60	13	16	32	—	—	M5×10ℓ	—	9		40TBC
	50	115	66	66	25	75	11	20	32	—	—	M5×10ℓ	—	9		50TBC
	70	124	84	78	25	96	16	36	40	—	—	M6×12ℓ	—	9		70TBC

Note1) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the dedicated bellows, contact THK.
Note3) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

J50 - 60/540

Model number of bellows for NSR50TBC

Dimensions of the bellows (length when compressed / length when extended)

Note) The length of the bellows is calculated as follow.

$$\text{Lmin} = \frac{S}{(A-1)}$$

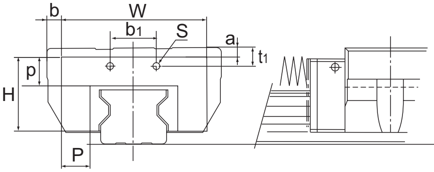
S: Stroke length (mm)

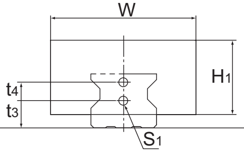
$$\text{Lmax} = \text{Lmin} \cdot A$$

A: Extension rate

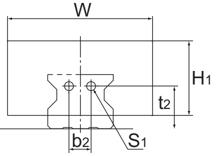
[Dedicated Bellows JSRG for Model SRG]

The table below shows the dimensions of dedicated bellows JSRG for model SRG. Specify the corresponding model number of the desired bellows from the table.





Models SRG15 and 30



Models SRG35 to 65

Unit: mm

Model No.		Main dimensions																		A (Lmax / Lmin)	Supported model numbers	
		W	H	H_1	P	p	b_1	t_1		b_2	t_2	t_3	t_4	Screw size S	Mounting bolt S_1	a		b				
								A/C	R/V							A/C	R/V	A/C	R/V			
JSRG	15	55	27	27	14.2	12.7	28	10.3	10.3	—	—	10.6	—	M2	M4	7	7	4	10.5	5	SRG	15
	20	66	32	32	17	15	38.5	9.6	9.6	—	—	7.4	8	M2	M3	6.6	6.6	1.5	11	6		20
	25	78	38	38	23	18	27.6	3.9	7.9	—	—	10	8	M2	M3×6ℓ	–6.5	–2.5	4	15	6		25
	30	84	42	42	22	19	37.4	10.4	13.4	—	—	11	10	M3	M4×8ℓ	–5	–2	3	12	7		30
	35	88	42	42	22	15	35	5	12	13	23	—	—	M3	M4×4ℓ	0	7	6	–9	5		35
	40	100	51	51	20	20	32	7	17	15	29	—	—	M3	M5×4ℓ	0	10	10	–7	7		45
	50	108	57	57	20	20	36	10	20	25	35	—	—	M3	M5×4ℓ	3	13	16	–4	7		55
	65	132	75.5	75.5	28.5	25	46	9	9	28	42	—	—	M4	M6×5ℓ	3	3	19	–3	9		65

Note1) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.
Note2) For lubrication when using the dedicated bellows, contact THK.
Note3) When using the dedicated bellows, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

JSRG35 - 60/420

Model number of bellows for SRG35	Dimensions of the bellows (length when compressed / length when extended)

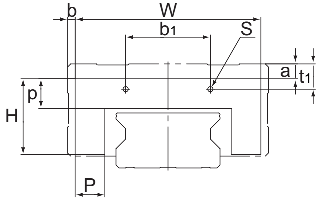
Note) The length of the bellows is calculated as follow.

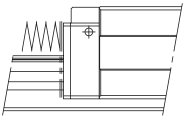
$$\mathrm{Lmin} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

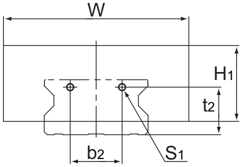
$$\mathrm{Lmax} = \mathrm{Lmin} \cdot A$$ A: Extension rate

[Dedicated Bellows JSRW for Model SRW]

The table below shows the dimensions of dedicated bellows JSRW for model SRW. Specify the corresponding model number of the desired bellows from the table.







Unit: mm

Model No.		Main dimensions													A $\left(\frac{L_{max}}{L_{min}}\right)$	Supported model numbers	
		W	H	H_1	P	p	b_1	t_1	b_2	t_2	Screw size S	Mounting bolt S_1	a	b			
JSRW	70	125	51	51	20	20	57	17	35	32	M3	M5×4L	10	5	7	SRW	70
	85	138	57	57	20	20	68	20	42	36	M3	M5×4L	13	13.5	7		85
	100	169	75.5	75.5	28.5	25	83	19	50	46	M4	M6×5L	13	15.5	9		100

Note1) For lubrication when using the dedicated bellows, contact THK.
Note2) When desiring to use the dedicated bellows other than in horizontal mount (i.e., vertical, wall and inverted mount), or when desiring a heat-resistant type of bellows, contact THK.

Model number coding

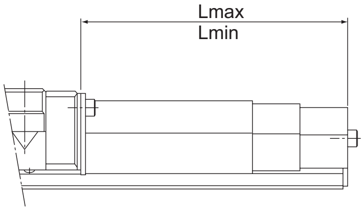
JSRW70 - 60/420

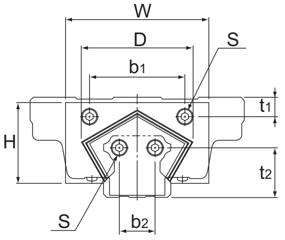
Model number of bellows for SRW70	Dimensions of the bellows (length when compressed / length when extended)

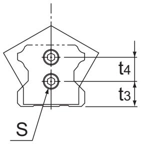
LM Cover

[Dedicated LM Cover TPH for Model HSR]

The tables below show the dimensions of dedicated LM cover TPH for model HSR. Specify the corresponding model number of the desired bellows from the table.







Models HSR25 and 30

Unit: mm

Model No.		Main dimensions										Supported model numbers	
		W	D (max)	H	b_1	t_1	b_2	t_2	t_3	t_4	Mounting bolt S		
TPH	25	55	42	28	30	7	—	—	10	8	M3×6ℓ	HSR	25
	30	60	48	34	40	8	—	—	11	10	M4×8ℓ		30
	35	70	55	38	40	9	14	23	—	—	M4×8ℓ		35
	45	90	75	48	58	10	20	29	—	—	M5×10ℓ		45
	55	100	88	55	66	11	26	35	—	—	M5×10ℓ		55

Unit: mm

Model No.		Stage	L		Stroke
			min	max	
TPH	25	3	200	530	330
		3	150	380	230
		3	100	230	130
	30	3	250	680	430
		3	200	530	330
		3	150	380	230
	35	3	300	830	530
		3	250	680	430
		3	200	530	330
		3	150	380	230

Unit: mm

Model No.		Stage	L		Stroke
			min	max	
TPH	45	3	350	980	630
		3	300	830	530
		3	250	680	430
		3	200	530	330
	55	4	400	1460	1060
		4	350	1330	980
		4	300	1060	760
		4	250	860	610

Note1) For lubrication when using the dedicated LM cover, contact THK.

Note2) When using the dedicated LM cover, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

TPH55 - 400/1460

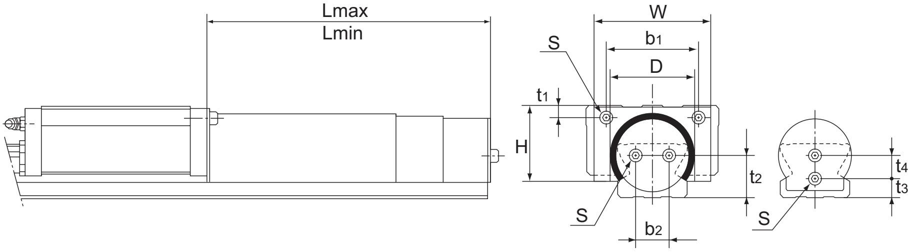
TPH55: Model number of LM cover for HSR55

400: Lmin (cover length when compressed)

1460: Lmax (cover length when extended)

[Dedicated LM Cover TPS for Model SR]

The tables below show the dimensions of dedicated LM cover TPS for model SR. Specify the corresponding model number of the desired bellows from the table.



Models SR30 to 55 Model SR25

Unit: mm

Model No.		Main dimensions										Supported model numbers	
		W	D (max)	H	b_1	t_1	b_2	t_2	t_3	t_4	Mounting bolt S		
TPS	25	42	30	26.5	29	5	—	—	6	7	M3×6ℓ	SR	25
	30	54	37	34.5	42	5	12	17	—	—	M4×8ℓ		30
	35	64	42	38	44	6.5	14	20	—	—	M5×10ℓ		35
	45	76	55	48	60	8	22	27	—	—	M5×10ℓ		45
	55	90	61	54.5	70	10	24	28	—	—	M6×12ℓ		55

Unit: mm

Model No.		Stage	L		Stroke
			min	max	
TPS	25	3	200	530	330
		3	150	380	230
		3	100	230	130
	30	3	250	680	430
		3	200	530	330
		3	150	380	230
	35	3	300	830	530
		3	250	680	430
		3	200	530	330
		3	150	380	230

Unit: mm

Model No.		Stage	L		Stroke
			min	max	
TPS	45	3	350	980	630
		3	300	830	530
		3	250	680	430
		3	200	530	330
	55	4	400	1460	1060
		4	350	1330	980
		4	300	1060	760
		4	250	860	610

Note1) For lubrication when using the dedicated LM cover, contact THK.

Note2) When using the dedicated LM cover, the LM block and LM rail need to be machined so that the bellows can be mounted. Be sure to indicate that the dedicated bellows is required when ordering the LM Guide.

Model number coding

TPS55 - 400/1460

TPS55: Model number of LM cover for SR55

400: Lmin (cover length when compressed)

1460: Lmax (cover length when extended)

Cap C

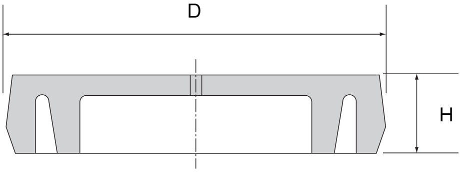
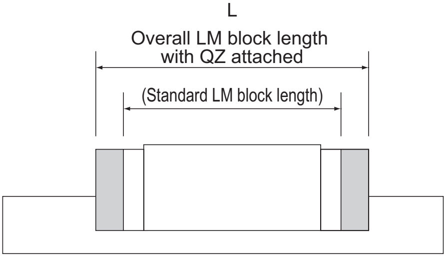


Table1 List of Model Numbers Supported for the Dedicated Cap C for LM Rail Mounting Holes

Model No.	Bolt used	Main dimensions (mm)		Supported model number														
		D	H	SSR	SCR	SR	SNR SNS	NR NRS	SHS HSR CSR HCR	HMG	SHW HRW	SRG SRN	GSR	HR	SRS RSR RSH	SRS-W RSR-W RSH-W	NSR-TBC	SRW
C3	M3	6.3	1.2	—	—	15	—	—	12	—	—	—	—	1123 1530	12 15	9	—	—
C4	M4	7.8	1.0	15Y	—	—	—	—	15	15	12, 14, 17, 21, 27	15	15	—	14	—	—	—
C5	M5	9.8	2.4	20	—	20	25	25X	20	—	—	20	20	2042	20	—	20	—
C6	M6	11.4	2.7	25Y 30	25	25Y 30	30	30	25	25	35	25	25	—	25	—	25 30	—
C8	M8	14.4	3.7	35	30 35	35	35	35	30 35	35	50	30 35	30	2555 3065	—	—	40	—
C10	M10	18.0	3.7	—	—	45	—	—	—	—	60	—	35	3575	—	—	50	70
C12	M12	20.5	4.7	—	45	55	45	45	45	45	—	45	—	4085	—	—	70	85
C14	M14	23.5	5.7	—	—	—	55	55	55	—	—	55	—	—	—	—	—	100
C16	M16	26.5	5.7	—	65	70 85	65	65	65	65	—	65	—	50105	—	—	—	—
C22	M22	35.5	5.7	—	—	—	—	85	85	—	—	—	—	—	—	—	—	—

Note) The dedicated cap for the LM rail mounting hole can be made of other materials (e.g., metal). Contact THK for details.

LM Block Dimension (Dimension L) with QZ Attached



Unit: mm

Model No.		Standard overall length	L								
			QZUU	QZSS	QZDD	QZZZ	QZKK	QZSSHH	QZDDHH	QZZZHH	QZKKHH
SHS	15C/V/R	64.4	84.4	84.4	89.8	86.8	92.2	100	105.4	101.2	106.6
	15LC/LV	79.4	99.4	99.4	104.8	101.8	107.2	115	120.4	116.2	121.6
	20C/V	79	99	99	105.4	103	109.4	115.4	121.8	117.8	124.2
	20LC/LV	98	118	118	124.4	122	128.4	134.4	140.8	136.8	143.2
	25C/V/R	92	114.4	114.4	121.6	120.4	127.6	132	139.2	134.4	141.6
	25LC/LV/LR	109	131.4	131.4	138.6	137.4	144.6	149	156.2	151.4	158.6
	30C/V/R	106	127.4	127.4	136	133.8	142.4	149.4	158	151.8	160.4
	30LC/LV/LR	131	152.4	152.4	161	158.8	167.4	174.4	183	176.8	185.4
	35C/V/R	122	145	145	154.8	152.4	162.2	168	177.8	170.4	180.2
	35LC/LV/LR	152	175	175	184.8	182.4	192.2	198	207.8	200.4	210.2
	45C/V/R	140	173	173	182.8	181.2	191	199	208.8	202.2	212
	45LC/LV/LR	174	207	207	216.8	215.2	225	233	242.8	236.2	246
	55C/V/R	171	205.4	205.4	216.6	214.2	225.4	232	243.2	235.2	246.4
	55LC/LV/LR	213	247.4	247.4	258.6	256.2	267.4	274	285.2	277.2	288.4
	65C/V	221	256.2	256.2	268.6	266.2	278.6	288	300.4	291.2	303.6
	65LC/LV	272	307.2	307.2	319.6	317.2	329.6	339	351.4	342.2	354.6
SSR	15XVY	40.3	59.3	59.3	65.1	62.7	68.5	75.5	81.3	76.7	82.5
	15XWY/XTBY	56.9	75.9	75.9	81.7	79.3	85.1	92.1	97.9	93.3	99.1
	20XV	47.7	66.2	66.2	73.1	72.1	79	83.7	90.6	86.1	93
	20XW/XTB	66.5	85	85	91.9	90.9	97.8	102.5	109.4	104.9	111.8
	25XVY	60	82.6	82.6	90	88.4	95.8	100	107.4	102.4	109.8
	25XWY/XTBY	83	105.6	105.6	113	111.4	118.8	123	130.4	125.4	132.8
	30XW	97	119.7	119.7	127.8	125.4	133.5	141	149.1	143.4	151.5
	35XW	110.9	134.3	134.3	143.3	141.3	150.3	156.9	165.9	159.3	168.3
SNR/ SNS	25R/C	82.8	105.2	105.2	112.8	110.9	118.5	122.5	130.1	124.9	132.5
	25LR/LC	102	124.4	124.4	132	130.1	137.7	141.7	149.3	144.1	151.7
	30R/C	98	121.2	121.2	131	126.9	136.7	141.7	151.5	144.1	153.9
	30LR/LC	120.5	143.7	143.7	153.5	149.4	159.2	164.2	174	166.6	176.4
	35R/C	109.5	142.7	142.7	152.9	149.5	159.7	164.3	174.5	166.7	176.9
	35LR/LC	135	168.2	168.2	178.4	175	185.2	189.8	200	192.2	202.4
	45R/C	138.2	171.4	171.4	181.6	179	189.2	196.4	206.6	199.6	209.8
	45LR/LC	171	204.2	204.2	214.4	211.8	222	229.2	239.4	232.4	242.6
	55R/C	163.3	204.5	204.5	214.7	213.2	223.4	231	241.2	234.2	244.4
	55LR/LC	200.5	241.7	241.7	251.9	250.4	260.6	268.2	278.4	271.4	281.6
	65R/C	186	227.6	227.6	238.2	236.3	246.9	257.5	268.1	260.7	271.3
	65LR/LC	246	287.6	287.6	298.2	296.3	306.9	317.5	328.1	320.7	331.3
SHW	12CAM/CRM	37	47	47	—	—	—	—	—	—	—
	12HRM	50.4	60.4	60.4	—	—	—	—	—	—	—

Unit: mm

Model No.		Standard overall length	L								
			QZUU	QZSS	QZDD	QZZZ	QZKK	QZSSHH	QZDDHH	QZZZHH	QZKKHH
SHW	14CAM/CRM	45.5	55.5	55.5	—	—	—	—	—	—	—
	17CAM/CRM	51	63	63	66	65.4	68.4	—	—	—	—
	21CA/CR	59	75	75	80	77.8	82.8	91.6	96.6	93.2	98.2
	27CA/CR	72.8	92.8	92.8	98.6	96.4	102.2	109.4	115.2	111.8	117.6
	35CA/CR	107	127	127	134.4	132	134.4	149	156.4	151.4	158.8
	50CA/CR	141	161	161	169.2	167.4	175.6	186	194.2	188.4	196.6
SRS	7	23.4	33.4	33.4	—	—	—	—	—	—	—
	7W	31	41	41	—	—	—	—	—	—	—
	9	30.8	40.8	40.8	—	—	—	—	—	—	—
	9W	39	49	49	—	—	—	—	—	—	—
	12	34.4	44.4	44.4	—	—	—	—	—	—	—
	12W	44.5	54.5	54.5	—	—	—	—	—	—	—
	15	43	55	55	—	—	—	—	—	—	—
	15W	55.5	67.5	67.5	—	—	—	—	—	—	—
	20	50	66	66	—	—	—	83.2	—	—	—
	25	77	97	97	—	—	—	115.2	—	—	—
SCR	15S	64.4	84.4	84.4	89.8	86.8	92.2	100.4	105.4	101.4	106.9
	20S	79	99	99	105.4	103	109.4	115.5	122	118	124.5
	20	98	118	118	124.4	122	128.4	134.5	141	137	143.5
	25	109	131.4	131.4	138.6	137.4	144.6	149	156.2	151.4	158.6
	30	131	152.4	152.4	161	158.8	167.4	174.4	183	176.8	185.4
	35	152	175	175	184.8	182.4	192.2	198	207.8	200.4	210.2
	45	174	207	207	216.8	215.2	225	233	242.8	236.2	246
	65	272	307.2	307.2	319.6	317.2	329.6	339	351.4	342.2	354.6
HSR	15A/B/R/YR	56.6	79.6	79.6	87.6	84.2	92.2	98.8	106.8	100.0	108.0
	20A/B/R/CA/CB/YR	74	96.2	96.2	104.4	102	110.2	113.6	121.8	116	124.2
	20LA/LB/LR/HA/HB	90	112.2	112.2	120.4	118	126.2	129.6	137.8	132	140.2
	25A/B/R/CA/CB/YR	83.1	104.1	104.1	112.1	109.8	117.8	121.4	129.4	123.8	131.8
	25LA/LB/LR/HA/HB	102.2	123.2	123.2	131.2	128.9	136.9	140.5	148.5	142.9	150.9
	30A/B/R/CA/CB/YR	98	119	119	127	124.7	132.7	140.3	148.3	142.7	150.7
	30LA/LB/LR/HA/HB	120.6	141.6	141.6	149.6	147.3	155.3	162.9	170.9	165.3	173.3
	35A/B/R/CA/CB/YR	109.4	132.2	132.2	142	139	148.8	154.6	164.4	157	166.8
	35LA/LB/LR/HA/HB	134.8	157.6	157.6	167.4	164.4	174.2	180	189.8	182.4	192.2
	45A/B/R/CA/CB/YR	139	174.8	174.8	181.6	176.6	186.4	—	—	—	—
	45LA/LB/LR/HA/HB	170.8	206.6	206.6	213.4	208.4	218.2	—	—	—	—
	55A/B/R/CA/CB/YR	163	197.2	197.2	208.4	202	213.2	—	—	—	—
	55LA/LB/LR/HA/HB	201.1	235.3	235.3	246.5	240.1	251.3	—	—	—	—
	65A/B/R/CA/CB/YR	186	221.4	221.4	233.8	226.6	239	—	—	—	—
	65LA/LB/LR/HA/HB	245.5	280.9	280.9	293.3	286.1	298.5	—	—	—	—
NR/ NRS	25XR/XA/XB	82.8	105.2	105.2	112.8	110.9	118.5	122.5	130.1	124.9	132.5
	25XLR/XLA/XLB	102	124.4	124.4	132	130.1	137.7	141.7	149.3	144.1	151.7
	30R/A/B	98	120.4	120.4	129.4	126.1	135.1	141.7	150.7	144.1	153.1
	30LR/LA/LB	120.5	142.9	142.9	151.9	148.6	157.6	164.2	173.2	166.6	175.6
	35R/A/B	109.5	142.7	142.7	152.9	149.5	159.7	164.3	174.5	166.7	176.9
	35LR/LA/LB	135	168.2	168.2	178.4	175	185.2	189.8	200	192.2	202.4
	45R/A/B	139	172.2	172.2	182.4	179.8	190	197.6	207.8	200.8	211
	45LR/LA/LB	171	204.2	204.2	214.4	211.8	222	229.6	239.8	232.8	243
	55R/A/B	162.8	204.8	204.8	215	213.5	223.7	231.3	241.5	234.5	244.7
	55LR/LA/LB	200	242	242	252.2	250.7	260.9	268.5	278.7	271.7	281.9
	65R/A/B	185.6	227.6	227.6	238.2	236.3	246.9	258.1	268.7	261.3	271.9
	65LR/LA/LB	245.6	287.6	287.6	298.2	296.3	306.9	318.1	328.7	321.3	331.9

Unit: mm

Model No.		Standard overall length	L								
			QZUU	QZSS	QZDD	QZZZ	QZKK	QZSSHH	QZDDHH	QZZZHH	QZKKHH
RSR	9	31	40.8	—	—	—	—	—	—	—	—
	9N	41	50.8	—	—	—	—	—	—	—	—
	9W	39	49	—	—	—	—	—	—	—	—
	9WN	51	60.7	—	—	—	—	—	—	—	—
RSR	12	35	45	—	—	—	—	—	—	—	—
	12N	47.5	57.7	—	—	—	—	—	—	—	—
	12W	44.5	54.5	—	—	—	—	—	—	—	—
	12WN	59.5	69.5	—	—	—	—	—	—	—	—
	15	43	55	—	—	—	—	—	—	—	—
	15N	61	72.7	—	—	—	—	—	—	—	—
	15W	55.5	67.5	—	—	—	—	—	—	—	—
	15WN	74.5	86.5	—	—	—	—	—	—	—	—
SRG	15A/V	69	92	92	94	—	—	—	—	—	—
	20A/V	86	109	109	111	112.4	114.4	126.6	128.6	129	131
	20LA/LV	106	129	129	131	132.4	134.4	146.6	148.6	149	151
	25C/R	95.5	125.5	125.5	130.5	130.5	135.5	145.3	151.7	147.7	154.1
	25LC/LR	115.1	145.1	145.1	150.1	150.1	155.1	164.9	171.3	167.3	173.7
	30C/R	111	141	141	148	146	153	160.8	169.2	164.6	171.6
	30LC/LR	135	165	165	172	170	177	184.8	193.2	188.6	195.6
	35C/R	125	155	155	162.8	163.4	171.2	178.6	186.4	181	188.8
	35LC/LR	155	185	185	192.8	193.4	201.2	208.6	216.4	211	218.8
	45C/R	155	185	185	194.2	194.2	203.4	212	221.2	215.2	224.5
	45LC/LR	190	220	220	229.2	229.2	238.4	247	256.2	250.2	259.4
	55C/R	185	225	225	234.2	234.2	243.4	252	261.2	255.2	264.4
	55LC/LR	235	275	275	284.2	284.2	293.4	302	311.2	305.2	314.4
	65LC/LV	303	343	343	354.2	354.2	365.4	375.4	386.6	378.6	389.8
SRN	35C/R	125	155	155	162.8	163.4	171.2	178.6	186.4	181	188.8
	35LC/LR	155	185	185	192.8	193.4	201.2	208.6	216.4	211	218.8
	45C/R	155	185	185	194.2	194.2	203.4	212	221.2	215.2	224.5
	45LC/LR	190	220	220	229.2	229.2	238.4	247	256.2	250.2	259.4
	55C/R	185	225	225	234.2	234.2	243.4	252	261.2	255.2	264.4
	55LC/LR	235	275	275	284.2	284.2	293.4	302	311.2	305.2	314.4
	65LC/LR	303	343	343	354.2	354.2	365.4	375.4	386.6	378.6	389.8
SRW	70	190	220	220	229.2	229.2	238.4	247	256.2	250.2	259.4
	85	235	275	275	284.2	284.2	293.4	302	311.2	305.2	314.4
	100	303	343	343	354.2	354.2	365.4	375.4	386.6	378.6	389.8

Model number coding

SHS25 LC 2 QZ KKHH C0 +1200L P T Z -Ⅱ

- SHS25: Model number
- LC: Type of LM block
- 2: No. of LM blocks used on the same rail
- QZ: With QZ Lubricator (*1)
- KKHH: Contamination protection accessory symbol (*2)
- C0: Radial clearance symbol (*3)
  - Normal (No symbol)
  - Light preload (C1)
  - Medium preload (C0)
- +1200L: LM rail length (in mm)
- P: Accuracy symbol (*4)
  - Normal grade (No Symbol)
  - High accuracy grade (H)
  - Precision grade (P)/Super precision grade (SP)
  - Ultra precision grade (UP)
- T: Symbol for LM rail jointed use
- Z: With steel tape
- -Ⅱ: Symbol for No. of rails used on the same plane (*5)

(*1) See A-361. (*2) See A-368. (*3) See A-113. (*4) See A-118. (*5) See A-59.

Note) This model number indicates that a single-rail unit constitutes one set. (i.e., required number of sets when 2 rails are used in parallel is 2 at a minimum.)
Those models equipped with QZ Lubricator cannot have a grease nipple.

Lubrication Adapter

An oil lubricant-only lubrication adapter is available for models NR/NRS.
Even if the LM Guide is installed in an orientation where oil lubrication is difficult, such as wall mount and inversed mount, the adapter is capable of feeding a constant quantity of lubricant to the four raceways.

[Features]

The dedicated lubrication adapter for models NR-NRS is built in with a constant quantity distributor. Therefore, the adapter can accurately feed a constant quantity of lubricant to each raceway regardless of the mounting orientation.
The adapter is economical since it is capable of constantly feeding the optimum amount of lubricant and helping eliminate the supply of surplus lubricant.
To provide pipe arrangement, simply connect an intermittent lubrication pump widely used for ordinary machine tools to the greasing holes (M8) on the front and the side of the lubrication adapter.

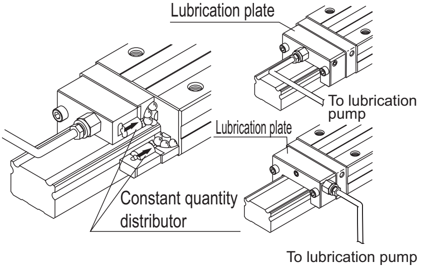


Fig.3 Structural Drawing

[Specifications]

Viscosity range of lubricant used	32 to 64 mm²/s recommended
Discharge	0.03×4, 0.06×4cc/1shot
Diameter of pipe connected	ϕ4, ϕ6
Material	Aluminum alloy

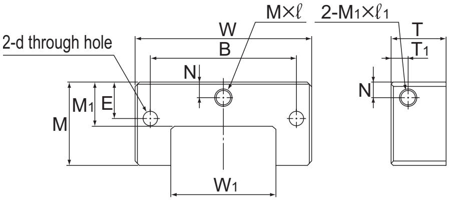


Fig.4

Table2 Dimension Table for Lubrication Adapter

Unit: mm

Model No.	Main dimensions												Quantity per shot (cc/shot)
	Width W	Height M	T	W_1	M_1	B	E	N	T_1	d	M×ℓ	M_1×ℓ_1	
A30N	56	29	25	29	14.5	46	14	5	5.3	3.5	M8×8	M8×8	0.03×4
A35N	66	33	25	35	17	54	16.5	6	5.3	4.5	M8×8	M8×8	
A45N	81	38	25	48	20	67	16.5	7	7.8	6.6	M8×8	M8×8	
A55N	94	45.5	25	56	22	76	20.5	7	7.8	6.6	M8×8	M8×8	0.06×4
A65N	119	55.5	25	67	26.3	92	25.5	11.5	7.8	9	M8×8	M8×8	
A85N	147	68.5	25	92	34	114	32	15.5	7.8	9	M8×8	M8×8	

End Piece EP

For those models whose balls may fall if the LM rail is pulled out of the LM block, an end piece is attached to the product to prevent the LM block from being removed from the LM rail.

For models that can use the end piece, see the table below.

If removing the end piece when using the LM Guide, be sure that the LM block will not overshoot.

The end piece can also be used as a fixing jig for a steel tape, and is available also for the LM rail of models SSR, SR and HSR.

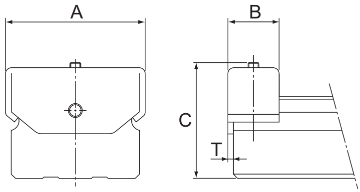


Fig.5 End Piece EP for Models NR/NRS

Table3 Dimension Table for End Piece EP for Models NR/NRS

Unit: mm

Model No.	A	B	C	T
NR/NRS 25X	26	14	25	1.5
NR/NRS 30	31	14	31	1.5
NR/NRS 35	38	16	32.5	2
NR/NRS 45	49	18	41	2
NR/NRS 55	57	20	46.5	2
NR/NRS 65	69.4	22	59	3.2
NR/NRS 75	81.7	28	56	3.2
NR/NRS 85	91.4	22	68	3.2
NR/NRS 100	106.4	25	73	3.2

Greasing Hole

[Grease Nipple and Greasing Hole for Models SHW and SRS]

Models SHW and SRS do not have a grease nipple as standard. Installation of a grease nipple and the drilling of a greasing hole is performed at THK. When ordering SHW and SRS, indicate that the desired model requires a grease nipple or greasing hole. (For greasing hole dimensions and supported grease nipple types and dimensions, see Table4.)

When using SHW and SRS under harsh conditions, use QZ Lubricator* (optional) or Laminated Contact Scraper LaCS* (optional).

Note1) Grease nipple is not available for models SHW12, SHW14, SRS9M, SRS9WM, SRS12M and SRS12WM. They can have a greasing hole.
Note2) Using a greasing hole other than for greasing may cause damage.
Note3) For QZ Lubricator*, see A-361. For Laminated Contact Scraper LaCS*, see A-353.
Note4) When desiring a grease nipple for a model attached with QZ Lubricator, contact THK.

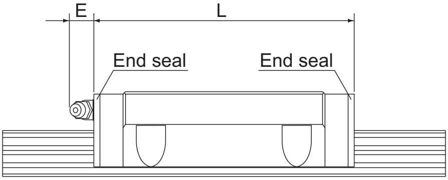


Fig.6 Dimensions of the Grease Nipple for Model SHW

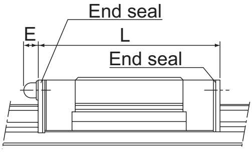


Fig.7 Dimensions of the Grease Nipple for Model SRS

Note) For the L dimension, see the corresponding specification table.

Table4 Table of Grease Nipple and Greasing Hole Dimensions

Unit: mm

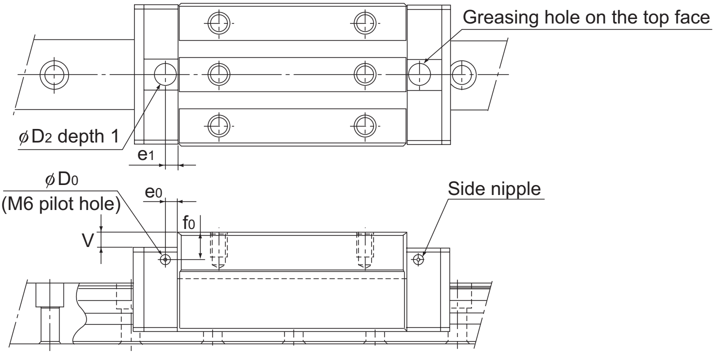
Model No.		E	Grease nipple or greasing hole
SHW	12	—	ϕ2.2 drilled hole
	14	—	ϕ2.2 drilled hole
	17	5	PB107
	21	5.5	PB1021B
	27	12	B-M6F
	35	12	B-M6F
	50	16	B-PT1/8
SRS	9M	—	ϕ1.5 drilled hole
	9WM	—	ϕ1.6 drilled hole
	12M	—	ϕ2.0 drilled hole
	12WM	—	ϕ2.0 drilled hole
	15M	4.0 (5.0)	PB107
	15WM	4.0 (5.0)	PB107
	20M	3.5 (5.0)	PB107
	25M	4.0 (5.5)	PB1021B

Note) Figures in the parentheses indicate dimensions without a seal.

[Greasing Hole for Model SRG]

Model SRG allows lubrication from both the side and top faces of the LM block. The greasing hole of standard types is not drilled through in order to prevent foreign material from entering the LM block. When using the greasing hole, contact THK.

When using the greasing hole on the top face of models SRG-R and SRG-LR, a greasing adapter is separately required. Contact THK for details.



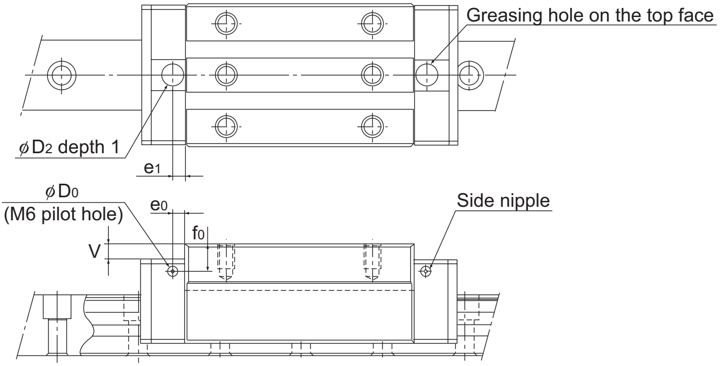
Unit: mm

Model No.		Pilot hole for side nipple			Applicable nipple	Greasing hole on the top face			
		e_0	f_0	D_0		D_2	(O-ring)	V	e_1
SRG	15A 15V	4	4	2.9	PB107	9.2	(P6)	0.5	5.5
	20A 20LA	4	5	2.9	PB107	9.2	(P6)	0.5	6.5
	20V 20LV	4	5	2.9	PB107	9.2	(P6)	0.5	6.5
	25C 25LC	6	6.3	5.2	M6F	10.2	(P7)	0.5	6
	25R 25LR	6	10.3	5.2	M6F	10.2	(P7)	4.5	6
	30C 30LC	6	5.8	5.2	M6F	10.2	(P7)	0.4	6
	30R 30LR	6	8.8	5.2	M6F	10.2	(P7)	3.4	6
	35C 35LC	6	6	5.2	M6F	10.2	(P7)	0.4	6
	35R 35LR	6	13	5.2	M6F	10.2	(P7)	7.4	6
	45C 45LC	7	7	5.2	M6F	10.2	(P7)	0.4	7
	45R 45LR	7	17	5.2	M6F	10.2	(P7)	10.4	7
	55C 55LC	9	8.5	5.2	M6F	10.2	(P7)	0.4	11
	55R 55LR	9	18.5	5.2	M6F	10.2	(P7)	10.4	11
	65LC	9	13.5	5.2	M6F	10.2	(P7)	0.4	10
	65LV	9	13.5	5.2	M6F	10.2	(P7)	0.4	10

Note) The greasing interval is longer than that of full-roller types because of the roller cage effect. However, the actual greasing interval may vary depending on the service environment, such as a high load and high speed. Contact THK for details.

[Greasing Hole for Model SRN]

Model SRN allows lubrication from both the side and top faces of the LM block. The greasing hole of standard types is not drilled through in order to prevent foreign material from entering the LM block. When using the greasing hole, contact THK.



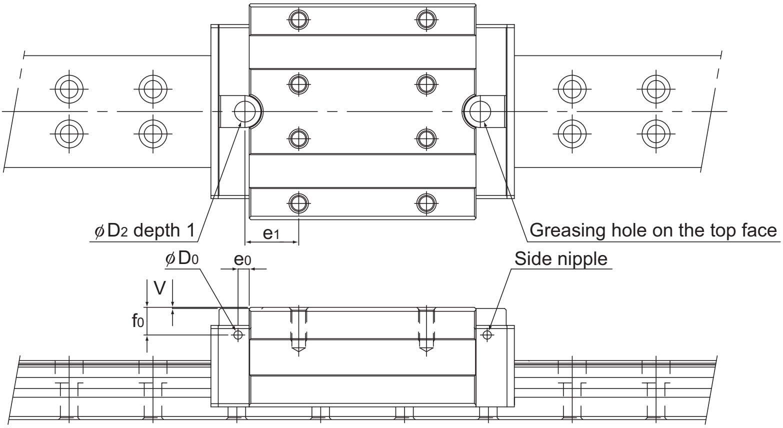
Unit: mm

Model No.		Pilot hole for side nipple			Applicable nipple	Greasing hole on the top face			
		e_0	f_0	D_0		D_2	(O-ring)	V	e_1
SRN	35C 35LC	8	6.5	5.2	M6F	10.2	(P7)	0.4	6
	35R 35LR	8	6.5	5.2	M6F	10.2	(P7)	0.4	6
	45C 45LC	8.5	7	5.2	M6F	10.2	(P7)	0.4	7
	45R 45LR	8.5	7	5.2	M6F	10.2	(P7)	0.4	7
	55C 55LC	10	8	5.2	M6F	10.2	(P7)	0.4	11
	55R 55LR	10	8	5.2	M6F	10.2	(P7)	0.4	11
	65LC	9	11	5.2	M6F	10.2	(P7)	0.4	10
	65LR	9	11	5.2	M6F	10.2	(P7)	0.4	10

Note) The greasing interval is longer than that of full-roller types because of the roller cage effect. However, the actual greasing interval may vary depending on the service environment, such as a high load and high speed. Contact THK for details.

[Greasing Hole for Model SRW]

Model SRW allows lubrication from both the side and top faces of the LM block. The greasing hole of standard types is not drilled through in order to prevent foreign material from entering the LM block. When using the greasing hole, contact THK.



Unit: mm

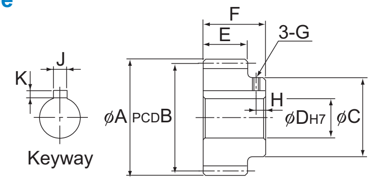
Model No.		Pilot hole for side nipple			Applicable nipple	Greasing hole on the top face			
		e_0	f_0	D_0		D_2	(O-ring)	V	e_1
SRW	70	7	17	5.2	M6F	13	(P10)	0.4	33.7
	85	9	17.7	5.2	M6F	13	(P10)	0.4	42.75
	100	9	22.4	5.2	M6F	13	(P10)	0.4	55

Note) The greasing interval is longer than that of full-roller types because of the roller cage effect. However, the actual greasing interval may vary depending on the service environment, such as a high load and high speed. Contact THK for details.

Rack and Pinion

[Pinion for rack - type A]

The keyway worked type



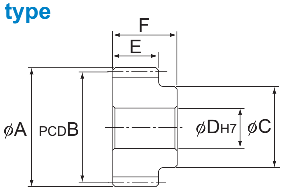
Unit: mm

Model No.	Pitch	Number of teeth	Tip circle diameter A	Meshing PCD B	Boss diameter C	Hole diameter D	Tooth width E	Overall length F	G	H	Keyway J×K	Supported model numbers
GP 6-20A	6	20	42.9	39	30	18	16.5	24.5	M3	4	6×2.8	GSR 25-R
GP 6-25A		25	51.9	48	35	18						
GP 8-20A	8	20	57.1	52	40	20	19	26	M3	5	8×3.3	GSR 30-R
GP 8-25A		25	69.1	64	40	20			M4			
GP10-20A	10	20	70.4	64	45	25	22	30	M4	5	8×3.3	GSR 35-R
GP10-25A		25	86.4	80	60	25					10×3.3	

Note1) When placing an order, specify the model number from the table.
Note2) Non-standard pinions with different numbers of teeth are also available upon request. Contact THK for details.

[Pinion for rack - type C]

The reworkable hole diameter type

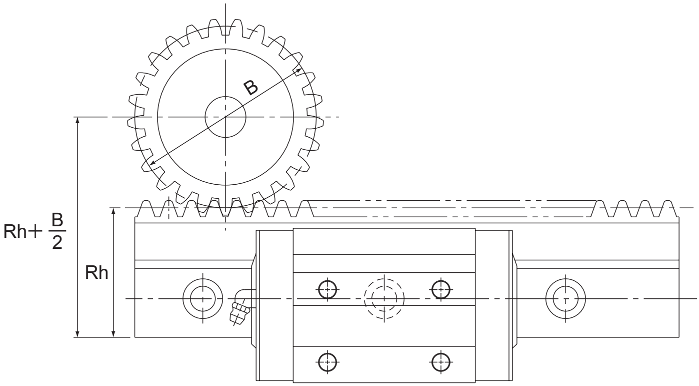


Unit: mm

Model No.	Pitch	Number of teeth	Tip circle diameter A	Meshing PCD B	Boss diameter C	Hole diameter D	Tooth width E	Overall length F	Supported model numbers
GP 6-20C	6	20	42.9	39	30	12	16.5	24.5	GSR 25-R
GP 6-25C		25	51.9	48	35	15			
GP 8-20C	8	20	57.1	52	40	18	19	26	GSR 30-R
GP 8-25C		25	69.1	64	40	18			
GP10-20C	10	20	70.4	64	45	18	22	30	GSR 35-R
GP10-25C		25	86.4	80	60	18			

Note1) When placing an order, specify the model number from the table.
Note2) Non-standard pinions with different numbers of teeth are also available upon request. Contact THK for details.

[The dimension when the LM rail is used in combination with a pinion]



Unit: mm

Model GSR Model No.	Pinion Model No.	LM rail Pitch line height Rh	Pinion Meshing PCD B	Rh+B/2
GSR 25-R	GP 6-20A	43	39	62.5
	GP 6-20C			
	GP 6-25A		48	67
	GP 6-25C			
GSR 30-R	GP 8-20A	48	52	74
	GP 8-20C			
	GP 8-25A		64	80
	GP 8-25C			
GSR 35-R	GP 10-20A	57	64	89
	GP 10-20C			
	GP 10-25A		80	97
	GP 10-25C			

LM Guide Actuator

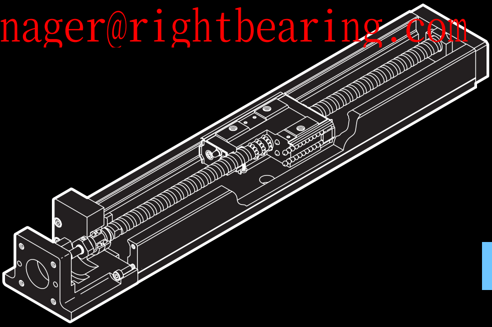
THK General Catalog

B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".



KR

LM Guide Actuator

B Product Specifications

Dimensional Drawing, Dimensional Table

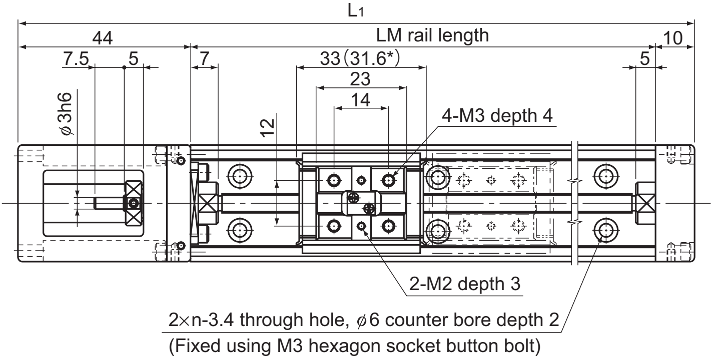
A Technical Descriptions of the Products (Separate)

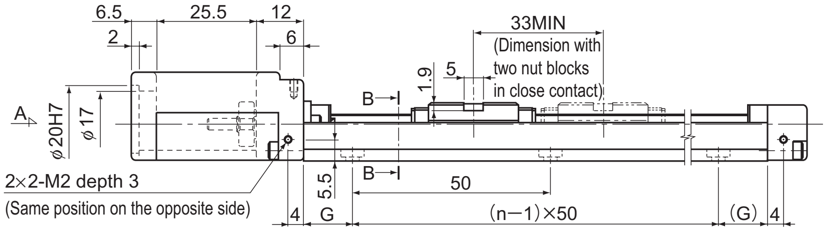
Technical Descriptions

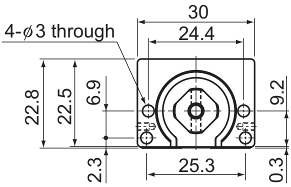
* Please see the separate "A Technical Descriptions of the Products".

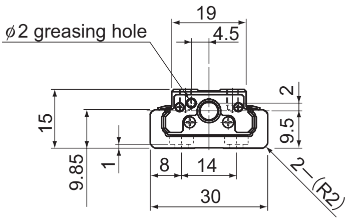
Model KR15 Standard Type

Model KR15□□A (with a Single Nut Block)
Model KR15□□B (with Two Nut Blocks)









A arrow view

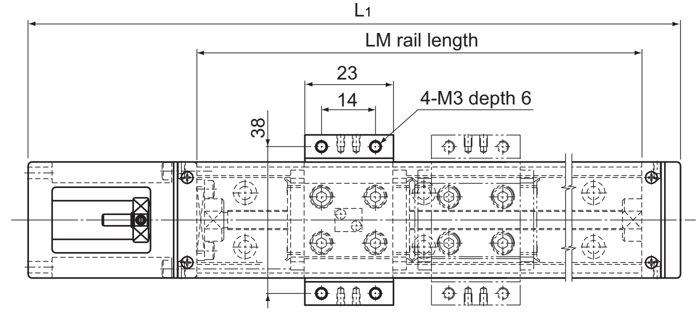
B-B cross section

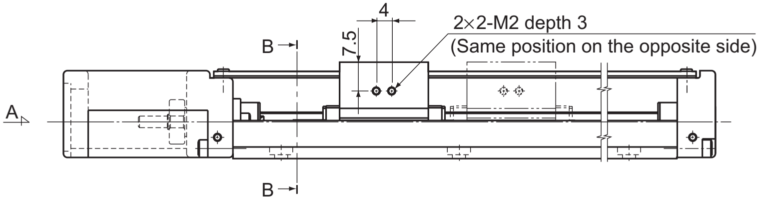
LM rail length (mm)	Overall length L_1(mm)	Available stroke range (mm)		G (mm)	n	Overall main unit mass (kg)	
		Type A	Type B			Type A	Type B
75	129	31.4	—	12.5	2	0.19	—
100	154	56.4	—	25	2	0.22	—
125	179	81.4	48.4	12.5	3	0.25	0.292
150	204	106.4	73.4	25	3	0.28	0.322
175	229	131.4	98.4	12.5	4	0.31	0.352
200	254	156.4	123.4	25	4	0.34	0.382

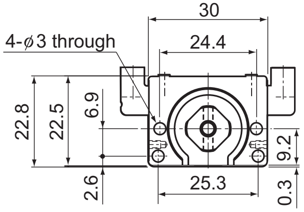
Note1) The available stroke range of model KR15□□B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 64.6 mm.

Model KR15 (with a Cover)

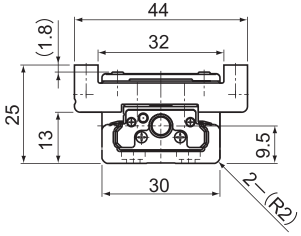
Model KR15□□A (with a Single Nut Block)
Model KR15□□B (with Two Nut Blocks)







A arrow view



B-B cross section

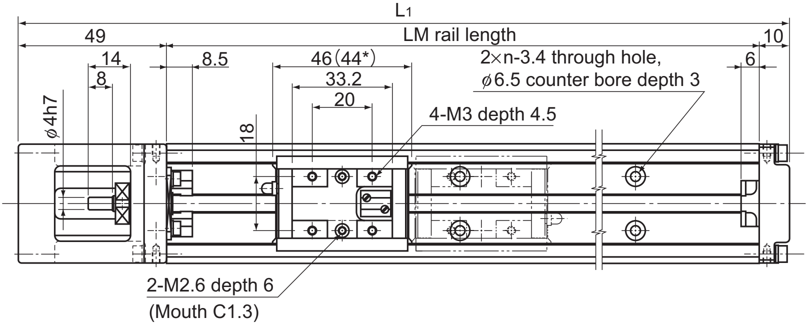
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
75	129	31.4	—	0.23	—
100	154	56.4	—	0.26	—
125	179	81.4	48.4	0.3	0.364
150	204	106.4	73.4	0.33	0.394
175	229	131.4	98.4	0.36	0.424
200	254	156.4	123.4	0.4	0.464

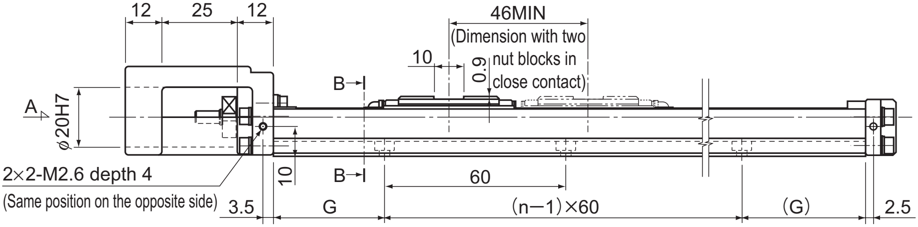
Note) The available stroke range of model KR15□□B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

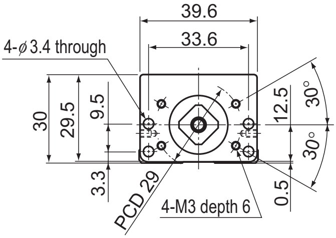
Description of Each Option⇒A-430 Dimensions⇒B-301

Model KR20 Standard Type

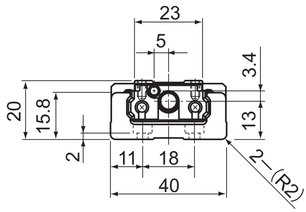
Model KR20□□A (with a Single Nut Block)
Model KR20□□B (with Two Nut Blocks)







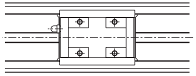
A arrow view



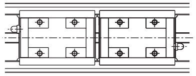
B-B cross section

Nipple orientation

With a single nut block



With two nut blocks

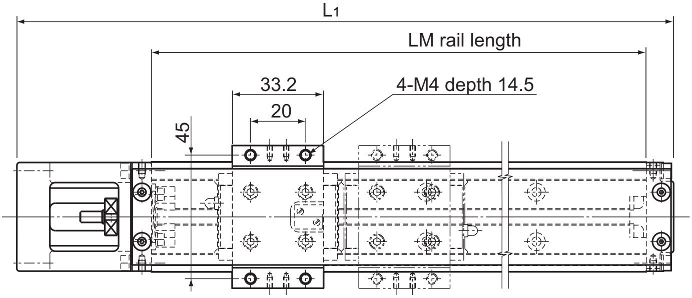


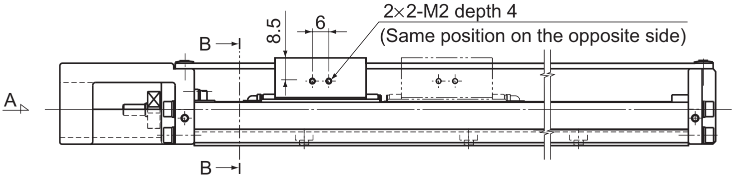
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		G (mm)	n	Overall main unit mass (kg)	
		Type A	Type B			Type A	Type B
100	159	41.5	—	20	2	0.45	—
150	209	91.5	45.5	15	3	0.58	0.655
200	259	141.5	95.5	40	3	0.72	0.795

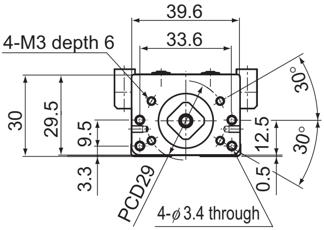
Note1) The available stroke range of model KR2001B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 90mm.

Model KR20 (with a Cover)

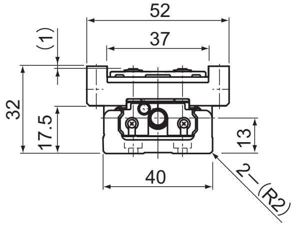
Model KR20☐☐A (with a Single Nut Block)
Model KR20☐☐B (with Two Nut Blocks)







A arrow view



B-B cross section

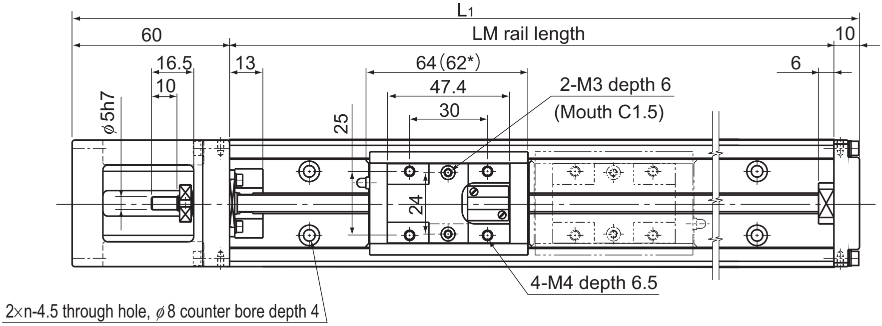
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
100	159	41.5	—	0.51	—
150	209	91.5	45.5	0.66	0.78
200	259	141.5	95.5	0.8	0.92

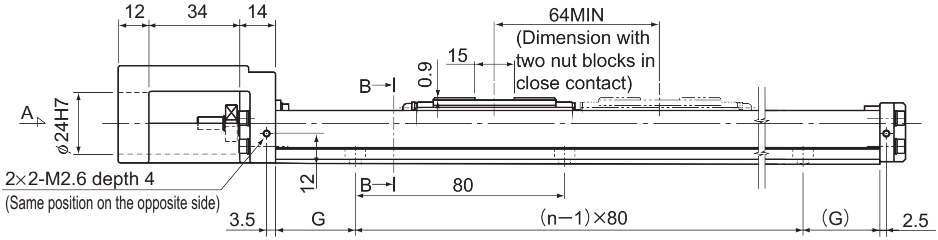
Note) The available stroke range of model KR2001B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

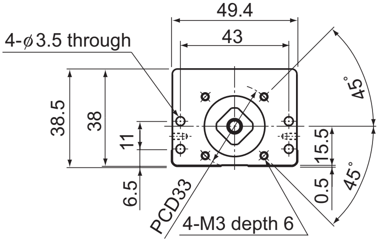
Description of Each Option⇒A-430 Dimensions⇒B-301

Model KR26 Standard Type

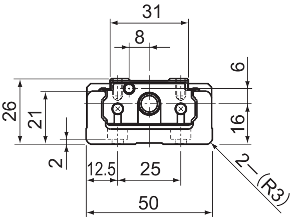
Model KR26☐☐A (with a Single Nut Block)
Model KR26☐☐B (with Two Nut Blocks)



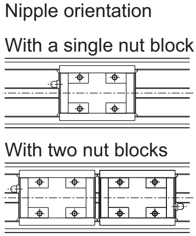




A arrow view



B-B cross section

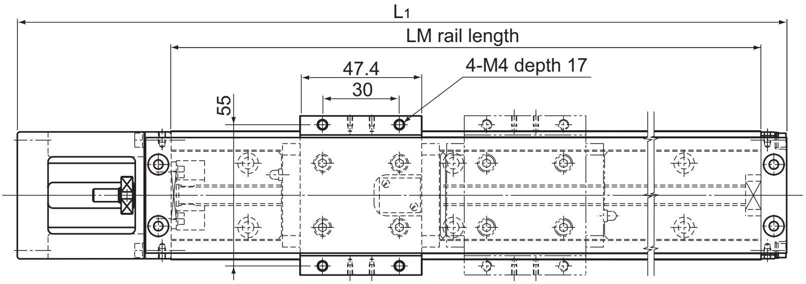


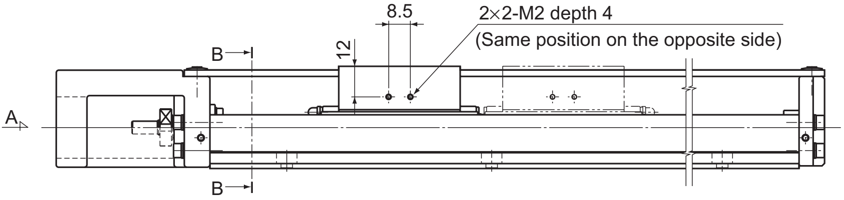
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		G (mm)	n	Overall main unit mass (kg)	
		Type A	Type B			Type A	Type B
150	220	69	—	35	2	0.99	—
200	270	119	55	20	3	1.2	1.38
250	320	169	105	45	3	1.41	1.59
300	370	219	155	30	4	1.62	1.8

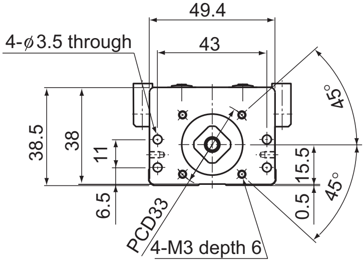
Note1) The available stroke range of model KR2602B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 126mm.

Model KR26 (with a Cover)

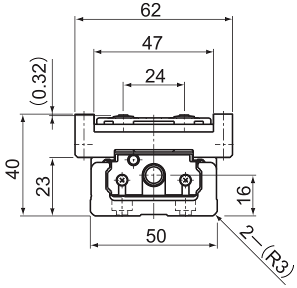
Model KR26☐☐A (with a Single Nut Block)
Model KR26☐☐B (with Two Nut Blocks)







A arrow view



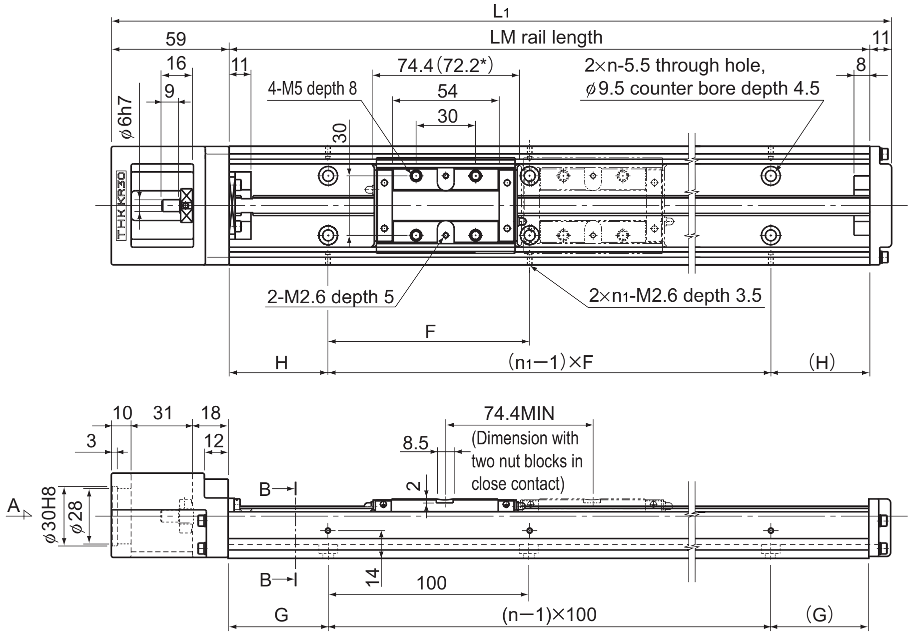
B-B cross section

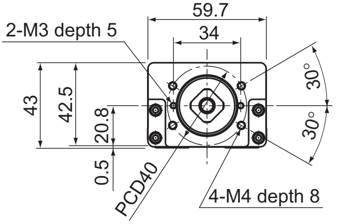
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
150	220	69	—	1.12	—
200	270	119	55	1.34	1.605
250	320	169	105	1.56	1.825
300	370	219	155	1.78	2.045

Note) The available stroke range of model KR2602B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

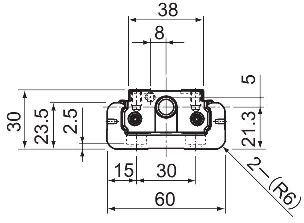
Model KR30H Standard Type

Model KR30H□□A (with a Single Long Nut Block)
Model KR30H□□B (with Two Long Nut Blocks)





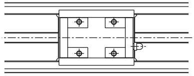
A arrow view



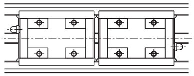
B-B cross section

Nipple orientation

With a single nut block



With two nut blocks

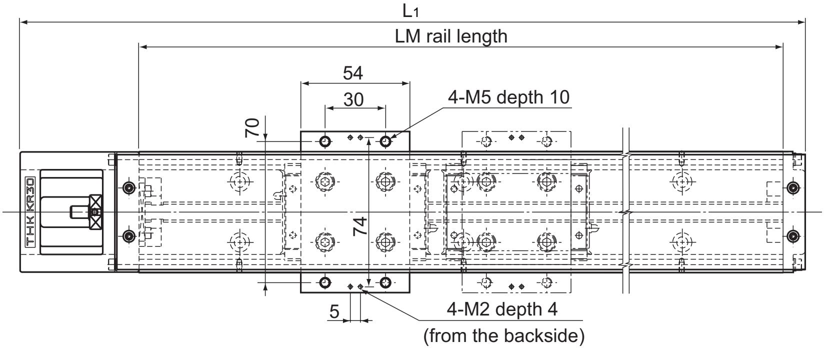


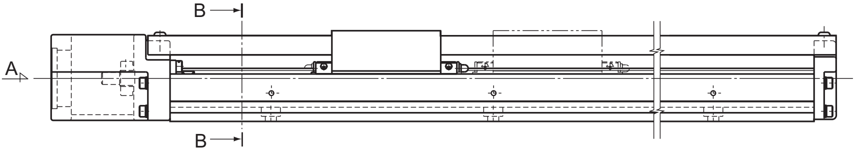
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	G (mm)	F (mm)	n	n1	Overall main unit mass (kg)	
		Type A	Type B						Type A	Type B
150	220	58.8	—	25	25	100	2	2	1.4	—
200	270	108.8	—	50	50	100	2	2	1.6	—
300	370	208.8	134.4	50	50	200	3	2	2.2	2.5
400	470	308.8	234.4	100	50	200	4	2	2.7	3
500	570	408.8	334.4	50	50	200	5	3	3.2	3.5
600	670	508.8	434.4	100	50	200	6	3	3.8	4.1

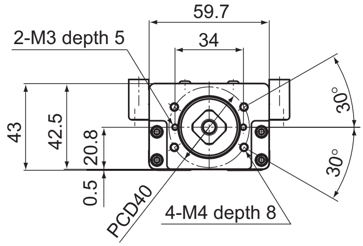
Note1) The available stroke range of model KR30H □□ B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 146.6mm.

Model KR30H (with a Cover)

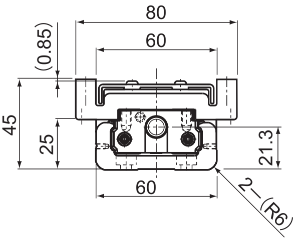
Model KR30H☐☐A (with a Single Long Nut Block)
Model KR30H☐☐B (with Two Long Nut Blocks)







A arrow view



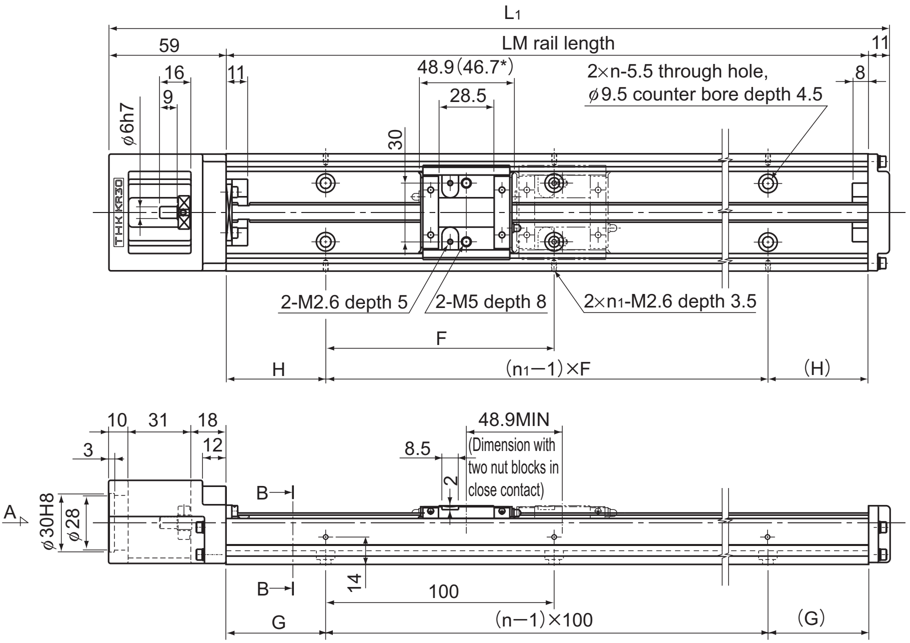
B-B cross section

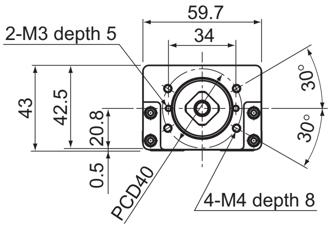
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
150	220	58.8	—	1.6	—
200	270	108.8	—	1.8	—
300	370	208.8	134.4	2.4	2.83
400	470	308.8	234.4	3	3.43
500	570	408.8	334.4	3.5	3.93
600	670	508.8	434.4	4.1	4.53

Note) The available stroke range of model KR30H☐☐B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

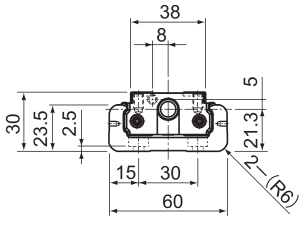
Model KR30H Standard Type

Model KR30H☐☐C (with a Single Short Nut Block)
Model KR30H☐☐D (with Two Short Nut Blocks)



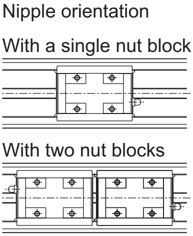


A arrow view



B-B cross section

Nipple orientation

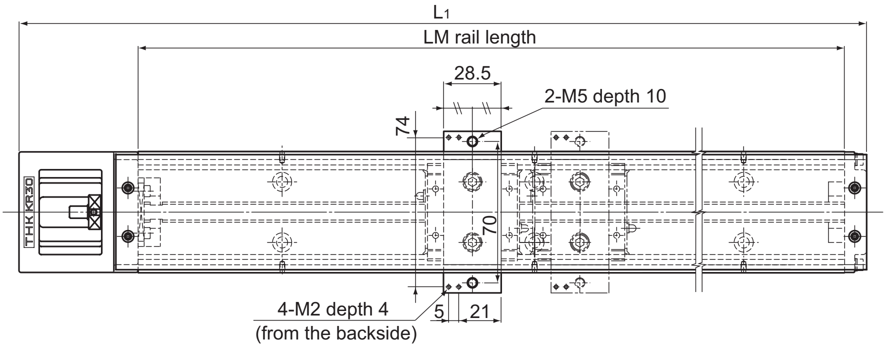


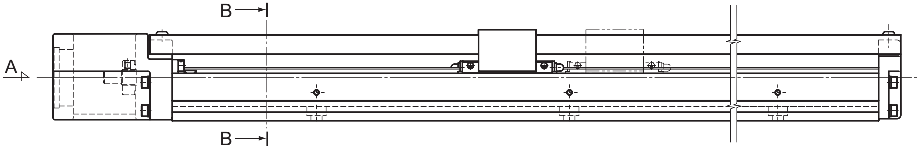
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	G (mm)	F (mm)	n	n1	Overall main unit mass (kg)	
		Type C	Type D						Type C	Type D
150	220	84.3	35.4	25	25	100	2	2	1.3	1.47
200	270	134.3	85.4	50	50	100	2	2	1.5	1.67
300	370	234.3	185.4	50	50	200	3	2	2.1	2.27
400	470	334.3	285.4	100	50	200	4	2	2.6	2.77
500	570	434.3	385.4	50	50	200	5	3	3.1	3.27
600	670	534.3	485.4	100	50	200	6	3	3.7	3.87

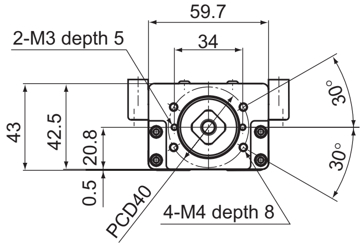
Note1) The available stroke range of model KR30H☐☐D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.
Note2) * indicates the block length when calculating the available stroke range. With type D, it is 95.6mm.

Model KR30H (with a Cover)

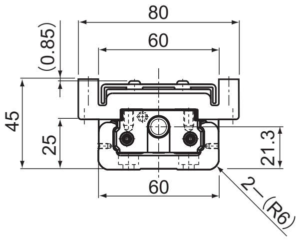
Model KR30H□□C (with a Single Short Nut Block)
Model KR30H□□D (with Two Short Nut Blocks)







A arrow view



B-B cross section

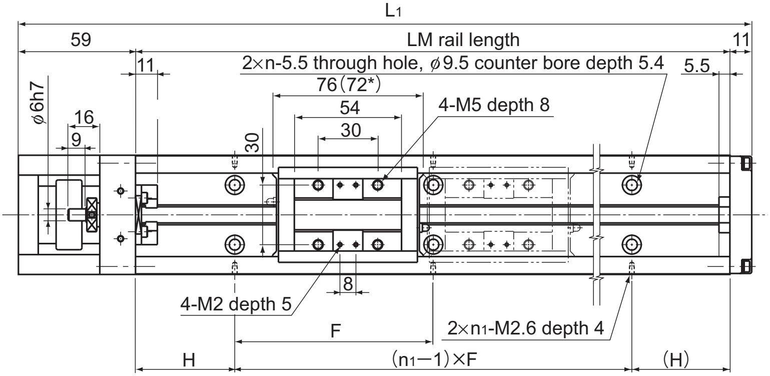
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type C	Type D	Type C	Type D
150	220	84.3	35.4	1.4	1.64
200	270	134.3	85.4	1.6	1.84
300	370	234.3	185.4	2.2	2.44
400	470	334.3	285.4	2.8	3.04
500	570	434.3	385.4	3.3	3.54
600	670	534.3	485.4	3.9	4.14

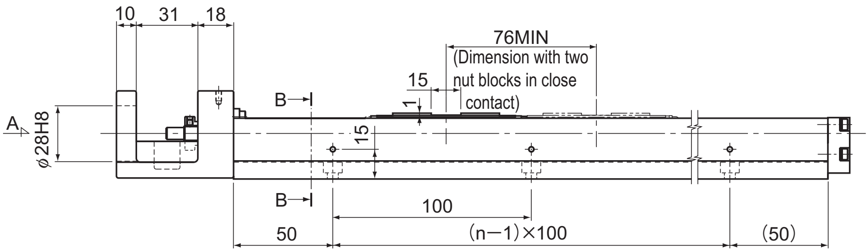
Note) The available stroke range of model KR30H□□D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

Description of Each Option⇒A-430 Dimensions⇒B-301

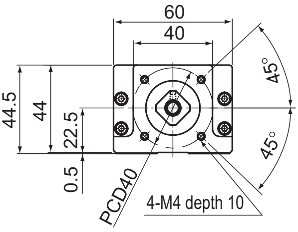
Model KR33 Standard Type

Model KR33□□A (with a Single Long Nut Block)
Model KR33□□B (with Two Long Nut Blocks)

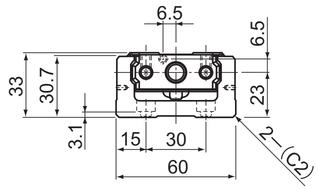




(25 if the LM rail length is 150)   (25 if the LM rail length is 150)



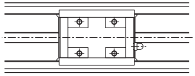
A arrow view



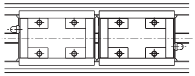
B-B cross section

Nipple orientation

With a single nut block



With two nut blocks

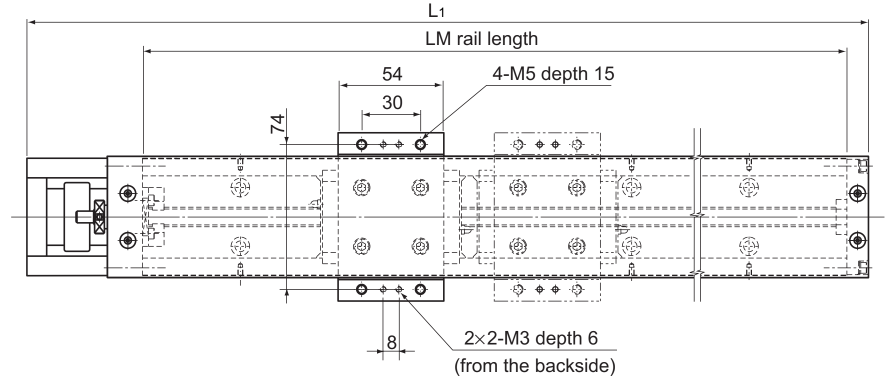


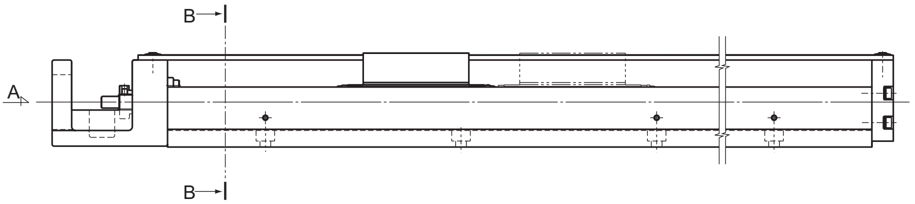
LM rail length (mm)	Overall length L_1(mm)	Available stroke range (mm)		H (mm)	F (mm)	n	n_1	Overall main unit mass (kg)	
		Type A	Type B					Type A	Type B
150	220	61.5	—	25	100	2	2	1.7	—
200	270	111.5	—	50	100	2	2	2	—
300	370	211.5	135.5	50	200	3	2	2.6	2.95
400	470	311.5	235.5	100	200	4	2	3.2	3.55
500	570	411.5	335.5	50	200	5	3	3.9	4.25
600	670	511.5	435.5	100	200	6	3	4.5	4.85

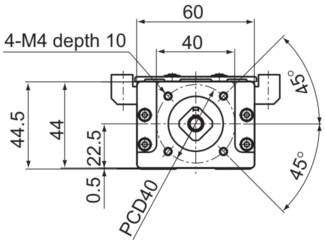
Note1) The available stroke range of model KR33□□B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 148mm.

Model KR33 (with a Cover)

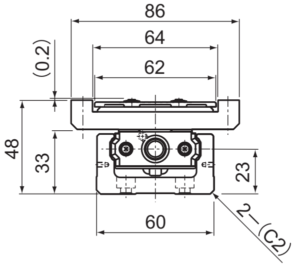
Model KR33□□A (with a Single Long Nut Block)
Model KR33□□B (with Two Long Nut Blocks)







A arrow view



B-B cross section

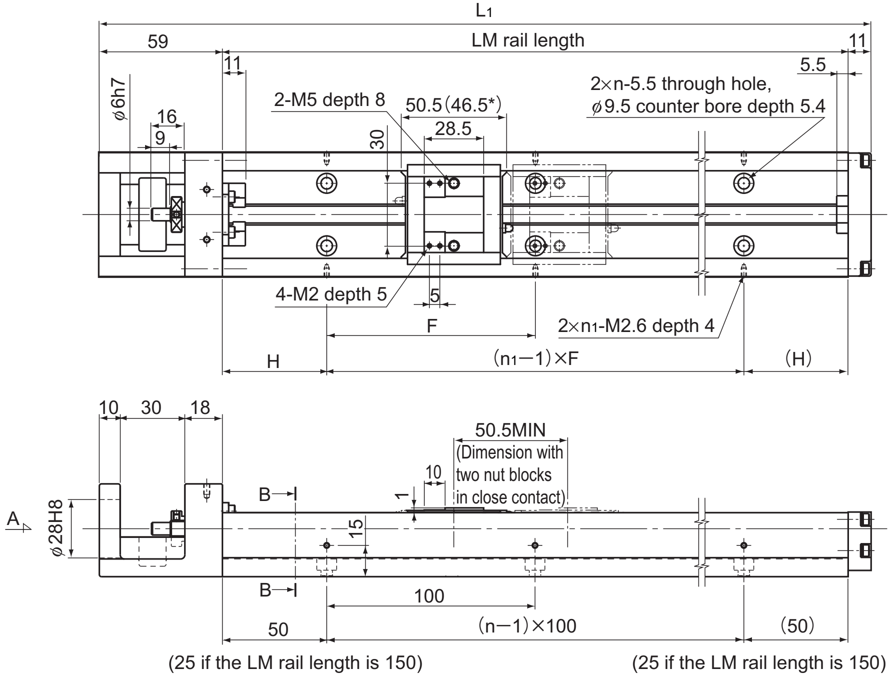
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
150	220	61.5	—	1.9	—
200	270	111.5	—	2.2	—
300	370	211.5	135.5	2.8	3.28
400	470	311.5	235.5	3.5	3.98
500	570	411.5	335.5	4.2	4.68
600	670	511.5	435.5	4.8	5.28

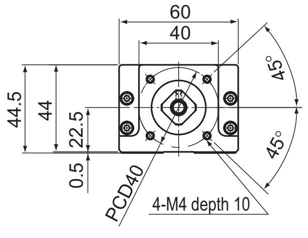
Note) The available stroke range of model KR33□□B indicates the value when two nut blocks are used in close contact with each other.
It must be noted that the cover-mounting bolt is 0.2 mm higher than the top face of the top table.
For model number coding, see B-290.

Description of Each Option⇒A-430 Dimensions⇒B-301

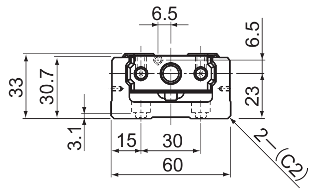
Model KR33 Standard Type

Model KR33□□C (with a Single Short Nut Block)
Model KR33□□D (with Two Short Nut Blocks)

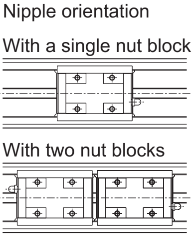




A arrow view



B-B cross section



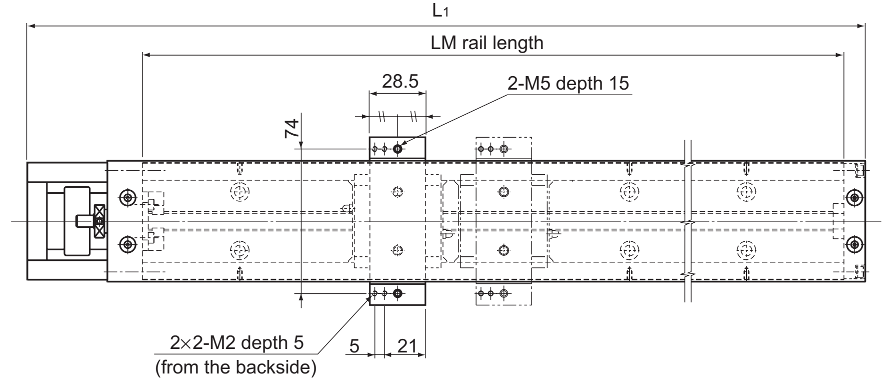
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	F (mm)	n	n1	Overall main unit mass (kg)	
		Type C	Type D					Type C	Type D
150	220	87	36.5	25	100	2	2	1.6	1.83
200	270	137	86.5	50	100	2	2	1.9	2.13
300	370	237	186.5	50	200	3	2	2.5	2.73
400	470	337	286.5	100	200	4	2	3.1	3.33
500	570	437	386.5	50	200	5	3	3.8	4.03
600	670	537	486.5	100	200	6	3	4.4	4.63

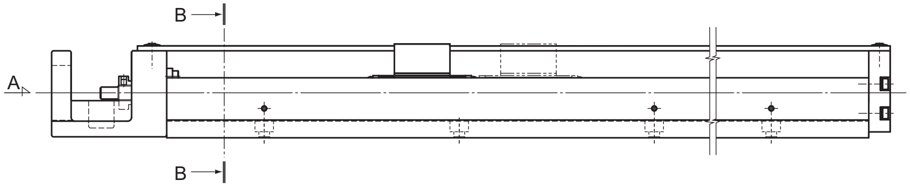
Note1) The available stroke range of model KR33□□D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

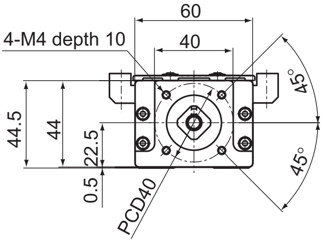
Note2) * indicates the block length when calculating the available stroke range. With type D, it is 97mm.

Model KR33 (with a Cover)

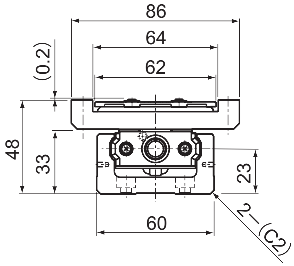
Model KR33□□C (with a Single Short Nut Block)
Model KR33□□D (with Two Short Nut Blocks)







A arrow view



B-B cross section

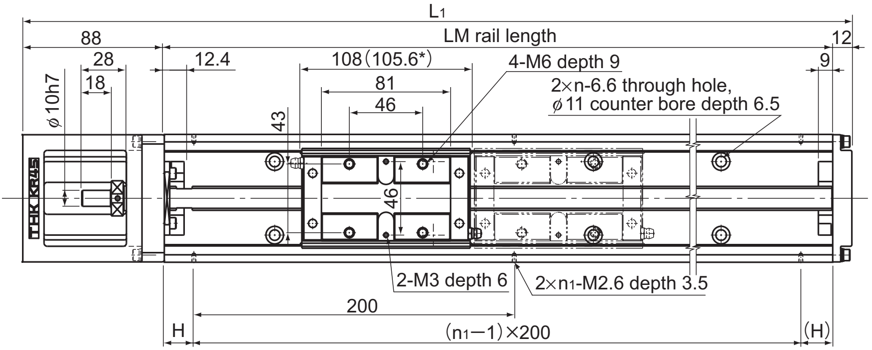
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type C	Type D	Type C	Type D
150	220	87	36.5	1.7	2
200	270	137	86.5	2.1	2.4
300	370	237	186.5	2.7	3
400	470	337	286.5	3.3	3.6
500	570	437	386.5	4	4.3
600	670	537	486.5	4.7	5

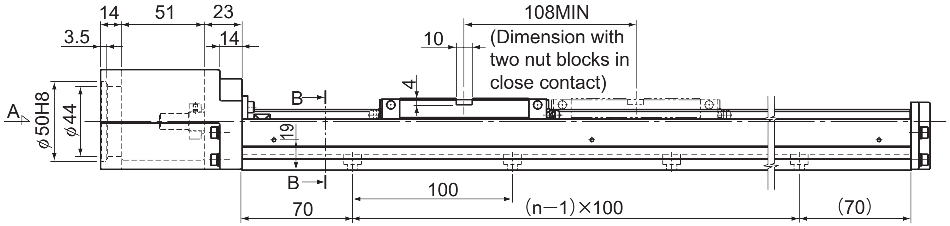
Note) The available stroke range of model KR33□□D indicates the value when two nut blocks are used in close contact with each other.
It must be noted that the cover-mounting bolt is 0.2 mm higher than the top face of the top table.
For model number coding, see B-290.

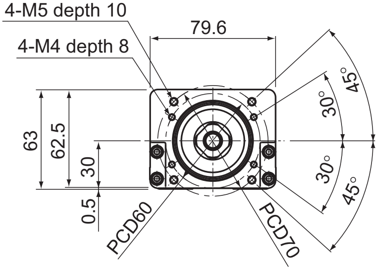
Description of Each Option⇒A-430 Dimensions⇒B-301

Model KR45H Standard Type

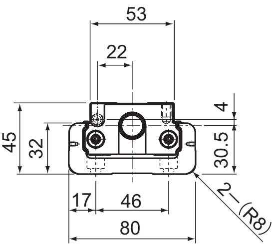
Model KR45H☐☐A (with a Single Long Nut Block)
Model KR45H☐☐B (with Two Long Nut Blocks)





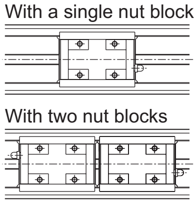


A arrow view



B-B cross section

Nipple orientation



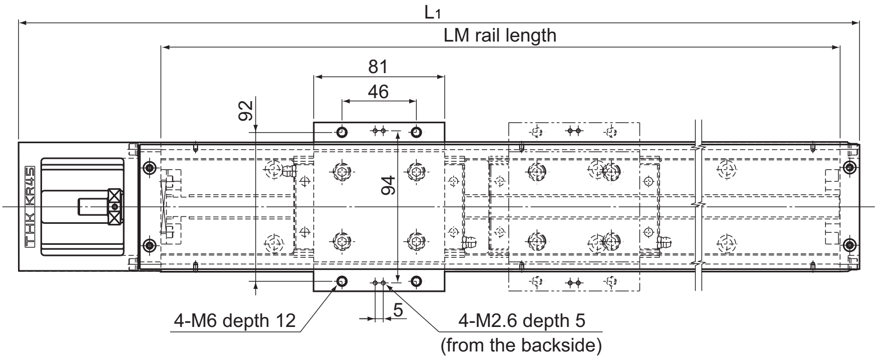
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	n	n1	Overall main unit mass (kg)	
		Type A	Type B				Type A	Type B
340	440	213	105	70	3	2	5.1	6.05
440	540	313	205	20	4	3	6.1	7.05
540	640	413	305	70	5	3	7.1	8.05
640	740	513	405	20	6	4	8.1	9.05
740	840	631	505	70	7	4	9.1	10.05
840	940	713	605	20	8	5	10.1	11.05
940	1040	813	705	70	9	5	11.2	12.15

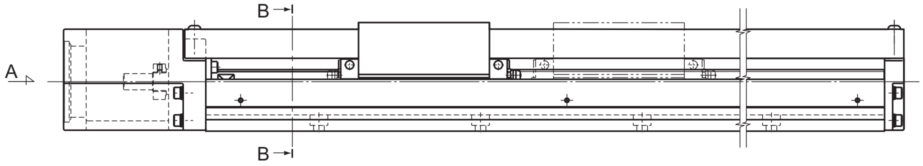
Note1) The available stroke range of model KR45H☐☐B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

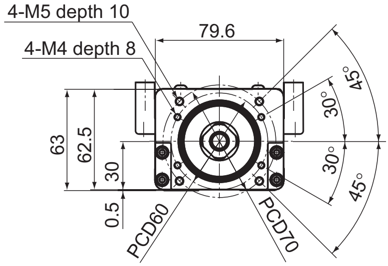
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 213.6mm.

Model KR45H (with a Cover)

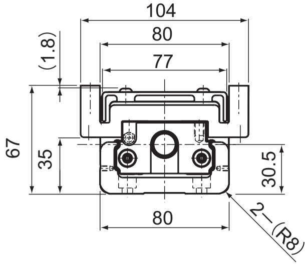
Model KR45H□□A (with a Single Long Nut Block)
Model KR45H□□B (with Two Long Nut Blocks)







A arrow view



B-B cross section

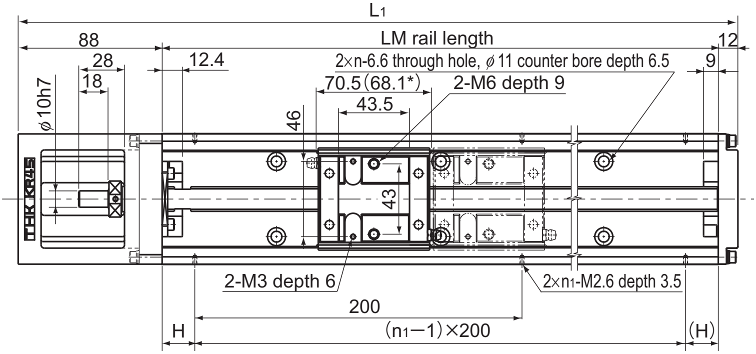
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
340	440	213	105	5.7	7.01
440	540	313	205	6.8	8.11
540	640	413	305	7.9	9.21
640	740	513	405	9	10.31
740	840	613	505	10.1	11.41
840	940	713	605	11.2	12.51
940	1040	813	705	12.3	13.61

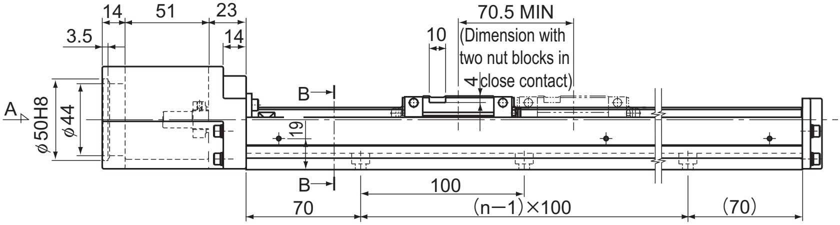
Note) The available stroke range of model KR45H□□B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

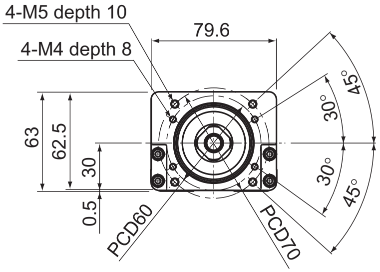
Description of Each Option⇒A-430 **Dimensions⇒B-301**

Model KR45H Standard Type

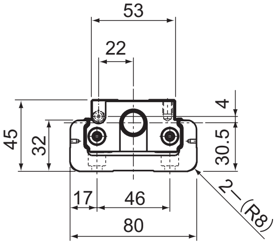
Model KR45H□□C (with a Single Short Nut Block)
Model KR45H□□D (with Two Short Nut Blocks)







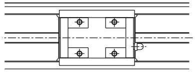
A arrow view



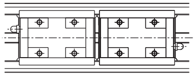
B-B cross section

Nipple orientation

With a single nut block



With two nut blocks



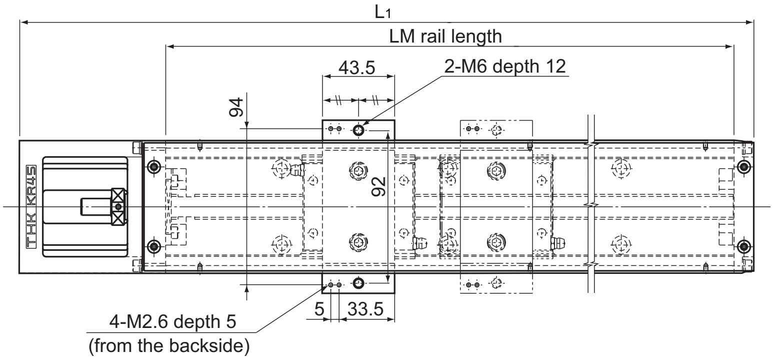
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	n	n1	Overall main unit mass (kg)	
		Type C	Type D				Type C	Type D
340	440	250.5	180	70	3	2	4.7	5.23
440	540	350.5	280	20	4	3	5.7	6.23
540	640	450.5	380	70	5	3	6.7	7.23
640	740	550.5	480	20	6	4	7.7	8.23
740	840	650.5	580	70	7	4	8.7	9.23
840	940	750.5	680	20	8	5	9.7	10.23
940	1040	850.5	780	70	9	5	10.8	11.33

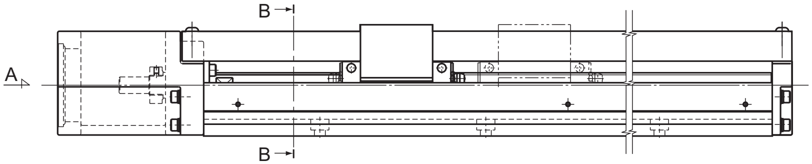
Note) The available stroke range of model KR45H□□D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

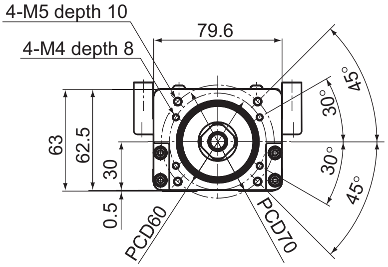
Note) * indicates the block length when calculating the available stroke range. With type D, it is 138.6mm.

Model KR45H (with a Cover)

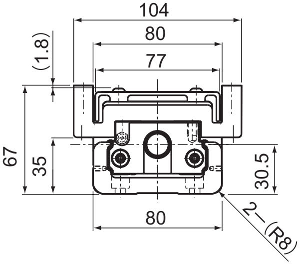
Model KR45H☐☐C (with a Single Short Nut Block)
Model KR45H☐☐D (with Two Short Nut Blocks)







A arrow view



B-B cross section

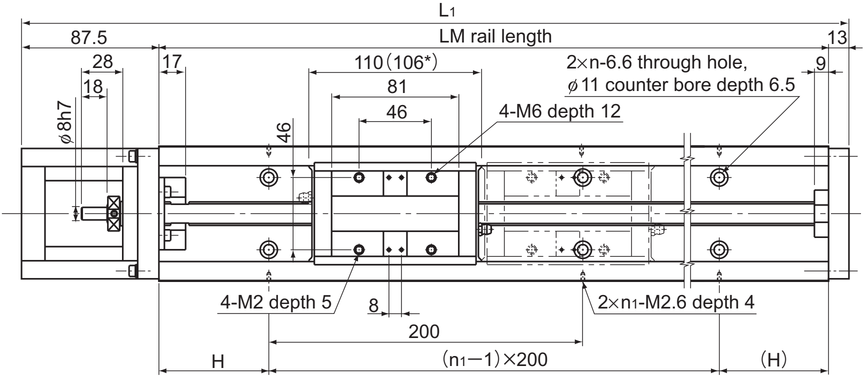
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type C	Type D	Type C	Type D
340	440	250.5	180	5.1	5.82
440	540	350.5	280	6.2	6.92
540	640	450.5	380	7.3	8.02
640	740	550.5	480	8.4	9.12
740	840	650.5	580	9.5	10.22
840	940	750.5	680	10.6	11.32
940	1040	850.5	780	11.7	12.42

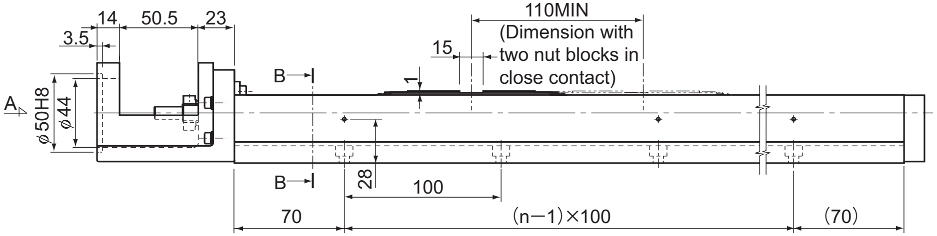
Note) The available stroke range of model KR45H☐☐D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

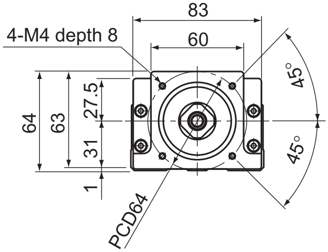
Description of Each Option⇒A-430 Dimensions⇒B-301

Model KR46 Standard Type

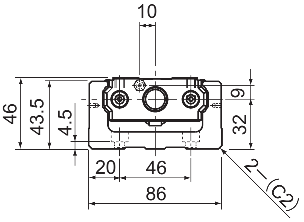
Model KR46□□A (with a Single Long Nut Block)
Model KR46□□B (with Two Long Nut Blocks)



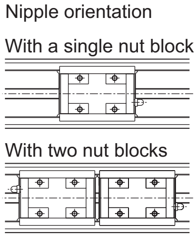




A arrow view



B-B cross section



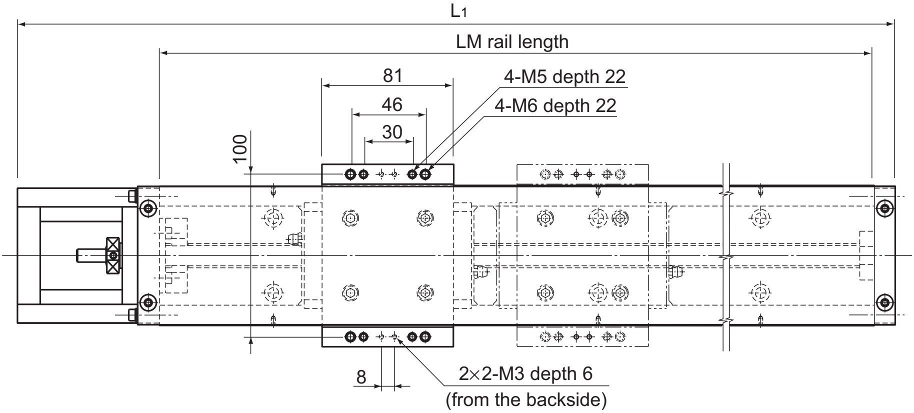
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	n	n1	Overall main unit mass (kg)	
		Type A	Type B				Type A	Type B
340	440.5	208	98	70	3	2	7.7	8.9
440	540.5	308	198	20	4	3	9	10.2
540	640.5	408	298	70	5	3	10.3	11.5
640	740.5	508	398	20	6	4	11.6	12.8
740	840.5	608	498	70	7	4	12.8	14
840	940.5	708	598	20	8	5	14.1	15.3
940	1040.5	808	698	70	9	5	15.3	16.5

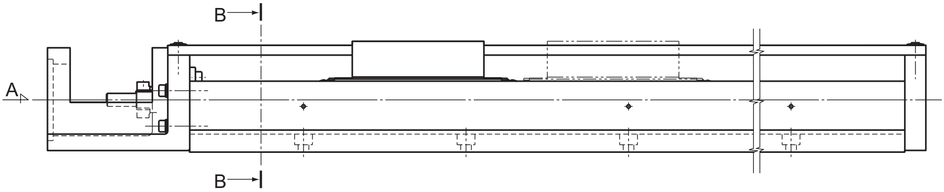
Note1) The available stroke range of model KR46□□B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

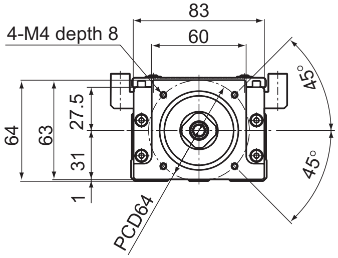
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 216mm.

Model KR46 (with a Cover)

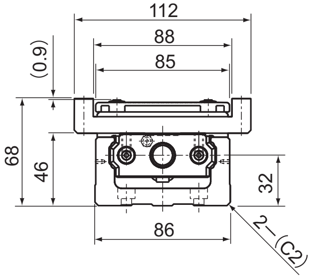
Model KR46□□A (with a Single Long Nut Block)
Model KR46□□B (with Two Long Nut Blocks)







A arrow view



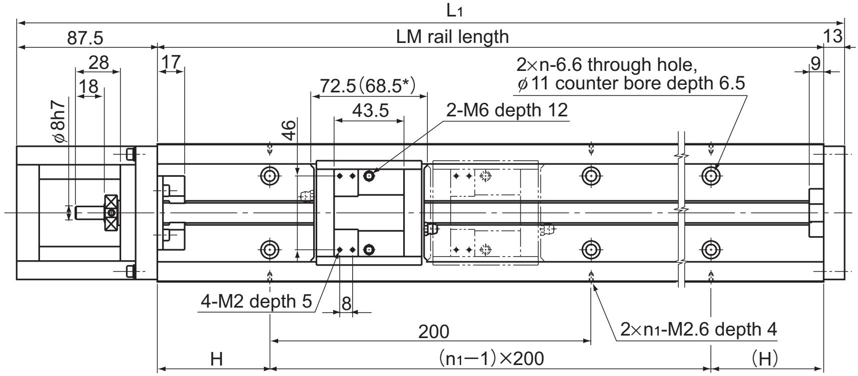
B-B cross section

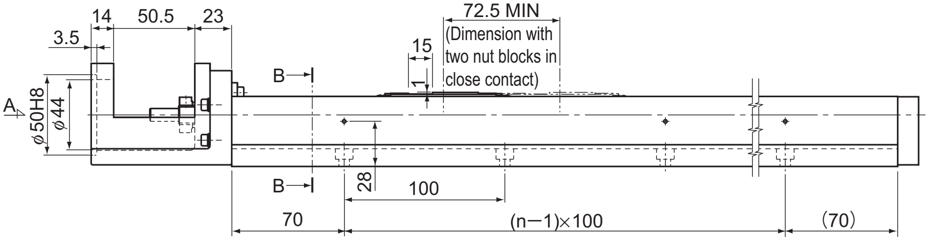
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
340	440.5	208	98	8.3	9.79
440	540.5	308	198	9.7	11.19
540	640.5	408	298	11	12.49
640	740.5	508	398	12.4	13.89
740	840.5	608	498	13.7	15.19
840	940.5	708	598	15	16.49
940	1040.5	808	698	16.3	17.79

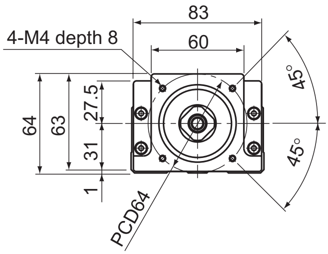
Note) The available stroke range of model KR46□□B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

Model KR46 Standard Type

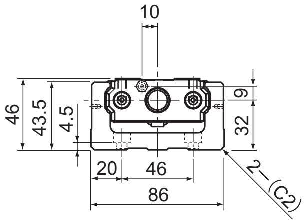
Model KR46☐☐C (with a Single Short Nut Block)
Model KR46☐☐D (with Two Short Nut Blocks)







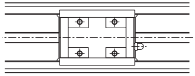
A arrow view



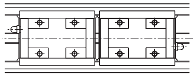
B-B cross section

Nipple orientation

With a single nut block



With two nut blocks



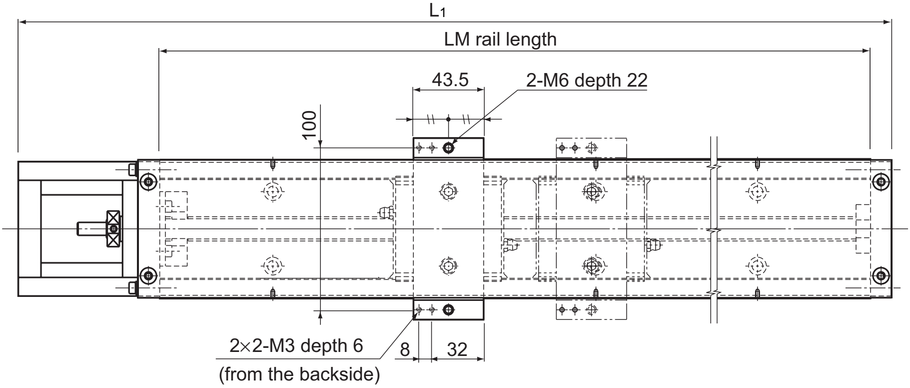
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	n	n1	Overall main unit mass (kg)	
		Type C	Type D				Type C	Type D
340	440.5	245.5	173	70	3	2	7.3	8.1
440	540.5	345.5	273	20	4	3	8.6	9.4
540	640.5	445.5	373	70	5	3	9.9	10.7
640	740.5	545.5	473	20	6	4	11.2	12
740	840.5	645.5	573	70	7	4	12.4	13.2
840	940.5	745.5	673	20	8	5	13.7	14.5
940	1040.5	845.5	773	70	9	5	14.9	15.7

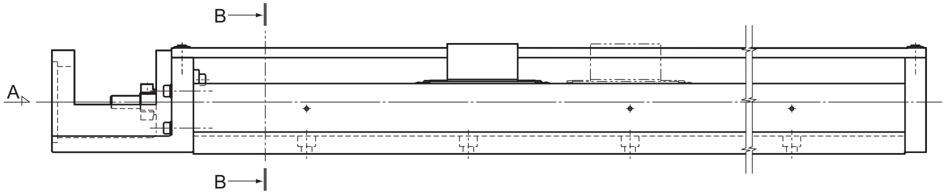
Note) The available stroke range of model KR46☐☐D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

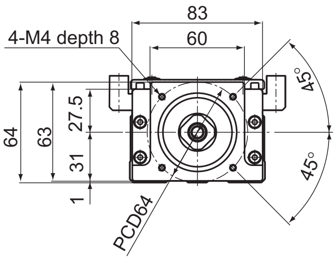
Note) * indicates the block length when calculating the available stroke range. With type D, it is 141mm.

Model KR46 (with a Cover)

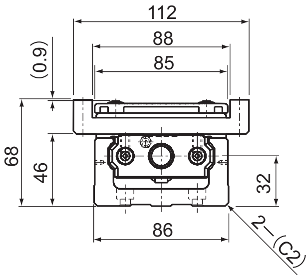
Model KR46□□C (with a Single Short Nut Block)
Model KR46□□D (with Two Short Nut Blocks)







A arrow view



B-B cross section

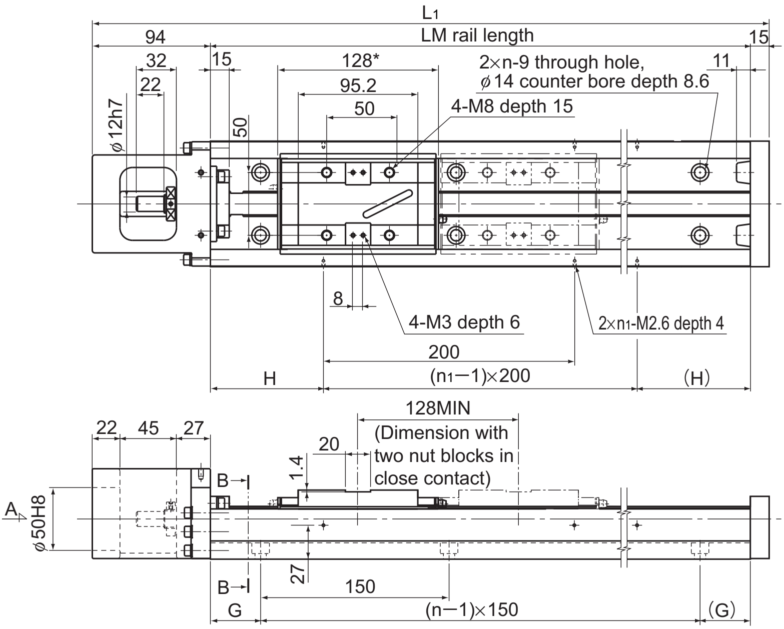
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type C	Type D	Type C	Type D
340	440.5	245.5	173	7.8	8.79
440	540.5	345.5	273	9.1	10.09
540	640.5	445.5	373	10.5	11.49
640	740.5	545.5	473	11.9	12.89
740	840.5	645.5	573	13.2	14.19
840	940.5	745.5	673	14.5	15.49
940	1040.5	845.5	773	15.8	16.79

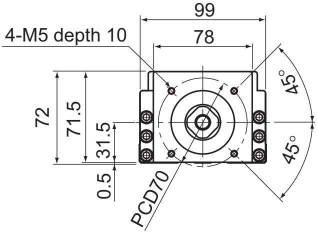
Note) The available stroke range of model KR46□□D indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

Description of Each Option⇒A-430 Dimensions⇒B-301

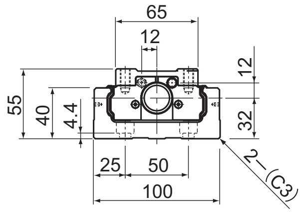
Model KR55 Standard Type

Model KR5520A (with a Single Nut Block)
Model KR5520B (with Two Nut Blocks)



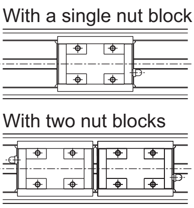


A arrow view



B-B cross section

Nipple orientation

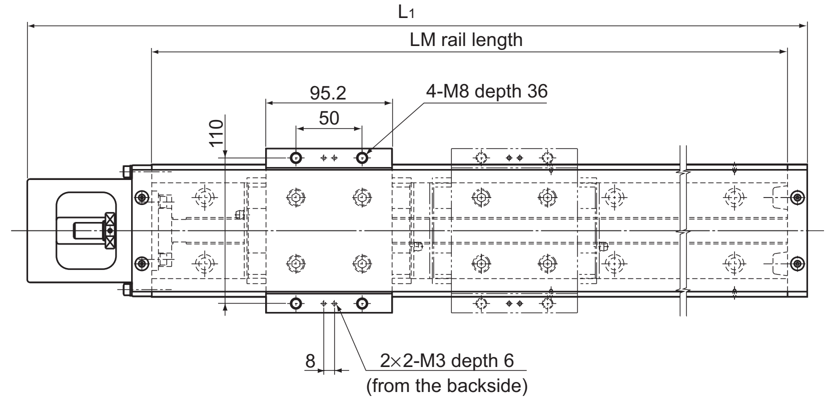


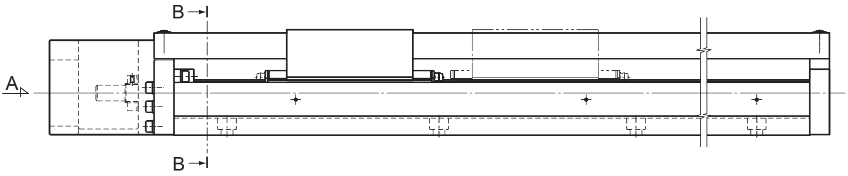
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	G (mm)	n	n1	Overall main unit mass (kg)	
		Type A	Type B					Type A	Type B
980	1089	826	698	90	40	7	5	19.9	21.6
1080	1189	926	798	40	15	8	6	21.7	23.4
1180	1289	1026	898	90	65	8	6	23.4	25.1
1280	1389	1126	998	40	40	9	7	25.1	26.8
1380	1489	1226	1098	90	15	10	7	26.9	28.6

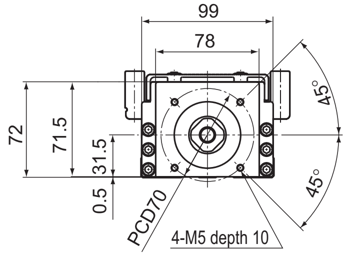
Note) The available stroke range of model KR5520B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

Model KR55 (with a Cover)

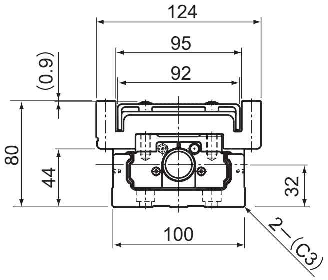
Model KR5520A (with a Single Nut Block)
Model KR5520B (with Two Nut Blocks)







A arrow view



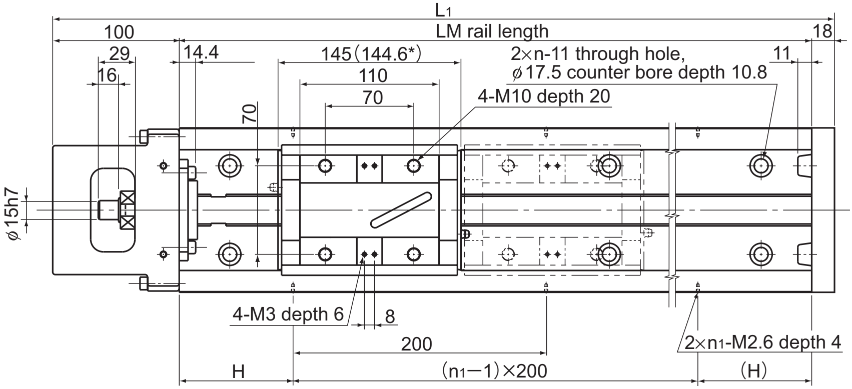
B-B cross section

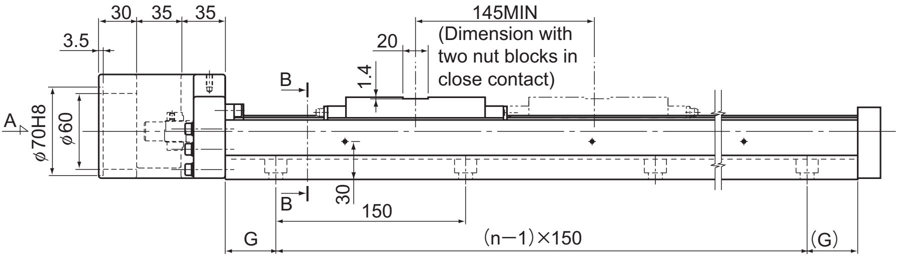
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
980	1089	826	698	22.7	26.2
1080	1189	926	798	24.6	28.1
1180	1289	1026	898	26.4	29.9
1280	1389	1126	998	28.1	31.6
1380	1489	1226	1098	30	33.5

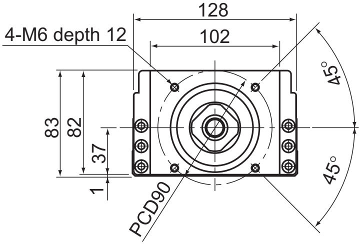
Note) The available stroke range of model KR5520B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

Model KR65 Standard Type

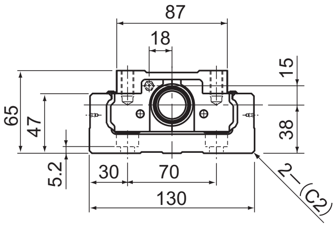
Model KR6525A (with a Single Nut Block)
Model KR6525B (with Two Nut Blocks)







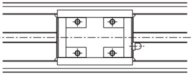
A arrow view



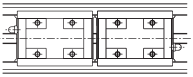
B-B cross section

Nipple orientation

With a single nut block



With two nut blocks



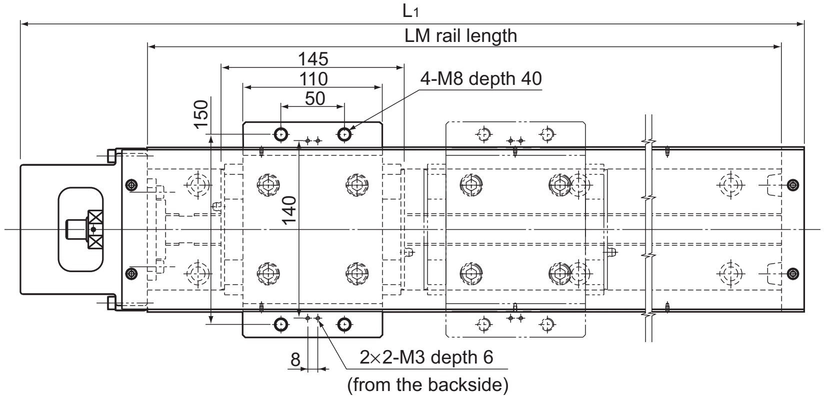
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	G (mm)	n	n1	Overall main unit mass (kg)	
		Type A	Type B					Type A	Type B
980	1098	810	665	90	40	7	5	31.6	34.6
1180	1298	1010	865	90	65	8	6	37	40
1380	1498	1210	1065	90	90	9	7	42.4	45.4
1680	1798	1510	1365	40	90	11	9	50.5	53.5

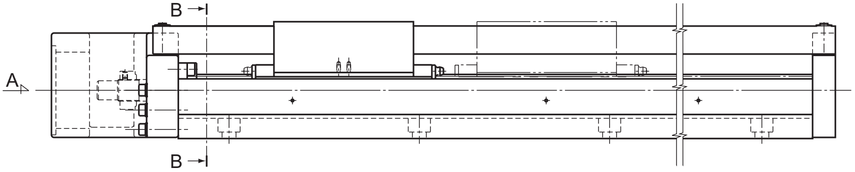
Note1) The available stroke range of model KR6525B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

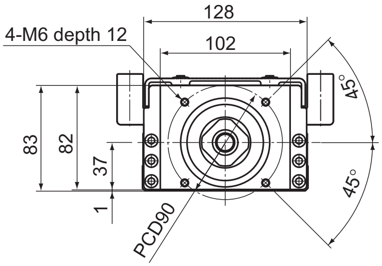
Note2) * indicates the block length when calculating the available stroke range. With type B, it is 289.6mm.

Model KR65 (with a Cover)

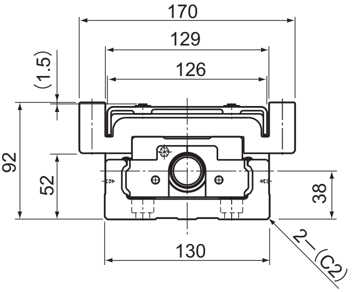
Model KR6525A (with a Single Nut Block)
Model KR6525B (with Two Nut Blocks)







A arrow view



B-B cross section

LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		Overall main unit mass (kg)	
		Type A	Type B	Type A	Type B
980	1098	810	665	36.3	43
1180	1298	1010	865	42	48.7
1380	1498	1210	1065	47.6	54.3
1680	1798	1510	1365	56.1	62.8

Note) The available stroke range of model KR6525B indicates the value when two nut blocks are used in close contact with each other.
For model number coding, see B-290.

Description of Each Option⇒A-430 Dimensions⇒B-301

Model number coding

Model number coding

KR33 10 A +400L P 0 - 0 0 0 0

Model No.

Motor bracket type
(housing A, intermediate flange) See B-312 onward.

Sensor specification See B-308.

With/without a cover
0: none, 1: with a cover, 2: with a bellows

With/without a motor
0: none, 1:with a motor (mounted at THK)

Accuracy grade
No Symbol: Normal grade, H: High accuracy grade, P: Precision grade

LM rail length (in mm) See A-396.

Block type See A-394.

Ball screw lead (in mm) See A-396.

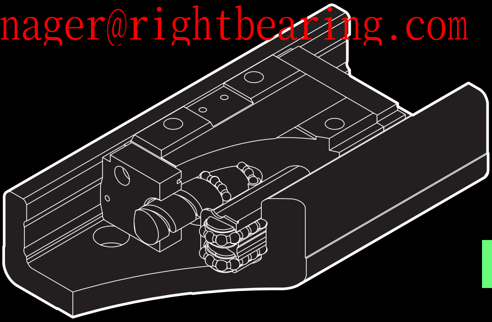
Mass of Moving Element

Table1 shows the mass of the nut block and sub table of model KR.

Table1 Mass of the Nut Block and Sub Table of KR

Unit: kg

Model No.	Block A (long block) type		Block C (short block) type	
	Nut block	Sub table	Nut block	Sub table
KR15	0.042	0.022	—	—
KR20	0.075	0.045	—	—
KR26	0.180	0.085	—	—
KR30H	0.30	0.13	0.17	0.07
KR33	0.35	0.13	0.23	0.07
KR45H	0.95	0.36	0.53	0.19
KR46	1.20	0.29	0.80	0.19
KR55	1.70	1.80	—	—
KR65	3.00	3.70	—	—



SKR

Caged Ball LM Guide Actuator

B Product Specifications

Dimensional Drawing, Dimensional Table

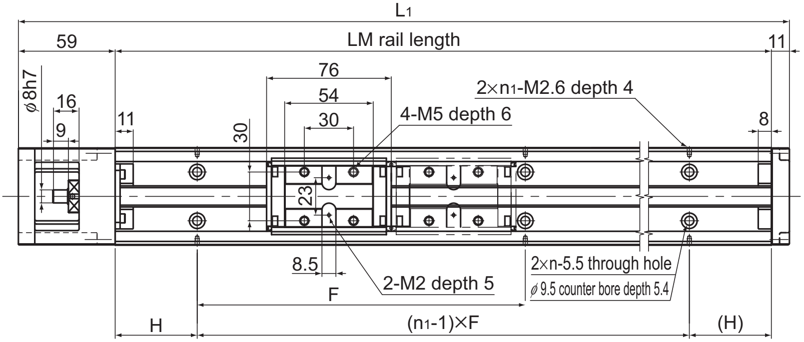
A Technical Descriptions of the Products (Separate)

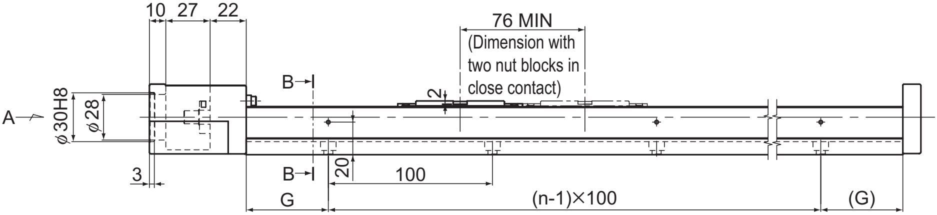
Technical Descriptions

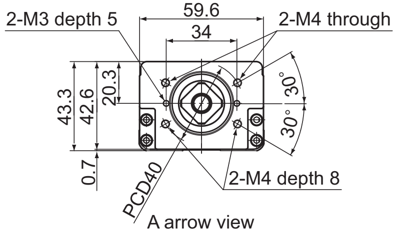
* Please see the separate "A Technical Descriptions of the Products".

Model SKR33 Standard Type

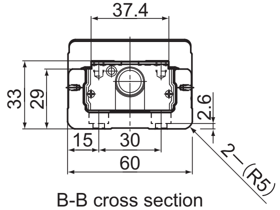
Model SKR33☐☐A (with a Single Long Block)
Model SKR33☐☐B (with Two Long Blocks)







A arrow view



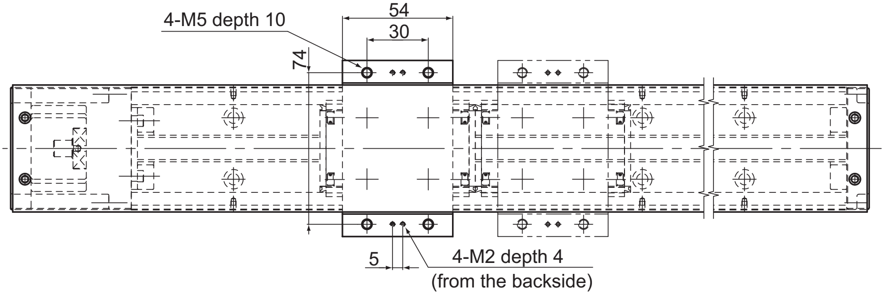
B-B cross section

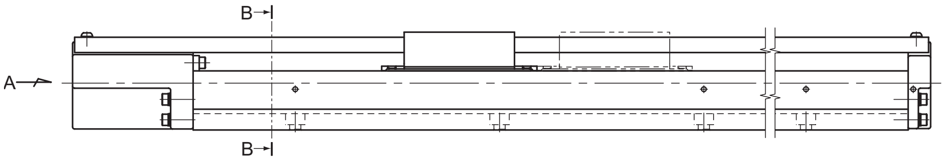
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	G (mm)	F (mm)	n	n1	Overall main unit mass (kg)	
		Type A	Type B						Type A	Type B
150	220	55	—	25	25	100	2	2	1.7	—
200	270	105	—	50	50	100	2	2	2.1	—
300	370	205	129	50	50	200	3	2	2.8	3.1
400	470	305	229	100	50	200	4	2	3.5	3.8
500	570	405	329	50	50	200	5	3	4.2	4.5
600	670	505	429	100	50	200	6	3	5.0	5.3
700	770	605	529	50	50	200	7	4	5.7	6.0

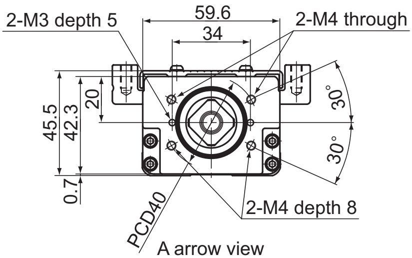
Note) The available stroke range of model SKR 33 ☐☐ B indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

Model SKR33 (with a Cover)

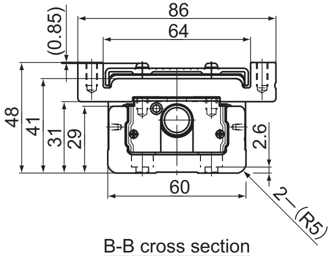
Model SKR33□□A (with a Single Long Block)
Model SKR33□□B (with Two Long Blocks)







A arrow view



B-B cross section

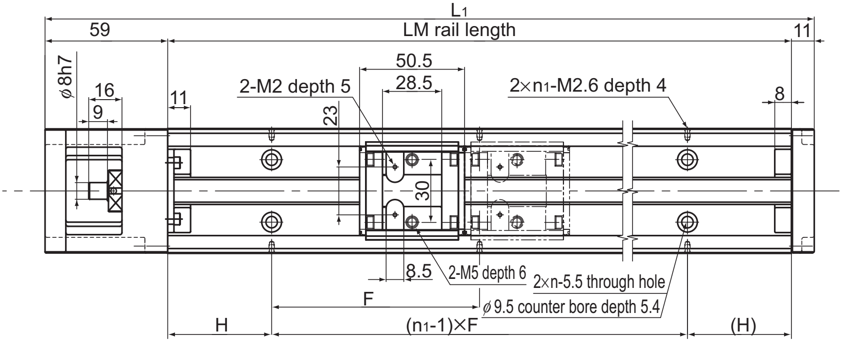
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		H (mm)	G (mm)	F (mm)	n	n_1	Overall main unit mass (kg)	
		Type A	Type B						Type A	Type B
150	220	55	—	25	25	100	2	2	1.9	—
200	270	105	—	50	50	100	2	2	2.3	—
300	370	205	129	50	50	200	3	2	3.1	3.5
400	470	305	229	100	50	200	4	2	3.8	4.2
500	570	405	329	50	50	200	5	3	4.6	5.0
600	670	505	429	100	50	200	6	3	5.3	5.7
700	770	605	529	50	50	200	7	4	6.1	6.5

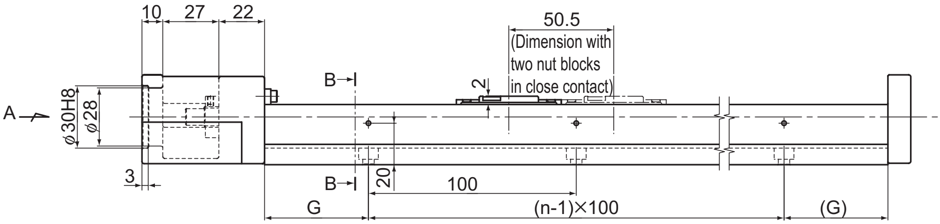
Note) The available stroke range of model SKR 33 □□ B indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

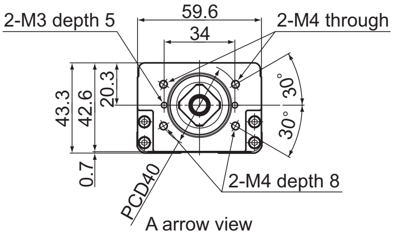
Description of Each Option⇒A-430 Dimensions⇒B-301

Model SKR33 Standard Type

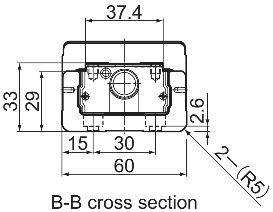
Model SKR33☐☐C (with a Single Short Block)
Model SKR33☐☐D (with Two Short Blocks)







A arrow view



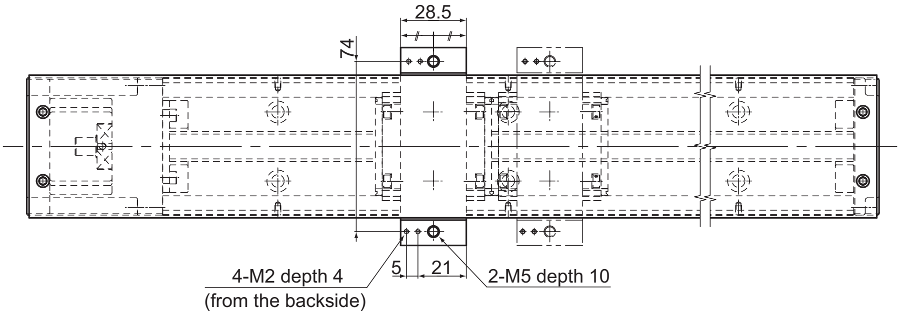
B-B cross section

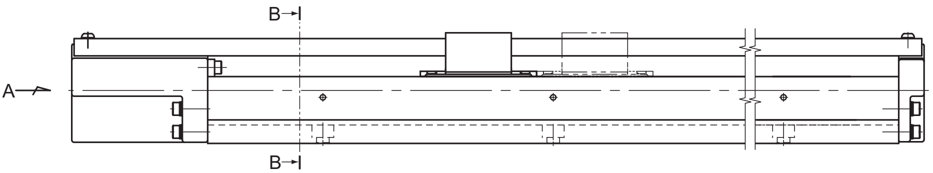
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		H (mm)	G (mm)	F (mm)	n	n₁	Overall main unit mass (kg)	
		Type C	Type D						Type C	Type D
150	220	80.5	30	25	25	100	2	2	1.6	1.8
200	270	130.5	80	50	50	100	2	2	2.0	2.1
300	370	230.5	180	50	50	200	3	2	2.7	2.8
400	470	330.5	280	100	50	200	4	2	3.4	3.6
500	570	430.5	380	50	50	200	5	3	4.1	4.3
600	670	530.5	480	100	50	200	6	3	4.8	5.0
700	770	630.5	580	50	50	200	7	4	5.5	5.7

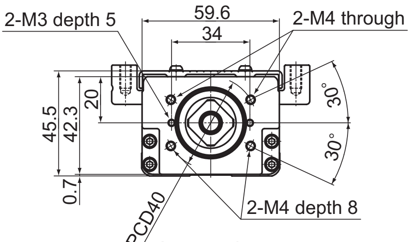
Note) The available stroke range of model SKR33☐☐D indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

Model SKR33 (with a Cover)

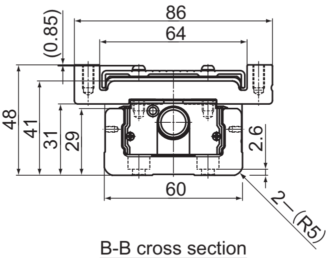
Model SKR33□□C (with a Single Short Block)
Model SKR33□□D (with Two Short Blocks)







A arrow view



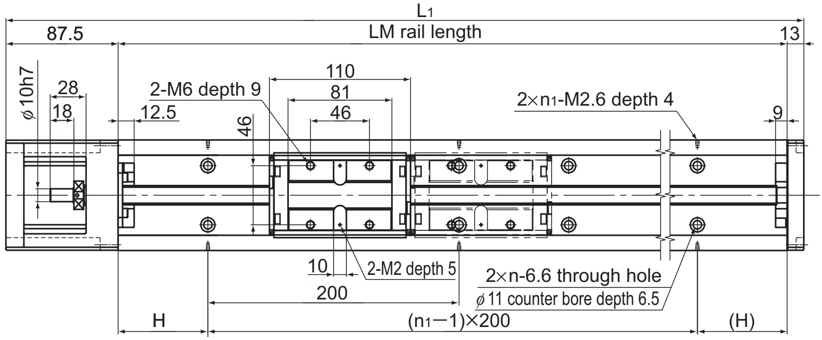
B-B cross section

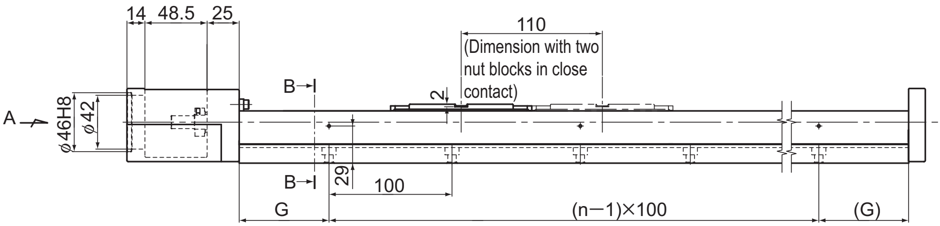
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		H (mm)	G (mm)	F (mm)	n	n₁	Overall main unit mass (kg)	
		Type C	Type D						Type C	Type D
150	220	80.5	30	25	25	100	2	2	1.8	2.0
200	270	130.5	80	50	50	100	2	2	2.2	2.3
300	370	230.5	180	50	50	200	3	2	2.9	3.1
400	470	330.5	280	100	50	200	4	2	3.7	3.8
500	570	430.5	380	50	50	200	5	3	4.4	4.6
600	670	530.5	480	100	50	200	6	3	5.2	5.3
700	770	630.5	580	50	50	200	7	4	5.9	6.1

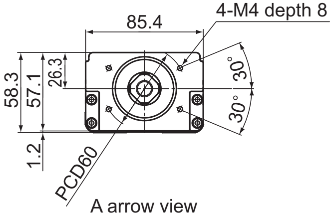
Note) The available stroke range of model SKR33□□ D indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

Model SKR46 Standard Type

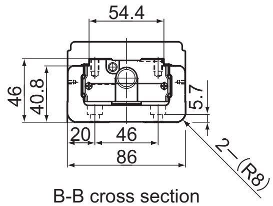
Model SKR46□□A (with a Single Long Block)
Model SKR46□□B (with Two Long Blocks)







A arrow view



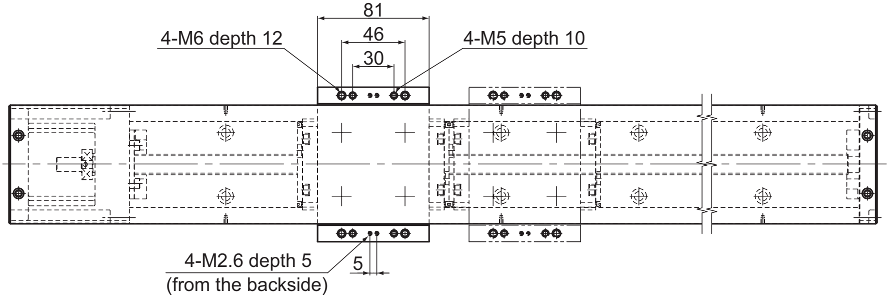
B-B cross section

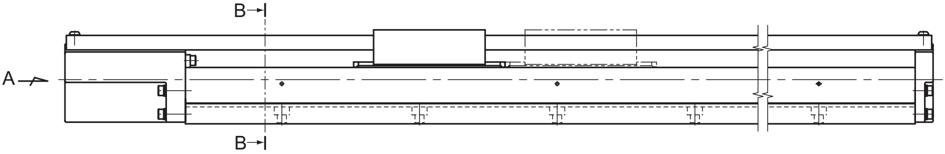
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		H (mm)	G (mm)	n	n₁	Overall main unit mass (kg)	
		Type A	Type B					Type A	Type B
340	440.5	208.5	98.5	70	70	3	2	6.4	7.4
440	540.5	308.5	198.5	20	70	4	3	7.8	8.7
540	640.5	408.5	298.5	70	70	5	3	9.2	10.1
640	740.5	508.5	398.5	20	70	6	4	10.6	11.5
740	840.5	608.5	498.5	70	70	7	4	12.0	12.9
940	1040.5	808.5	698.5	70	70	9	5	14.8	15.7

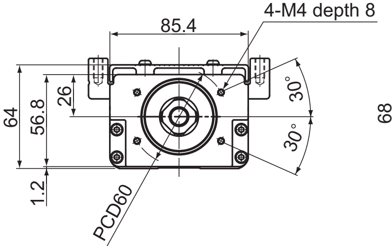
Note) The available stroke range of model SKR 46 □□ B indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

Model SKR46 (with a Cover)

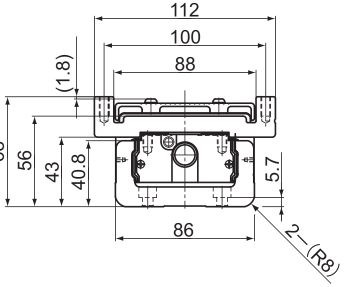
Model SKR46□□A (with a Single Long Block)
Model SKR46□□B (with Two Long Blocks)







A arrow view



B-B cross section

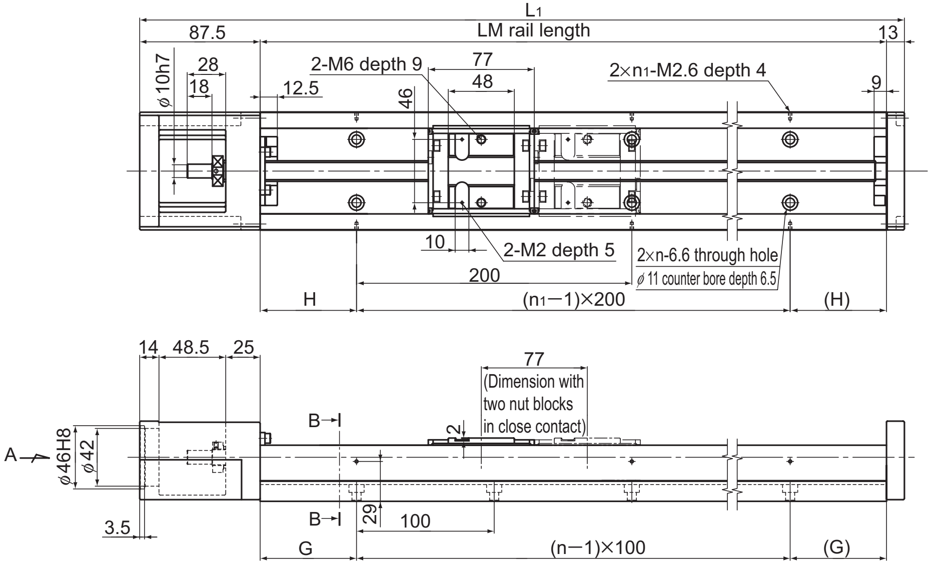
LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		H (mm)	G (mm)	n	n₁	Overall main unit mass (kg)	
		Type A	Type B					Type A	Type B
340	440.5	208.5	98.5	70	70	3	2	7.1	8.3
440	540.5	308.5	198.5	20	70	4	3	8.6	9.8
540	640.5	408.5	298.5	70	70	5	3	10.0	11.3
640	740.5	508.5	398.5	20	70	6	4	11.5	12.7
740	840.5	608.5	498.5	70	70	7	4	13.0	14.2
940	1040.5	808.5	698.5	70	70	9	5	16.0	17.2

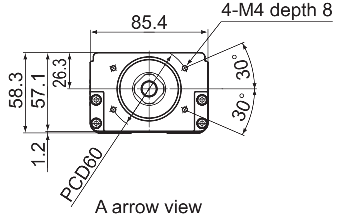
Note) The available stroke range of model SKR 46 □□ B indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

Description of Each Option⇒A-430 Dimensions⇒B-301

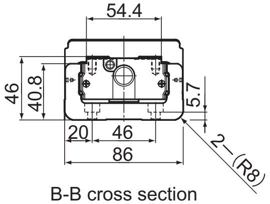
Model SKR46 Standard Type

Model SKR46□□C (with a Single Short Block)
Model SKR46□□D (with Two Short Blocks)





A arrow view



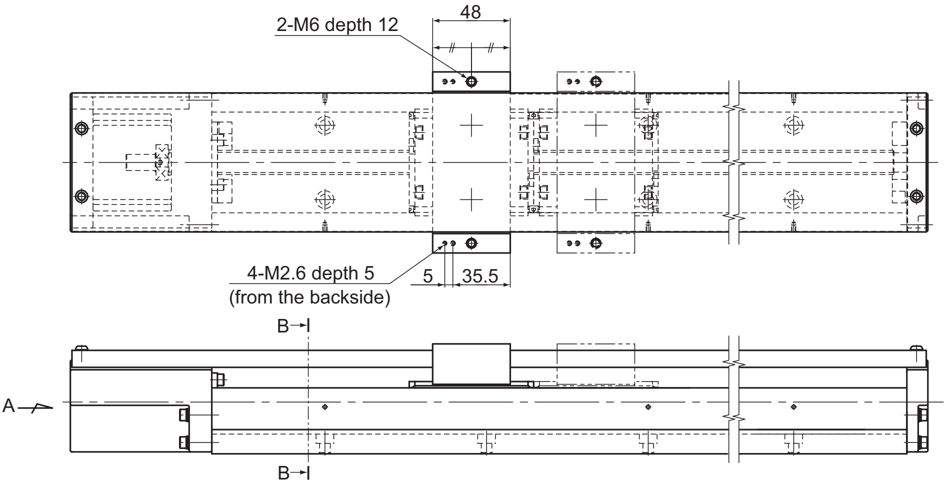
B-B cross section

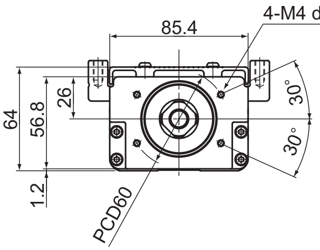
LM rail length (mm)	Overall length L1(mm)	Available stroke range (mm)		H (mm)	G (mm)	n	n1	Overall main unit mass (kg)	
		Type C	Type D					Type C	Type D
340	440.5	241.5	164.5	70	70	3	2	6.1	6.7
440	540.5	341.5	264.5	20	70	4	3	7.5	8.1
540	640.5	441.5	364.5	70	70	5	3	8.9	9.5
640	740.5	541.5	464.5	20	70	6	4	10.3	10.8
740	840.5	641.5	564.5	70	70	7	4	11.7	12.2
940	1040.5	841.5	764.5	70	70	9	5	14.5	15.0

Note) The available stroke range of model SKR46 □□ D indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

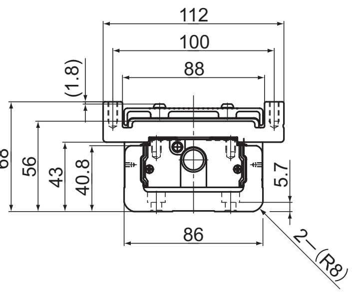
Model SKR46 (with a Cover)

Model SKR46☐☐C (with a Single Short Block)
Model SKR46☐☐D (with Two Short Blocks)





A arrow view



B-B cross section

LM rail length (mm)	Overall length L₁(mm)	Available stroke range (mm)		H (mm)	G (mm)	n	n₁	Overall main unit mass (kg)	
		Type C	Type D					Type C	Type D
340	440.5	241.5	164.5	70	70	3	2	6.6	7.4
440	540.5	341.5	264.5	20	70	4	3	8.1	8.9
540	640.5	441.5	364.5	70	70	5	3	9.6	10.3
640	740.5	541.5	464.5	20	70	6	4	11.0	11.8
740	840.5	641.5	564.5	70	70	7	4	12.5	13.3
940	1040.5	841.5	764.5	70	70	9	5	15.5	16.3

Note) The available stroke range of model SKR46☐☐D indicates the value when two blocks are used in close contact with each other.
For model number coding, see B-300.

Model Number Coding

Model number coding

SKR33 10 A +400L P 0 - 0 0 0 0

Model No.

Motor bracket type
(housing A, intermediate flange) See B-337 onward.

Sensor specification See B-308.

With/without a cover
0: none, 1: with a cover, 2: with a bellows

With/without a motor
0: none, 1:with a motor (mounted at THK)

Accuracy grade
No Symbol: Normal grade, H: High accuracy grade, P: Precision grade

LM rail length (in mm) See A-418.

Block type See A-424.

Ball screw lead (in mm) See A-418.

Mass of Moving Element

Table1 shows the mass of the nut block and sub table of model SKR.

Table1 Mass of the Nut Block and Sub Table of SKR

Unit: kg

Model No.	Block A (long block) type		Block C (short block) type	
	Nut block	Sub table	Nut block	Sub table
SKR33	0.31	0.13	0.17	0.07
SKR46	0.91	0.34	0.57	0.20

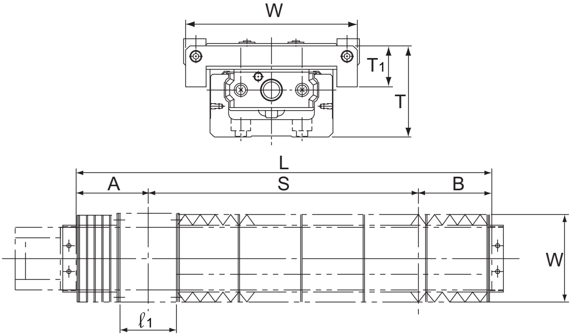
LM Guide Actuator

Options

Bellows

For model KR, a bellows is available for contamination protection in addition to a cover.

[Block A Type]



Unit: mm

Model No.	LM rail length L	Stroke length S	MIN/MAX	Motor side A	Counter-motor side B	ℓ_1	W	T	T_1
KR15	75	25	12.5/37.5	25		23	49	23.5	15.5
	100	37	19/56	31.5					
	125	50	25/75	38.5					
	150	62	31.5/93.5	44					
	175	75	37.5/112.5	50					
	200	87	44/131	56.5					
KR20	100	35	14.4/50.4	33	32.2	33.2	60	30	20
	150	63	25.9/88.9	44.5	43.8				
	200	91	36.9/127.9	55.5	54.7				
KR26	150	57	20.3/80.3	45		47.4	74	38	20
	200	87	30.3/120.3	55					
	250	115	40.3/160.3	65					
	300	145	50.3/200.3	75					
KR30H	150	58	16/74	46		54	80	39	17.5
	200	92	24/116	54					
	300	160	40/200	70					
	400	226	57/283	87					
	500	290	75/365	105					
	600	358	91/449	121					
KR33	150	57	14/76	48	45	54	84	44.5	20
	200	104	17/123	48	48				
	300	180	30/210	59	61				
	400	260	40/300	69	71				
	500	330	55/385	84	86				
	600	410	65/475	94	96				

Model No.	LM rail length L	Stroke length S	MIN/MAX	Motor side A	Counter-motor side B	ℓ_1	W	T	T_1
KR45H	340	190	30/220	74.5	75.5	81	104	56	28
	440	270	40/310	84.5	85.5				
	540	340	55/395	99.5	100.5				
	640	420	65/485	109.5	110.5				
	740	500	75/575	119.5	120.5				
	840	580	85/665	129.5	130.5				
	940	650	100/750	144.5	145.5				
KR46	340	178	29.5/207.5	81	81	81	110	56	20
	440	258	39.5/297.5	91	91				
	540	328	54.5/382.5	106	106				
	640	418	59.5/477.5	111	111				
	740	488	74.5/562.5	126	126				
	940	648	94.5/742.5	146	146				
KR55	980	770	55.4/825.4	105	105	95.2	154	77	42
	1080	856	62.4/918.4	112	112				
	1180	944	68.4/1012.4	118	118				
	1280	1030	75.4/1105.4	125	125				
	1380	1116	82.4/1198.4	132	132				
KR65	980	746.5	58/804.5	115	118.5	110	184	87	49
	1180	914.5	74/988.5	131	134.5				
	1380	1082.5	90/1172.5	147	150.5				
	1680	1334.5	114/1448.5	171	174.5				

Note) For use other than in horizontal mount (e.g., vertical mount and wall mount), the extension rate differs from the specification value. Contact THK for details.

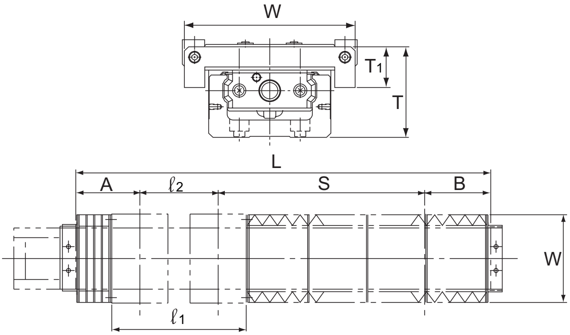
Note : The length of the bellows is calculated as follow.

$$L_{min} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$$L_{max} = L_{min} \cdot A$$ A: Extension rate (see right table)

Model No.	A (extension rate)
KR15	3
KR20	3
KR26	4
KR30H	5
KR33	7
KR45H	7
KR46	7
KR55	13
KR65	13

[Block B Type]



Unit: mm

Model No.	LM rail length L	Stroke length S	MIN/MAX	Motor side A	Counter-motor side B	ℓ_1	ℓ_2	W	T	T_1
KR15	125	33	17/50	29.5		56	33	49	23.5	15.5
	150	46	23/69	35.5						
	175	58	29.5/87.5	42						
	200	71	35.5/106.5	48						
KR20	150	38	15.4/53.4	34	33.2	79.2	46	60	30	20
	200	66	26.4/92.4	45	44.2					
KR26	200	46	17.8/68.8	42.5		111.4	64	74	38	20
	250	77	27.8/108.8	52.5						
	300	107	37.8/148.8	62.5						
KR30H	200	40	12.8/52.8	42.8		128.4	74.4	80	39	17.5
	300	108	28.8/136.8	58.8						
	400	176	44.8/220.8	74.8						
	500	240	62.8/302.8	92.8						
	600	308	78.8/386.8	108.8						
KR33	300	114	25/139	54	56	130	76	84	44.5	20
	400	194	35/229	64	66					
	500	264	50/321	79	81					
	600	344	60/404	89	91					
KR45H	340	102	20/122	64.5	65.5	189	108	104	56	28
	440	182	30/212	74.5	75.5					
	540	252	45/297	89.5	90.5					
	640	332	55/387	99.5	100.5					
	740	412	65/477	109.5	110.5					
	840	492	75/567	119.5	120.5					
	940	572	85/657	129.5	130.5					
KR46	340	90	15.5/111.5	73	67	191	110	110	56	20
	440	168	29.5/197.5	81	81					
	540	248	39.5/287.5	91	91					
	640	318	54.5/372.5	106	106					
	740	408	59.5/467.5	111	111					
	940	548	89.5/637.5	141	141					

Model No.	LM rail length L	Stroke length S	MIN/MAX	Motor side A	Counter-motor side B	ℓ_1	ℓ_2	W	T	T_1
KR55	980	652	50.4/702.4	100	100	223.1	128	154	77	42
	1080	738	57.4/795.4	107	107					
	1180	826	63.4/889.4	113	113					
	1280	912	70.4/982.4	120	120					
	1380	998	77.4/1075.4	127	127					
KR65	980	625.5	46/671.5	103	106.5	225	145	184	87	49
	1180	795.5	61/856.5	118	121.5					
	1380	959.5	79/1038.5	136	139.5					
	1680	1211.5	103/1314.5	160	163.5					

Note) For use other than in horizontal mount (e.g., vertical mount and wall mount), the extension rate differs from the specification value. Contact THK for details.

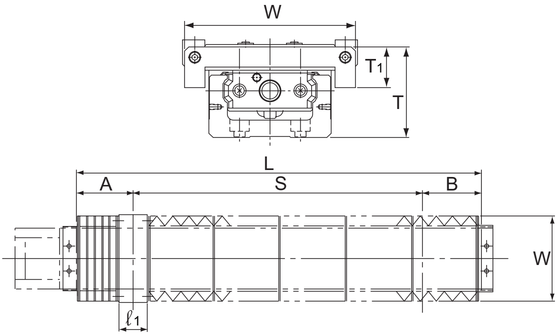
Note : The length of the bellows is calculated as follow.

$$\text{Lmin} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$$\text{Lmax} = \text{Lmin} \cdot A$$ A: Extension rate (see right table)

Model No.	A (extension rate)
KR15	3
KR20	3
KR26	4
KR30H	5
KR33	7
KR45H	7
KR46	7
KR55	13
KR65	13

[Block C Type]



Unit: mm

Model No.	LM rail length L	Stroke length S	MIN/MAX	Motor side A	Counter-motor side B	ℓ_1	W	T	T_1
KR30H	150	73	21.25/94.25	38.5		28.5	80	39	17.5
	200	107	29.25/136.25	46.5					
	300	175	45.25/220.25	62.5					
	400	243	61.25/304.25	78.5					
	500	307	79.25/386.25	96.5					
	600	375	95.25/470.25	112.5					
KR33	150	78.7	17/98.5	36	35.3	28.5	84	44.5	20
	200	119.4	23/142.5	39.3	41.3				
	300	195.4	35/230.5	51.3	53.3				
	400	269.4	48/317.5	64.3	66.3				
	500	345.4	60/405.5	76.3	78.3				
	600	425.4	70/495.5	86.3	88.3				
KR45H	340	219	34.25/253.25	60	61	43.5	104	56	28
	440	299	44.25/343.25	70	71				
	540	369	59.25/428.25	85	86				
	640	449	69.25/518.25	95	96				
	740	529	79.25/608.25	105	106				
	840	609	89.25/698.25	115	116				
	940	679	104.25/783.25	130	131				
KR46	340	205.4	34.5/240	67.3	67.3	43.5	110	56	20
	440	279.4	47.5/327	80.3	80.3				
	540	355.4	59.5/415	92.3	92.3				
	640	439.4	67.5/507	100.3	100.3				
	740	509.4	82.5/592	115.3	115.3				
	940	675.4	99.5/775	132.3	132.3				

Note) For use other than in horizontal mount (e.g., vertical mount and wall mount), the extension rate differs from the specification value. Contact THK for details.

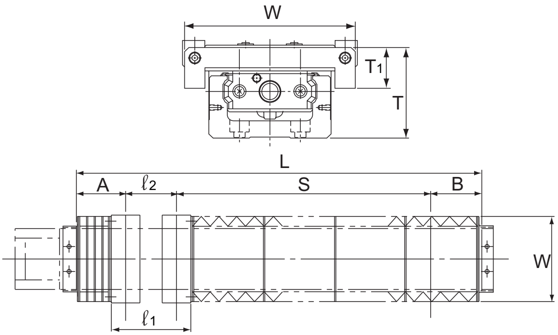
Note : The length of the bellows is calculated as follow.

$$L_{min} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$$L_{max} = L_{min} \cdot A$$ A: Extension rate (see right table)

Model No.	A (extension rate)
KR30H	5
KR33	7
KR45H	7
KR46	7

[Block D Type]



Unit: mm

Model No.	LM rail length L	Stroke length: S	MIN/MAX	Motor side A	Counter-motor side B	ℓ1	ℓ2	W	T	T1
KR30H	150	40	13.3/53.3	30.55		77.4	48.9	80	39	17.5
	200	74	21.3/95.3	38.55						
	300	142	37.3/179.3	54.55						
	400	210	53.3/263.3	70.55						
	500	274	71.3/345.3	88.55						
	600	342	87.3/429.3	104.55						
KR33	150	31.2	14/51	36	32.3	79	50.5	84	44.5	20
	200	78.2	17/98	36	35.3					
	300	154.9	30/185	46.3	48.3					
	400	234.9	40/275	56.3	58.3					
	500	304.9	55/360	71.3	73.3					
	600	384.9	65/450	81.3	83.3					
KR45H	340	167	25/192	50.75	51.75	114	70.5	104	56	28
	440	247	35/282	60.75	61.75					
	540	317	50/367	75.75	76.75					
	640	397	60/457	85.75	86.75					
	740	477	70/547	95.75	96.75					
	840	557	80/637	105.75	106.75					
	940	627	95/722	120.75	121.75					
KR46	340	142.9	29.5/167.5	62.3	62.3	116	72.5	110	56	20
	440	222.9	39.5/262.5	72.3	72.3					
	540	292.9	54.5/347.5	87.3	87.3					
	640	382.9	59.5/442.5	92.3	92.3					
	740	452.9	74.5/527.5	107.3	107.3					
	940	612.9	94.5/707.5	127.3	127.3					

Note) For use other than in horizontal mount (e.g., vertical mount and wall mount), the extension rate differs from the specification value. Contact THK for details.

Note : The length of the bellows is calculated as follow.

$$\mathrm{Lmin} = \frac{S}{(A-1)}$$ S: Stroke length (mm)

$\mathrm{Lmax} = \mathrm{Lmin} \cdot A$ A: Extension rate (see right table)

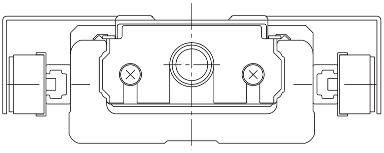
Model No.	A (extension rate)
KR30H	5
KR33	7
KR45H	7
KR46	7

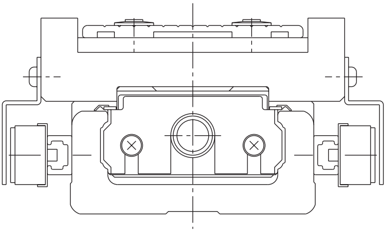
Sensor

Optional proximity sensors and photo sensors are available for models KR and SKR. Models equipped with a sensor are also provided with a dedicated sensor rail/sensor dog (detecting plate).

Some models with a short rail are attached with a sensor and sensor rail on both sides. See the table below.

[Example of Installation]





Model No.	Rail length
KR15A	75L
	100L
KR15B	125L
KR20A	75L
	100L
	125L
KR20B	125L
	150L
KR26A	100L
	125L
	150L
KR26B	175L
	200L

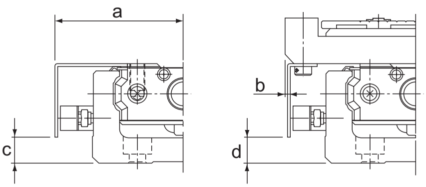
Table1 With/without a sensor

Symbol	Description	Type	Accessory
0	None	—	—
1	With sensor rail	—	Mounting screw
2	Photo Sensor	EE-SX671 (Omron)	Mounting screw/nut, detecting plate, sensor rail, mounting plate, connector (EE-1001)
4	Proximity Sensor a-contact (ON when close)	GL-12F (SUNX)	Mounting screw/nut, detecting plate, sensor rail, fixture (MS-GL12)
5	Proximity Sensor a-contact (ON when close)	GXL-N12F (SUNX)	Mounting screw/nut, detecting plate, sensor rail, fixture (MS-GXL12)
6	Photo Sensor	EE-SX674 (Omron)	Mounting screw/nut, detecting plate, sensor rail, mounting plate, connector (EE-1001)
7	Proximity Sensor a-contact (ON when close)	APM-D3A1-001 (Yamatake)	Mounting screw/nut, detecting plate, sensor rail
8	Proximity Sensor a-contact (ON when close)	GL-N12F (SUNX)	Mounting screw/nut, detecting plate, sensor rail
9	Proximity Sensor b-contact (ON when away)	GL-N12FB (SUNX)	Mounting screw/nut, detecting plate, sensor rail
A	Proximity Sensor b-contact (ON when away)	GXL-N12FB (SUNX)	Mounting screw/nut, detecting plate, sensor rail, fixture (MS-GXL12)
B	Proximity Sensor b-contact (ON when away)	APM-D3B1-003 (Yamatake)	Mounting screw/nut, detecting plate, sensor rail
C	Proximity Sensor a-contact (1 unit), b-contact (2 units)	GL-N12F (1 unit), GL-N12FB (2 units)	Mounting screw/nut, detecting plate, sensor rail
D	Proximity Sensor a-contact (1 unit), b-contact (2 units)	GXL-N12F (1 unit), GXL-N12FB (2 units)	Mounting screw/nut, detecting plate, sensor rail, fixture (MS-GXL12)
E	Proximity Sensor a-contact (1 unit), b-contact (2 units)	APM-D3A1-001 (1 unit), APM-D3B1-003 (2 units)	Mounting screw/nut, detecting plate, sensor rail

[Proximity Sensor]

APM-D3A1-001 (Yamatake)	3 units
APM-D3B1-003 (Yamatake)	3 units
GL-12F (SUNX)	3 units
GXL-N12F (SUNX)	3 units
GX-N12F (SUNX)	3 units
GL-N12FB (SUNX)	3 units
GXL-N12FB (SUNX)	3 units

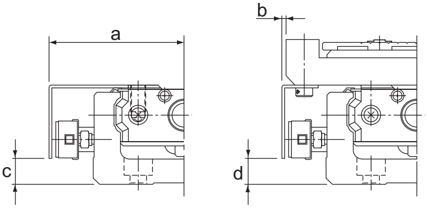
- **Proximity Sensor: APM-D3A1-001 APM-D3B1-003 (Yamatake)**



Unit: mm

Model No.	a	b	c	d
KR15	27.8	−5.8	1.4	1.4
KR20	32.5	6.6	6	6
KR26	37.5	6.4	8	8
KR30H	43.3	3.3	8.8	9
KR33	42.5	−0.6	8.8	9
KR45H	53.2	1.2	14	14
KR46	55.4	−0.6	21.8	22
KR55	62.4	0.4	22	22
KR65	77.4	−7.5	25.1	25
SKR33	43.05	0.3	14.8	15
SKR46	56.2	0.2	26.8	22

- **Proximity Sensor: GL-12F, GL-N12F, GXL-N12F, GL-N12FB, GXL-N12FB (SUNX)**



Unit: mm

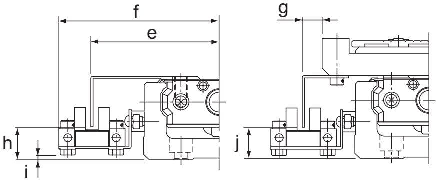
Model No.	a	b	c	d
KR20	34	8	3.6	4
KR26	39	7.9	6	6
KR30H	45	5	8.8	9
KR33	44.5	1.5	8.8	9
KR45H	54.8	2.8	13.8	14
KR46	57.4	1.5	21.8	22
KR55	63.5	1.5	22	22
KR65	79	−6	25.1	25
SKR33	44.7	2	13.8	14
SKR46	57.7	1.8	24.8	22

[Photo Sensor]

EE-SX671 (Omron)	3 units
EE-SX674 (Omron)	3 units
Connector EE-1001 (Omron)	3 units

Note) The connector is a standard attachment to the photo sensor.

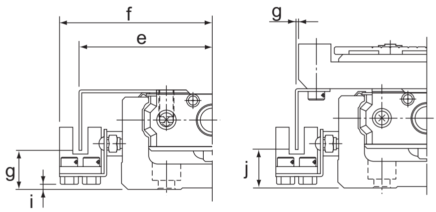
● Photo Sensor: EE-SX671 (Omron)



Unit: mm

Model No.	e	f	g	h	i	j
KR20	41	54	15	9.5	1	9.5
KR26	46	58.5	15	11.5	3	11.5
KR30H	51.3	64.3	11.3	13.8	1.4	13.5
KR33	50.8	63.7	7.8	12.8	1.6	13
KR45H	61.2	74.2	9.3	18.3	6.4	18.5
KR46	63.6	76.6	7.6	25.8	14.6	26
KR55	70.7	83.5	8.6	24.5	13.6	25
KR65	85.5	98.5	0.6	28.1	16.6	28
SKR33	51.1	63.6	8.3	18.8	7.4	19.5
SKR46	64.1	76.6	8.3	29.8	16.4	26.5

● Photo Sensor: EE-SX674 (Omron)

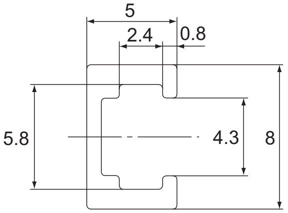


Unit: mm

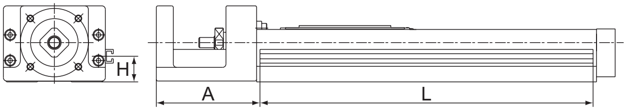
Model No.	e	f	g	h	i	j
KR20	38.5	45	12.5	11	0.8	11
KR26	43.5	50	12.5	13	2.8	13
KR30H	46.2	52.8	6.3	13.8	1.1	14
KR33	43.9	50.3	0.9	12.8	1.6	13
KR45H	56.2	62.7	4.2	19	6.1	19
KR46	56.7	63.2	0.7	25.8	14.6	26
KR55	63.8	70.1	1.8	24.5	13.6	25
KR65	78.8	85.1	–6.2	28.1	16.6	28
SKR33	45.9	52.1	3.3	17.8	7.1	20
SKR46	58.9	65.1	3.2	28.8	16.1	27

[Sensor Rail]

The sensor rail can be attached alone.



Sensor rail



Unit: mm

Model No.	Rail length	H	A	L
KR15	75	5.5	37.5	88
	100			113
	125			138
	150			163
	175			188
	200			213
KR20	100	10	43	111
	150			161
	200			211
KR26	150	12	54	161
	200			211
	250			261
	300			311
KR30H	150	14	61	146
	200			196
	300			296
	400			396
	500			496
	600			596
KR33	150	15	61	146
	200			196
	300			296
	400			396
	500			496
	600			596
KR45H	340	19	90	336
	440			436
	540			536
	640			636
	740			736
	840			836
	940			936

Unit: mm

Model No.	Rail length	H	A	L
KR46	340	28	89.5	336
	440			436
	540			536
	640			636
	740			736
	940			936
KR55	980	27	96	976
	1080			1076
	1180			1176
	1280			1276
	1380			1376
KR65	980	30	102	976
	1180			1176
	1380			1376
	1680			1676
SKR33	150	20	61	146
	200			196
	300			296
	400			396
	500			496
	600			596
	700			696
SKR46	340	29	89.5	336
	440			436
	540			536
	640			636
	740			736
	940			936

Motor Bracket

[Motors Used in Model KR and Corresponding Motor Brackets]

For model KR, motor brackets are available that allow different motors to be attached. Each motor bracket model has an administration number according to the motor to be used. Specify the corresponding administration number when placing an order.

Table2 Table of Motors Used and Corresponding Motor Brackets

Motor model No.					Model No. Dimen-sion angle	KR15	KR20	KR26	KR30H	KR33	KR45H	KR46	KR55	KR65
AC servomotor	Yaskawa Electric	Σ-mini		SGMM-A1 (10W)	□25	0B	3N	0N	—	—	—	—	—	—
				SGMM-A2 (20W)		0B	3N	0N	—	—	—	—	—	—
				SGMM-A3 (30W)		—	3N	0N	—	—	—	—	—	—
		Σ-II		SGMAH-A3 (30W)	□40	—	0B	0B	0B	5H	0B	0F	—	—
				SGMAH-A5 (50W)		—	0B	0B	0B	5H	0B	0F	—	—
				SGMAH-01 (100W)		—	—	—	0B	5H	0B	0F	—	—
				SGMPH-01 (100W)	□60	—	—	—	—	—	0D	40	00	0A
				SGMAH-02 (200W)		—	—	—	—	—	0D	40	00	0A
				SGMAH-04 (400W)		—	—	—	—	—	0D	40	00	0A
				SGMPH-02 (200W)	□80	—	—	—	—	—	—	—	0B	00
				SGMPH-04 (400W)		—	—	—	—	—	—	—	0B	00
				SGMAH-08 (750W)		—	—	—	—	—	—	—	0B	0G
	Mitsubishi Electric	MELSERVO	J2-Jr	HC-AQ013 (10W)	□28	0A	3M	0M	—	—	—	—	—	—
				HC-AQ023 (20W)		0A	3M	0M	—	—	—	—	—	—
				HC-AQ033 (30W)		—	3M	0M	—	—	—	—	—	—
			J2 Super	HC-MFS053 (50W)	□40	—	0B	0B	0B	5H	0B	0F	—	—
				HC-MFS13 (100W)		—	—	—	0B	5H	0B	0F	—	—
				HC-MFS23 (200W)	□60	—	—	—	—	—	0D	40	00	0A
				HC-KFS23 (200W)		—	—	—	—	—	0D	40	00	0A
				HC-MFS43 (400W)		—	—	—	—	—	0D	40	00	0A
				HC-KFS43 (400W)		—	—	—	—	—	0D	40	00	0A
				HC-MFS73 (750W)	□80	—	—	—	—	—	—	—	0B	0G
				HC-KFS73 (750W)		—	—	—	—	—	—	—	0B	0G
	Matsushita Electric	MINAS A		MSMA3A (30W)	□38	—	0A	0A	0A	5K	0A	0G	—	—
				MSMA5A (50W)		—	0A	0A	0A	5K	0A	0G	—	—
				MSMA01 (100W)		—	—	—	0A	5K	0A	0G	—	—
				MQMA01 (100W)	□60	—	—	—	—	—	0C	30	—	—
				MSMA02 (200W)		—	—	—	—	—	0C	30	—	—
				MSMA04 (400W)		—	—	—	—	—	0C	30	—	—
				MSMA08 (750W)	□80	—	—	—	—	—	—	—	0A	2B
	SANYO Electric	SANMOTION Q1		Q1AA04003D (30W)	□40	—	0B	0B	0B	5H	0B	0F	—	—
				Q1AA04005D (50W)		—	0B	0B	0B	5H	0B	0F	—	—
				Q1AA04010D (100W)		—	—	—	0B	5H	0B	0F	—	—
				Q1AA06020D (200W)	□60	—	—	—	—	—	0D	40	00	0A
				Q1AA06040D (400W)		—	—	—	—	—	0D	40	00	0A
				Q1AA07075D (750W)	□76	—	—	—	—	—	—	—	0A	2B

				Model No.	KR15	KR20	KR26	KR30H	KR33	KR45H	KR46	KR55	KR65
Motor model No.				Dimension angle									
AC servomotor	Omron	OMNUC W	R88M-W03030 (30W)	□40	—	0B	0B	0B	5H	0B	0F	—	—
			R88M-W05030 (50W)		—	0B	0B	0B	5H	0B	0F	—	—
			R88M-W10030 (100W)		—	—	—	0B	5H	0B	0F	—	—
			R88M-W20030 (200W)	□60	—	—	—	—	—	0D	40	00	0A
			R88M-W40030 (400W)		—	—	—	—	—	0D	40	00	0A
			R88M-W75030 (750W)	□80	—	—	—	—	—	—	—	0B	0G
	Fanuc	βis series	β0.2/5000is (50W)	□40	—	0B	0B	0B	5H	0B	0F	—	—
			β0.3/5000is (100W)		—	—	—	0B	5H	0B	0F	—	—
			β0.4/5000is (125W)	□60	—	—	—	—	—	0D	40	00	0A
			β0.5/5000is (200W)		—	—	—	—	—	0D	40	00	0A
			β1/5000is (400W)		—	—	—	—	—	0D	40	00	0A
Stepping motor	Oriental Motor	αStep	ASC3*	□28	0D	0F	0F	—	—	—	—	—	—
			AS 46, ASC46	□42	—	0E	0E	XC	5I	—	—	—	—
			AS 6*, ASC66	□60	—	—	—	0E	5G	0F	10	—	—
			AS 9*	□85	—	—	—	—	—	—	—	0G	2F
		5 phase PMU	PMU33/35 (PMM33/35)	□28	0D	0F	0F	—	—	—	—	—	—
			PMC33/35 (PMM33/35)		0D	0F	0F	—	—	—	—	—	—
		5 phase RK	RK54□	□42	—	0E	0E	XC	5I	—	—	—	—
			RK56□	□60	—	—	—	0E	5G	0F	10	—	—
			RK59□	□85	—	—	—	—	—	—	—	0G	2F
		2 phase UMK	UMK24* (PK24*)	□42	—	0E	0E	XC	5I	—	—	—	—
			UMK26* (PK26*)	□56.4	—	—	—	0D	5F	—	—	—	—

Note1) The symbols in the table each indicate the last two digits of an administration number.
Note2) For the coupling for mounting a motor in the table, contact THK.
Note3) Model KR15 has a limit in input torque. The permissible input torque for model KR1501 is 51 N-mm at a maximum and that for model KR1502 is 103 N-mm at a maximum. If the maximum torque of the motor mounted to model KR15 exceeds the permissible input torque, take a safety measure such as setting a torque limit.

[Motor Bracket Dimensional Table for Model KR]

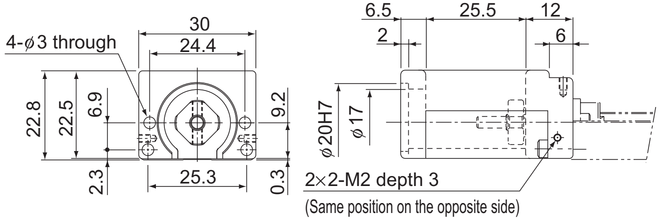
- **For Model KR15**

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

■Housing A

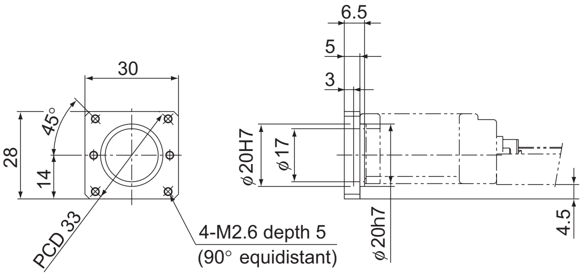
—
00



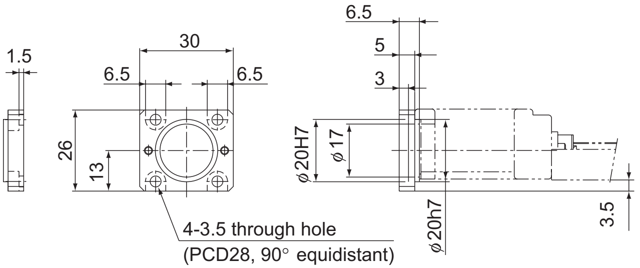
■Intermediate Flange

Each intermediate flange is made of steel and provided with THK AP-C treatment, a surface treatment for high corrosion resistance.

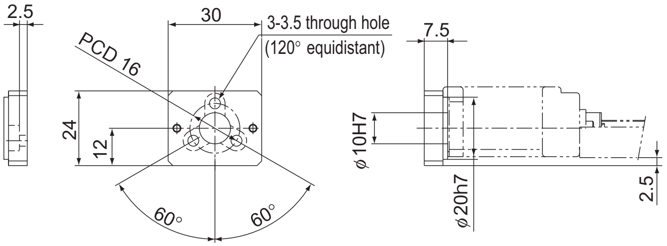
F15-A
0A



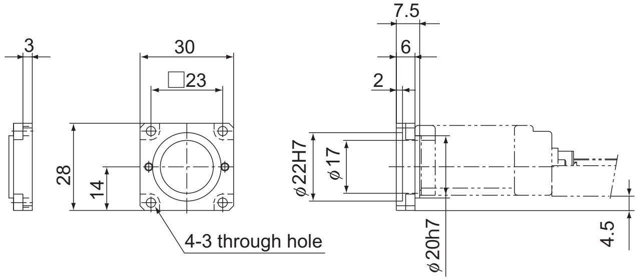
F15-B
0B



F15-C
0C



F15-D
0D



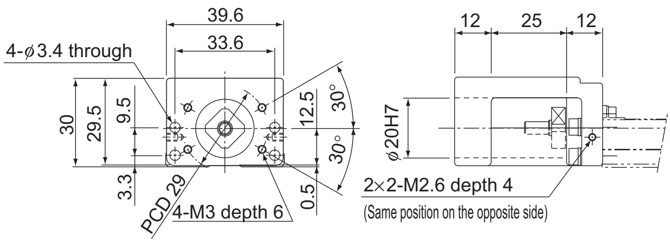
- **For Model KR20**

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

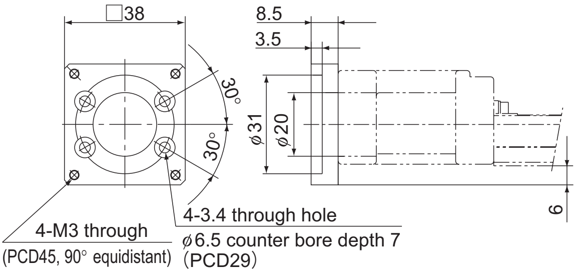
■Housing A

—
00

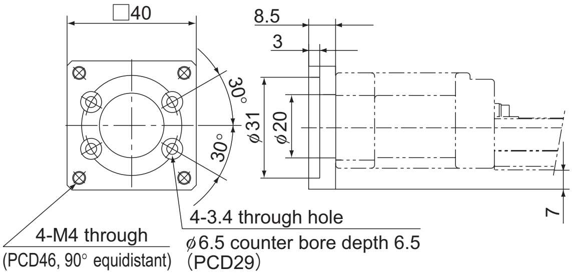


■Intermediate Flange

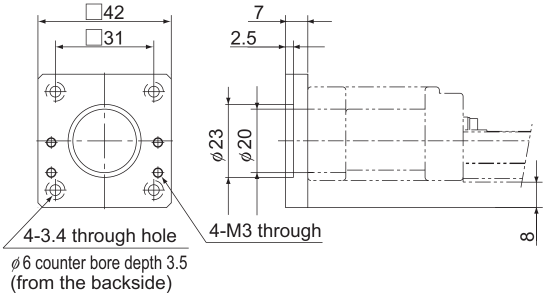
F20-A
0A



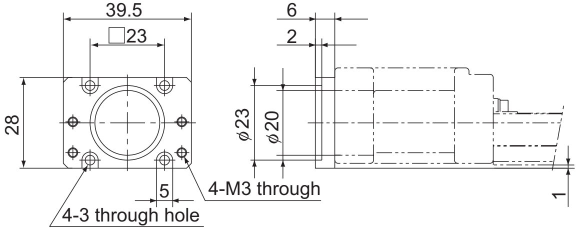
F20-B
0B



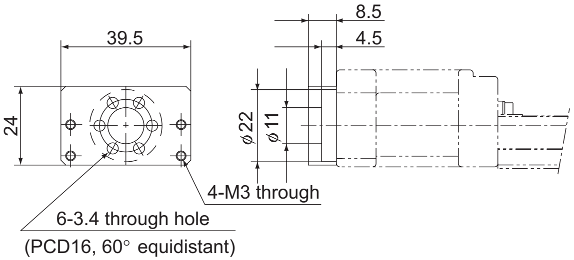
F20-E
0E



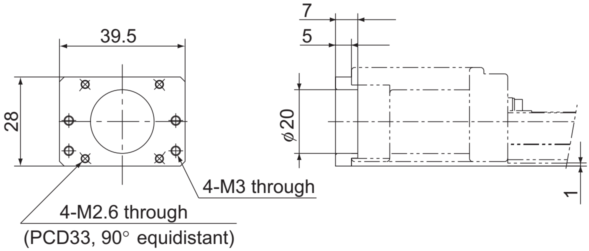
F20-F
0F



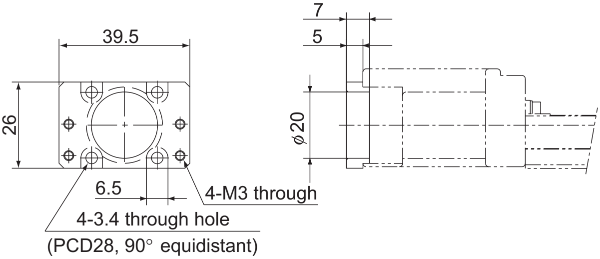
F20-G
0G



F20-M
3M



F20-N
3N


39.5
26
6.5
4-M3 through
4-3.4 through hole
(PCD28, 90° equidistant)
7
5
ϕ20

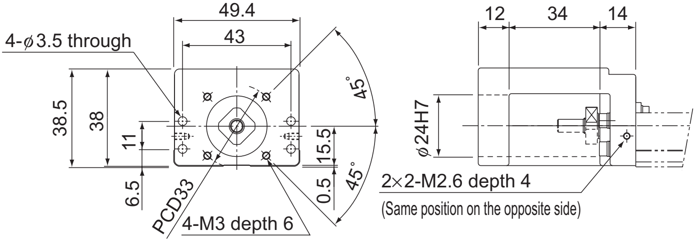
● For Model KR26

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

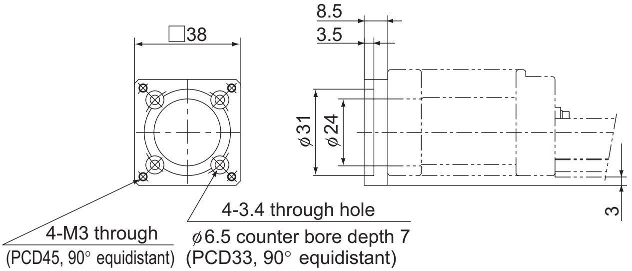
■Housing A

—
00

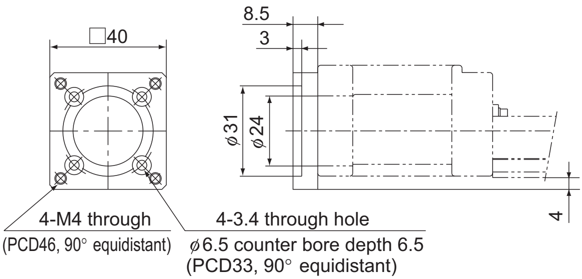


■Intermediate Flange

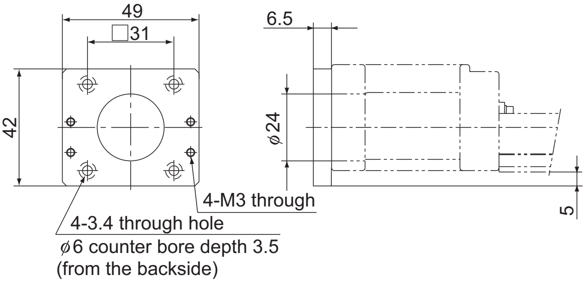
F26-A
0A



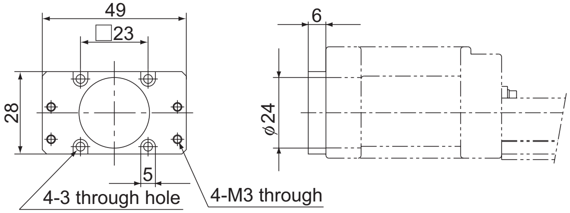
F26-B
0B



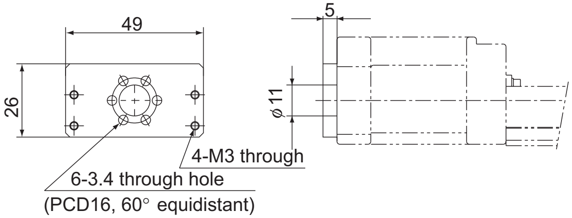
F26-E
0E



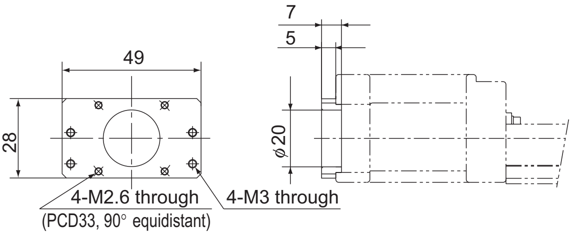
F26-F
0F



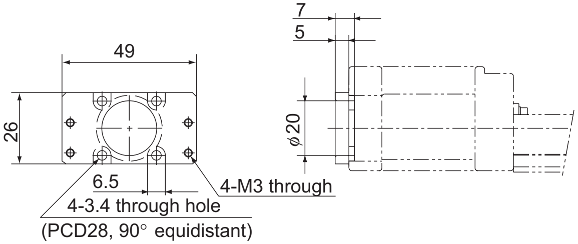
F26-G
0G



F26-M
0M



F26-N
0N


7
5
49
26
φ20
6.5
4-M3 through
4-3.4 through hole
(PCD28, 90° equidistant)

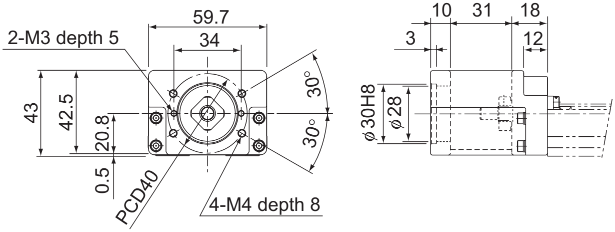
● For Model KR30H

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

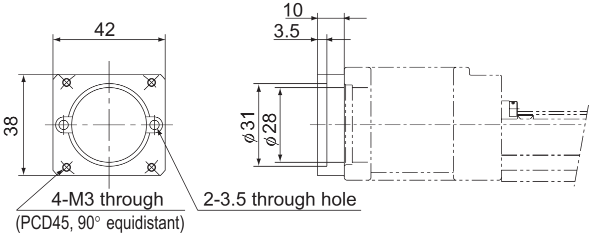
■Housing A

—
00

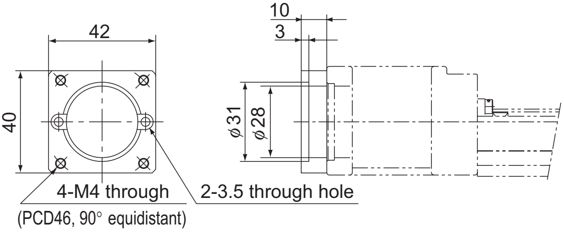


■Intermediate Flange

F30-A
0A

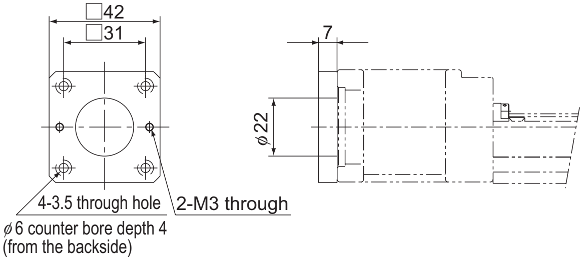


F30-B
0B



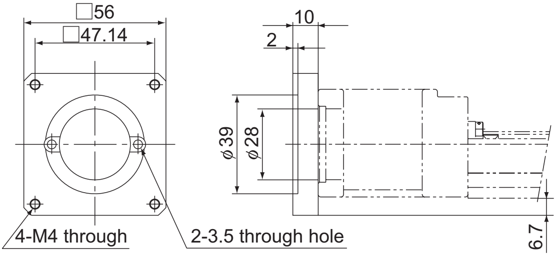
F30-C

XC



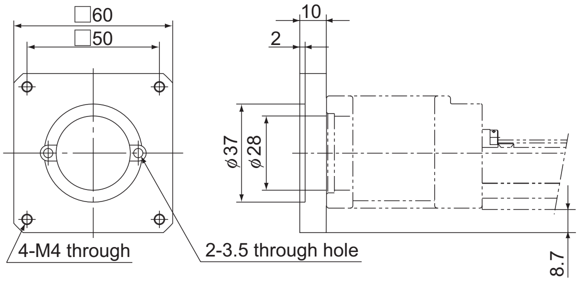
F30-D

0D



F30-E

0E



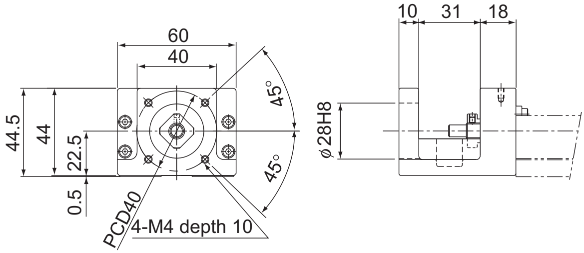
● For Model KR33

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

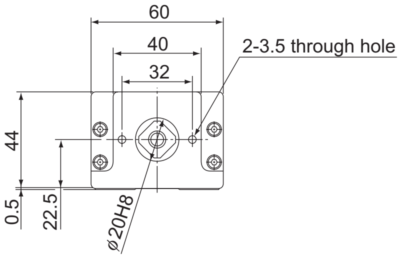
Note) "-" for intermediate flange model number indicates that only housing A is attached.

■Housing A

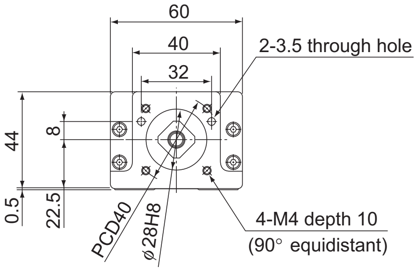
—
00



—
10

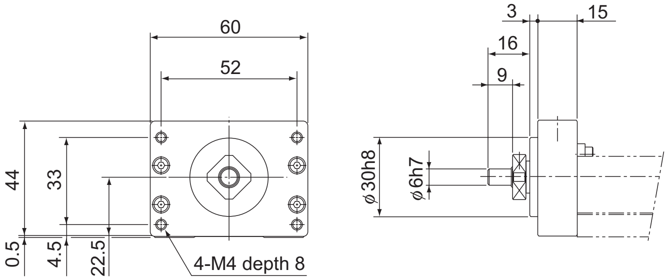


—
50



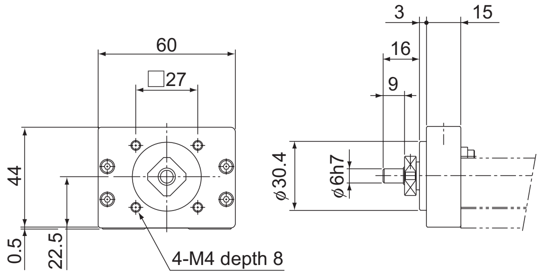
■Housing A for a Separate Motor

—
30



■Turnaround Housing A

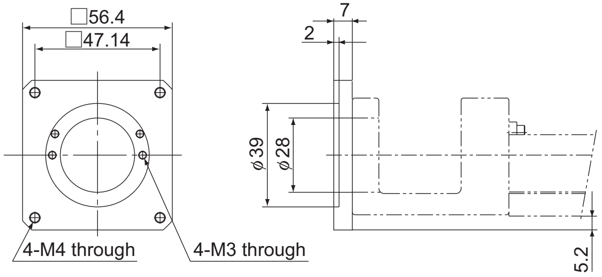
—
40



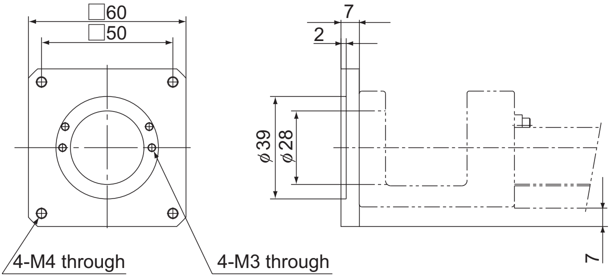
■Intermediate Flange

Each intermediate flange is made of steel and provided with THK AP-C treatment, a surface treatment for high corrosion resistance.

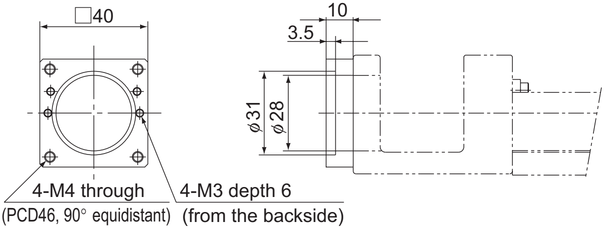
F33-F
5F



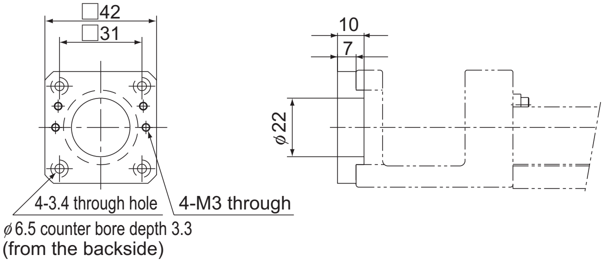
F33-G
5G



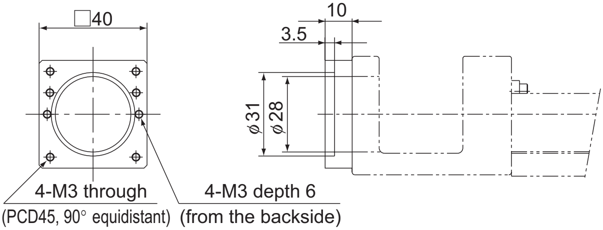
F33-H
5H



F33-I
5I



F33-K
5K



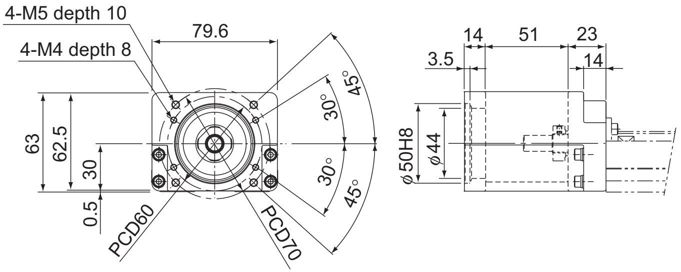
● For Model KR45H

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

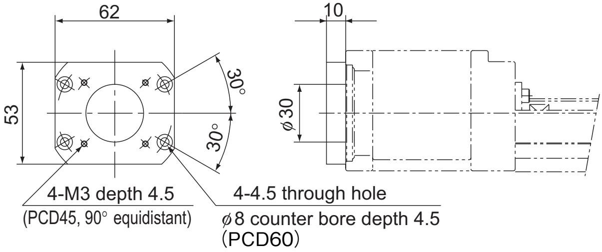
■Housing A

—
00

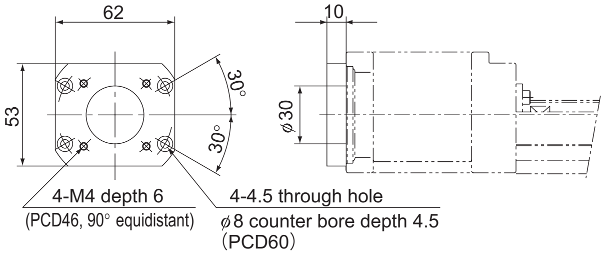


■Intermediate Flange

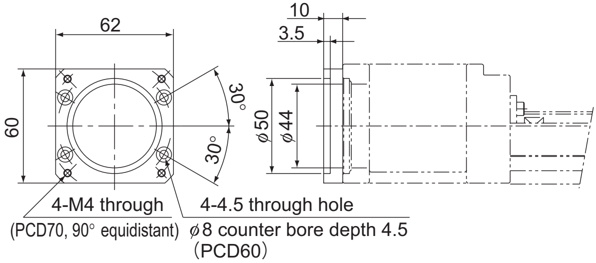
F45-A
0A



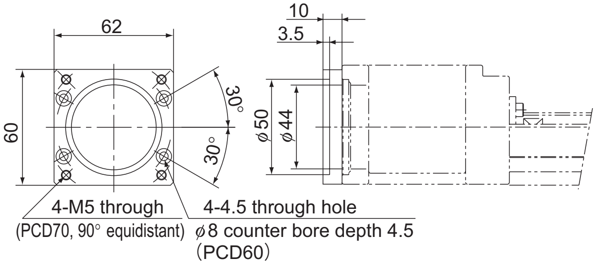
F45-B
0B



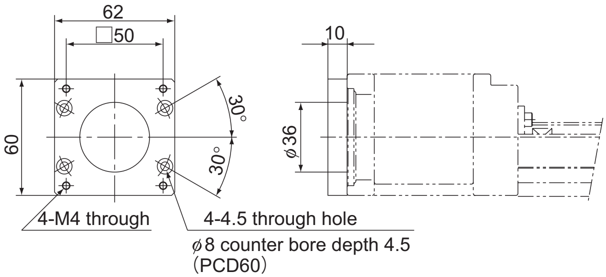
F45-C
0C



F45-D
0D



F45-F
0F



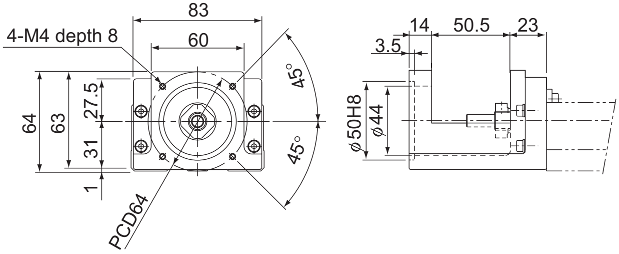
● For Model KR46

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

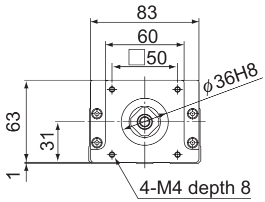
Note) "-" for intermediate flange model number indicates that only housing A is attached.

■Housing A

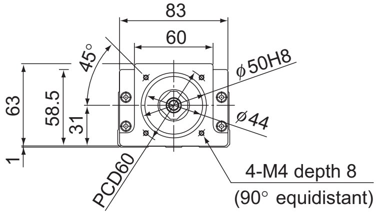
—
00



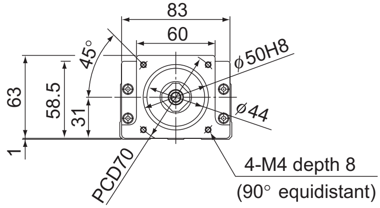
—
10



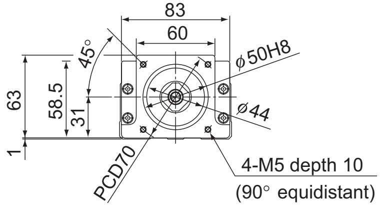
—
20



—
30

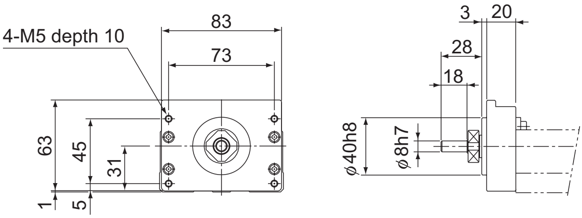


—
40



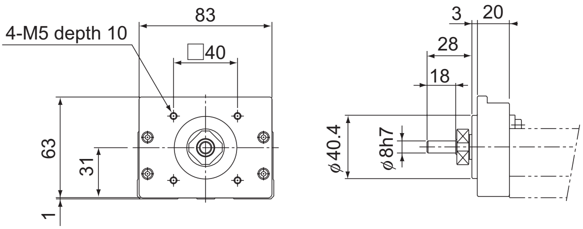
■Housing A for a Separate Motor

—
50



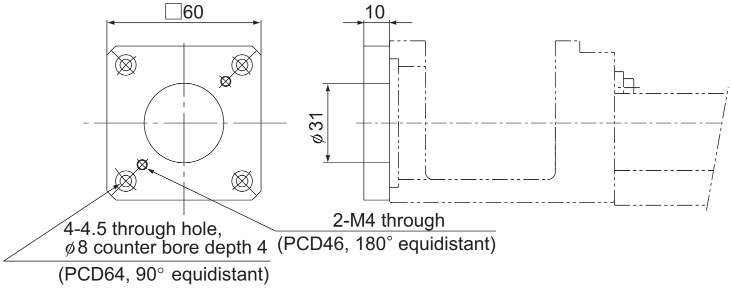
■Turnaround Housing A

—
60

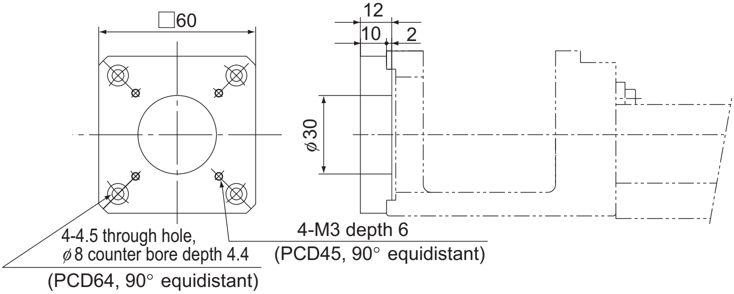


■Intermediate Flange

F46-F
0F



F46-G
0G



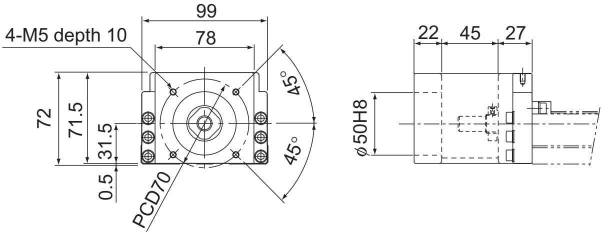
- **For Model KR55**

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

■Housing A

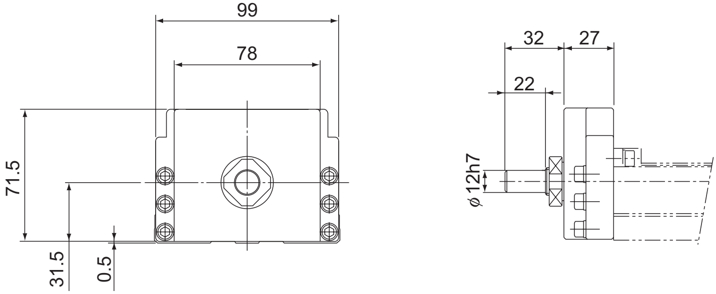
—
00



■Turnaround Housing A

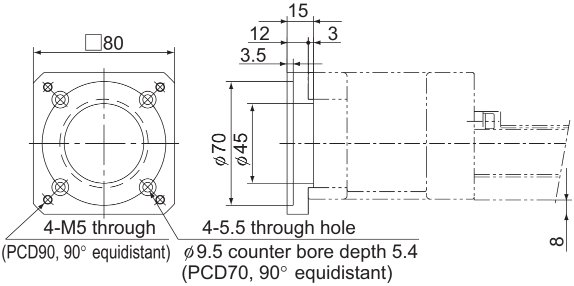
Note) Indicate the mounting holes when placing an order.

—
10

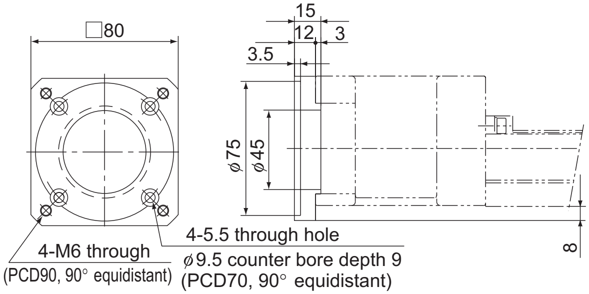


■Intermediate Flange

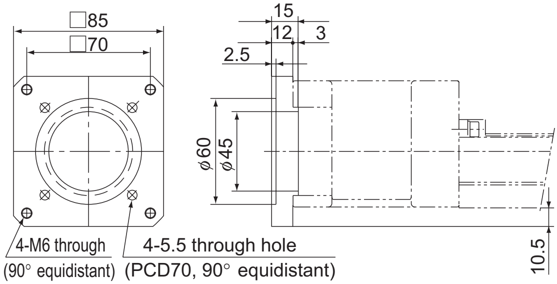
F55-A
0A



F55-B
0B



F55-G
0G



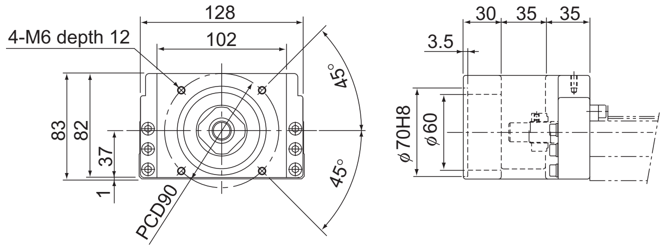
● For Model KR65

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

■Housing A

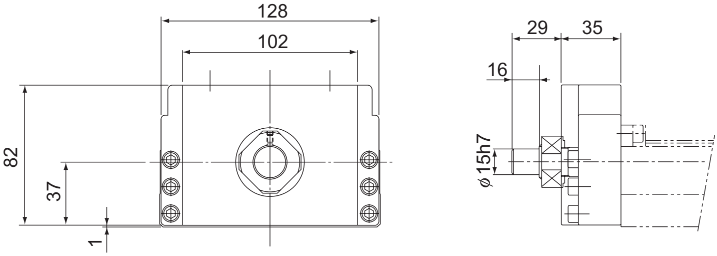
—
00



■Turnaround Housing A

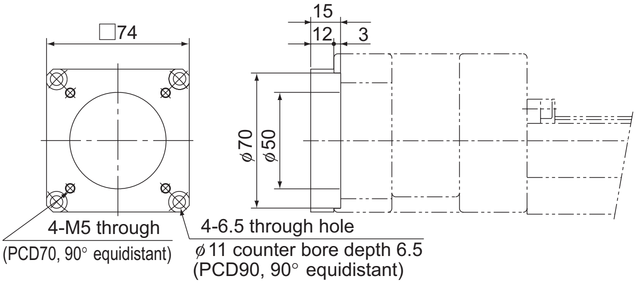
Note) Indicate the mounting holes when placing an order.

—
10

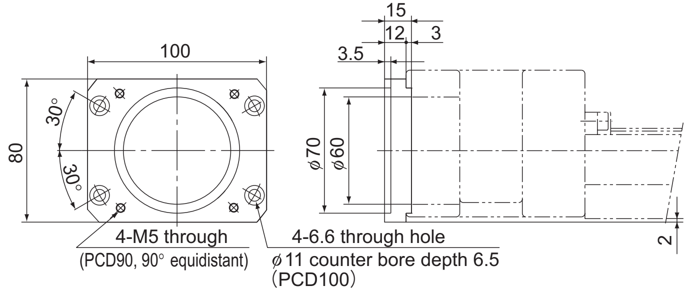


■Intermediate Flange

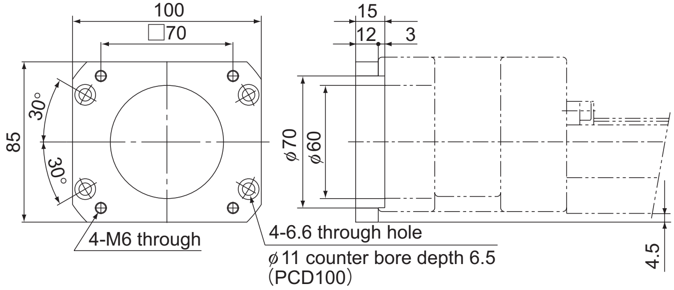
F65-A
0A



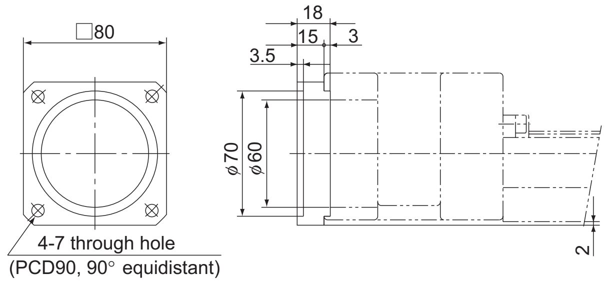
F65-B
2B



F65-F
2F

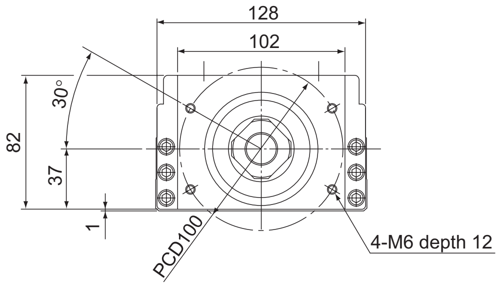


F65-G
0G



■Housing A

—
20



[Motors Used in Model SKR and Corresponding Motor Brackets]

Several types of intermediate flanges for mounting motors are available for model SKR. Each intermediate flange model has an administration number according to the motor to be used and to the actuator model number. Specify the corresponding administration number when placing an order.

Table3 Table of Motors Used and Corresponding Motor Brackets

Motor model No.					Flange angle	SKR33	SKR46
Servomotor	Yaskawa Electric	Σ-II		SGMAH-A3 (30W)	□40	0H	0F
				SGMAH-A5 (50W)		0H	0F
				SGMAH-01 (100W)		0H	0F
				SGMPH-01 (100W)	□60	—	04
				SGMAH-02 (200W)		—	04
				SGMAH-04 (400W)		—	04
	Mitsubishi Electric	MELSERVO	J2 Super	HC-MFS 053 (50W)	□40	0H	0F
				HC-KFS 053 (50W)		0H	0F
				HC-MFS 13 (100W)		0H	0F
				HC-KFS 13 (100W)		0H	0F
				HC-MFS 23 (200W)	□60	—	04
				HC-KFS 23 (200W)		—	04
				HC-MFS 43 (400W)		—	04
				HC-KFS 43 (400W)		—	04
	Matsushita Electric	MINAS A		MSMA 3A (30W)	□38	0K	0G
				MSMA 5A (50W)		0K	0G
				MSMA 01 (100W)		0K	0G
				MQMA 01 (100W)	□60	—	03
				MSMA 02 (200W)		—	03
				MSMA 04 (400W)		—	03
	SANYO Electric	SANMOTION Q1		Q1AA04003D (30W)	□40	0H	0F
				Q1AA04005D (50W)		0H	0F
				Q1AA04010D (100W)		0H	0F
				Q1AA06020D (200W)	□60	—	04
				Q1AA06040D (400W)		—	04
	Omron	OMNUC W		R88M-W03030 (30W)	□40	0H	0F
				R88M-W05030 (50W)		0H	0F
				R88M-W10030 (100W)		0H	0F
				R88M-W20030 (200W)	□60	—	04
				R88M-W40030 (400W)		—	04
	Fanuc	βis series		β0.2/5000is (50W)	□40	0H	0F
				β0.3/5000is (100W)		0H	0F
				β0.4/5000is (125W)	□60	—	04
				β0.5/5000is (200W)		—	04
				β1/5000is (400W)		—	04
Stepping motor	Oriental Motor	αStep		AS 46, ASC46	□42	0I	—
				AS 6□, ASC66	□60	0G	01
		5 phase	RK	RK54□	□42	0I	—
				RK56□	□60	0G	01
		2 phase	UMK	UMK24□	□42	0I	—
				UMK26□	□56.4	0F	—
			CSK	CSK24□	□42	0I	—
				CSK26□	□56.4	0F	—

Note1) The symbols in the table each indicate the last two digits of an administration number.
Note2) For the coupling for mounting a motor in the table, contact THK.

[Motor bracket dimensional table for model SKR]

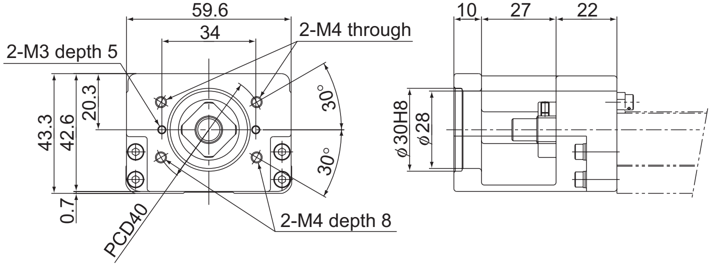
● For Model SKR33

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

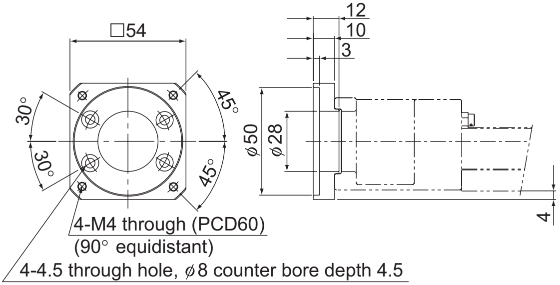
■Housing A

—
00

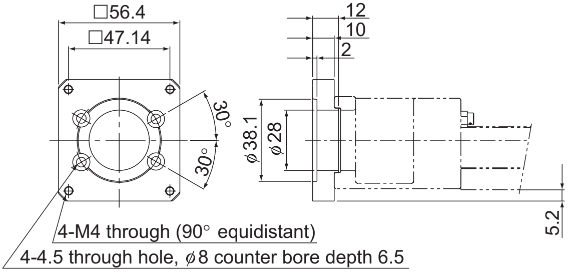


■Intermediate Flange

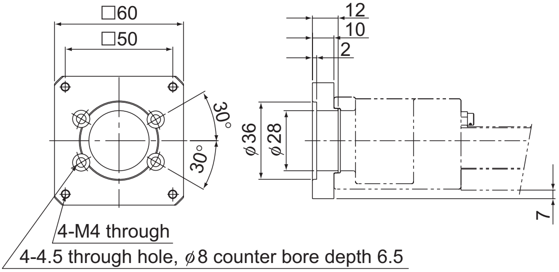
—
0B



—
0F



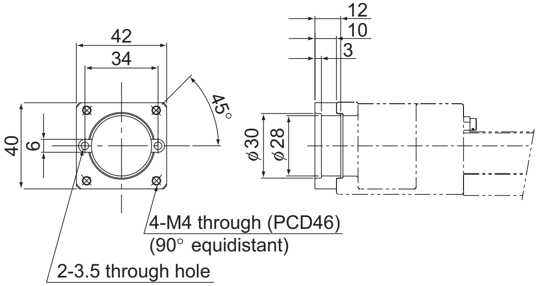
—
0G



4-M4 through

4-4.5 through hole, φ8 counter bore depth 6.5

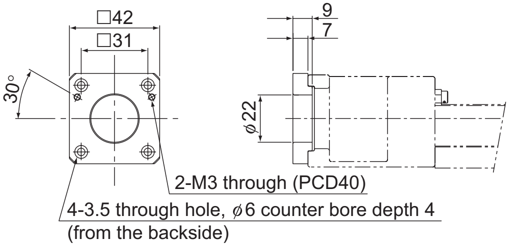
—
0H



4-M4 through (PCD46)
(90° equidistant)

2-3.5 through hole

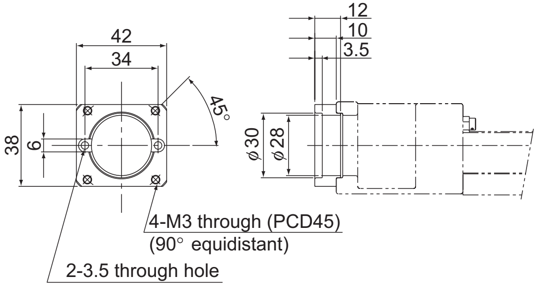
—
0I



2-M3 through (PCD40)

4-3.5 through hole, φ6 counter bore depth 4
(from the backside)

—
0K



4-M3 through (PCD45)
(90° equidistant)

2-3.5 through hole

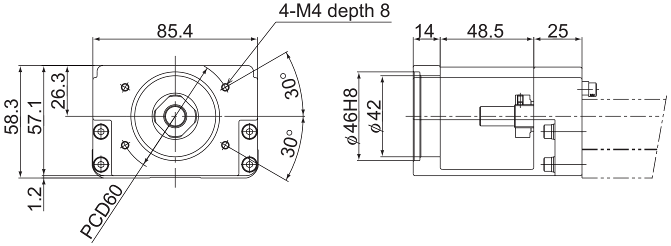
● For Model SKR46

F□□-□	···Intermediate flange model number
□□	···Last two digits of administration number

Note) "-" for intermediate flange model number indicates that only housing A is attached.

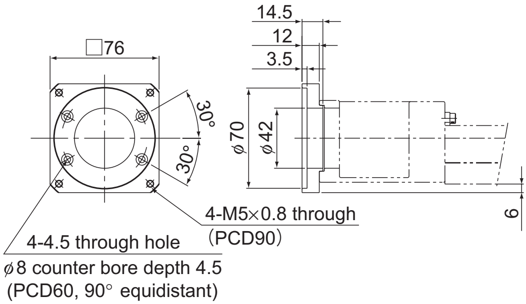
■Housing A

—
00



■Intermediate Flange

—
0A



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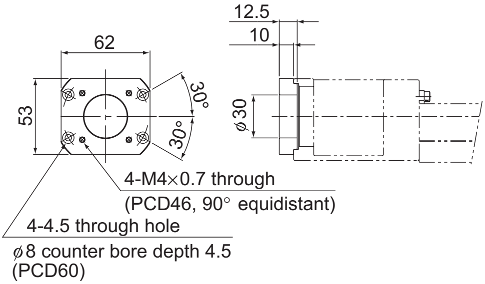
0F



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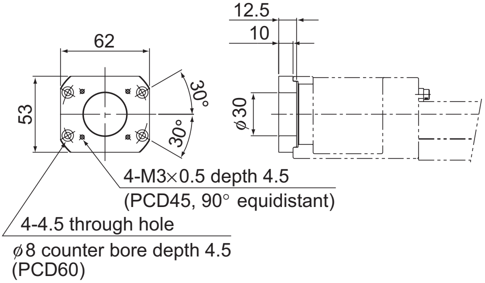
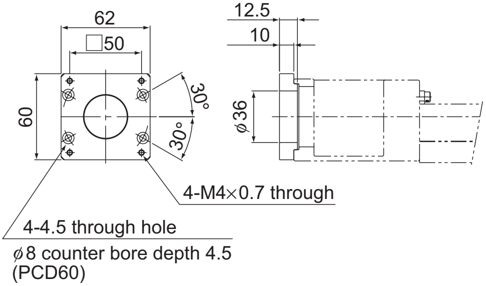
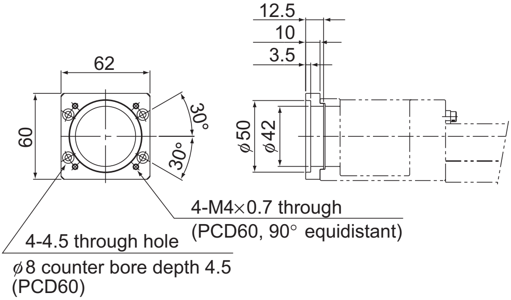
0G


12.5
10
62
53
30°
30°
ϕ30
4-M3×0.5 depth 4.5
(PCD45, 90° equidistant)
4-4.5 through hole
ϕ8 counter bore depth 4.5
(PCD60)

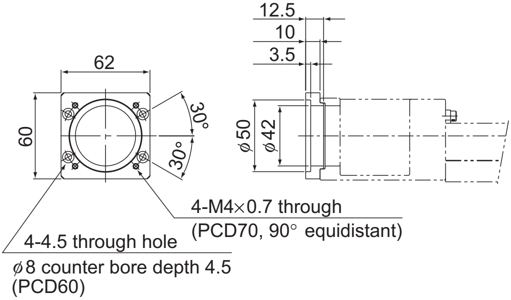
—
01


12.5
10
62
□50
60
30°
30°
ϕ36
4-M4×0.7 through
4-4.5 through hole
ϕ8 counter bore depth 4.5
(PCD60)

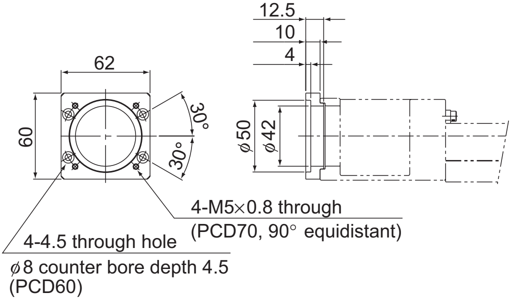
—
02


12.5
10
3.5
62
60
30°
30°
ϕ50
ϕ42
4-M4×0.7 through
(PCD60, 90° equidistant)
4-4.5 through hole
ϕ8 counter bore depth 4.5
(PCD60)

—
03


12.5
10
3.5
62
60
30°
30°
ϕ50
ϕ42
4-M4×0.7 through
(PCD70, 90° equidistant)
4-4.5 through hole
ϕ8 counter bore depth 4.5
(PCD60)

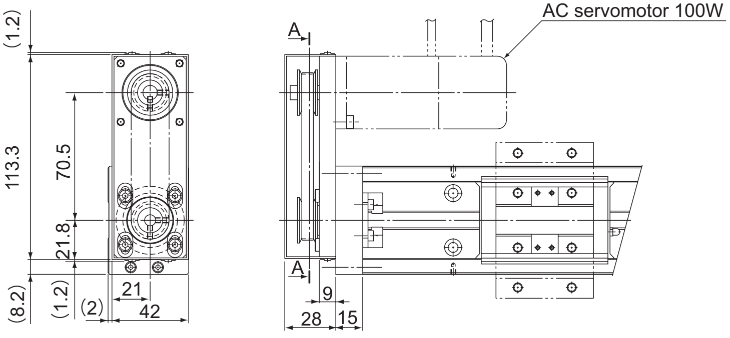
—
04


12.5
10
4
62
60
30°
30°
ϕ50
ϕ42
4-M5×0.8 through
(PCD70, 90° equidistant)
4-4.5 through hole
ϕ8 counter bore depth 4.5
(PCD60)

Motor Wrap Type (for Reference)

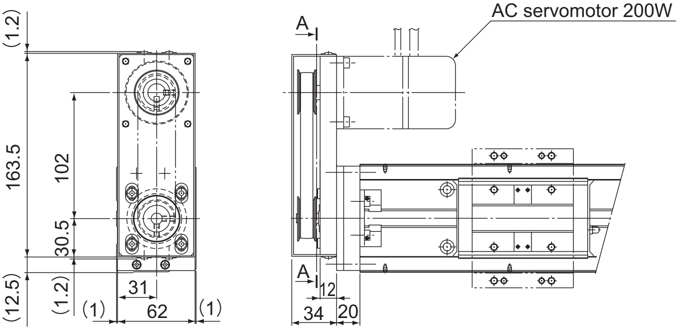
Motor wrap types are available that allow the motor to be turned around in order to minimize the dimension in the longitudinal direction. Contact THK for details. (Pulley ratio: 1:1)

[Example of Motor Turnaround with Model KR33]



A-A cross section

[Example of Motor Turnaround with Model KR46]



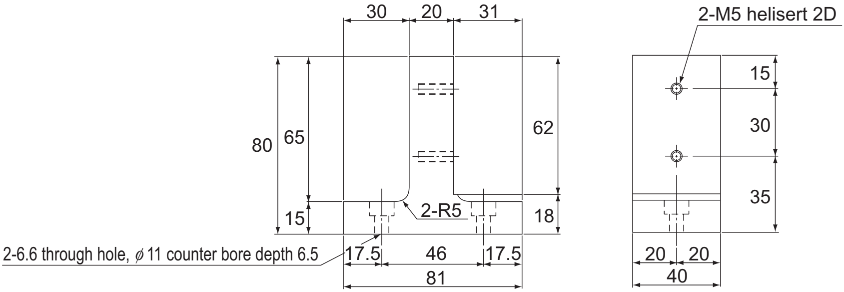
A-A cross section

Note) The specifications vary according to the motor. Contact THK for details.

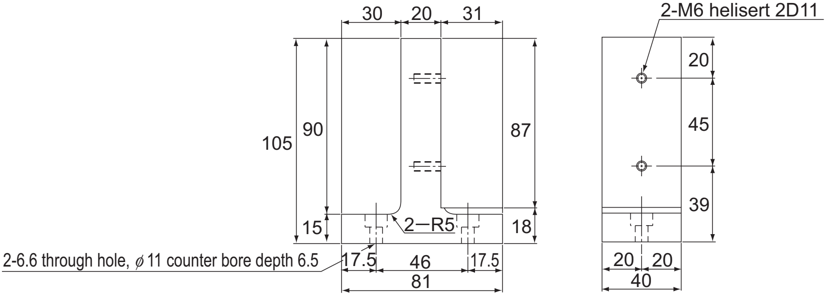
XY Bracket (for Reference)

Brackets for installing models KR33 and 46 only are available as standard. The brackets use aluminum to reduce the weights and keep the inertia as low as possible.

[KR-008XS (for Model KR33, Single-Shaft Type)]

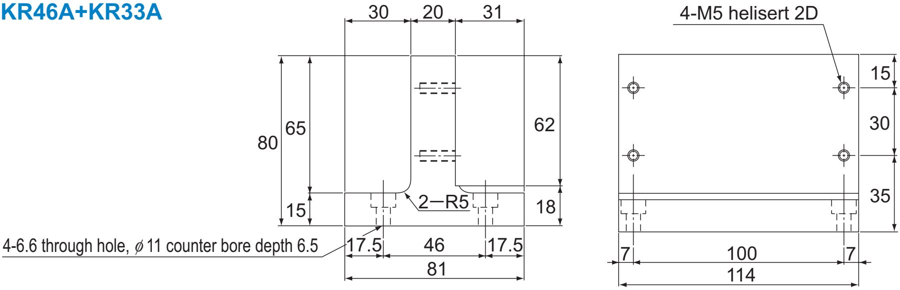


[KR-008XL (for Model KR46, Single-Shaft Type)]



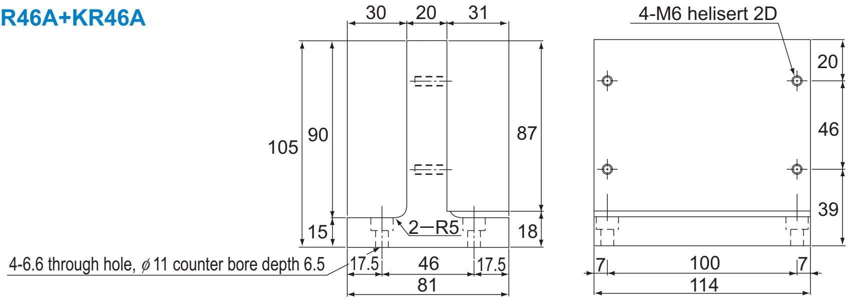
[KR-003XS (for Model KR33, LM Rail Fixed)]

KR46A+KR33A



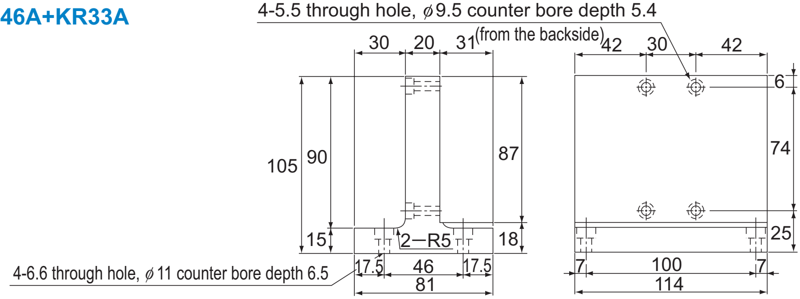
[KR-003XL (for Model KR46, LM Rail Fixed)]

KR46A+KR46A

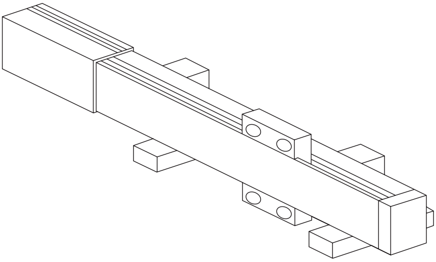


[KR-002XS (for Model KR33, Slider Fixed)]

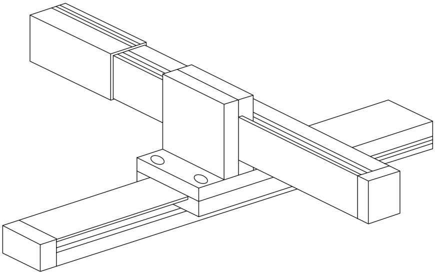
KR46A+KR33A



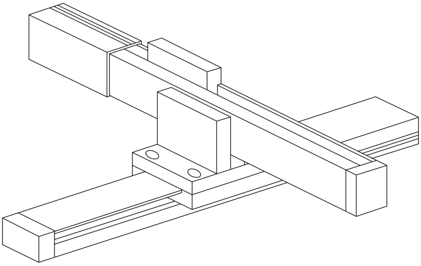
[Example of Combinations]



For single shaft



Slider fixed



Rail fixed

LM Actuator

THK General Catalog

B Product Specifications

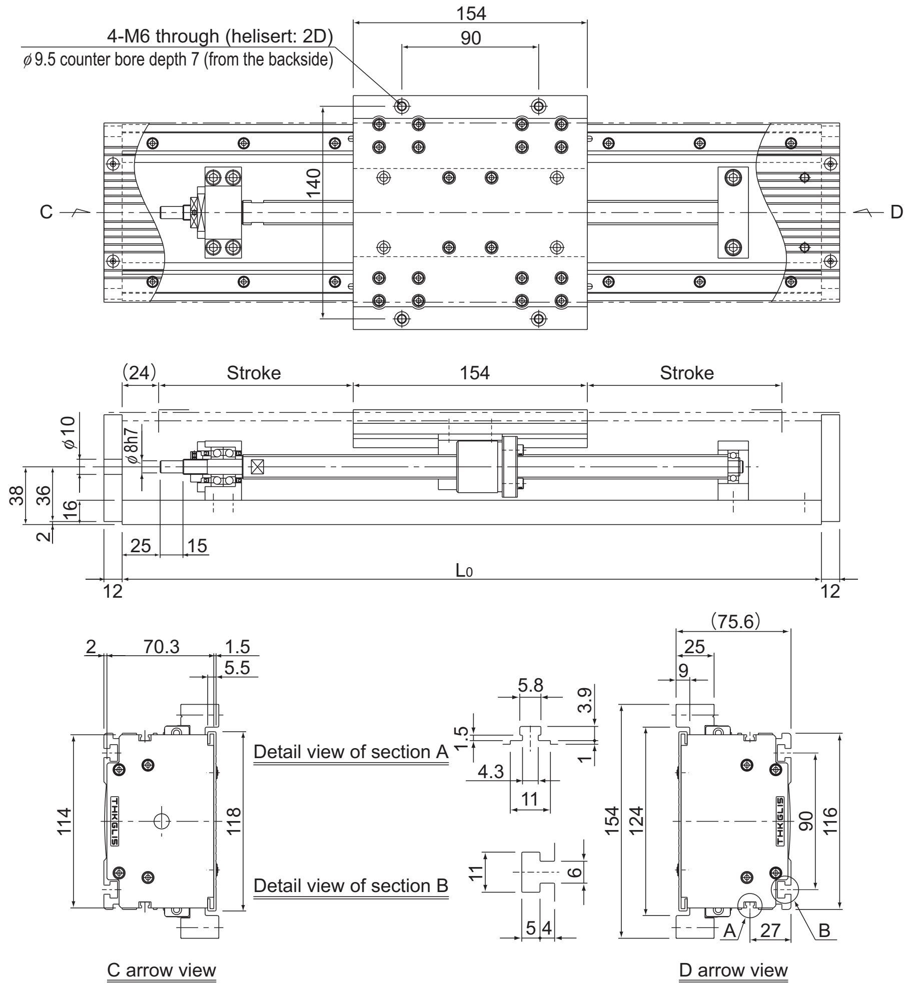
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Model GL

* Please see the separate "A Technical Descriptions of the Products".

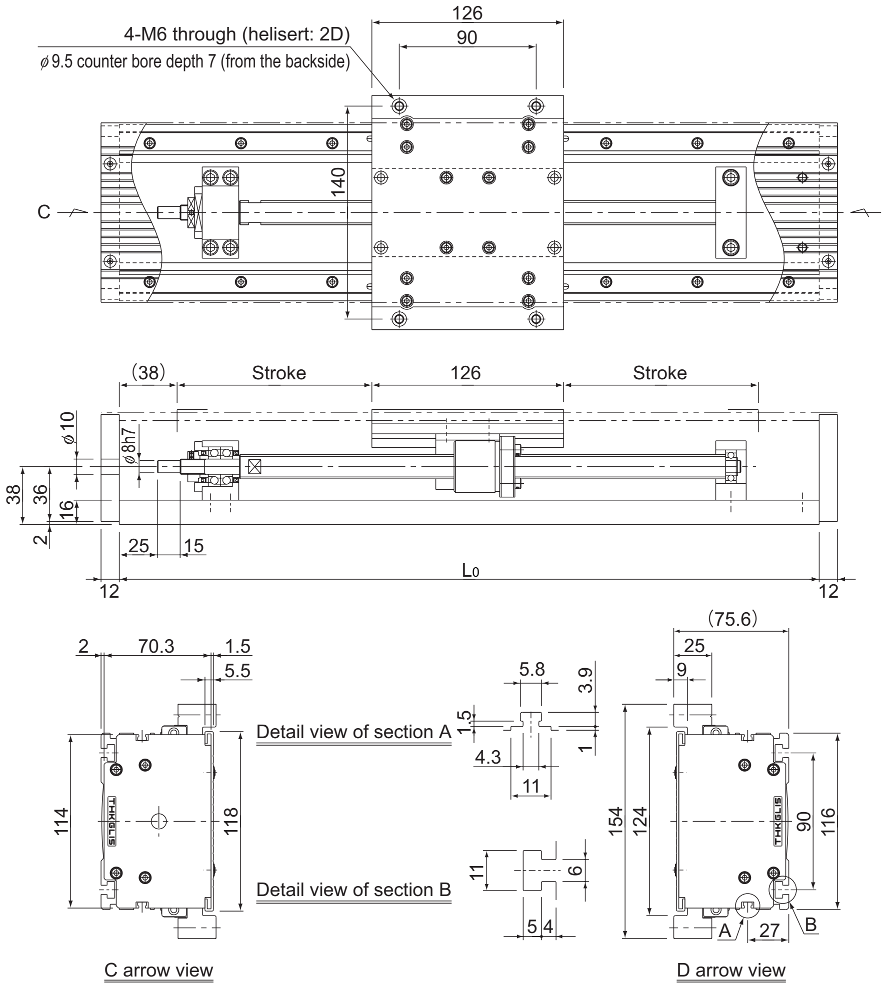
Ball Screw Drive Type Long Table Type of Model GL15



Base length L_0 (mm)	340	460	580	700	820	1060	1240	1420
Stroke (mm)	100	220	340	460	580	820	1000	1180
Mass (kg)	5.7	6.8	7.9	9.0	10.2	12.4	14.1	15.8

* Mass of moving element (table): 1.7 (kg)
For model number coding, see B-356.

Ball Screw Drive Type Short Table Type of Model GL15



Detail view of section A

Detail view of section B

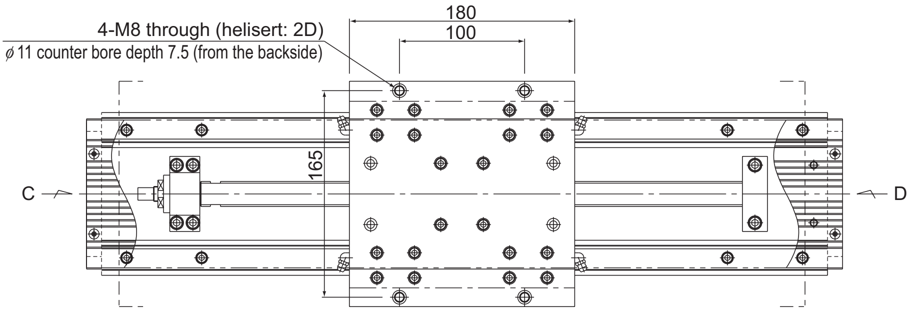
C arrow view

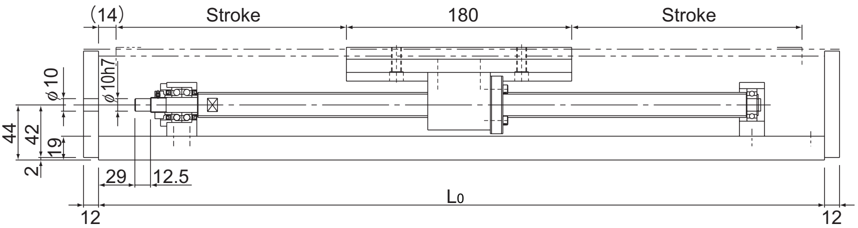
D arrow view

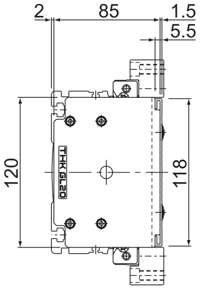
Base length L0 (mm)	340	460	580	700	820	1060	1240	1420
Stroke (mm)	100	220	340	460	580	820	1000	1180
Mass (kg)	6.0	7.1	8.3	9.4	10.5	12.8	14.5	16.1

* Mass of moving element (table): 1.4 (kg)
For model number coding, see B-356.

Ball Screw Drive Type Long Table Type of Model GL20

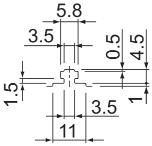




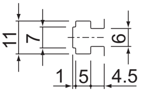


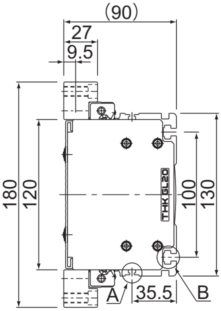
C arrow view

Detail view of section A



Detail view of section B



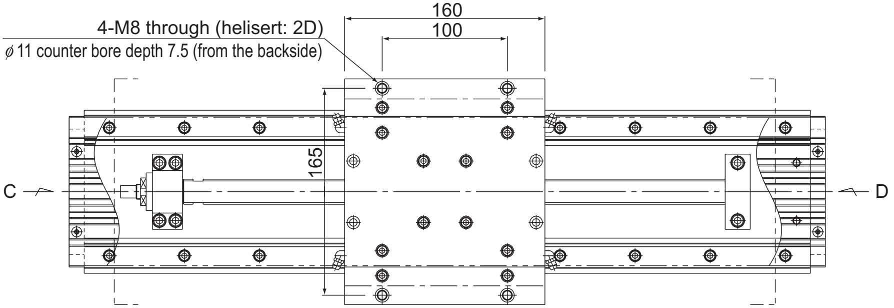


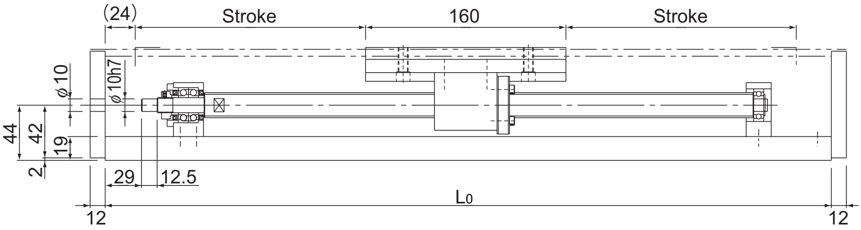
D arrow view

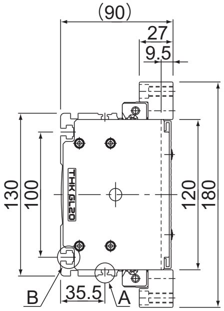
Base length L₀ (mm)	460	580	700	820	1060	1240	1420	1600	1780
Stroke (mm)	200	320	440	560	800	980	1160	1340	1520
Mass (kg)	9.6	11.2	12.8	14.3	17.9	20.3	22.7	25.0	27.4

* Mass of moving element (table): 3 (kg)
For model number coding, see B-356.

Ball Screw Drive Type Short Table Type of Model GL20

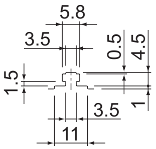




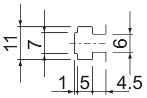


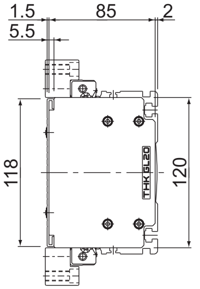
C arrow view

Detail view of section A



Detail view of section B



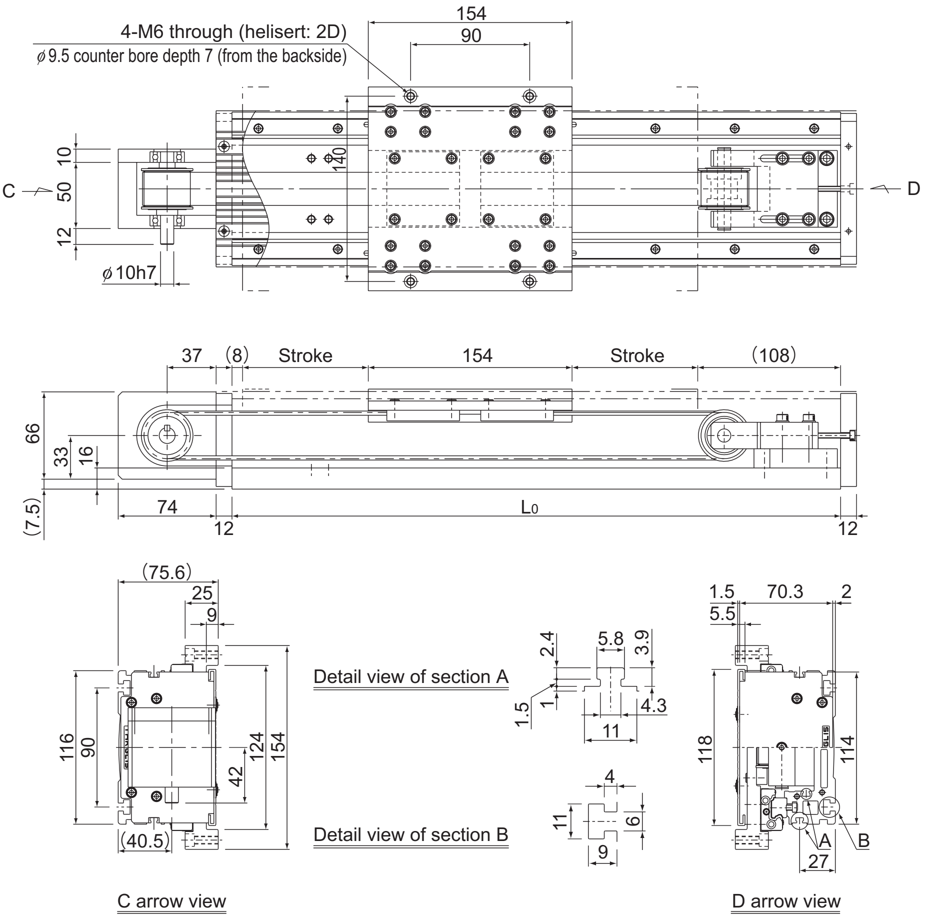


D arrow view

Base length L₀ (mm)	460	580	700	820	1060	1240	1420	1600	1780
Stroke (mm)	200	320	440	560	800	980	1160	1340	1520
Mass (kg)	9.6	11.2	12.8	14.3	17.9	20.3	22.7	25.0	27.4

* Mass of moving element (table): 2.6 (kg)
For model number coding, see B-356.

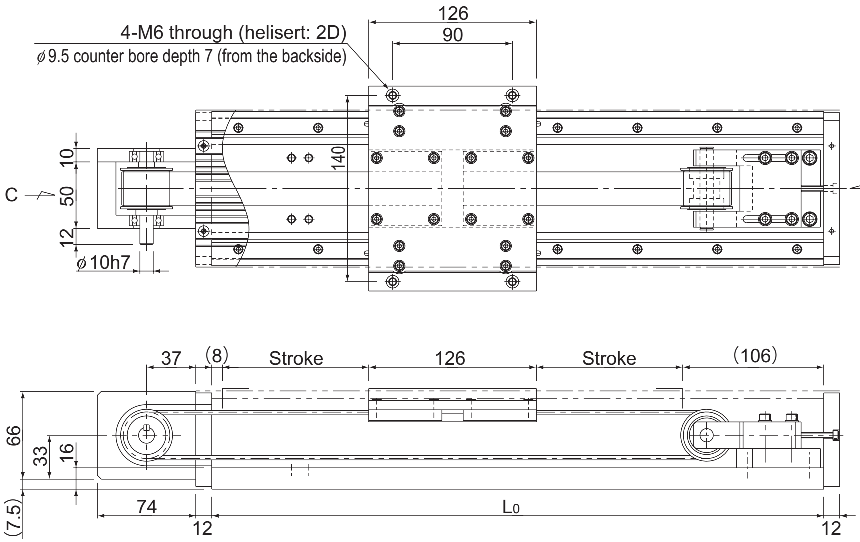
Belt Drive Type Long Table Type of Model GL15

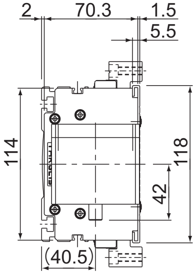


Base length L₀ (mm)	340	460	580	700	820	1060	1240	1420	1600	1780	1960
Stroke (mm)	70	190	310	430	550	790	970	1150	1330	1510	1690
Mass (kg)	7.9	8.8	9.8	10.8	11.8	13.7	15.2	16.6	18.1	19.6	21.0

* Mass of moving element (table): 1.7 (kg)
For model number coding, see B-356.

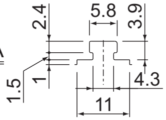
Belt Drive Type Short Table Type of Model GL15



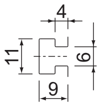


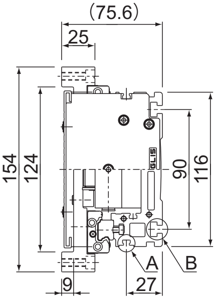
C arrow view

Detail view of section A



Detail view of section B



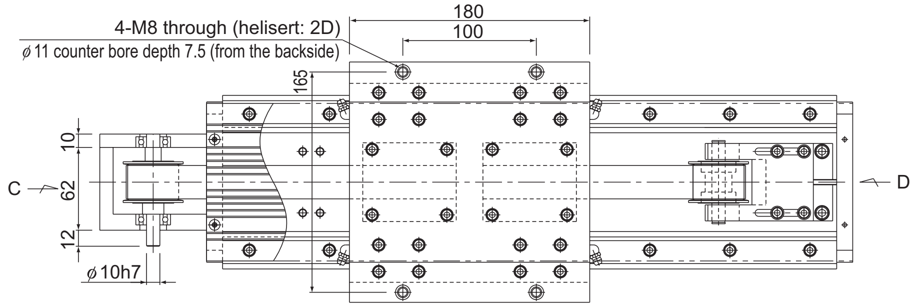


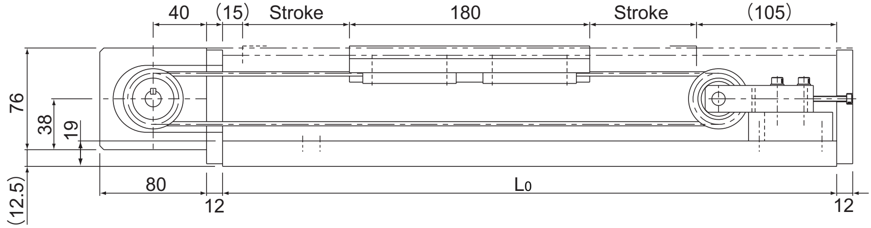
D arrow view

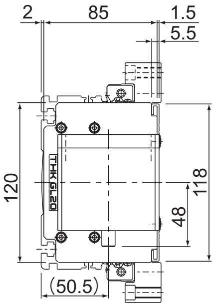
Base length L0 (mm)	340	460	580	700	820	1060	1240	1420	1600	1780	1960
Stroke (mm)	100	220	340	460	580	820	1000	1180	1360	1540	1720
Mass (kg)	7.0	8.0	9.0	9.9	10.9	12.9	14.3	15.8	17.3	18.7	20.2

* Mass of moving element (table): 1.3 (kg)
For model number coding, see B-356.

Belt Drive Type Long Table Type of Model GL20

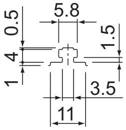




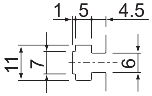


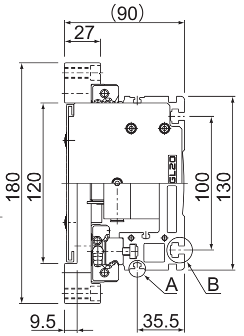
C arrow view

Detail view of section A



Detail view of section B



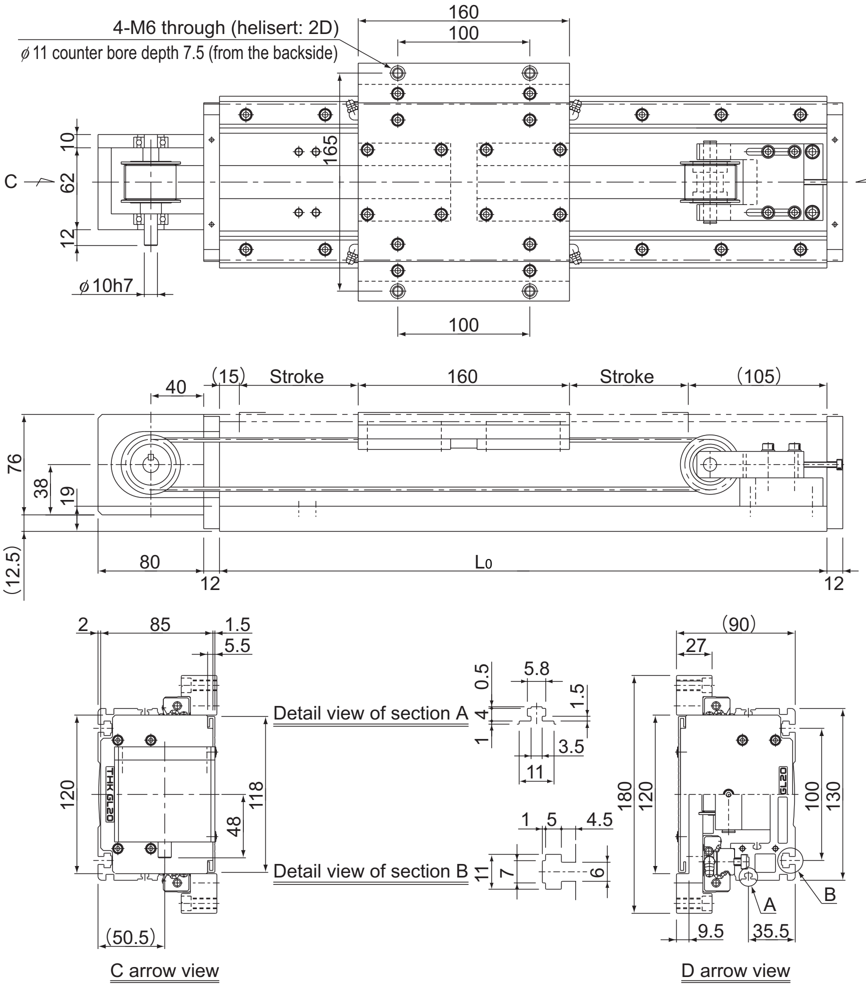


D arrow view

Base length L₀ (mm)	460	580	700	820	1060	1240	1420	1600	1780	1960	2200	2320	2500	3000
Stroke (mm)	160	280	400	520	760	940	1120	1300	1480	1660	1900	2020	2200	2700
Mass (kg)	11.5	12.8	14.2	15.5	18.1	20.1	22.1	24.1	26.1	28.1	30.7	32.0	34.0	39.6

* Mass of moving element (table): 2.8 (kg)
For model number coding, see B-356.

Belt Drive Type Short Table Type of Model GL20



Base length L0 (mm)	460	580	700	820	1060	1240	1420	1600	1780	1960	2200	2320	2500	3000
Stroke (mm)	180	300	420	540	780	960	1140	1320	1500	1680	1920	2040	2220	2720
Mass (kg)	11.2	12.5	13.8	15.2	17.8	19.8	21.8	23.8	25.8	27.7	30.4	31.7	33.7	39.2

* Mass of moving element (table): 2.3 (kg)
For model number coding, see B-356.

Model Number Coding

Model number coding

GL□□-□□□-□4-□-□-□-□-□□□□

Model number
GL15, GL20

Base length
0.34: 340mm to 300: 3000mm

Symbol for LM block
V4: Short type, T4: Long type

Symbol for top table
S: Short type (V4 only), L: Long type (T4 only)

Symbol for drive method
B05: Ball screw lead 5mm
B16: Ball screw lead 16mm (Model GL15 only)
B20: Ball screw lead 20mm (Model GL20 only)
B30: Ball screw lead 30mm (Model GL15 only)
B40: Ball screw lead 40mm (Model GL20 only)
E : Belt drive

Symbol for Endplate (Ball Screw drive type only)
No Symbol: Without Endplate, P: With Endplate

Cover symbol
No Symbol: None, C: With Cover, J: With Bellows

Assembly symbol
ASSY: Assembly and adjustment done
KIT : Without assembly and adjustment

Model number coding

Example 1 (finished assembly)

GL15-082-T4-L-B30-P-J-ASSY

Example 2 (kit parts)

GL20-070-T4-L-E-C-KIT

Note) Kit parts that are not assembled or adjusted are delivered as a whole.

Bellows

For model GL, a bellows is available for contamination protection in addition to a cover.

[Model GL15]

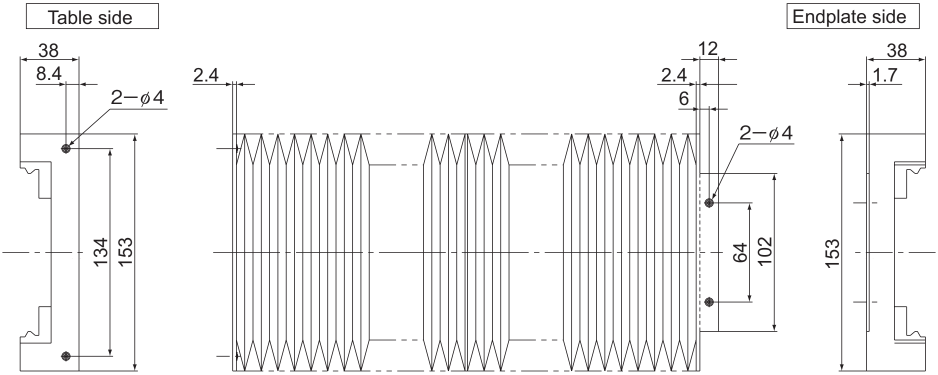


Fig.1 External Dimensions of the Bellows

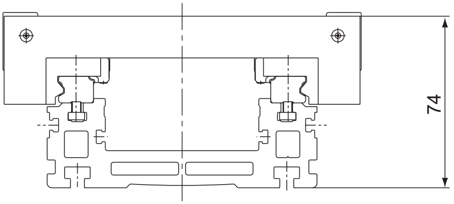


Fig.2 Mounting Height of the Bellows

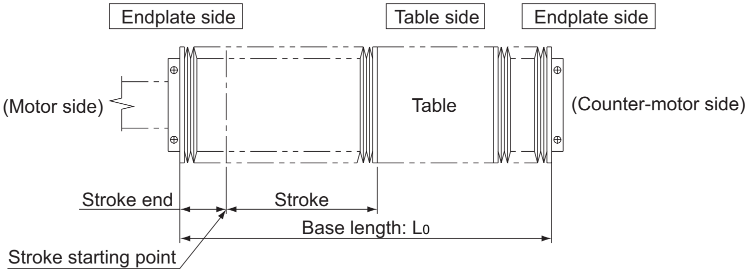


Fig.3 Schematic Drawing of Mounting the Bellows

Table1 Stroke of the Ball Screw Drive Type of Model GL15

Base length: L_0 (mm)		340	460	580	700	820	1060	1240	1420
Stroke (mm)		100	220	340	455	560	770	910	1070
Stroke starting point (mm)	Type S	57	57	57	59.5	67	82	102	112
	Type L	43	43	43	45.5	53	68	88	98

Table2 Stroke of the Belt Drive Type of Model GL15

Base length: L_0 (mm)		340	460	580	700	820	1060	1240	1420	1600	1780	1960
Stroke (mm)	Type S	78	188	308	408	508	728	868	1008	1148	1288	1488
	Type L	50	160	280	380	480	700	840	980	1120	1260	1400
Stroke starting point (mm)		30	40	50	65	80	105	125	145	165	185	205

* The stroke starting point has the same dimensions for both the S-shape table and the L-shape table.

[Model GL20]

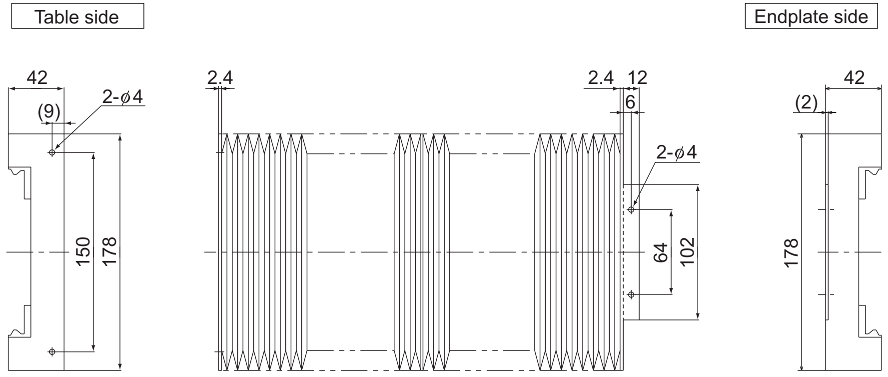


Fig.4 External Dimensions of the Bellows

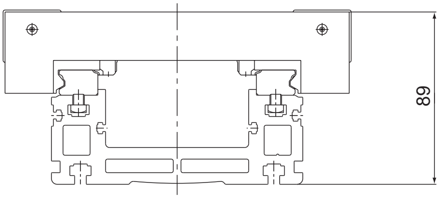


Fig.5 Mounting Height of the Bellows

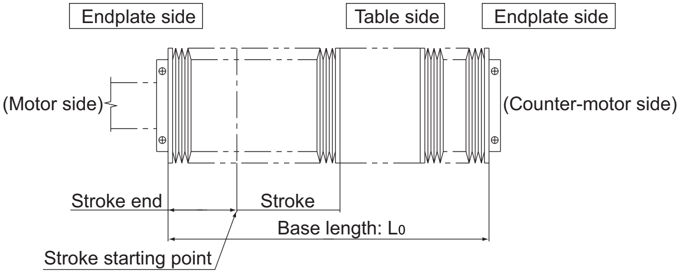


Fig.6 Schematic Drawing of Mounting the Bellows

Table3 Stroke of the Ball Screw Drive Type of Model GL20

Base length: L_0 (mm)		460	580	700	820	1060	1240	1420	1600	1780
Stroke (mm)		200	320	440	560	780	940	1100	1260	1400
Stroke starting point (mm)	Type S	50	50	50	50	60	70	80	90	110
	Type L	40	40	40	40	50	60	70	80	100

Table4 Stroke of the Belt Drive Type of Model GL20

Base length: L_0 (mm)		460	580	700	820	1060	1240	1420	1600	1780	1960	2200	2320	2500	3000
Stroke (mm)	Type S	160	260	360	460	680	840	1110	1160	1300	1440	1640	1720	1860	2280
	Type L	140	240	340	440	660	820	990	1140	1280	1420	1620	1700	1840	2260
Stroke starting point (mm)		40	50	80	100	110	120	125	145	160	180	200	220	240	280

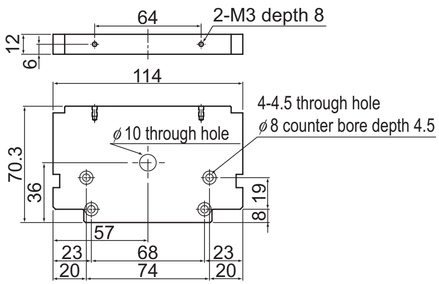
* The stroke starting point has the same dimensions for both the S-shape table and the L-shape table.

Precautions on Using the Bellows

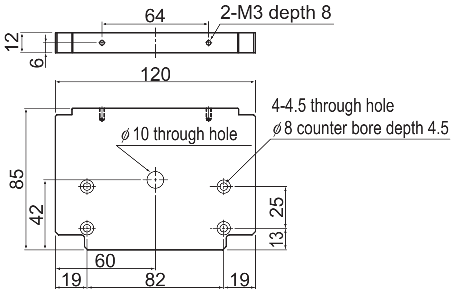
When mounting a bellows longer than the table of model GL onto the table for model GL, secure an area that sticks out of the table's longitudinal length by at least 1 mm.

Endplate

With the ball screw drive type of model GL, the end plate on the motor mounting side is machined according to the motor used. Indicate the motor to be used when placing an order to THK.



Model GL15



Model GL20

Plate nut for mounting the base

For model GL, a plate nut for mounting the base is available. It is attached as standard when mode GL is delivered.

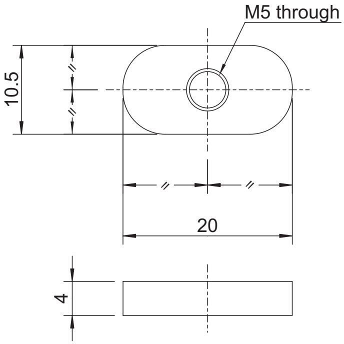


Fig.7 Plate Nut

Table5 Number of Plate Nuts for Mounting the Base

Standard base length (mm)	340	460	580	700	820	1060	1240	1420	1600	1780	1960	2200	2320	2500	3000
Pcs	4	4	6	6	8	10	10	12	14	14	16	16	18	18	20

Ball Spline

THK General Catalog

Ball Spline

THK General Catalog

B Product Specifications

Dimensional Drawing, Dimensional Table

High Torque Type Ball Spline

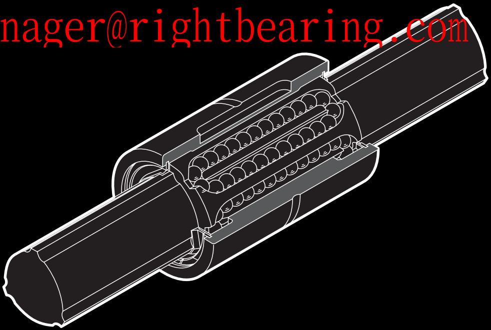
Medium Torque Type Ball Spline

Rotary Ball Spline With Geared type

Rotary Ball Spline With Support Bearing type

A Technical Descriptions of the Products (Separate)

*** Please see the separate "A Technical Descriptions of the Products".**



High Torque Type Ball Spline
Models LBS, LBST, LBF, LBR and LBH

Ball Spline

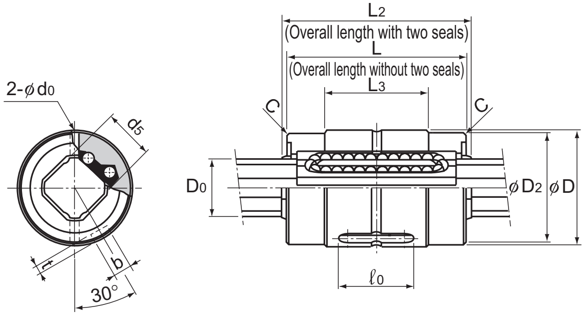
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".



Models LBS6 and 8

Model No.	Spline nut dimensions										
	Outer diameter		Length					Keyway dimensions			
	D	Tolerance	L	Tolerance	L_2	L_3	D_2	b H8	t $^{+0.05}_{0}$	ℓ_0	C
LBS 6	12	0 −0.011	20	0 −0.2	20.8	11	11.5	2	0.8	10	0.3
LBS 8	16		25		26.4	14.5	15.5	2.5	1.2	12.5	0.3
LBS 10	19	0 −0.013	30		—	—	—	3	1.5	17	0.3

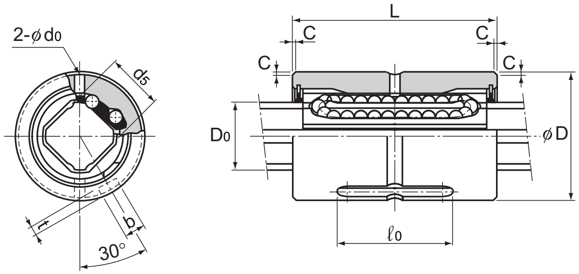
Note) Models LBS6 and 8 are of end cap type.
Keep the end caps of models LBS6 and 8 from impact.
THK does not offer a high temperature type of miniature Ball Spline.

Model number coding

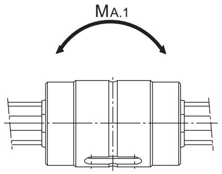
2 LBS6 UU CL +200L H

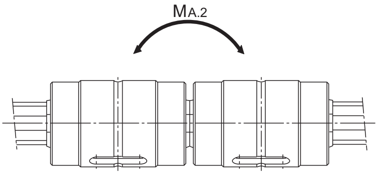
- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBS6: Model No.
- UU: Contamination protection accessory symbol (*1)
- CL: Symbol for clearance in the rotational direction (*2)
- +200L: Overall spline shaft length (in mm)
- H: Accuracy symbol (*3)

(*1) See A-509. (*2) See A-481. (*3) See A-482.



Model LBS10





Unit: mm

	Greasing hole	Spline shaft outer diameter		Basic torque rating		Basic load rating (radial)		Static permissible moment		Mass	
	d_0	D_0	d_5	C_T N-m	C_{0T} N-m	C kN	C_0 kN	$M_{A.1}$** N-m	$M_{A.2}$** N-m	Spline Nut g	Spline shaft kg/m
	1.2	6	5.3	1.53	2.41	0.637	0.785	2.2	19.4	6.6	0.22
	1.2	8	7.3	4.07	6.16	1.18	1.42	5.1	39.6	15.4	0.42
	1.5	10	8.3	7.02	10.4	1.62	1.96	8.1	67.6	36.7	0.55

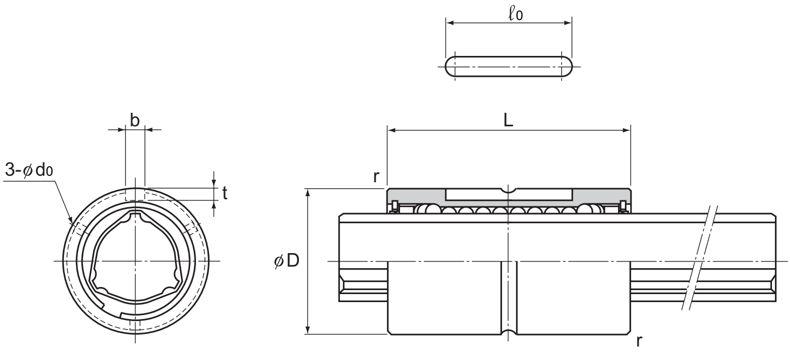
Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.

**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.

(Single spline nut configuration is not stable in accuracy. We recommend using two spline nuts in close contact with each other.)

For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Model LBS (Medium Load Type)



Model No.	Spline nut dimensions								
	Outer diameter		Length		Keyway dimensions				Greasing hole
	D	Tolerance	L	Tolerance	b H8	t $^{+0.05}_{\ 0}$	ℓ_0	r	d_0
LBS 15	23	$^{\ 0}_{-0.013}$	40	$^{\ 0}_{-0.2}$	3.5	2	20	0.5	2
○● LBS 20	30	$^{\ 0}_{-0.016}$	50		4	2.5	26	0.5	2
○● LBS 25	37		60	$^{\ 0}_{-0.3}$	5	3	33	0.5	2
○● LBS 30	45		70		7	4	41	1	3
○● LBS 40	60	$^{\ 0}_{-0.019}$	90		10	4.5	55	1	3
○● LBS 50	75		100		15	5	60	1.5	4
○● LBS 70	100	$^{\ 0}_{-0.022}$	110		18	6	68	2	4
○● LBS 85	120		140	$^{\ 0}_{-0.4}$	20	7	80	2.5	5
○● LBS 100	140	$^{\ 0}_{-0.025}$	160		28	9	93	3	5

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

(Example) LBS20 A CL+500L H
High temperature symbol

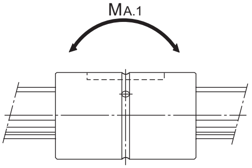
●: indicates model numbers for which felt seal types are available (see A-509).
A felt seal cannot be attached to Ball Spline models using metal retainer.

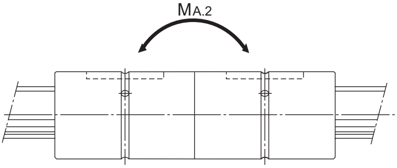
Model number coding

2 LBS40 UU CL +1000L P K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBS40: Model No.
- UU: Contamination protection accessory symbol (*1)
- CL: Symbol for clearance in the rotational direction (*2)
- +1000L: Overall spline shaft length (in mm)
- P: Accuracy symbol (*3)
- K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-381.





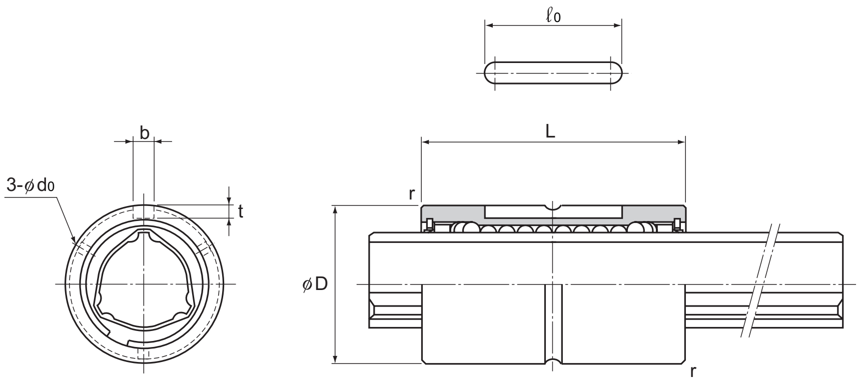
Unit: mm

	Basic torque rating		Basic load rating (radial)		Static permissible moment		Mass	
	C_T N-m	C_{0T} N-m	C kN	C_0 kN	$M_{A.1}$** N-m	$M_{A.2}$** N-m	Spline Nut kg	Spline shaft kg/m
	30.4	74.5	4.4	8.4	25.4	185	0.06	1
	74.5	160	7.8	14.9	60.2	408	0.14	1.8
	154	307	13	23.5	118	760	0.25	2.7
	273	538	19.3	33.8	203	1270	0.44	3.8
	599	1140	31.9	53.4	387	2640	1	6.8
	1100	1940	46.6	73	594	4050	1.7	10.6
	2190	3800	66.4	102	895	6530	3.1	21.3
	3620	6360	90.5	141	2000	12600	5.5	32
	5190	12600	126	237	3460	20600	9.5	45

Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
(Single LBS-unit configuration is not stable in accuracy. We recommend using a single LBST unit or two LBS units in close contact with each other.)
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Description of Each Option⇒A-509

Model LBST (Heavy Load Type)



Model No.	Spline nut dimensions								
	Outer diameter		Length		Keyway dimensions				Greasing hole
	D	Tolerance	L	Tolerance	b H8	t $^{+0.05}_{0}$	ℓ0	r	d0
○● LBST 20	30	$^{0}_{-0.016}$	60	$^{0}_{-0.2}$	4	2.5	26	0.5	2
○● LBST 25	37		70	$^{0}_{-0.3}$	5	3	33	0.5	2
○● LBST 30	45		80		7	4	41	1	3
○● LBST 40	60	$^{0}_{-0.019}$	100		10	4.5	55	1	3
○● LBST 50	75		112		15	5	60	1.5	4
○ LBST 60	90	$^{0}_{-0.022}$	127		18	6	68	1.5	4
○● LBST 70	100		135		18	6	68	2	4
○● LBST 85	120		155	$^{0}_{-0.4}$	20	7	80	2.5	5
○● LBST 100	140	$^{0}_{-0.025}$	175		28	9	93	3	5
○ LBST 120	160		200	$^{0}_{-0.5}$	28	9	123	3.5	6
○ LBST 150	205	$^{0}_{-0.029}$	250		32	10	157	3.5	6

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

(Example) LBST25 A CM+400L H
A: High temperature symbol

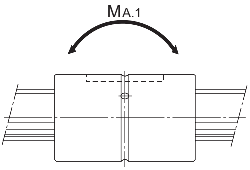
●: indicates model numbers for which felt seal types are available (see A-509).
A felt seal cannot be attached to Ball Spline models using metal retainer.

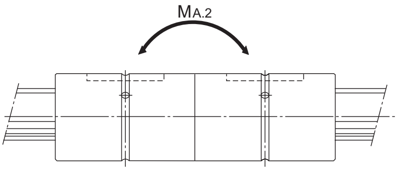
Model number coding

2 LBST50 UU CM +800L H K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBST50: Model No.
- UU: Contamination protection accessory symbol (*1)
- CM: Symbol for clearance in the rotational direction (*2)
- +800L: Overall spline shaft length (in mm)
- H: Accuracy symbol (*3)
- K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-381.



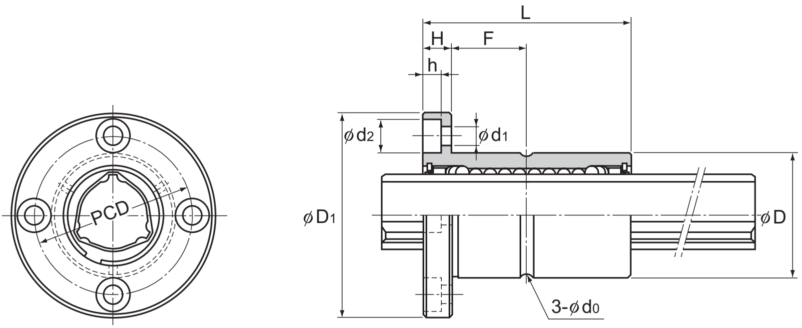


Unit: mm

Basic torque rating		Basic load rating (radial)		Static permissible moment		Mass	
C_T N-m	C_{0T} N-m	C kN	C_0 kN	$M_{A.1}$** N-m	$M_{A.2}$** N-m	Spline Nut kg	Spline shaft kg/m
90.2	213	9.4	20.1	103	632	0.17	1.8
176	381	14.9	28.7	171	1060	0.29	2.7
312	657	22.5	41.4	295	1740	0.5	3.8
696	1420	37.1	66.9	586	3540	1.1	6.8
1290	2500	55.1	94.1	941	5610	1.9	10.6
1870	3830	66.2	121	1300	8280	3.3	15.6
3000	6090	90.8	164	2080	11800	3.8	21.3
4740	9550	119	213	3180	17300	6.1	32
6460	14400	137	271	4410	25400	10.4	45
8380	19400	148	306	5490	32400	12.9	69.5
13900	32200	196	405	8060	55400	28	116.6

Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Model LBF (Medium Load Type)



Model No.	Spline nut dimensions									
	Outer diameter		Length		Flange diameter				Greasing hole	
	D	Tolerance	L	Tolerance	D_1	Tolerance	H	F	d_0	PCD
LBF 15	23	0 −0.013	40	0 −0.2	43	0 −0.2	7	13	2	32
○● LBF 20	30	0 −0.016	50		49		7	18	2	38
○● LBF 25	37		60	0 −0.3	60		9	21	2	47
○● LBF 30	45		70		70		10	25	3	54
○● LBF 40	57	0 −0.019	90		90		14	31	3	70
○● LBF 50	70		100		108	0 −0.3	16	34	4	86
○ LBF 60	85		127		124		18	45.5	4	102
○● LBF 70	95	0 −0.022	110		142		20	35	4	117
○● LBF 85	115		140	0 −0.4	168		22	48	5	138
○● LBF 100	135	0 −0.025	160		195	0 −0.4	25	55	5	162

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

(Example) LBF20 A CL+500L H

A — High temperature symbol

●: indicates model numbers for which felt seal types are available (see A-509).
A felt seal cannot be attached to Ball Spline models using metal retainer.

Model number coding

2 LBF20 DD CL +900L P K

2 — Number of spline nuts on one shaft (no symbol for one nut)

LBF20 — Model No.

DD — Contamination protection accessory symbol (*1)

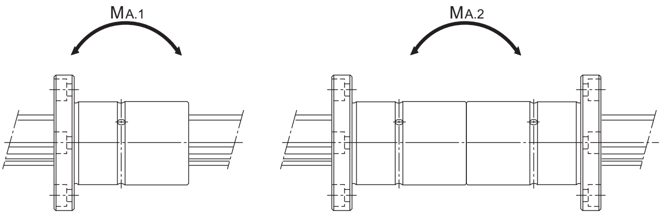
CL — Symbol for clearance in the rotational direction (*2)

+900L — Overall spline shaft length (in mm)

P — Accuracy symbol (*3)

K — Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-381.

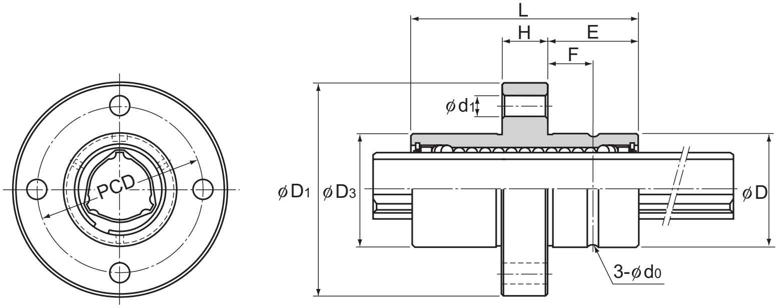


Unit: mm

		Basic torque rating		Basic load rating (radial)		Static permissible moment		Mass	
	Mounting hole $d_1 \times d_2 \times h$	C_T N-m	C_{0T} N-m	C kN	C_0 kN	$M_{A.1}$** N-m	$M_{A.2}$** N-m	Spline Nut kg	Spline shaft kg/m
	4.5×8×4.4	30.4	74.5	4.4	8.4	25.4	185	0.11	1
	4.5×8×4.4	74.5	160	7.8	14.9	60.2	408	0.2	1.8
	5.5×9.5×5.4	154	307	13	23.5	118	760	0.36	2.7
	6.6×11×6.5	273	538	19.3	33.8	203	1270	0.6	3.8
	9×14×8.6	599	1140	31.9	53.4	387	2640	1.2	6.8
	11×17.5×11	1100	1940	46.6	73	594	4050	1.9	10.6
	11×17.5×11	1870	3830	66.2	121	1300	8280	3.5	15.6
	14×20×13	2190	3800	66.4	102	895	6530	3.6	21.3
	16×23×15.2	3620	6360	90.5	141	2000	12600	6.2	32
	18×26×17.5	5910	12600	126	237	3460	20600	11	45

Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
(Single spline nut configuration is not stable in accuracy. We recommend using two spline nuts in close contact with each other.)
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Model LBR



Model No.	Spline nut dimensions								
	Outer diameter		Outer diameter	Length		Flange diameter			
	D	Tolerance	D3	L	Tolerance	D1	H	E	PCD
LBR 15	25	0 −0.013	25.35	40	0 −0.2	45.4	9	15.5	34
○● LBR 20	30	0 −0.016	30.35	60		56.4	12	24	44
○● LBR 25	40		40.35	70	0 −0.3	70.4	14	28	54
○● LBR 30	45		45.4	80		75.4	16	32	61
○● LBR 40	60	0 −0.019	60.4	100		96.4	18	41	78
○● LBR 50	75		75.4	112		112.4	20	46	94
○ LBR 60	90	0 −0.022	90.5	127		134.5	22	52.5	112
○● LBR 70	95		95.6	135		140.6	24	55.5	117
○● LBR 85	120		120.6	155	0 −0.4	170.6	26	64.5	146
○● LBR 100	140	0 −0.025	140.6	175		198.6	34	70.5	170

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

(Example) LBR40 A CM+600L H
A: High temperature symbol

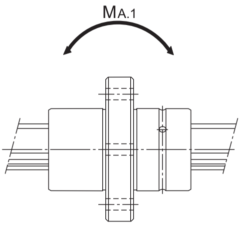
●: indicates model numbers for which felt seal types are available (see A-509).
A felt seal cannot be attached to Ball Spline models using metal retainer.

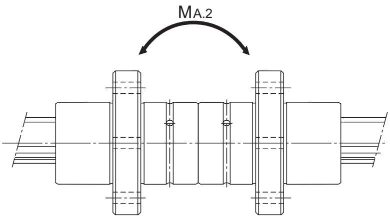
Model number coding

2 LBR30 UU CM +700L H K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBR30: Model No.
- UU: Contamination protection accessory symbol (*1)
- CM: Symbol for clearance in the rotational direction (*2)
- +700L: Overall spline shaft length (in mm)
- H: Accuracy symbol (*3)
- K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-381.





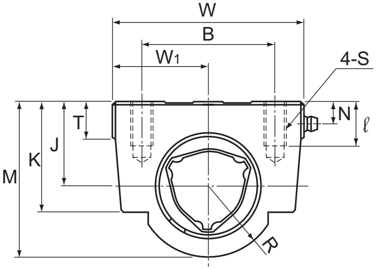
Unit: mm

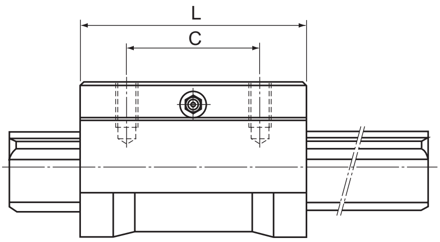
	Mounting hole d_1	F	Greasing hole d_0	Basic torque rating C_T N-m	Basic torque rating C_{0T} N-m	Basic load rating (radial) C kN	Basic load rating (radial) C_0 kN	Static permissible moment $M_{A.1}$** N-m	Static permissible moment $M_{A.2}$** N-m	Mass Spline Nut kg	Mass Spline shaft kg/m
	4.5	7.5	2	30.4	74.5	4.4	8.4	25.4	185	0.14	1
	5.5	12	2	90.2	213	9.4	20.1	103	632	0.33	1.8
	5.5	14	2	176	381	14.9	28.7	171	1060	0.54	2.7
	6.6	16	3	312	657	22.5	41.4	295	1740	0.9	3.8
	9	20.5	3	696	1420	37.1	66.9	586	3540	1.7	6.8
	11	23	4	1290	2500	55.1	94.1	941	5610	2.7	10.6
	11	26	4	1870	3830	66.2	121	1300	8280	3.7	15.6
	14	27	4	3000	6090	90.8	164	2080	11800	6	21.3
	16	32	5	4740	9550	119	213	3180	17300	8.3	32
	18	35	5	6460	14400	137	271	4410	25400	14.2	45

Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Description of Each Option⇒A-509

Model LBH





Model No.	Spline nut dimensions									
	Height M	Width W	Length L	B	C	S×ℓ	J ±0.15	W_1 ±0.15	T	K
○ LBH 15	29	34	43	26	26	M4×10	15	17	6	20
○● LBH 20	38	48	62	35	35	M6×12	20	24	7	26
○● LBH 25	47.5	60	73	40	40	M8×16	25	30	8	33
○● LBH 30	57	70	83	50	50	M8×16	30	35	10	39
○● LBH 40	70	86	102	60	60	M10×20	38	43	15	50
○● LBH 50	88	100	115	75	75	M12×25	48	50	18	63

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

(Example) LBH30 A CM+600L H
High temperature symbol

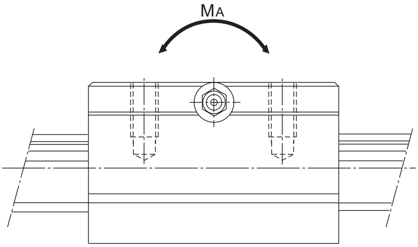
●: indicates model numbers for which felt seal types are available (see A-509).
A felt seal cannot be attached to Ball Spline models using metal retainer.

Model number coding

2 LBH40 UU CL +700L P K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBH40: Model No.
- UU: Contamination protection accessory symbol (*1)
- CL: Symbol for clearance in the rotational direction (*2)
- +700L: Overall spline shaft length (in mm)
- P: Accuracy symbol (*3)
- K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-381.

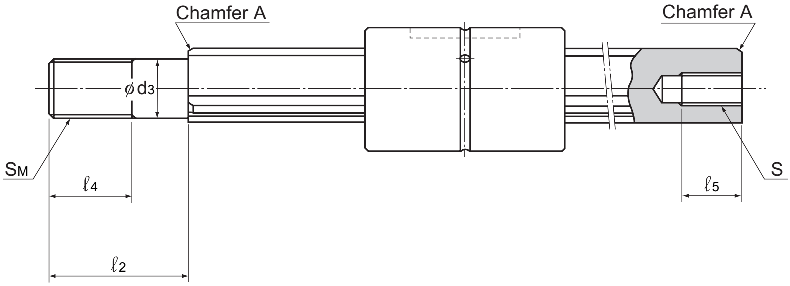


Unit: mm

R	N	Grease nipple	Basic torque rating		Basic load rating (radial)		Static permissible moment	Mass	
			C_T N-m	C_{0T} N-m	C kN	C_0 kN	M_A** N-m	Spline Nut kg	Spline shaft kg/m
14	5	ϕ4 drive Nipple	30.4	74.5	4.4	8.4	25.4	0.23	1
18	7	A-M6F	90.2	213	9.4	20.1	103	0.58	1.8
22	6	A-M6F	176	381	14.9	28.7	171	1.1	2.7
26	8	A-M6F	312	657	22.5	41.4	295	1.73	3.8
32	10	A-M6F	696	1420	37.1	66.9	586	3.18	6.8
40	13.5	A-PT1/8	1290	2500	55.1	94.1	941	5.1	10.6

Note) **M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Model LBS with Recommended Shaft End Shape



Unit: mm

Model No.	d_3	Tolerance	ℓ_2	S_M	ℓ_4	$S \times \ell_5$
LBS 15	10	$^{\ \ 0}_{-0.015}$	23	M10×1.25	14	M6×10
LBS 20	14	$^{\ \ 0}_{-0.018}$	30	M14×1.5	18	M8×15
LBS 25	18		42	M18×1.5	25	M10×18
LBS 30	20	$^{\ \ 0}_{-0.021}$	46	M20×1.5	27	M12×20
LBS 40	30		70	M30×2	40	M18×30
LBS 50	36	$^{\ \ 0}_{-0.025}$	80	M36×3	46	M20×35

Note) For details of chamfer A, see B-382.

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (type K), as described on A-488.

Since production of a spline shaft with a specific shape is performed at your request, provide a drawing of the desired shaft shape when asking an estimate or placing an order.

[Sectional Shape of the Spline Shaft]

Table1 shows the sectional shape of a spline shaft. If the spline shaft ends need to be cylindrical, the minor diameter (ϕd) value should not be exceeded if possible.

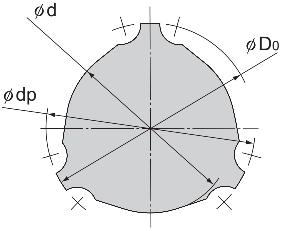


Table1 Sectional Shape of the Spline Shaft

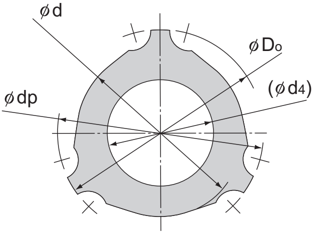
Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
Minor diameter ϕ d	11.7	15.3	19.5	22.5	31	39	46.5	54.5	67	81	101	130
Major diameter ϕ D_0	14.5	19.7	24.5	29.6	39.8	49.5	60	70	84	99	117	147
Ball center-to-center diameter ϕ dp	15	20	25	30	40	50	60	70	85	100	120	150
Mass (kg/m)	1	1.8	2.7	3.8	6.8	10.6	15.6	21.3	32	45	69.5	116.6

* The minor diameter ϕd must be a value at which no groove is left after machining.

[Hole Shape of the Standard Hollow Type Spline Shaft]

Table2 shows the hole shape of the standard hollow type spline shaft. Use this table when a requirement such as piping, wiring, air-vent or weight reduction needs to be met.



Type K

Table2 Sectional Shape of the Standard Hollow Type Spline Shaft

Unit: mm

Nominal shaft diameter	20	25	30	40	50	60	70	85	100	120	150
Minor diameter ϕ d	15.3	19.5	22.5	31	39	46.5	54.5	67	81	101	130
Major diameter ϕ D_0	19.7	24.5	29.6	39.8	49.5	60	70	84	99	117	147
Ball center-to-center diameter ϕ dp	20	25	30	40	50	60	70	85	100	120	150
Hole diameter (ϕ d_4)	6	8	12	18	24	30	35	45	56	60	80
Mass (kg/m)	1.6	2.3	2.9	4.9	7	10	13.7	19.5	25.7	47.3	77.1

* The minor diameter ϕd must be a value at which no groove is left after machining.

[Chamfering of the Spline Shaft Ends]

To facilitate the insertion of the spline shaft into a spline nut, the shaft ends are normally chamfered with dimensions as indicated below unless otherwise specified.

● Chamfer A

If the spline shaft ends are stepped, tapped or drilled for specific use, they are machined with chamfer A dimensions indicated in Table3.

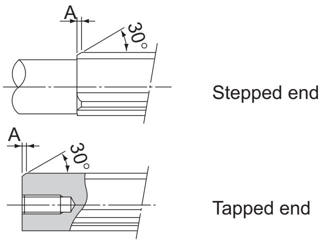


Fig.1 Chamfer A

● Chamfer B

If either end of the spline shaft is not used, such as cantilever support, it is machined with chamfer B dimensions indicated in Table3.

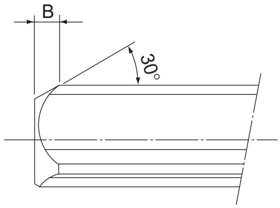


Fig.2 Chamfer B

Table3 Chamfer Dimensions of Spline Shaft Ends

Unit: mm

Nominal shaft diameter	15	20	25	30	40	50	60	70	85	100	120	150
Chamfer A	1	1	1.5	2.5	3	3.5	5	6.5	7	7	7.5	8
Chamfer B	3.5	4.5	5.5	7	8.5	10	13	15	16	17	17	18

Note) Spline shafts with nominal diameters 6, 8 and 10 are chamfered to C0.5.

[Length of Imperfect Area of a Special Spline Shaft]

If the middle area or the end of a spline shaft is to be thicker than the minor diameter (ϕd), an imperfect spline area is required to secure a recess for grinding. Table4 shows the relationship between the length of the incomplete section (S) and the flange diameter (ϕdf).
(This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.)

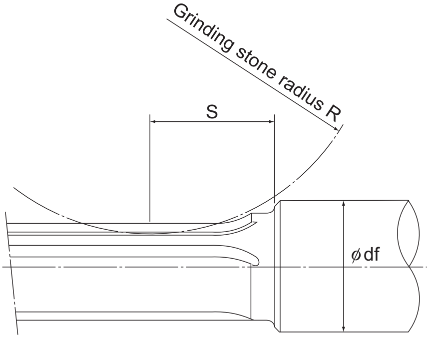


Table4 Length of Imperfect Spline Area: S

Unit: mm

Flange diameter ϕdf Nominal shaft diameter	15	20	25	30	35	40	50	60	80	100	120	140	160	180	200
15	26	40	48	55	60	—	—	—	—	—	—	—	—	—	—
20	—	30	45	54	61	67	—	—	—	—	—	—	—	—	—
25	—	—	33	47	56	62	73	—	—	—	—	—	—	—	—
30	—	—	—	35	48	57	69	79	—	—	—	—	—	—	—
40	—	—	—	—	—	39	59	71	88	—	—	—	—	—	—
50	—	—	—	—	—	—	42	61	82	96	—	—	—	—	—
60	—	—	—	—	—	—	—	45	75	91	103	—	—	—	—
70	—	—	—	—	—	—	—	—	65	85	99	109	—	—	—
85	—	—	—	—	—	—	—	—	34	72	90	102	—	—	—
100	—	—	—	—	—	—	—	—	—	52	79	95	106	—	—
120	—	—	—	—	—	—	—	—	—	—	54	81	97	108	—
150	—	—	—	—	—	—	—	—	—	—	—	30	72	91	104

* This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.

Accessories

Ball Spline models LBS and LBST are provided with a standard key as indicated in Table5.

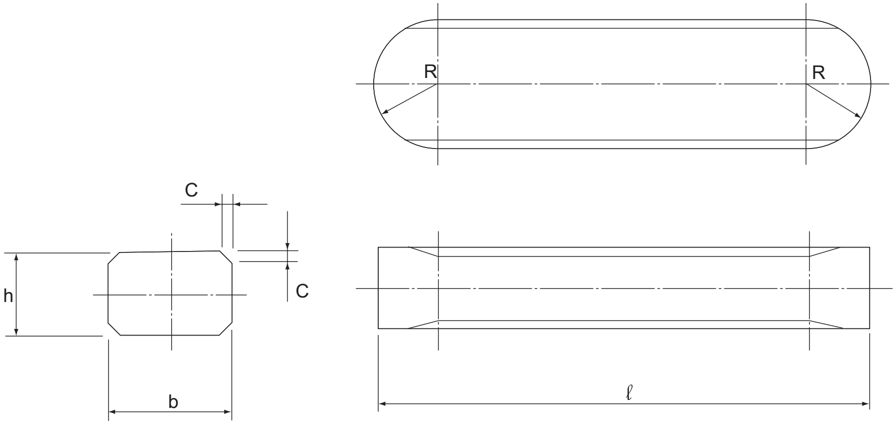
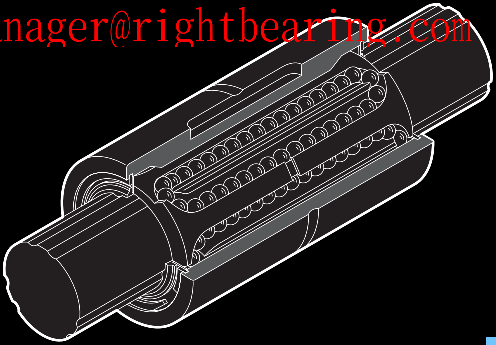


Table5 Standard Keys for Models LBS and LBST

Unit: mm

Nominal shaft diameter	Width b		Height h		Length ℓ		R	C
		Tolerance(p7)		Tolerance(h7)		Tolerance(h12)		
LBS 6	2	+0.016 +0.006	1.3	0 −0.025	10	0 −0.150	1	0.3
LBS 8	2.5		2		12.5	0 −0.180	1.25	
LBS 10	3		2.5		17		1.5	
LBS 15	3.5	+0.024 +0.012	3.5	0 −0.030	20	0 −0.210	1.75	0.5
LBS 20 LBST 20	4		4		26		2	
LBS 25 LBST 25	5		5		33	0 −0.250	2.5	
LBS 30 LBST 30	7	+0.030 +0.015	7	0 −0.036	41		3.5	
LBS 40 LBST 40	10		8		55	0 −0.300	5	0.8
LBS 50 LBST 50	15	+0.036 +0.018	10		60		7.5	
LBST 60 LBS 70 LBST 70	18		12	0 −0.043	68		9	1.2
LBS 85 LBST 85	20	+0.043 +0.022	13		80	0 −0.350	14	
LBS 100 LBST 100	28		18		93	0 −0.400	14	
LBST 120	28		18		123		14	
LBST 150	32	+0.051 +0.026	20	0 −0.052	157		16	2



Medium Torque Type Ball Spline
Models LT and LF

Ball Spline

B Product Specifications

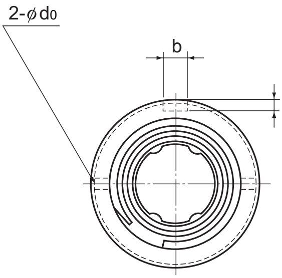
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

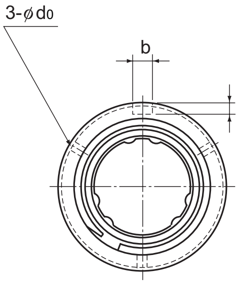
Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

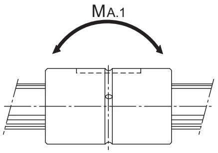
Model LT



Model LT13 or smaller



Model LT16 or greater



Model No.	Spline nut dimensions								
	Outer diameter		Length		b H8	Keyway dimensions		r	Greasing hole
	D	Tolerance	L	Tolerance		t +0.05 0	ℓ_0		d_0
Note) LT 4	10	0 −0.009	16	0 −0.2	2	1.2	6	0.5	—
Note) LT 5	12	0 −0.011	20		2.5	1.2	8	0.5	—
LT 6	14		25		2.5	1.2	10.5	0.5	1
LT 8	16		25		2.5	1.2	10.5	0.5	1.5
LT 10	21	0 −0.013	33		3	1.5	13	0.5	1.5
LT 13	24		36		3	1.5	15	0.5	1.5
○ LT 16	31		50		3.5	2	17.5	0.5	2
○ LT 20	35	0 −0.016	63		4	2.5	29	0.5	2
○ LT 25	42		71	0 −0.3	4	2.5	36	0.5	3
○ LT 30	47		80		4	2.5	42	0.5	3
○ LT 40	64	0 −0.019	100		6	3.5	52	0.5	4
○ LT 50	80		125		8	4	58	1	4
○ LT 60	90	0 −0.022	140	0 −0.4	12	5	67	1	5
○ LT 80	120		160		16	6	76	2	5
○ LT 100	150	0 −0.025	185		20	7	110	2.5	5

Note) Models LT4 and 5 do not have a retainer. Do not remove the shaft from the spline nut. (It will cause balls to fall off.)

○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

(Example) LT20 A CL+500L H
A: High temperature symbol

Model number coding

2 LT30 UU CL +500L H K

2: Number of spline nuts on one shaft (no symbol for one nut)

LT30: Model No.

UU: Contamination protection accessory symbol (*1)

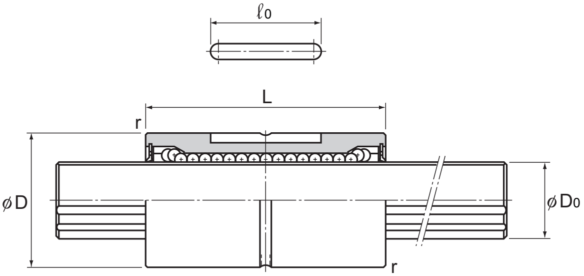
CL: Symbol for clearance in the rotational direction (*2)

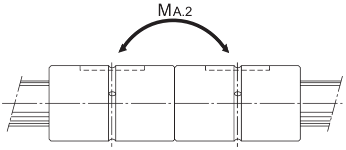
+500L: Overall spline shaft length (in mm)

H: Accuracy symbol (*3)

K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-391.





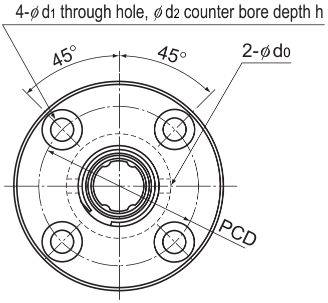
Unit: mm

	Spline shaft diameter	Rows of balls	Basic torque rating		Basic Load Rating		Static permissible moment		Mass	
	D_0 h7		C_T N-m	C_{0T} N-m	C kN	C_0 kN	$M_{A.1}$** N-m	$M_{A.2}$** N-m	Spline Nut g	Spline shaft kg/m
	4	4	0.59	0.78	0.44	0.61	0.88	6.4	5.2	0.1
	5	4	0.88	1.37	0.66	0.88	1.5	11.6	9.1	0.15
	6	4	0.98	1.96	1.18	2.16	4.9	36.3	17	0.23
	8	4	1.96	2.94	1.47	2.55	5.9	44.1	18	0.4
	10	4	3.92	7.84	2.84	4.9	15.7	98	50	0.62
	13	4	5.88	10.8	3.53	5.78	19.6	138	55	1.1
	16	6	31.4	34.3	7.06	12.6	67.6	393	165	1.6
	20	6	56.9	55.9	10.2	17.8	118	700	225	2.5
	25	6	105	103	15.2	25.8	210	1140	335	3.9
	30	6	171	148	20.5	34	290	1710	375	5.6
	40	6	419	377	37.8	60.5	687	3760	1000	9.9
	50	6	842	769	60.9	94.5	1340	7350	1950	15.5
	60	6	1220	1040	73.5	111.7	1600	9990	2500	22.3
	80	6	2310	1920	104.9	154.8	2510	16000	4680	39.6
	100	6	3730	3010	136.2	195	3400	24000	9550	61.8

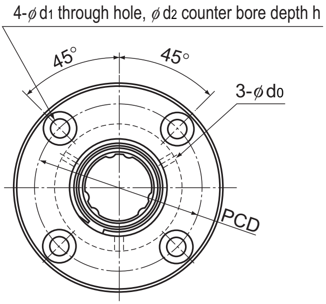
Note) **$M_{A.1}$indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
(Single LT-unit configuration is not stable in accuracy. We recommend using two units in close contact with each other.)
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Description of Each Option⇒A-509

Model LF



Model LF13 or smaller



Model LF16 or greater

Model No.	Spline nut dimensions												
	Outer diameter		Length		Flange diameter						Greasing hole		Mounting hole
	D	Tolerance	L	Tolerance	D_1	Tolerance	H	F	C	r	d_0	PCD	$d_1×d_2×h$
LF 6	14	0 −0.011	25	0 −0.2	30	0 −0.2	5	7.5	0.5	0.5	1.5	22	3.4×6.5×3.3
LF 8	16		25		32		5	7.5	0.5	0.5	1.5	24	3.4×6.5×3.3
LF 10	21	0 −0.013	33		42		6	10.5	0.5	0.5	1.5	32	4.5×8×4.4
LF 13	24		36		44		7	11	0.5	0.5	1.5	33	4.5×8×4.4
○ LF 16	31		50		51		7	18	0.5	0.5	2	40	4.5×8×4.4
○ LF 20	35	0 −0.016	63		58		9	22.5	0.5	0.5	2	45	5.5×9.5×5.4
○ LF 25	42		71	0 −0.3	65		9	26.5	0.5	0.5	3	52	5.5×9.5×5.4
○ LF 30	47		80		75		10	30	0.5	0.5	3	60	6.6×11×6.5
○ LF 40	64	0 −0.019	100		100		14	36	1	0.5	4	82	9×14×8.6
○ LF 50	80		125		124		16	46.5	1	1	4	102	11×17.5×11

Note) ○: indicates model numbers for which high temperature types are available (with metal retainer; service temperature: up to 100℃).

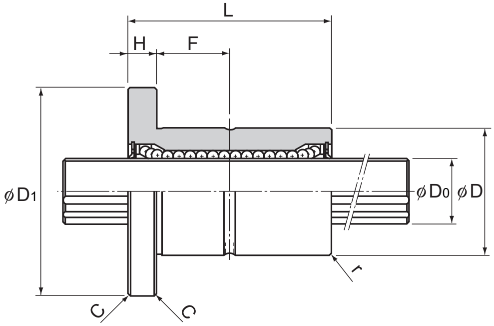
(Example) LF30 A CL+700L H
High temperature symbol

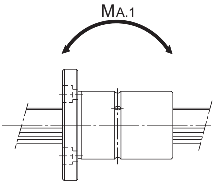
Model number coding

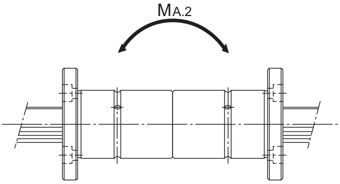
2 LF20 UU CM +400L P N

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LF20: Model No.
- UU: Contamination protection accessory symbol (*1)
- CM: Symbol for clearance in the rotational direction (*2)
- +400L: Overall spline shaft length (in mm)
- P: Accuracy symbol (*3)
- N: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-391.





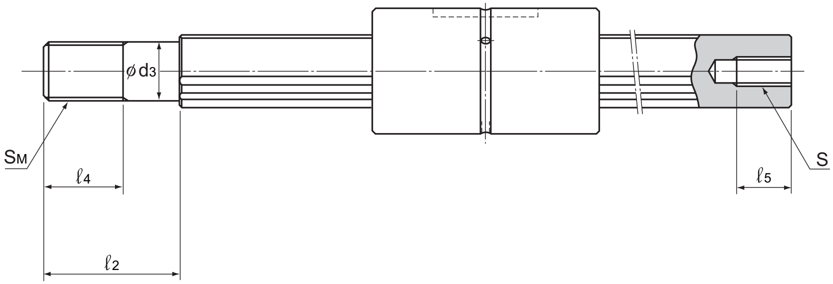


Unit: mm

	Spline shaft diameter D_0 h7	Rows of balls	Basic torque rating		Basic load rating		Static permissible moment		Mass	
			C_T N-m	C_{0T} N-m	C kN	C_0 kN	$M_{A.1}$** N-m	$M_{A.2}$** N-m	Spline Nut g	Spline shaft kg/m
	6	4	0.98	1.96	1.18	2.16	4.9	36.3	35	0.23
	8	4	1.96	2.94	1.47	2.55	5.9	44.1	37	0.4
	10	4	3.92	7.84	2.84	4.9	15.7	98	90	0.62
	13	4	5.88	10.8	3.53	5.78	19.6	138	110	1.1
	16	6	31.4	34.3	7.06	12.6	67.6	393	230	1.6
	20	6	56.9	55.9	10.2	17.8	118	700	330	2.5
	25	6	105	103	15.2	25.8	210	1140	455	3.9
	30	6	171	148	20.5	34	290	1710	565	5.6
	40	6	419	377	37.8	60.5	687	3760	1460	9.9
	50	6	842	769	60.9	94.5	1340	7350	2760	15.5

Note) **$M_{A.1}$ indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
**$M_{A.2}$ indicates the permissible moment value in the axial direction when two spline nuts in close contact with each other are used, as shown in the figure above.
(Single LF-unit configuration is not stable in accuracy. We recommend using two units in close contact with each other.)
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Model LT with Recommended Shaft End Shape



Unit: mm

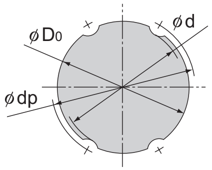
Model No.	d_3	Tolerance	ℓ_2	S_M	ℓ_4	S×ℓ_5
LT 6	5	0 −0.012	12	M5×0.8	7	M2.5×4
LT 8	6		14	M6×1	8	M3×5
LT 10	8	0 −0.015	18	M8×1	11	M4×6
LT 13	10		23	M10×1.25	14	M5×8
LT 16	14	0 −0.018	30	M14×1.5	18	M6×10
LT 20	16		38	M16×1.5	22	M8×15
LT 25	22	0 −0.021	50	M22×1.5	28	M10×18
LT 30	27		60	M27×2	34	M14×25
LT 40	36	0 −0.025	80	M36×3	45	M18×30
LT 50	45		100	M45×4.5	58	M22×40

Spline Shaft

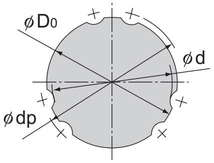
Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (types K and N), as described on A-493.
Since production of a spline shaft with a specific shape is performed at your request, provide a drawing of the desired shaft shape when asking an estimate or placing an order.

[Sectional Shape of the Spline Shaft]

Table1 shows the sectional shape of a spline shaft. If the spline shaft ends need to be cylindrical, the minor diameter (ϕd) value should not be exceeded if possible.



Model LT13 or smaller



Model LT16 or greater

Table1 Sectional Shape of the Spline Shaft

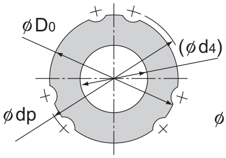
Unit: mm

Nominal shaft diameter	4	5	6	8	10	13	16	20	25	30	40	50	60	80	100
Minor diameter ϕ d	3.5	4.5	5	7	8.5	11.5	14.5	18.5	23	28	37.5	46.5	56.5	75.5	95
Major diameter ϕ D_0 h7	4	5	6	8	10	13	16	20	25	30	40	50	60	80	100
Ball center-to-center diameter ϕ dp	4.6	5.7	7	9.3	11.5	14.8	17.8	22.1	27.6	33.2	44.2	55.2	66.3	87.9	109.5
Mass(kg/m)	0.1	0.15	0.23	0.4	0.62	1.1	1.6	2.5	3.9	5.6	9.9	15.5	22.3	39.6	61.8

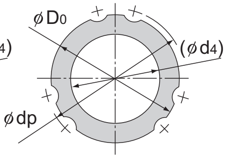
* The minor diameter ϕd must be a value at which no groove is left after machining.

[Hole Shape of the Standard Hollow Type Spline Shaft]

Table2 shows the hole shape of the standard hollow type spline shaft (types K and N).
Use this table when a requirement such as piping, wiring, air-vent or weight reduction needs to be met.



Type K
(Thick)



Type N
(Thin)

Table2 Sectional Shape of the Standard Hollow Type Spline Shaft

Unit: mm

Nominal shaft diameter		6	8	10	13	16	20	25	30	40	50	60	80	100
Major diameter ϕ D_0		6	8	10	13	16	20	25	30	40	50	60	80	100
Ball center-to-center diameter ϕ dp		7	9.3	11.5	14.8	17.8	22.1	27.6	33.2	44.2	55.2	66.3	87.9	109.5
Type K	Hole diameter (ϕ d_4)	2.5	3	4	5	7	10	12	16	22	25	32	52.5	67.5
	Mass(kg/m)	0.2	0.35	0.52	0.95	1.3	1.8	3	4	6.9	11.6	16	22.6	33.7
Type N	Hole diameter (ϕ d_4)	—	—	—	—	11	14	18	21	29	36	—	—	—
	Mass(kg/m)	—	—	—	—	0.8	1.3	1.9	2.8	4.7	7.4	—	—	—

Note) The standard hollow type Spline Shaft is divided into types K and N. Indicate "K" or "N" at the end of the model number to distinguish between them when placing an order.

[Length of Imperfect Area of a Special Spline Shaft]

If the middle area or the end of a spline shaft is to be thicker than the minor diameter (φd), an imperfect spline area is required to secure a recess for grinding. Table3 shows the relationship between the length of the incomplete section (S) and the flange diameter (φdf).
(This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.)

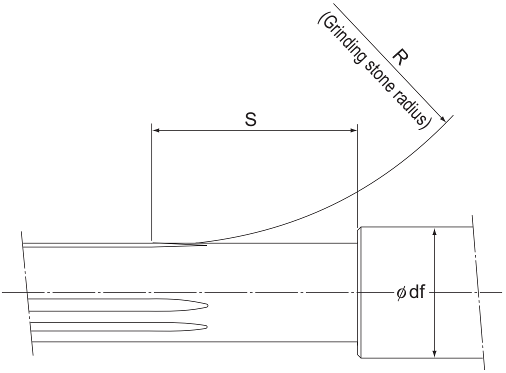


Table3 Length of Imperfect Spline Area: S Miniature type

Unit: mm

Flange diameter φdf Nominal shaft diameter	4	5	6	8	10
4	13	20	24	31	—
5	—	14	21	28	33

Standard Type

Unit: mm

Flange diameter φdf Nominal shaft diameter	6	8	10	13	16	20	25	30	40	50	60	80	100	120	140	160
6	18	28	33	39	—	—	—	—	—	—	—	—	—	—	—	—
8	—	18	28	35	41	—	—	—	—	—	—	—	—	—	—	—
10	—	—	19	31	38	45	—	—	—	—	—	—	—	—	—	—
13	—	—	—	21	36	46	56	—	—	—	—	—	—	—	—	—
16	—	—	—	—	23	40	53	62	—	—	—	—	—	—	—	—
20	—	—	—	—	—	23	43	55	71	—	—	—	—	—	—	—
25	—	—	—	—	—	—	28	49	72	88	—	—	—	—	—	—
30	—	—	—	—	—	—	—	29	62	80	95	—	—	—	—	—
40	—	—	—	—	—	—	—	—	32	63	81	107	—	—	—	—
50	—	—	—	—	—	—	—	—	—	35	65	96	118	—	—	—
60	—	—	—	—	—	—	—	—	—	—	38	87	114	134	—	—
80	—	—	—	—	—	—	—	—	—	—	—	42	89	115	135	—
100	—	—	—	—	—	—	—	—	—	—	—	—	44	90	116	136

* This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.

Accessories

Ball Spline model LT is provided with a standard key as indicated in Table4.

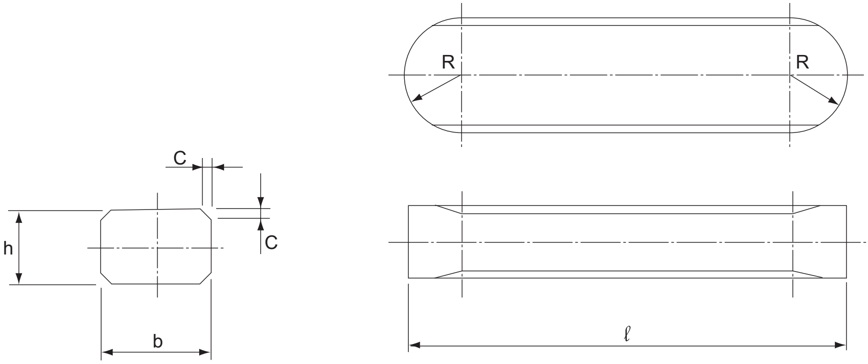
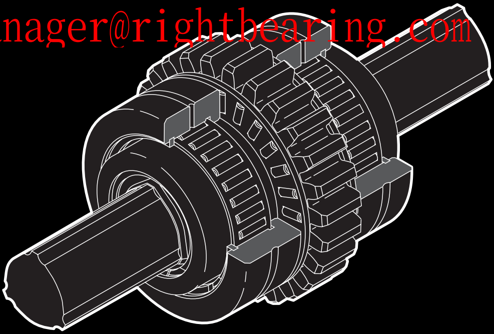


Table4 Standard Key for Model LT

Unit: mm

Nominal shaft diameter	Width b		Height h		Length ℓ		R	C
		Tolerance(p7)		Tolerance(h7)		Tolerance(h12)		
LT 4	2	+0.016 +0.006	2	0 −0.025	6	0 −0.120	1	0.3
LT 5	2.5		2.5		8	0 −0.150	1.25	0.5
LT 6 LT 8	2.5		2.5		10.5	0 −0.180	1.25	0.5
LT 10	3		3		13		1.5	
LT 13	3		3		15		1.5	
LT 16	3.5	+0.024 +0.012	3.5	0 −0.030	17.5		1.75	
LT 20	4		4		29	0 −0.210	2	
LT 25	4		4		36	0 −0.250	2	
LT 30	4		4		42		2	
LT 40	6		6		52	0 −0.300	3	
LT 50	8	+0.030 +0.015	7	0 −0.036	58		4	
LT 60	12	+0.036 +0.018	8		67		6	0.8
LT 80	16		10		76		8	
LT 100	20	+0.043 +0.022	13	0 −0.043	110	0 −0.350	10	



Rotary Ball Spline With Geared type
Models LBG and LBGT

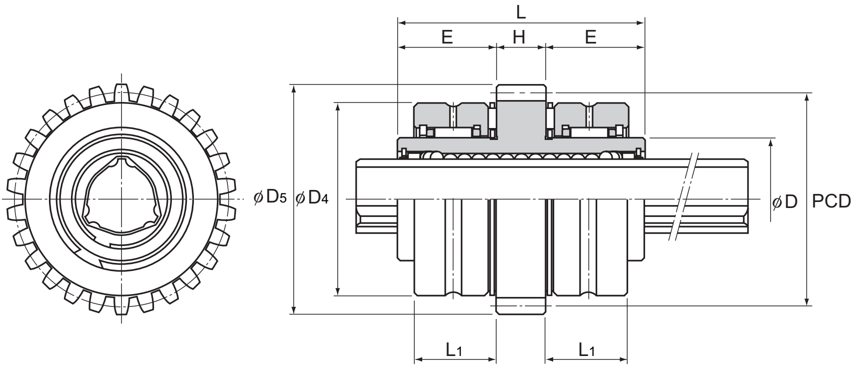
Ball Spline

B Product Specifications

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model LBG



Model No.	Spline nut dimensions									
	Spline nut outer diameter		Length		Outer diameter		Width			
	D	Tolerance	L	Tolerance	D_4	Tolerance	L_1	Tolerance	H	E
● LBG 20	30	0 −0.009	60	0 −0.2	47	0 −0.011	20	0 −0.16	12	24
● LBG 25	40	0 −0.011	70		60	0 −0.013	23	0 −0.19	14	28
● LBG 30	45		80		65		27		16	32
● LBG 40	60	0 −0.013	100		85	0 −0.015	31	0 −0.25	18	41
● LBG 50	75		112	0 −0.3	100		32		20	46
LBG 60	90	0 −0.015	127		120		38		22	52.5
● LBG 85	120		155		150	0 −0.025	40		26	64.5

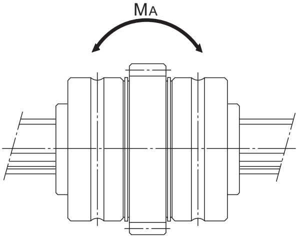
Note) ●: indicates model numbers for which felt seal types are available (see A-509).

Model number coding

2 LBG50 UU CM +700L H K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBG50: Model No.
- UU: Contamination protection accessory symbol (*1)
- CM: Symbol for clearance in the rotational direction (*2)
- +700L: Overall spline shaft length (in mm)
- H: Accuracy symbol (*3)
- K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-400.



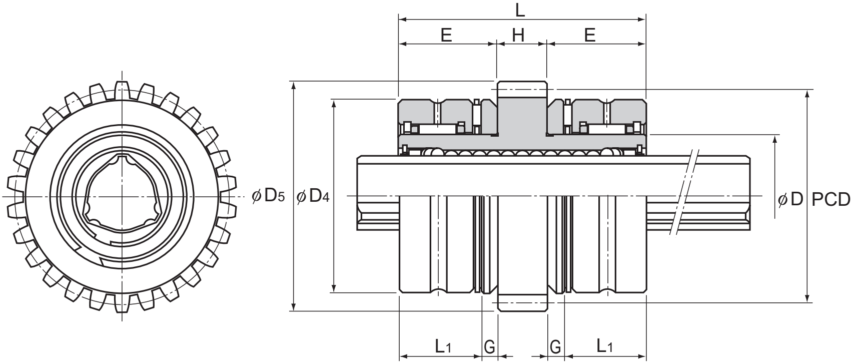
Unit: mm

	Gear specifications*				Basic torque rating		Basic load rating		Static permissible moment	Mass	
	Tip circle diameter D_5	Standard pitch diameter PCD	Module m	Number of teeth z	C_T N-m	C_{0T} N-m	C kN	C_0 kN	M_A** N-m	Spline nut unit kg	Spline shaft kg/m
	56	52	2	26	90.2	213	9.4	20.1	103	0.61	1.8
	70	65	2.5	26	176	381	14.9	28.7	171	1.4	2.7
	75	70	2.5	28	312	657	22.5	41.4	295	2.1	3.8
	96	90	3	30	696	1420	37.1	66.9	586	3	6.8
	111	105	3	35	1290	2500	55.1	94.1	941	4.1	10.6
	133	126	3.5	36	1870	3830	66.2	121	1300	6.3	15.6
	168	160	4	40	4740	9550	119	213	3180	11.8	32

Note) *The gear specifications in the table represent the dimensions with maximum module.
Special gear types such as helical gear and worm gear can also be manufactured at your request.
**M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Description of Each Option⇒A-509

Type LBGT



Model No.	Spline nut dimensions										
	Spline nut outer diameter		Length		Outer diameter		Width		Thrust raceway width		
	D	Tolerance	L	Tolerance	D_4	Tolerance	L_1	Tolerance	G	H	E
● LBGT 20	30	0 −0.009	60	0 −0.2	47	0 −0.011	20	0 −0.16	4	12	24
● LBGT 25	40	0 −0.011	70		60	0 −0.013	23	0 −0.19	5	14	28
● LBGT 30	45		80		65		27		5	16	32
● LBGT 40	60	0 −0.013	100		85	0 −0.015	31	0 −0.25	8	18	41
● LBGT 50	75		112	0 −0.3	100		32		10	20	46
LBGT 60	90	0 −0.015	127		120		38		12	22	52.5
● LBGT 85	120		155		150	0 −0.025	40		16	26	64.5

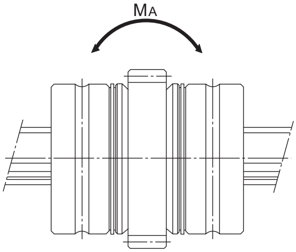
Note) ●: indicates model numbers for which felt seal types are available (see A-509).

Model number coding

2 LBGT40 UU CL +700L P K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LBGT40: Model No.
- UU: Contamination protection accessory symbol (*1)
- CL: Symbol for clearance in the rotational direction (*2)
- +700L: Overall spline shaft length (in mm)
- P: Accuracy symbol (*3)
- K: Symbol for standard hollow spline shaft (*4)

(*1) See A-509. (*2) See A-481. (*3) See A-482. (*4) See B-400.



Unit: mm

Gear specifications*				Basic torque rating		Basic load rating		Static permissible moment	Mass	
Tip circle diameter D_5	Standard pitch diameter PCD	Module m	Number of teeth z	C_T N-m	C_{0T} N-m	C kN	C_0 kN	M_A** N-m	Spline nut unit kg	Spline shaft kg/m
56	52	2	26	90.2	213	9.4	20.1	103	0.67	1.8
70	65	2.5	26	176	381	14.9	28.7	171	1.5	2.7
75	70	2.5	28	312	657	22.5	41.4	295	2.2	3.8
96	90	3	30	696	1420	37.1	66.9	586	3.3	6.8
111	105	3	35	1290	2500	55.1	94.1	941	4.8	10.6
133	126	3.5	36	1870	3830	66.2	121	1300	7.2	15.6
168	160	4	40	4740	9550	119	213	3180	13.4	32

Note) *The gear specifications in the table represent the dimensions with maximum module.
Special gear types such as helical gear and worm gear can also be manufactured at your request.
**M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Description of Each Option⇒A-509

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (type K), as described on A-488.
Since production of a spline shaft with a specific shape is performed at your request, provide a drawing of the desired shaft shape when asking an estimate or placing an order.

[Sectional Shape of the Spline Shaft]

Table1 shows the sectional shape of a spline shaft. If the spline shaft ends need to be cylindrical, the minor diameter (ϕd) value should not be exceeded if possible.

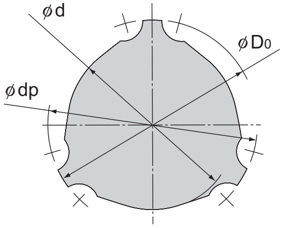


Table1 Sectional Shape of the Spline Shaft

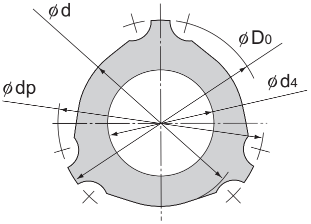
Unit: mm

Nominal shaft diameter	20	25	30	40	50	60	85
Minor diameter ϕd	15.3	19.5	22.5	31	39	46.5	67
Major diameter ϕD_0	19.7	24.5	29.6	39.8	49.5	60	84
Ball center-to-center diameter ϕdp	20	25	30	40	50	60	85
Mass (kg/m)	1.8	2.7	3.8	6.8	10.6	15.6	32

* The minor diameter ϕd must be a value at which no groove is left after machining.

[Hole Shape of the Standard Hollow Type Spline Shaft]

Table2 shows the hole shape of the standard hollow type spline shaft (type K) for models LBG and LBGT.
Use this table when a requirement such as piping, wiring, air-vent or weight reduction needs to be met.



Type K

Table2 Sectional Shape of the Standard Hollow Type Spline Shaft

Unit: mm

Nominal shaft diameter	20	25	30	40	50	60	85
Minor diameter ϕd	15.3	19.5	22.5	31	39	46.5	67
Major diameter ϕD_0	19.7	24.5	29.6	39.8	49.5	60	84
Ball center-to-center diameter ϕdp	20	25	30	40	50	60	85
Hole diameter ϕd_4	6	8	12	18	24	30	45
Mass (kg/m)	1.6	2.3	2.9	4.9	7	10	19.5

* The minor diameter ϕd must be a value at which no groove is left after machining.

[Chamfering of the Spline Shaft Ends]

For details,see B-382.

[Length of Imperfect Area of a Special Spline Shaft]

If the middle area or the end of a spline shaft is to be thicker than the minor diameter (φd), an imperfect spline area is required to secure a recess for grinding. Table3 shows the relationship between the length of the incomplete section (S) and the flange diameter (φdf).
(This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.)

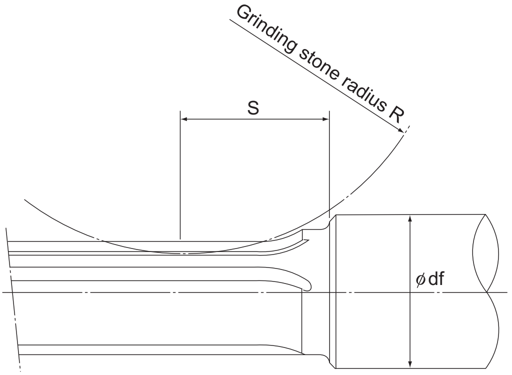
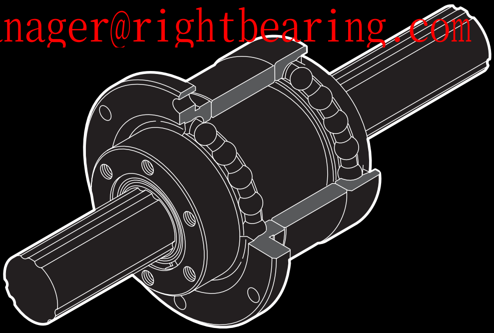


Table3 Length of Imperfect Spline Area: S

Unit: mm

Flange diameter φdf Nominal shaft diameter	20	25	30	35	40	50	60	80	100	120	140
20	25	36	43	48	53	—	—	—	—	—	—
25	—	32	46	55	62	73	—	—	—	—	—
30	—	—	35	48	56	69	78	—	—	—	—
40	—	—	—	—	38	59	71	88	—	—	—
50	—	—	—	—	—	42	61	82	96	—	—
60	—	—	—	—	—	—	45	74	91	102	—
70	—	—	—	—	—	—	—	64	85	98	108
85	—	—	—	—	—	—	—	34	72	90	102



Rotary Ball Spline With Support Bearing type

Models LTR and LTR-A

Ball Spline

B Product Specifications

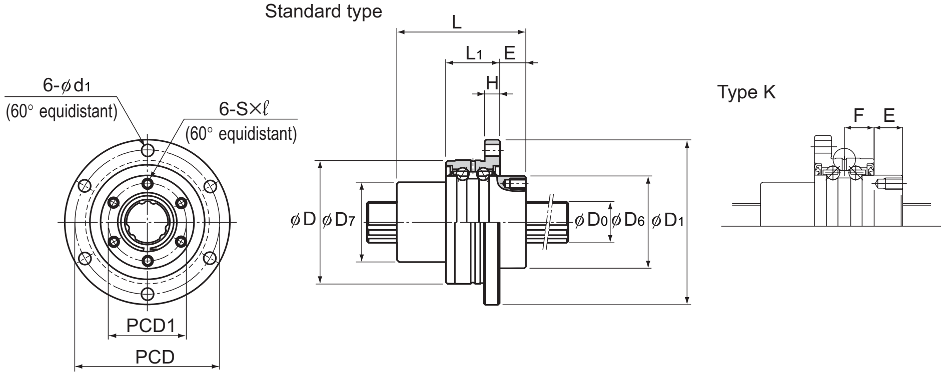
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model LTR-A Compact Type



Model LTR16A or greater

Model No.	Spline nut dimensions														
	Outer diameter		Length	Flange diameter					Standard type	Type K	Oil hole position				
	D	Tolerance	L	D_1	D_6 h7	D_7	H	L_1	E	E	F	E_1	PCD	PCD1	S×ℓ
LTR 8A	32	−0.009 −0.025	25	44	24	16	3	10.5	6	8.5	4	3	38	19	M2.6×3
LTR 10A	36		33	48	28	21	3	10.5	9	11.5	4	—	42	23	M3×4
LTR 16A	48		50	64	36	31	6	21	10	10	10.5	—	56	30	M4×6
LTR 20A	56	−0.010 −0.029	63	72	43.5	35	6	21	12	12	10.5	—	64	36	M5×8
LTR 25A	66		71	86	52	42	7	25	13	13	12.5	—	75	44	M5×8
LTR 32A	78		80	103	63	52	8	25	17	17	12.5	—	89	54	M6×10
LTR 40A	100	−0.012 −0.034	100	130	79.5	64	10	33	20	20	16.5	—	113	68	M6×10

Model number coding

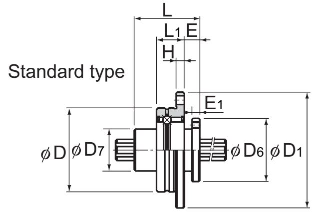
2 LTR32A K UU ZZ CL +500L P K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LTR32A: Model No.
- K: Flange orientation symbol(*1)
- UU: Spline nut contamination protection accessory symbol(*2)
- ZZ: Support bearings contamination protection accessory symbol(*3)
- CL: Symbol for clearance in the rotational direction(*4)
- +500L: Overall spline shaft length (in mm)
- P: Accuracy symbol (*5)
- K: Symbol for standard hollow spline shaft (*6)

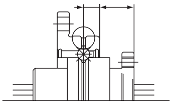
(*2) See A-509. (*3) See A-509. (*4) See A-481. (*5) See A-482. (*6) See B-408.

(*1) No Symbol: standard K: flange inversed

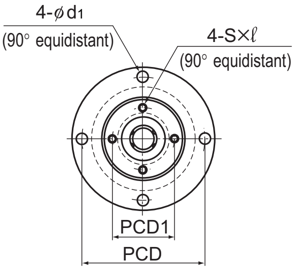
Standard type



Type K

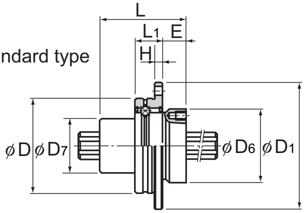


Model LTR8A

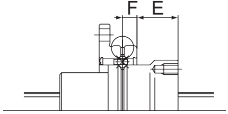


Model LTR8A Model LTR10A

Standard type



Type K

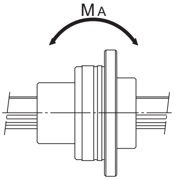


Model LTR10A

Unit: mm

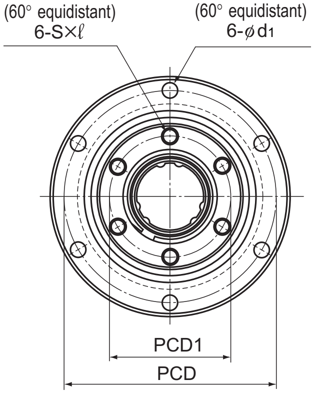
		Spline shaft diameter		Basic torque rating		Basic load rating		Static permissible moment	Support bearing basic load rating		Mass	
	d_1	D_0 h7	Rows of balls	C_T N-m	C_{0T} N-m	C KN	C_0 KN	M_A** N-m	C kN	C_0 kN	Spline Nut kg	Spline shaft kg/m
	3.4	8	4	1.96	2.94	1.47	2.55	5.9	0.69	0.24	0.08	0.4
	3.4	10	4	3.92	7.84	2.84	4.9	15.7	0.77	0.3	0.13	0.62
	4.5	16	6	31.3	34.3	7.05	12.6	67.6	6.7	6.4	0.35	1.6
	4.5	20	6	56.8	55.8	10.2	17.8	118	7.4	7.8	0.51	2.5
	5.5	25	6	105	103	15.2	25.8	210	9.7	10.6	0.79	3.9
	6.6	32	6	180	157	20.5	34	290	10.5	12.5	1.25	5.6
	9	40	6	418	377	37.8	60.4	687	16.5	20.7	2.51	9.9

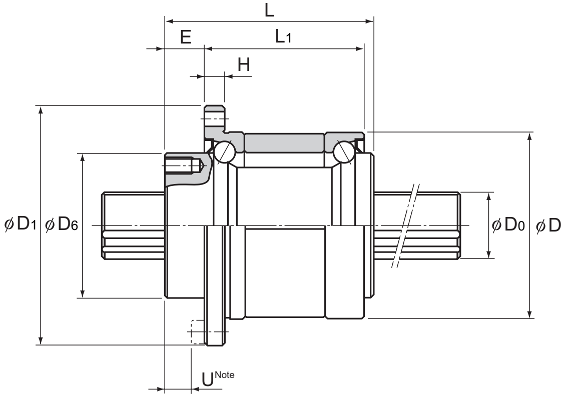
Note) **M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure below.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.



Description of Each Option⇒A-509

Model LTR





Model No.	Spline nut dimensions										
	Outer diameter		Length	Flange diameter							
	D	Tolerance	L	D1	D6 h7	H	L1	E	PCD	PCD1	S×ℓ
LTR 16	52	0 −0.007	50	68	39.5	5	37	10	60	32	M5×8
LTR 20	56		63	72	43.5	6	48	12	64	36	M5×8
LTR 25	62		71	78	53	6	55	13	70	45	M6×8
LTR 32	80		80	105	65.5	9	60	17	91	55	M6×10
LTR 40	100	0 −0.008	100	130	79.5	11	74	23	113	68	M6×10
LTR 50	120		125	156	99.5	12	97	25	136	85	M10×15
LTR 60	134	0 −0.009	140	170	115	12	112	25	150	100	M10×15

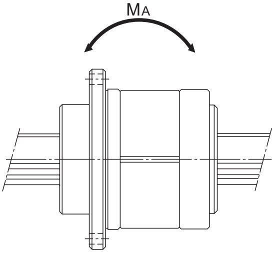
Model number coding

2 LTR50 K UU ZZ CM +1000L H K

- 2: Number of spline nuts on one shaft (no symbol for one nut)
- LTR50: Model No.
- K: Flange orientation symbol(*1)
- UU: Spline nut contamination protection accessory symbol(*2)
- ZZ: Support bearings contamination protection accessory symbol(*3)
- CM: Symbol for clearance in the rotational direction(*4)
- +1000L: Overall spline shaft length (in mm)
- H: Accuracy symbol (*5)
- K: Symbol for standard hollow spline shaft (*6)

(*2) See A-509. (*3) See A-509. (*4) See A-481. (*5) See A-482. (*6) See B-408.

(*1) No Symbol: standard K: flange inversed



Unit: mm

			Spline shaft diameter		Basic torque rating		Basic load rating		Static permissible moment	Support bearing basic load rating		Mass	
	d_1	U^{Note}	D_0 h7	Rows of balls	C_T N-m	C_{0T} N-m	C KN	C_0 KN	M_A** N-m	C kN	C_0 kN	Spline Nut kg	Spline shaft kg/m
	4.5	5	16	6	31.4	34.3	7.06	12.6	67.6	12.7	11.8	0.51	1.6
	4.5	7	20	6	56.9	55.9	10.2	17.8	118	16.3	15.5	0.7	2.5
	4.5	8	25	6	105	103	15.2	25.8	210	17.6	18	0.93	3.9
	6.6	10	32	6	180	157	20.5	34	290	20.1	24	1.8	5.6
	9	13	40	6	419	377	37.8	60.5	687	37.2	42.5	3.9	9.9
	11	13	50	6	842	769	60.9	94.5	1340	41.7	54.1	6.7	15.5
	11	13	60	6	1220	1040	73.5	111.7	1600	53.1	68.4	8.8	22.3

Note) **M_A indicates the permissible moment value in the axial direction when a single spline nut is used, as shown in the figure above.
Dimension U represents the dimension from the head of the hexagonal-socket-head type bolt to the spline nut end.
For details on the maximum lengths of ball spline shafts by accuracy, please see B-410.

Description of Each Option⇒A-509

Spline Shaft

Spline shafts are divided in shape into precision solid spline shaft, special spline shaft and hollow spline shaft (types K and N), as described on A-493.
Since production of a spline shaft with a specific shape is performed at your request, provide a drawing of the desired shaft shape when asking an estimate or placing an order.

[Sectional Shape of the Spline Shaft]

Table1 shows the sectional shape of a spline shaft. If the spline shaft ends need to be cylindrical, the minor diameter (ϕd) value should not be exceeded if possible.

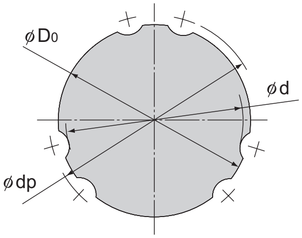


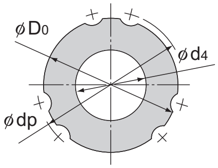
Table1 Sectional Shape of the Spline Shaft Unit: mm

Nominal shaft diameter	8	10	16	20	25	32	40	50	60
Minor diameter ϕ d	7	8.5	14.5	18.5	23	30	37.5	46.5	56.5
Major diameter ϕD_0 h7	8	10	16	20	25	32	40	50	60
Ball center-to-center diameter ϕ dp	9.3	11.5	17.8	22.1	27.6	35.2	44.2	55.2	66.3
Mass (kg/m)	0.4	0.62	1.6	2.5	3.9	5.6	9.9	15.5	22.3

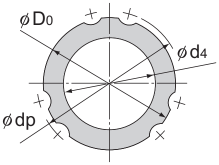
* The minor diameter ϕd must be a value at which no groove is left after machining.

[Hole Shape of the Standard Hollow Type Spline Shaft]

Table2 shows the hole shape of the standard hollow type spline shaft (types K and N).
Use this table when a requirement such as piping, wiring, air-vent or weight reduction needs to be met.



Type K
(Thick)



Type N
(Thin)

Table2 Sectional Shape of the Standard Hollow Type Spline Shaft Unit: mm

Nominal shaft diameter		8	10	16	20	25	32	40	50	60
Major diameter ϕD_0		8	10	16	20	25	32	40	50	60
Ball center-to-center diameter ϕ dp		9.3	11.5	17.8	22.1	27.6	35.2	44.2	55.2	66.3
Type K	Hole diameter ϕd_4	3	4	7	10	12	18	22	25	32
	Mass(kg/m)	0.35	0.52	1.3	1.8	3	4.3	6.9	11.6	16
Type N	Hole diameter ϕd_4	—	—	11	14	18	23	29	36	—
	Mass(kg/m)	—	—	0.8	1.3	1.9	3.1	4.7	7.4	—

Note) The standard hollow type Spline Shaft is divided into types K and N. Indicate "K" or "N" at the end of the model number to distinguish between them when placing an order.

[Chamfering of the Spline Shaft Ends]

For details,see B-382.

[Length of Imperfect Area of a Special Spline Shaft]

If the middle area or the end of a spline shaft is to be thicker than the minor diameter (φd), an imperfect spline area is required to secure a recess for grinding. Table3 shows the relationship between the length of the incomplete section (S) and the flange diameter (φdf).
(This table does not apply to overall length of 1,500 mm or greater. Contact THK for details.)

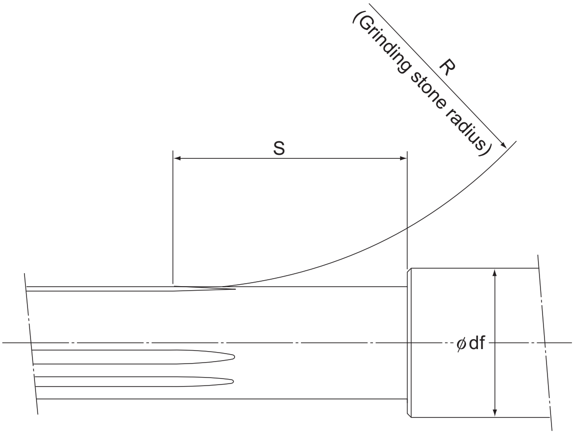


Table3 Length of Imperfect Spline Area: S

Unit: mm

Flange diameter φdf / Nominal shaft diameter	6	8	10	13	16	20	25	30	40	50	60	80	100	120	140	160
8	—	16	24	30	35	—	—	—	—	—	—	—	—	—	—	—
10	—	—	17	27	32	37	—	—	—	—	—	—	—	—	—	—
16	—	—	—	—	21	36	46	54	—	—	—	—	—	—	—	—
20	—	—	—	—	—	21	38	48	62	—	—	—	—	—	—	—
25	—	—	—	—	—	—	23	39	56	67	—	—	—	—	—	—
32	—	—	—	—	—	—	—	24	49	62	72	—	—	—	—	—
40	—	—	—	—	—	—	—	—	27	50	63	81	—	—	—	—
50	—	—	—	—	—	—	—	—	—	29	51	74	89	—	—	—
60	—	—	—	—	—	—	—	—	—	—	28	56	71	82	—	—

Maximum Manufacturing Length by Accuracy

Table1 and Table2 show the maximum manufacturing lengths of ball spline shafts by accuracy.

Table1 Maximum Manufacturing Length of Models LBS, LBST, LBF, LBR, LBH, LBG and LBGT by Accuracy Unit: mm

Nominal shaft diameter	Accuracy		
	Normal grade (No symbol)	High accuracy grade (H)	Precision Grade (P)
6	200	150	100
8	600	200	150
10	600	400	300
15	1800	600	600
20	1800	700	700
25	3000	1400	1400
30	3000	1400	1400
40	3000	1400	1400
50	3000	1400	1400
60	3800	2500	2000
70	3800	2500	2000
85	3800	3000	3000
100	4000	3000	3000
120	3000	3000	3000
150	3000	3000	3000

Table2 Maximum Manufacturing Length of Models LT, LF, LTR and LTR-A by Accuracy Unit: mm

Nominal shaft diameter	Accuracy		
	Normal grade (No symbol)	High accuracy grade (H)	Precision Grade (P)
4	600	200	200
5	600	315	200
6	600	400	315
8	1000	500	400
10	1000	630	500
13	1000	800	630
16	2000	1000	1000
20	2000	1500	1000
25	3000	1500	1000
30	3000	1600	1250
40	3000	2000	1520
50	3000	2000	1500
60	4000	2000	2000
80	4000	2000	2000
100	4000	3000	3000

1. The length in the table represents the overall shaft length.
2. With standard hollow shaft type (K), the values in the table apply.
3. With standard hollow shaft type (N), the available maximum length for both the normal grade and the high accuracy grade is up to the length defined for the precision grade in the table.

Spline Nut

THK General Catalog

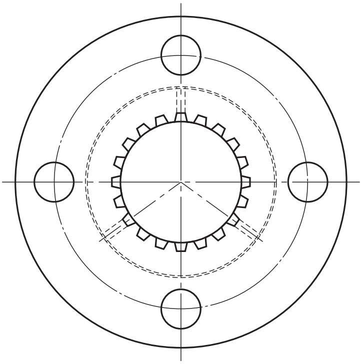
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model DPM



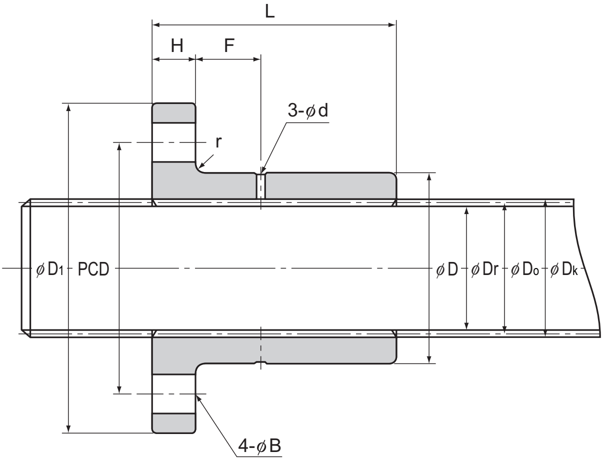
Spline Nut	Outer dimensions			Spline nut dimensions						
Model No.	Outer diameter D	Outer diameter Tolerance h9	Length L	Flange diameter D_1	H	B	PCD	r	F	d
DPM 1220	22	0 −0.052	20	44	6	5.4	31	1.5	7	1.5
DPM 1230			30							
DPM 1520	22		20	44	6	5.4	31	1.5	7	1.5
DPM 1530			30							
DPM 1723	28		23	51	7	6.6	38	1.5	8	1.5
DPM 1735			35							
DPM 2028	32	0 −0.062	28	56	7	6.6	42	1.5	10.5	1.5
DPM 2040			40							
DPM 2536	36		36	61	8	6.6	47	2	14	2
DPM 2550			50							
DPM 3040	44		40	76	10	9	58	2	15	2
DPM 3056			56							
DPM 3544	52	0 −0.074	44	84	10	9	66	2.5	17	2.5
DPM 3560			60							
DPM 4050	58		50	98	12	11	76	2.5	19	3
DPM 4068			68							
DPM 4555	64		55	104	12	11	80	2.5	21.5	3
DPM 4575			75							
DPM 5060	68		60	109	12	11	85	2.5	24	3.5
DPM 5080			80							

Note) The dynamic permissible torque (T) indicates the torque at which the contact surface pressure on the spline teeth is 9.8 N/mm^2.
Clearance in the rotational direction: $\alpha \leqq 20'$ MAX

Model number coding

Combination of spline nut and spline shaft

$$\underbrace{2}_{\text{Number of spline nuts used on the same shaft}}\ \underbrace{\text{DPM2040}}_{\text{Model No. of spline nut}}\ \underbrace{+360\text{L}}_{\text{Overall spline shaft length (in mm)}}$$



Unit: mm

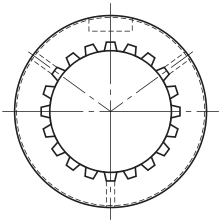
	Spline shaft	Spline details				Standard shaft length	Maximum shaft length	Dynamic permissible torque T^{Note} N-m	Mass	
	Model No.	Pitch diameter D_0	Major diameter D_k	Minor diameter D_r	Number of teeth Z				Spline Nut g	Spline Shaft kg/m
	SS 12	12	12.8	10.9	16	1500	1500	17.6	80	0.9
								26.5	90	
	SS 15	15	16.1	13.5	16	1500	2000	30.4	70	1.4
								46.1	80	
	SS 17	17	18.2	15.4	16	1500	2000	43.1	120	1.7
								65.7	150	
	SS 20	20	21.5	18.3	16	1500	3200	70.6	160	2.5
								100	200	
	SS 25	25	26.9	22.6	16	1500	3200	152	220	3.8
								211	270	
	SS 30	30	31.8	28.2	20	1500	3200	212	400	5.5
								297	480	
	SS 35	35	37.1	32.8	20	1500	3200	325	560	7.5
								443	670	
	SS 40	40	42.4	37.5	20	1500	3200	480	830	9.8
								673	970	
	SS 45	45	47.7	42.1	20	1500	3200	680	980	12.4
								927	1110	
	SS 50	50	53	46.8	20	1500	3200	910	1080	15.4
								1220	1290	

Model number coding

Spline shaft

$$\underbrace{\text{SS20}}_{\text{Model number of spline shaft}}\ \underbrace{+1500\text{L}}_{\text{Overall spline shaft length (in mm)}}$$

Model DP



Spline Nut Model No.	Outer dimensions			Spline nut dimensions					
	Outer diameter		L	Keyway dimensions					
	D	Tolerance h9	0 −0.3	b	Tolerance N9	t	ℓ	d	r
DP 12	22	0 −0.052	22	4	0 −0.030	2	16	1.5	1
DP 15	22		22	4		2	16	1.5	1
DP 17	28		26	5		2.5	18	1.5	1
DP 20	32	0 −0.062	31	7	0 −0.036	2.5	22	1.5	1
DP 25	36		40	7		2.5	26	2	1
DP 30	44		45	10		4	32	2	1.5
DP 35	52	0 −0.074	49	12	0 −0.043	4.5	40	2.5	1.5
DP 40	58		57	15		5	42	3	1.5
DP 45	64		62	15		5	48	3	1.5
DP 50	68		67	15		5	52	3.5	1.5

Note) The dynamic permissible torque (T) indicates the torque at which the contact surface pressure on the spline teeth is 9.8 N/mm^2.
Clearance in the rotational direction: α≦20' MAX

Model number coding

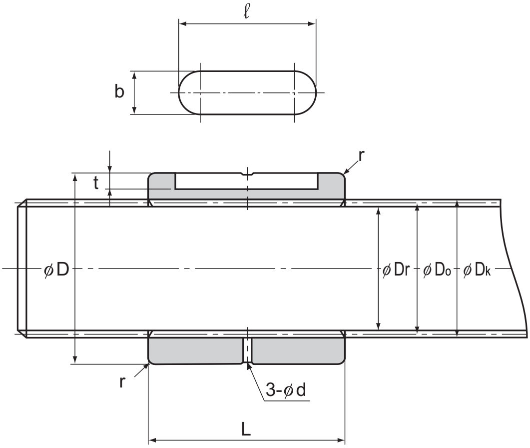
Combination of spline nut and spline shaft

2 DP20 +360L

Overall spline shaft length (in mm)

Model No. of spline nut

Number of spline nuts used on the same shaft



Unit: mm

	Spline shaft	Spline details				Standard shaft length	Maximum shaft length	Dynamic permissible torque	Mass	
	Model No.	Pitch diameter D_0	Major diameter D_k	Minor diameter D_r	Number of teeth Z			T^{Note} N-m	Spline Nut g	Spline Shaft kg/m
	SS 12	12	12.8	10.9	16	1500	1500	19.6	40	0.9
	SS 15	15	16.1	13.5	16	1500	2000	33.3	30	1.4
	SS 17	17	18.2	15.4	16	1500	2000	48	65	1.7
	SS 20	20	21.5	18.3	16	1500	3200	77.5	100	2.5
	SS 25	25	26.9	22.6	16	1500	3200	169	135	3.8
	SS 30	30	31.8	28.2	20	1500	3200	238	230	5.5
	SS 35	35	37.1	32.8	20	1500	3200	362	360	7.5
	SS 40	40	42.4	37.5	20	1500	3200	547	510	9.8
	SS 45	45	47.7	42.1	20	1500	3200	767	640	12.4
	SS 50	50	53	46.8	20	1500	3200	1020	710	15.4

Model number coding

Spline shaft

SS20 +1500L

Overall spline shaft length (in mm)

Model number of spline shaft

Linear Bushing

THK General Catalog

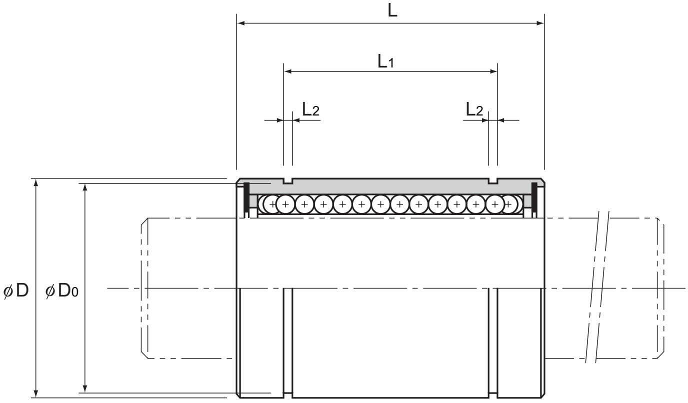
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model LM



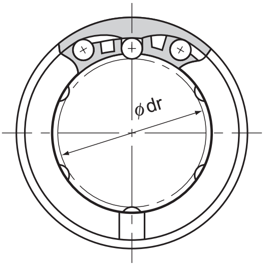
Model No.			Ball	Main						
				Inscribed bore diameter			Outer diameter		Length	
					Tolerance			Tolerance		
Standard type	Clearance-adjustable type	Open type	rows	dr	Precision	Upper	D	Precision/ high	L	Tolerance
LM 3	—	—	4	3	0 −0.005	0 −0.008	7	0 −0.009	10	0 −0.12
LM 4	—	—	4	4			8		12	
LM 5	—	—	4	5			10		15	
LM 6	LM 6-AJ	—	4	6	0 −0.006	0 −0.009	12	0 −0.011	19	0 −0.2
LM 8S	LM 8S-AJ	—	4	8			15		17	
LM 8	LM 8-AJ	—	4	8			15		24	
LM 10	LM 10-AJ	—	4	10			19	0 −0.013	29	
LM 12	LM 12-AJ	LM 12-OP	4	12			21		30	
LM 13	LM 13-AJ	LM 13-OP	4	13			23		32	
LM 16	LM 16-AJ	LM 16-OP	5	16			28		37	
LM 20	LM 20-AJ	LM 20-OP	5	20	0 −0.007	0 −0.010	32	0 −0.016	42	
LM 25	LM 25-AJ	LM 25-OP	6	25			40		59	0 −0.3
LM 30	LM 30-AJ	LM 30-OP	6	30			45		64	
LM 35	LM 35-AJ	LM 35-OP	6	35	0 −0.008	0 −0.012	52	0 −0.019	70	
LM 40	LM 40-AJ	LM 40-OP	6	40			60		80	
LM 50	LM 50-AJ	LM 50-OP	6	50			80	0 −0.022	100	
LM 60	LM 60-AJ	LM 60-OP	6	60	0 −0.009	0 −0.015	90		110	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If the ambient temperature exceeds 80℃, use the type equipped with a metal retainer (model LM-GA).
If requiring a type equipped with a seal, indicate it when placing an order.

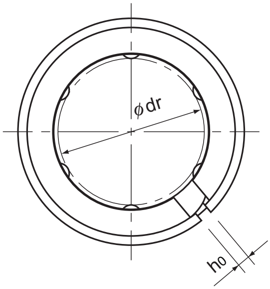
(Example) LM13 UU

Seal attached on both ends of the nut

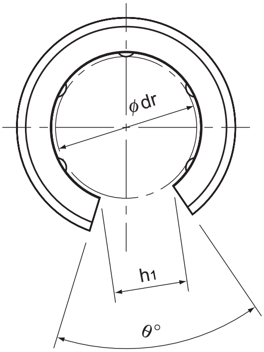
The accuracy of clearance-adjustable types (-AJ) and open types (-OP) in inscribed bore diameter and outer diameter indicates the value before division.



Model LM



Model LM-AJ



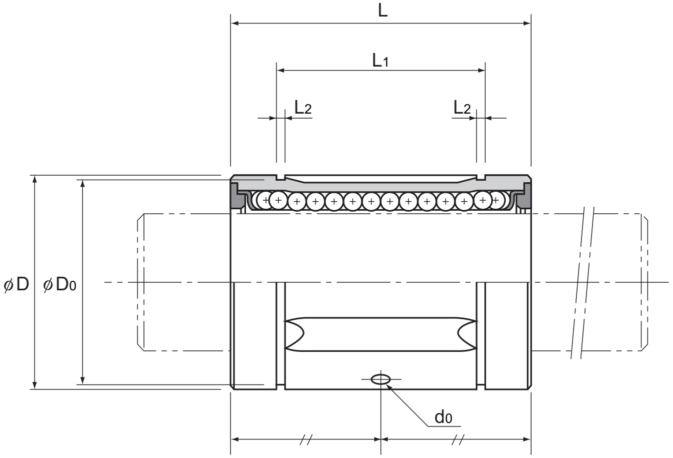
Model LM-OP

Unit: mm

dimensions							Eccentricity (max) µm		Radial clearance tolerance	Basic load rating		Mass
L_1	Tolerance	L_2	D_0	h_0	h_1	θ°	Precision	Upper	µm	C N	C_0 N	g
—	—	—	—	—	—	—	4	8	−2	88.2	108	1.4
—	—	—	—	—	—	—	4	8	−3	88.2	127	1.9
10.2	0 −0.2	1.1	9.6	—	—	—	4	8	−3	167	206	4
13.5		1.1	11.5	1	—	—	8	12	−5	206	265	8
11.5		1.1	14.3	1	—	—	8	12	−5	176	225	11
17.5		1.1	14.3	1	—	—	8	12	−5	265	402	16
22		1.3	18	1	—	—	8	12	−5	373	549	30
23		1.3	20	1.5	8	80	8	12	−5	412	598	31.5
23		1.3	22	1.5	9	80	8	12	−7	510	775	43
26.5		1.6	27	1.5	11	60	8	12	−7	775	1180	69
30.5		1.6	30.5	1.5	11	60	10	15	−9	863	1370	87
41	0 −0.3	1.85	38	2	12	50	10	15	−9	980	1570	220
44.5		1.85	43	2.5	15	50	10	15	−9	1570	2750	250
49.5		2.1	49	2.5	17	50	12	20	−13	1670	3140	390
60.5		2.1	57	3	20	50	12	20	−13	2160	4020	585
74		2.6	76.5	3	25	50	12	20	−13	3820	7940	1580
85		3.15	86.5	3	30	50	17	25	−16	4710	10000	2000

Note) When using the Linear Bushing on a single shaft, use two or more units (instead of one unit) on the same shaft to avoid a moment load, and secure a large distance between the units.

Model LM-GA (Metal Retainer Type)



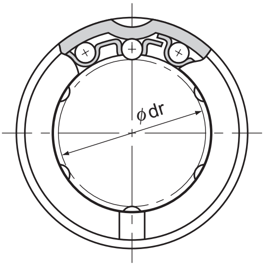
Model No.			Ball	Main						
				Inscribed bore diameter			Outer diameter		Length	
					Tolerance			Tolerance		
Standard type	Clearance-adjustable type	Open type	rows	dr	Precision	Upper	D	Precision/ high	L	Tolerance
LM 6GA	—	—	3	6	0 −0.006	0 −0.009	12	0 −0.011	19	0 −0.2
LM 8SGA	—	—	3	8			15		17	
LM 8GA	—	—	3	8			15		24	
LM 10GA	—	—	3	10			19	0 −0.013	29	
LM 12GA	LM 12GA-AJ	LM 12GA-OP	4	12			21		30	
LM 13GA	LM 13GA-AJ	LM 13GA-OP	4	13			23		32	
LM 16GA	LM 16GA-AJ	LM 16GA-OP	4	16			28		37	
LM 20GA	LM 20GA-AJ	LM 20GA-OP	5	20	0 −0.007	0 −0.010	32	0 −0.016	42	
LM 25GA	LM 25GA-AJ	LM 25GA-OP	5	25			40		59	0 −0.3
LM 30GA	LM 30GA-AJ	LM 30GA-OP	6	30			45		64	
LM 35GA	LM 35GA-AJ	LM 35GA-OP	6	35	0 −0.008	0 −0.012	52	0 −0.019	70	
LM 38GA	LM 38GA-AJ	LM 38GA-OP	6	38			57		76	
LM 40GA	LM 40GA-AJ	LM 40GA-OP	6	40			60		80	
LM 50GA	LM 50GA-AJ	LM 50GA-OP	6	50			80	0 −0.022	100	
LM 60GA	LM 60GA-AJ	LM 60GA-OP	6	60	0 −0.009	0 −0.015	90		110	
LM 80GA	LM 80GA-AJ	LM 80GA-OP	6	80			120		140	0 −0.4
LM 100GA	LM 100GA-AJ	LM 100GA-OP	6	100	0 −0.010	0 −0.020	150	0 −0.025	175	
LM 120A	LM 120A-AJ	LM 120A-OP	8	120			180		200	

Note) If requiring a type equipped with a seal, indicate it when placing an order. (seal heat resistance: 80℃.)

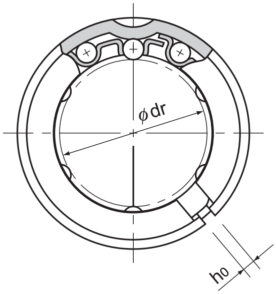
(Example) LM50GA UU

Seal attached on both ends of the nut

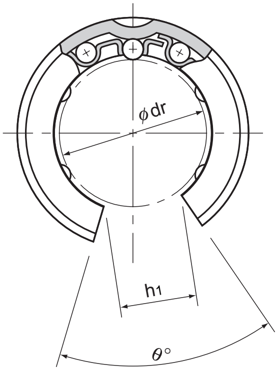
The accuracy of clearance-adjustable types (-AJ) and open types (-OP) in inscribed bore diameter and outer diameter indicates the value before division.



Model LM-GA



Model LM-GA-AJ



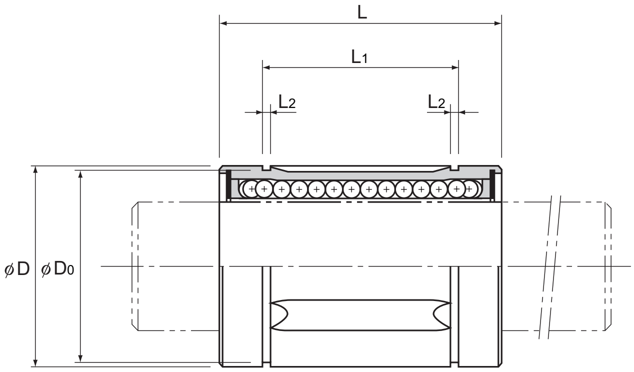
Model LM-GA-OP

Unit: mm

dimensions							Greasing hole	Eccentricity (max) μm		Radial clearance tolerance	Basic load rating		Mass
L_1	Tolerance	L_2	D_0	h_0	h_1	θ°	d_0	Precision	Upper	μm	C N	C_0 N	g
13.5	0 −0.2	1.1	11.5	—	—	—	—	8	12	−5	206	265	8
11.5		1.1	14.3	—	—	—	—	8	12	−5	176	225	11
17.5		1.1	14.3	—	—	—	—	8	12	−5	265	402	16
22		1.3	18	—	—	—	2	8	12	−5	373	549	30
23		1.3	20	1.5	7.5	80	2	8	12	−5	412	598	31.5
23		1.3	22	1.5	9	80	2	8	12	−7	510	775	43
26.5		1.6	27	1.5	11	60	2.3	8	12	−7	775	1180	69
30.5		1.6	30.5	2	11	60	2.3	10	15	−9	863	1370	87
41	0 −0.3	1.85	38	2	13	60	3	10	15	−9	980	1570	220
44.5		1.85	43	2.5	15	50	3	10	15	−9	1570	2750	250
49.5		2.1	49	2.5	17	50	3	12	20	−13	1670	3140	390
58.5		2.1	54.5	3	18	50	3	12	20	−13	2160	4020	565
60.5		2.1	57	3	20	50	3	12	20	−13	2160	4020	585
74		2.6	76.5	3	25	50	3	12	20	−13	3820	7940	1580
85		3.15	86.5	3	30	50	4	17	25	−16	4710	10000	2000
105.5	0 −0.4	4.15	116	3	40	50	4	17	25	−16	7350	16000	4520
125.5		4.15	145	3	50	50	4	20	30	−20	14100	34800	8600
158.6		4.15	175	4	85	80	5	20	30	−25	16400	40000	15000

Note) When using the Linear Bushing on a single shaft, use two or more units (instead of one unit) on the same shaft to avoid a moment load, and secure a large distance between the units.

Model LM-MG (Stainless Steel Type)



Model No.			Ball rows	Main						
Standard type	Clearance-adjustable type	Open type		Inscribed bore diameter			Outer diameter		Length	
				dr	Tolerance		D	Tolerance	L	Tolerance
					Precision	Upper		Precision/ high		
LM 3M	—	—	4	3	0 −0.005	0 −0.008	7	0 −0.009	10	0 −0.12
LM 4M	—	—	4	4			8		12	
LM 5M	—	—	4	5			10		15	
∗ LM 6MG	LM 6MG-AJ	—	4	6	0 −0.006	0 −0.009	12	0 −0.011	19	0 −0.2
∗ LM 8SMG	LM 8SMG-AJ	—	4	8			15		17	
∗ LM 8MG	∗ LM 8MG-AJ	—	4	8			15		24	
∗ LM 10MG	∗ LM 10MG-AJ	—	4	10			19	0 −0.013	29	
∗ LM 12MG	∗ LM 12MG-AJ	—	4	12			21		30	
∗ LM 13MG	∗ LM 13MG-AJ	∗ LM 13MG-OP	4	13			23		32	
∗ LM 16MG	∗ LM 16MG-AJ	∗ LM 16MG-OP	4	16			28		37	
∗ LM 20MG	∗ LM 20MG-AJ	∗ LM 20MG-OP	5	20	0 −0.007	0 −0.010	32	0 −0.016	42	
∗ LM 25MG	∗ LM 25MG-AJ	∗ LM 25MG-OP	5	25			40		59	0 −0.3
∗ LM 30MG	∗ LM 30MG-AJ	∗ LM 30MG-OP	6	30			45		64	
∗ LM 35MG	∗ LM 35MG-AJ	∗ LM 35MG-OP	6	35	0 −0.008	0 −0.012	52	0 −0.019	70	
∗ LM 40MG	∗ LM 40MG-AJ	∗ LM 40MG-OP	6	40			60		80	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If the ambient temperature exceeds 80℃, use the type equipped with a metal retainer and indicate "A" at the end of the model number.
(For those marked with ∗ in the table, metal retainers are available.)
(Metal retainer types of models LM6MG, 8SMG and 8MG each have 3 rows of balls.)

(Example) LM30MG A

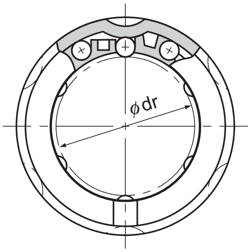
High temperature symbol

If requiring a type equipped with a seal, indicate it when placing an order. (seal heat resistance: 80℃.)
For an open type, only type A is available.

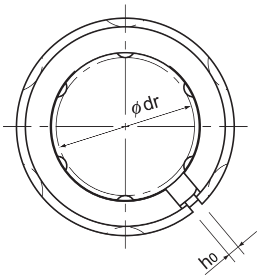
(Example) LM30MG UU

Seal attached on both ends of the nut

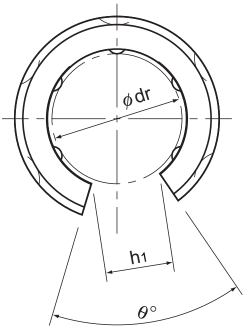
The accuracy of clearance-adjustable types (-AJ) and open types (-OP) in inscribed bore diameter and outer diameter indicates the value before division.



Model LM-MG



Model LM-MG-AJ



Model LM-MG-OP

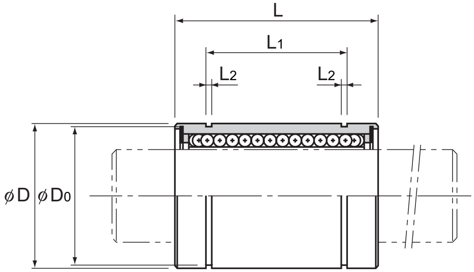
Unit: mm

dimensions							Eccentricity (max) µm		Radial clearance tolerance µm	Basic load rating		Mass g
L1	Tolerance	L2	D0	h0	h1	θ°	Precision	Upper		C N	C0 N	
—	—	—	—	—	—	—	4	8	−2	88.2	108	1.4
—	—	—	—	—	—	—	4	8	−3	88.2	127	1.9
10.2	0 −0.2	1.1	9.6	—	—	—	4	8	−3	167	206	4
13.5		1.1	11.5	1	—	—	8	12	−5	206	265	8
11.5		1.1	14.3	1	—	—	8	12	−5	176	225	11
17.5		1.1	14.3	1	—	—	8	12	−5	265	402	16
22		1.3	18	1	—	—	8	12	−5	373	549	30
23		1.3	20	1.5	—	—	8	12	−5	412	598	31.5
23		1.3	22	1.5	9	80	8	12	−7	510	775	43
26.5		1.6	27	1.5	11	80	8	12	−7	775	1180	69
30.5		1.6	30.5	1.5	11	60	10	15	−9	863	1370	87
41	0 −0.3	1.85	38	2	12	50	10	15	−9	980	1570	220
44.5		1.85	43	2.5	15	50	10	15	−9	1570	2750	250
49.5		2.1	49	2.5	17	50	12	20	−13	1670	3140	390
60.5		2.1	57	3	20	50	12	20	−13	2160	4020	585

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
Stainless-steel type does not have an oil hole (OA type specification is required).
When using the Linear Bushing on a single shaft, use two or more units (instead of one unit) on the same shaft to avoid a moment load, and secure a large distance between the units.

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LME



Model No.			Ball rows	Main					
				Inscribed bore diameter		Outer diameter		Length	
Standard type	Clearance-adjustable type	Open type		dr	Tolerance	D	Tolerance	L	Tolerance
LME 5	LME 5-AJ	—	4	5	+0.008 0	12	0 −0.008	22	0 −0.2
LME 8	LME 8-AJ	—	4	8		16		25	
LME 12	LME 12-AJ	LME 12-OP	4	12		22	0 −0.009	32	
LME 16	LME 16-AJ	LME 16-OP	5	16	+0.009 −0.001	26		36	
LME 20	LME 20-AJ	LME 20-OP	5	20		32	0 −0.011	45	
LME 25	LME 25-AJ	LME 25-OP	6	25	+0.011 −0.001	40		58	0 −0.3
LME 30	LME 30-AJ	LME 30-OP	6	30		47		68	
LME 40	LME 40-AJ	LME 40-OP	6	40	+0.013 −0.002	62	0 −0.013	80	
LME 50	LME 50-AJ	LME 50-OP	6	50		75		100	
LME 60	LME 60-AJ	LME 60-OP	6	60		90	0 −0.015	125	0 −0.4
LME 80	LME 80-AJ	LME 80-OP	6	80	+0.016 −0.004	120		165	

Note) Since Linear Bushing models LME50 or smaller models are incorporated with a synthetic resin retainer, do not use them at temperature exceeding 80℃.

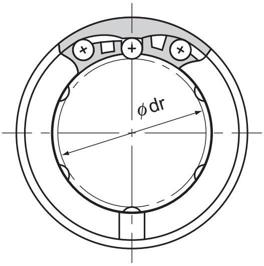
If the ambient temperature exceeds 80℃, use the type equipped with a metal retainer and indicate "A" at the end of the model number.

(Example) LME20G A
High temperature symbol

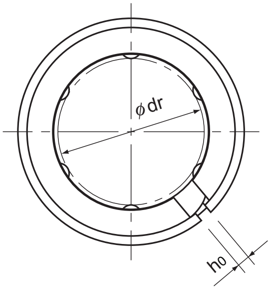
If requiring a type equipped with a seal, indicate it when placing an order. (seal heat resistance: 80℃.)

(Example) LME16 UU
Seal attached on both ends of the nut

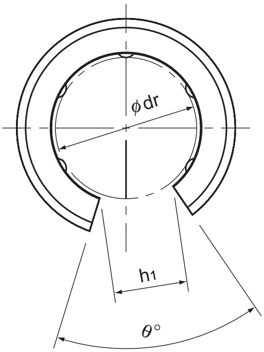
The accuracy of clearance-adjustable types (-AJ) and open types (-OP) in inscribed bore diameter and outer diameter indicates the value before division.



Model LME



Model LME-AJ



Model LME-OP

Unit: mm

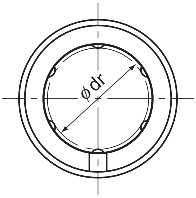
dimensions								Eccentricity (max)	Radial clearance tolerance	Basic load rating		Mass
	L_1	Tolerance	L_2	D_0	h_0	h_1	θ°	µm	µm	C N	C_0 N	g
	14.5	0 −0.2	1.1	11.5	1	—	—	12	−5	206	265	11
	16.5		1.1	15.2	1	—	—	12	−5	265	402	20
	22.9		1.3	21	1.5	7.5	78	12	−7	510	775	41
	24.9		1.3	24.9	1.5	10	78	12	−7	775	1180	57
	31.5		1.6	30.3	2	10	60	15	−9	863	1370	91
	44.1	0 −0.3	1.85	37.5	2	12.5	60	15	−9	980	1570	215
	52.1		1.85	44.5	2	12.5	50	15	−9	1570	2750	325
	60.6		2.15	59	3	16.8	50	17	−13	2160	4020	705
	77.6		2.65	72	3	21	50	17	−13	3820	7940	1130
	101.7	0 −0.4	3.15	86.5	3	27.2	54	20	−16	4710	10000	2220
	133.7		4.15	116	3	36.3	54	20	−16	7350	16000	5140

Note) If a metal retainer is used, the Linear Bushing has the shape as shown below.
When using the Linear Bushing on a single shaft, use two or more units (instead of one unit) on the same shaft to avoid a moment load, and secure a large distance between the units.

Model LME-GA

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LM-L

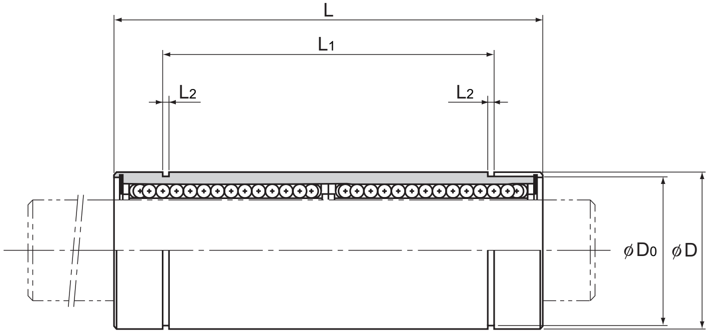


Model LM-L

Model No. Standard type	Ball rows	Main					
		Inscribed bore diameter		Outer diameter		Length	
		dr	Tolerance	D	Tolerance	L	Tolerance
LM 3L	4	3	0 −0.010	7	0 −0.013	19	0 −0.3
LM 4L	4	4		8		23	
LM 5L	4	5		10		29	
LM 6L	4	6		12		35	
LM 8L	4	8		15		45	
LM 10L	4	10		19	0 −0.016	55	
LM 12L	4	12		21		57	
LM 13L	4	13		23		61	
LM 16L	5	16		28		70	
LM 20L	5	20	0 −0.012	32	0 −0.019	80	
LM 25L	6	25		40		112	0 −0.4
LM 30L	6	30		45		123	
LM 35L	6	35	0 −0.015	52	0 −0.022	135	
LM 40L	6	40		60		154	
LM 50L	6	50		80		192	
LM 60L	6	60	0 −0.020	90	0 −0.025	211	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LM13L UU
Seal attached on both ends of the nut



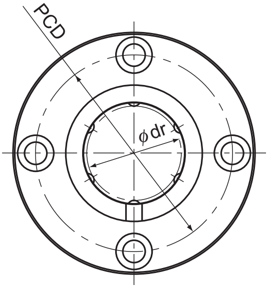
Unit: mm

dimensions				Eccentricity (max)	Radial clearance tolerance	Basic load rating		Mass
L1	Tolerance	L2	D0	μm	μm	C N	C0 N	g
—	—	—	—	10	−2	139	216	3
—		—	—	10	−3	139	254	4
20	0 −0.3	1.1	9.6	10	−3	263	412	8
27		1.1	11.5	15	−5	324	529	16
35		1.1	14.3	15	−5	431	784	31
44		1.3	18	15	−5	588	1100	62
46		1.3	20	15	−5	657	1200	80
46		1.3	22	15	−7	814	1570	90
53		1.6	27	15	−7	1230	2350	145
61		1.6	30.5	20	−9	1400	2750	180
82	0 −0.4	1.85	38	20	−9	1560	3140	440
89		1.85	43	20	−9	2490	5490	580
99		2.1	49	25	−13	2650	6270	795
121		2.1	57	25	−13	3430	8040	1170
148		2.6	76.5	25	−13	6080	15900	3100
170		3.15	86.5	25	−16	7650	20000	3500

Note) A stainless steel type is also available. Contact THK for details.

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMF



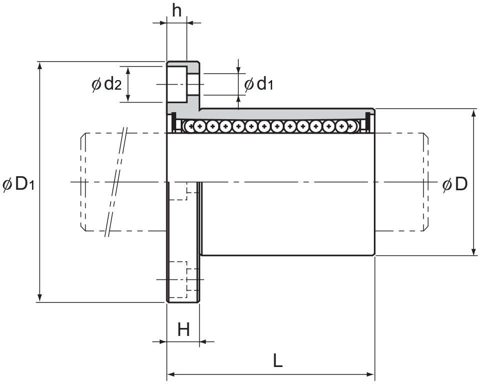
Model LMF

Model No.		Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	Ball rows	dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMF 6	4	6	0 −0.009	12	0 −0.011	19	0 −0.2	28	0 −0.2
LMF 8S	4	8		15		17		32	
LMF 8	4	8		15		24		32	
LMF 10	4	10		19	0 −0.013	29		39	
LMF 12	4	12		21		30		42	
LMF 13	4	13		23		32		43	
LMF 16	5	16		28		37		48	
LMF 20	5	20	0 −0.010	32	0 −0.016	42		54	
LMF 25	6	25		40		59	0 −0.3	62	
LMF 30	6	30		45		64		74	
LMF 35	6	35	0 −0.012	52	0 −0.019	70		82	
LMF 40	6	40		60		80		96	0 −0.3
LMF 50	6	50		80		100		116	
LMF 60	6	60	0 −0.015	90	0 −0.022	110		134	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMF25 UU

Seal attached on both ends of the nut

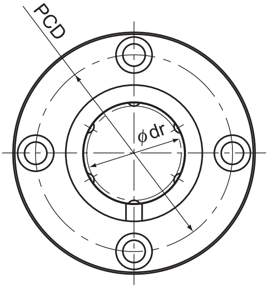


Unit: mm

H	PCD	Mounting hole d_1×d_2×h	Flange perpendicularity µm	Eccentricity (max) µm	Radial clearance tolerance µm	Basic load rating C N	Basic load rating C_0 N	Mass g
5	20	3.4×6.5×3.3	12	12	−5	206	265	26.5
5	24	3.4×6.5×3.3	12	12	−5	176	225	34
5	24	3.4×6.5×3.3	12	12	−5	265	402	40
6	29	4.5×8×4.4	12	12	−5	373	549	78
6	32	4.5×8×4.4	12	12	−5	412	598	76
6	33	4.5×8×4.4	12	12	−7	510	775	94
6	38	4.5×8×4.4	12	12	−7	775	1180	134
8	43	5.5×9.2×5.4	15	15	−9	863	1370	180
8	51	5.5×9.2×5.4	15	15	−9	980	1570	340
10	60	6.6×11×6.5	15	15	−9	1570	2750	460
10	67	6.6×11×6.5	20	20	−13	1670	3140	795
13	78	9×14×8.6	20	20	−13	2160	4020	1054
13	98	9×14×8.6	20	20	−13	3820	7940	2200
18	112	11×17.5×10.8	25	25	−13	4710	10000	2960

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMF-M (Stainless Steel Type)



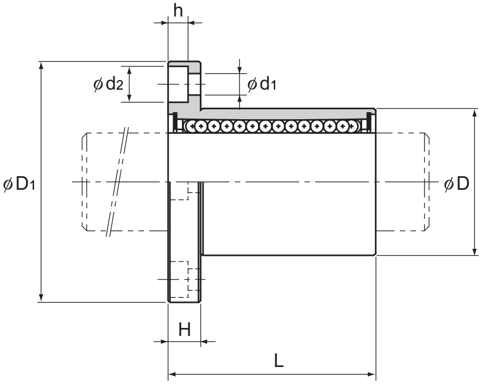
Model LMF-M

Model No.		Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	Ball rows	dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMF 6M	4	6	0 −0.009	12	0 −0.011	19	0 −0.2	28	0 −0.2
LMF 8SM	4	8		15		17		32	
LMF 8M	4	8		15		24		32	
LMF 10M	4	10		19	0 −0.013	29		39	
LMF 12M	4	12		21		30		42	
LMF 13M	4	13		23		32		43	
LMF 16M	5	16		28		37		48	
LMF 20M	5	20	0 −0.010	32	0 −0.016	42		54	
LMF 25M	6	25		40		59	0 −0.3	62	
LMF 30M	6	30		45		64		74	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMF20M UU

UU — Seal attached on both ends of the nut



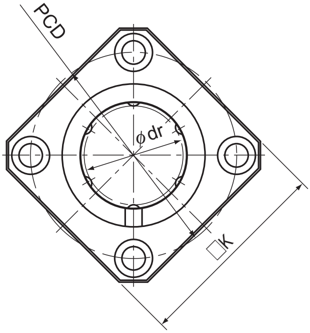
Unit: mm

				Flange perpendicularity	Eccentricity (max)	Radial	Basic load rating		
	H	PCD	Mounting hole d₁×d₂×h	µm	µm	clearance tolerance µm	C N	C_0 N	Mass g
	5	20	3.4×6.5×3.3	12	12	−5	206	265	26.5
	5	24	3.4×6.5×3.3	12	12	−5	176	225	34
	5	24	3.4×6.5×3.3	12	12	−5	265	402	40
	6	29	4.5×8×4.4	12	12	−5	373	549	78
	6	32	4.5×8×4.4	12	12	−5	412	598	76
	6	33	4.5×8×4.4	12	12	−7	510	775	94
	6	38	4.5×8×4.4	12	12	−7	775	1180	134
	8	43	5.5×9.2×5.4	15	15	−9	863	1370	180
	8	51	5.5×9.2×5.4	15	15	−9	980	1570	340
	10	60	6.6×11×6.5	15	15	−9	1570	2750	460

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.

Description of Each Option⇒A-549   Dimensions⇒B-461

Model LMK



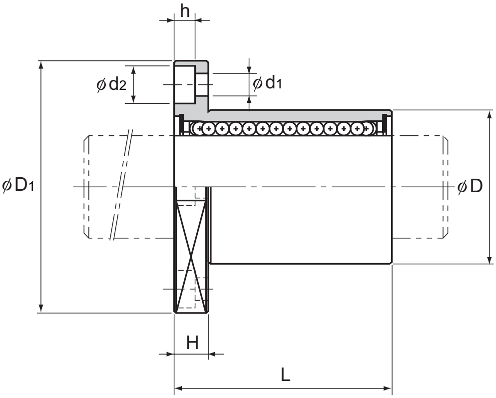
Model LMK

Model No.		Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	Ball rows	dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMK 6	4	6	0 −0.009	12	0 −0.011	19	0 −0.2	28	0 −0.2
LMK 8S	4	8		15		17		32	
LMK 8	4	8		15		24		32	
LMK 10	4	10		19	0 −0.013	29		39	
LMK 12	4	12		21		30		42	
LMK 13	4	13		23		32		43	
LMK 16	5	16		28		37		48	
LMK 20	5	20	0 −0.010	32	0 −0.016	42		54	
LMK 25	6	25		40		59	0 −0.3	62	
LMK 30	6	30		45		64		74	
LMK 35	6	35	0 −0.012	52	0 −0.019	70		82	
LMK 40	6	40		60		80		96	0 −0.3
LMK 50	6	50		80		100		116	
LMK 60	6	60	0 −0.015	90	0 −0.022	110		134	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMK13 UU

Seal attached on both ends of the nut

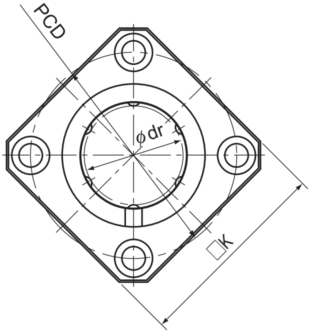


Unit: mm

	K	H	PCD	Mounting hole d₁×d₂×h	Flange perpendicularity µm	Eccentricity (max) µm	Radial clearance tolerance µm	Basic load rating C N	Basic load rating C₀ N	Mass g
	22	5	20	3.4×6.5×3.3	12	12	–5	206	265	18.5
	25	5	24	3.4×6.5×3.3	12	12	–5	176	225	23
	25	5	24	3.4×6.5×3.3	12	12	–5	265	402	29
	30	6	29	4.5×8×4.4	12	12	–5	373	549	61
	32	6	32	4.5×8×4.4	12	12	–5	412	598	56
	34	6	33	4.5×8×4.4	12	12	–7	510	775	75
	37	6	38	4.5×8×4.4	12	12	–7	775	1180	104
	42	8	43	5.5×9.2×5.4	15	15	–9	863	1370	145
	50	8	51	5.5×9.2×5.4	15	15	–9	980	1570	300
	58	10	60	6.6×11×6.5	15	15	–9	1570	2750	375
	64	10	67	6.6×11×6.5	20	20	–13	1670	3140	692
	75	13	78	9×14×8.6	20	20	–13	2160	4020	864
	92	13	98	9×14×8.6	20	20	–13	3820	7940	2020
	106	18	112	11×17.5×10.8	25	25	–13	4710	10000	2520

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMK-M (Stainless Steel Type)

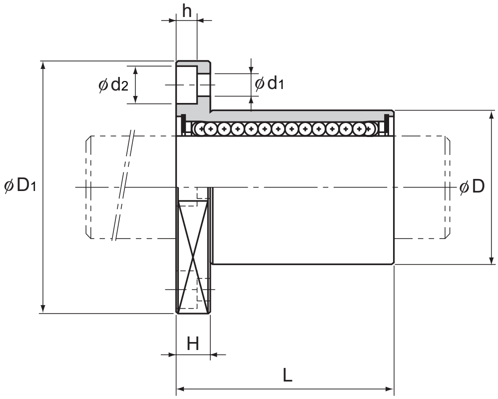


Model LMK-M

Model No. Standard type	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMK 6M	4	6	0 −0.009	12	0 −0.011	19	0 −0.2	28	0 −0.2
LMK 8SM	4	8		15		17		32	
LMK 8M	4	8		15		24		32	
LMK 10M	4	10		19	0 −0.013	29		39	
LMK 12M	4	12		21		30		42	
LMK 13M	4	13		23		32		43	
LMK 16M	5	16		28		37		48	
LMK 20M	5	20	0 −0.010	32	0 −0.016	42		54	
LMK 25M	6	25		40		59	0 −0.3	62	
LMK 30M	6	30		45		64		74	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMK25M UU
Seal attached on both ends of the nut



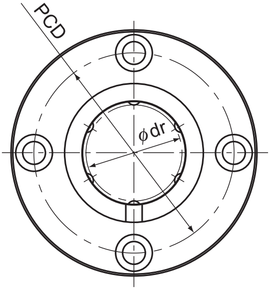
Unit: mm

					Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic load rating		
	K	H	PCD	Mounting hole d_1×d_2×h	µm	µm	µm	C N	C_0 N	Mass g
	22	5	20	3.4×6.5×3.3	12	12	−5	206	265	18.5
	25	5	24	3.4×6.5×3.3	12	12	−5	176	225	23
	25	5	24	3.4×6.5×3.3	12	12	−5	265	402	29
	30	6	29	4.5×8×4.4	12	12	−5	373	549	61
	32	6	32	4.5×8×4.4	12	12	−5	412	598	56
	34	6	33	4.5×8×4.4	12	12	−7	510	775	75
	37	6	38	4.5×8×4.4	12	12	−7	775	1180	104
	42	8	43	5.5×9.2×5.4	15	15	−9	863	1370	145
	50	8	51	5.5×9.2×5.4	15	15	−9	980	1570	300
	58	10	60	6.6×11×6.5	15	15	−9	1570	2750	375

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.

Description of Each Option⇒A-549 **Dimensions⇒B-461**

Model LMF-L



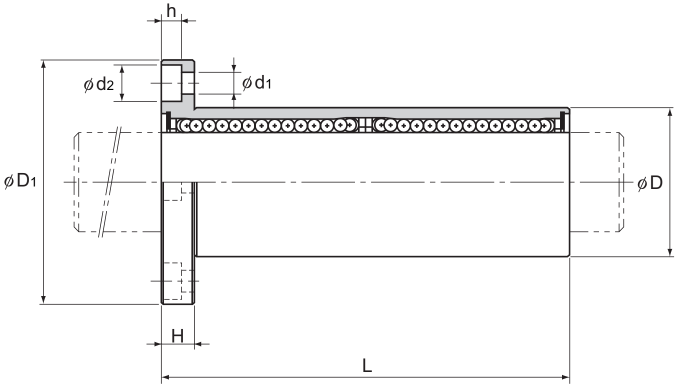
Model LMF-L

Model No. Standard type	Ball rows	Main dimensions Inscribed bore diameter dr	 Tolerance	 Outer diameter D	 Tolerance	 Length L	 Tolerance	 Flange diameter D_1	 Tolerance
LMF 6L	4	6	0 −0.010	12	0 −0.013	35	0 −0.3	28	0 −0.2
LMF 8L	4	8		15		45		32	
LMF 10L	4	10		19	0 −0.016	55		39	
LMF 12L	4	12		21		57		42	
LMF 13L	4	13		23		61		43	
LMF 16L	5	16		28		70		48	
LMF 20L	5	20	0 −0.012	32	0 −0.019	80		54	
LMF 25L	6	25		40		112	0 −0.4	62	
LMF 30L	6	30		45		123		74	
LMF 35L	6	35	0 −0.015	52	0 −0.022	135		82	
LMF 40L	6	40		60		154		96	0 −0.3
LMF 50L	6	50		80		192		116	
LMF 60L	6	60	0 −0.020	90	0 −0.025	211		134	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMF35L UU

Seal attached on both ends of the nut

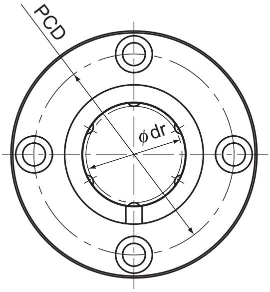


Unit: mm

			Flange perpendicularity	Eccentricity (max)	Radial clearance	Basic load rating		
		Mounting hole			tolerance	C	C_0	Mass
H	PCD	d_1×d_2×h	µm	µm	µm	N	N	g
5	20	3.4×6.5×3.3	15	15	−5	324	529	32
5	24	3.4×6.5×3.3	15	15	−5	431	784	53
6	29	4.5×8×4.4	15	15	−5	588	1100	105
6	32	4.5×8×4.4	15	15	−5	657	1200	100
6	33	4.5×8×4.4	15	15	−7	814	1570	130
6	38	4.5×8×4.4	15	15	−7	1230	2350	187
8	43	5.5×9.2×5.4	20	20	−9	1400	2750	260
8	51	5.5×9.2×5.4	20	20	−9	1560	3140	515
10	60	6.6×11×6.5	20	20	−9	2490	5490	655
10	67	6.6×11×6.5	25	25	−13	2650	6270	970
13	78	9×14×8.6	25	25	−13	3430	8040	1560
13	98	9×14×8.6	25	25	−13	6080	15900	3500
18	112	11×17.5×10.8	25	25	−13	7650	20000	4500

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMF-ML (Stainless Steel Type)



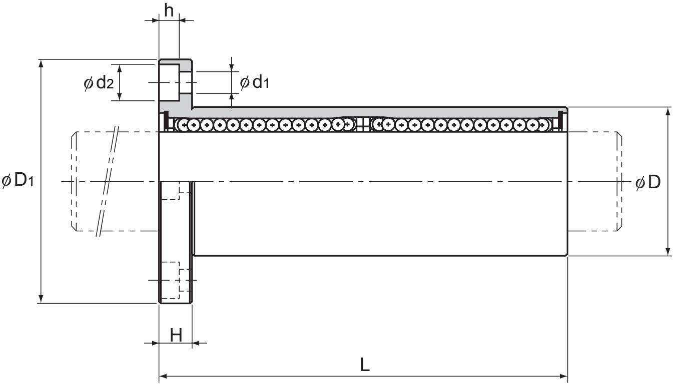
Model LMF-ML

Model No.	Ball	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	rows	dr	Tolerance	D	Tolerance	L	Tolerance	D₁	Tolerance
LMF 6ML	4	6	0 −0.010	12	0 −0.013	35	0 −0.3	28	0 −0.2
LMF 8ML	4	8		15		45		32	
LMF 10ML	4	10		19	0 −0.016	55		39	
LMF 12ML	4	12		21		57		42	
LMF 13ML	4	13		23		61		43	
LMF 16ML	5	16		28		70		48	
LMF 20ML	5	20	0 −0.012	32	0 −0.019	80		54	
LMF 25ML	6	25		40		112	0 −0.4	62	
LMF 30ML	6	30		45		123		74	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMF13ML UU

Seal attached on both ends of the nut



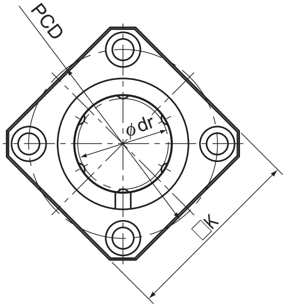
Unit: mm

				Flange perpendicularity	Eccentricity (max)	Radial clearance	Basic load rating		
			Mounting hole			tolerance	C	C_0	Mass
	H	PCD	d_1×d_2×h	µm	µm	µm	N	N	g
	5	20	3.4×6.5×3.3	15	15	–5	324	529	32
	5	24	3.4×6.5×3.3	15	15	–5	431	784	53
	6	29	4.5×8×4.4	15	15	–5	588	1100	105
	6	32	4.5×8×4.4	15	15	–5	657	1200	100
	6	33	4.5×8×4.4	15	15	–7	814	1570	130
	6	38	4.5×8×4.4	15	15	–7	1230	2350	187
	8	43	5.5×9.2×5.4	20	20	–9	1400	2750	260
	8	51	5.5×9.2×5.4	20	20	–9	1560	3140	515
	10	60	6.6×11×6.5	20	20	–9	2490	5490	655

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMK-L



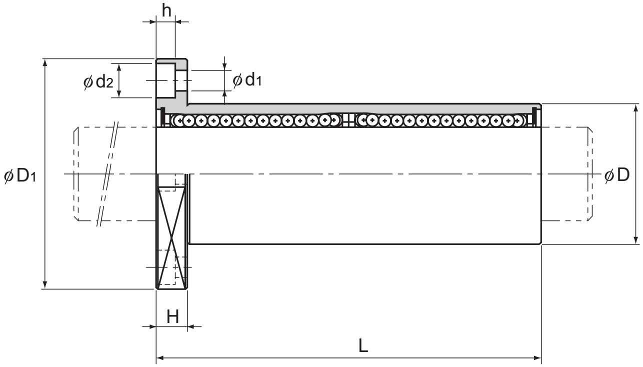
Model LMK-L

Model No.	Ball	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	rows	dr	Tolerance	D	Tolerance	L	Tolerance	D₁	Tolerance
LMK 6L	4	6	0 −0.010	12	0 −0.013	35	0 −0.3	28	0 −0.2
LMK 8L	4	8		15		45		32	
LMK 10L	4	10		19	0 −0.016	55		39	
LMK 12L	4	12		21		57		42	
LMK 13L	4	13		23		61		43	
LMK 16L	5	16		28		70		48	
LMK 20L	5	20	0 −0.012	32	0 −0.019	80		54	
LMK 25L	6	25		40		112	0 −0.4	62	
LMK 30L	6	30		45		123		74	
LMK 35L	6	35	0 −0.015	52	0 −0.022	135		82	
LMK 40L	6	40		60		154		96	0 −0.3
LMK 50L	6	50		80		192		116	
LMK 60L	6	60	0 −0.020	90	0 −0.025	211		134	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMK50L UU

Seal attached on both ends of the nut

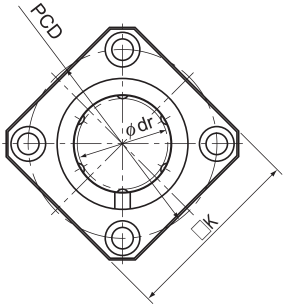


Unit: mm

					Flange perpendicularity	Eccentricity (max)	Radial clearance	Basic load rating		
				Mounting hole			tolerance	C	C₀	Mass
	K	H	PCD	d₁×d₂×h	µm	µm	µm	N	N	g
	22	5	20	3.4×6.5×3.3	15	15	−5	324	529	26
	25	5	24	3.4×6.5×3.3	15	15	−5	431	784	46
	30	6	29	4.5×8×4.4	15	15	−5	588	1100	88
	32	6	32	4.5×8×4.4	15	15	−5	657	1200	82
	34	6	33	4.5×8×4.4	15	15	−7	814	1570	108
	37	6	38	4.5×8×4.4	15	15	−7	1230	2350	160
	42	8	43	5.5×9.2×5.4	20	20	−9	1400	2750	230
	50	8	51	5.5×9.2×5.4	20	20	−9	1560	3140	475
	58	10	60	6.6×11×6.5	20	20	−9	2490	5490	575
	64	10	67	6.6×11×6.5	25	25	−13	2650	6270	870
	75	13	78	9×14×8.6	25	25	−13	3430	8040	1380
	92	13	98	9×14×8.6	25	25	−13	6080	15900	3300
	106	18	112	11×17.5×10.8	25	25	−13	7650	20000	4060

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMK-ML (Stainless Steel Type)



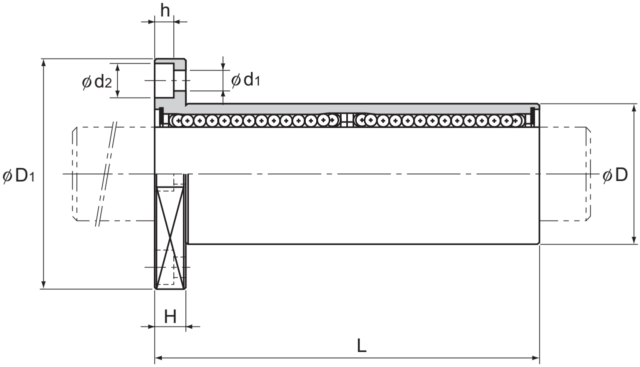
Model LMK-ML

Model No. Standard type	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMK 6ML	4	6	0 −0.010	12	0 −0.013	35	0 −0.3	28	0 −0.2
LMK 8ML	4	8		15		45		32	
LMK 10ML	4	10		19	0 −0.016	55		39	
LMK 12ML	4	12		21		57		42	
LMK 13ML	4	13		23		61		43	
LMK 16ML	5	16		28		70		48	
LMK 20ML	5	20	0 −0.012	32	0 −0.019	80		54	
LMK 25ML	6	25		40		112	0 −0.4	62	
LMK 30ML	6	30		45		123		74	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMK8ML UU

Seal attached on both ends of the nut



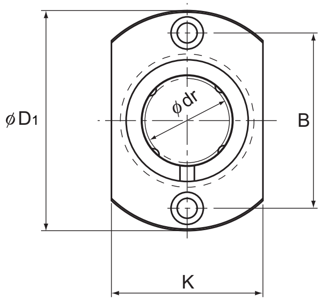
Unit: mm

					Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic load rating		Mass
	K	H	PCD	Mounting hole $d_1×d_2×h$	µm	µm	µm	C N	C_0 N	g
	22	5	20	3.4×6.5×3.3	15	15	−5	324	529	26
	25	5	24	3.4×6.5×3.3	15	15	−5	431	784	46
	30	6	29	4.5×8×4.4	15	15	−5	588	1100	88
	32	6	32	4.5×8×4.4	15	15	−5	657	1200	82
	34	6	33	4.5×8×4.4	15	15	−7	814	1570	108
	37	6	38	4.5×8×4.4	15	15	−7	1230	2350	160
	42	8	43	5.5×9.2×5.4	20	20	−9	1400	2750	230
	50	8	51	5.5×9.2×5.4	20	20	−9	1560	3140	475
	58	10	60	6.6×11×6.5	20	20	−9	2490	5490	575

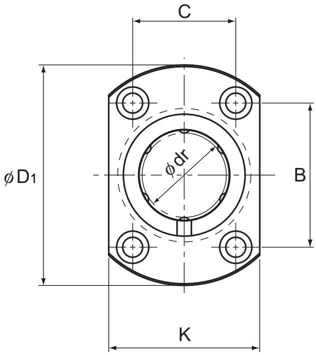
Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMH



Models LMH6 to 13



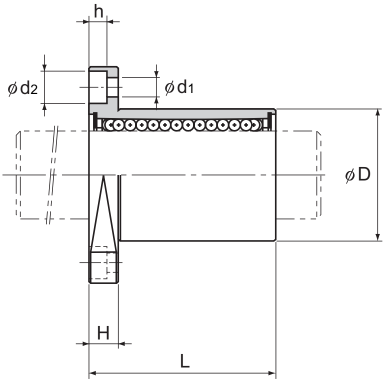
Models LMH16 to 30

Model No.	Ball	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	rows	dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMH 6	4	6	0 −0.009	12	0 −0.011	19	0 −0.2	28	0 −0.2
LMH 8	4	8		15		24		32	
LMH 10	4	10		19	0 −0.013	29		39	
LMH 12	4	12		21		30		42	
LMH 13	4	13		23		32		43	
LMH 16	5	16		28		37		48	
LMH 20	5	20	0 −0.010	32	0 −0.016	42		54	
LMH 25	6	25		40		59	0 −0.3	62	
LMH 30	6	30		45		64		74	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMH16 UU

Seal attached on both ends of the nut

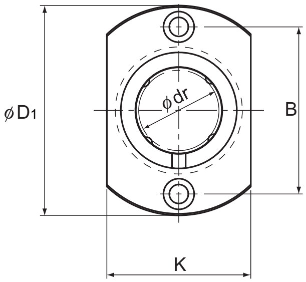


Unit: mm

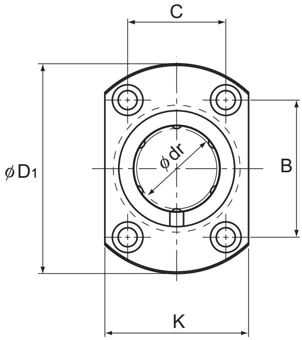
						Flange	Eccentricity (max)	Radial clearance	Basic load rating		
					Mounting hole	perpendicularity		tolerance	C	C_0	Mass
	K	H	B	C	$d_1 \times d_2 \times h$	µm	µm	µm	N	N	g
	18	5	20	—	3.4×6.5×3.3	12	12	−5	206	265	18
	21	5	24	—	3.4×6.5×3.3	12	12	−5	265	402	28
	25	6	29	—	4.5×8×4.4	12	12	−5	373	549	50
	27	6	32	—	4.5×8×4.4	12	12	−5	412	598	55
	29	6	33	—	4.5×8×4.4	12	12	−7	510	775	70
	34	6	31	22	4.5×8×4.4	12	12	−7	775	1180	95
	38	8	36	24	5.5×9.2×5.4	15	15	−9	863	1370	150
	46	8	40	32	5.5×9.2×5.4	15	15	−9	980	1570	275
	51	10	49	35	6.6×11×6.5	15	15	−9	1570	2750	350

Description of Each Option⇒A-549 Dimensions⇒B-461

Model LMH-L



Models LMH6L to 13L



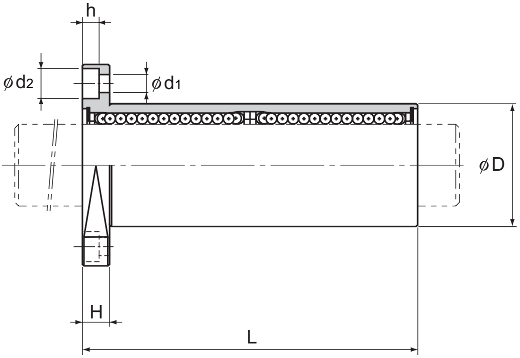
Models LMH16L to 30L

Model No.	Ball	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
Standard type	rows	dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMH 6L	4	6	0 −0.010	12	0 −0.013	35	0 −0.3	28	0 −0.2
LMH 8L	4	8		15		45		32	
LMH 10L	4	10		19	0 −0.016	55		39	
LMH 12L	4	12		21		57		42	
LMH 13L	4	13		23		61		43	
LMH 16L	5	16		28		70		48	
LMH 20L	5	20	0 −0.012	32	0 −0.019	80		54	
LMH 25L	6	25		40		112	0 −0.4	62	
LMH 30L	6	30		45		123		74	

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LMH20L UU

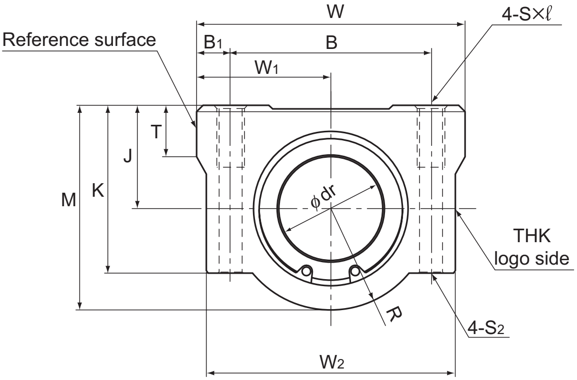
Seal attached on both ends of the nut



Unit: mm

K	H	B	C	Mounting hole d_1×d_2×h	Flange perpendicularity µm	Eccentricity (max) µm	Radial clearance tolerance µm	Basic load rating C N	Basic load rating C_0 N	Mass g
18	5	20	—	3.4×6.5×3.3	15	15	−5	324	529	28
21	5	24	—	3.4×6.5×3.3	15	15	−5	431	784	40
25	6	29	—	4.5×8×4.4	15	15	−5	588	1100	75
27	6	32	—	4.5×8×4.4	15	15	−5	657	1200	82
29	6	33	—	4.5×8×4.4	15	15	−7	814	1570	107
34	6	31	22	4.5×8×4.4	15	15	−7	1230	2350	143
38	8	36	24	5.5×9.2×5.4	20	20	−9	1400	2750	225
46	8	40	32	5.5×9.2×5.4	20	20	−9	1560	3140	450
51	10	49	35	6.6×11×6.5	20	20	−9	2490	5490	575

Models SC6 to 30



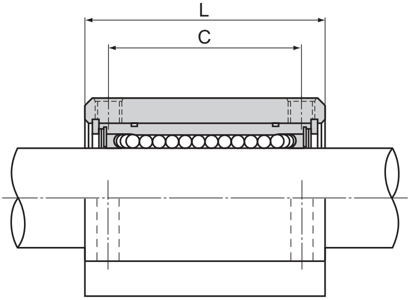
Models SC6 to 30

Model No.	Outer dimensions			LM casing dimensiones						
	Height	Width	Length	Mounting hole position			Tap	Through bolt	Center height	
	M	W	L	B	B_1	C	S×ℓ	model No,S_2	J ±0.02	W_1 ±0.02
SC 6UU	18	30	25	20	5	15	M4×8	M3	9	15
SC 8UU	22	34	30	24	5	18	M4×8	M3	11	17
SC 10UU	26	40	35	28	6	21	M5×12	M4	13	20
SC 12UU	29	42	36	30.5	5.75	26	M5×12	M4	15	21
SC 13UU	30	44	39	33	5.5	26	M5×12	M4	15	22
SC 16UU	38.5	50	44	36	7	34	M5×12	M4	19	25
SC 20UU	42	54	50	40	7	40	M6×12	M5	21	27
SC 25UU	51.5	76	67	54	11	50	M8×18	M6	26	38
SC 30UU	59.5	78	72	58	10	58	M8×18	M6	30	39

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
A stainless steel Linear Bushing model LM-MG, which is highly corrosion resistant, can also be incorporated at your request.

Example of Model Number for Use in Combination with Linear Bushing Units

Linear Bushing to be combined	Examle of model No.	
Both end attached with seal	SC 13UU	Standard stock
Without seal	SC 13	Build to order
Made of stainless steel; both end attached with seal	SC 13MUU	Build to order

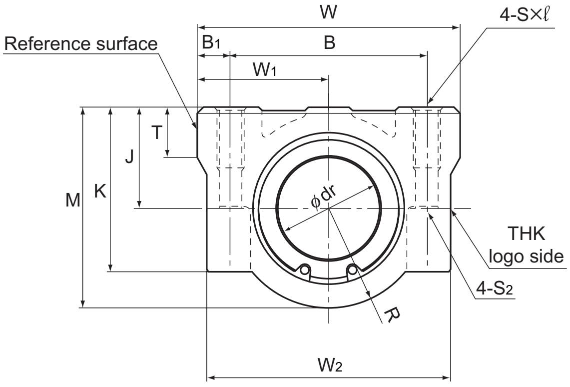


Unit: mm

					Inscribed bore diameter		Model No. of Linear Bushing to be combined	Basic load rating		Unit
	K	W_2	T	R	dr	Tolerance		C N	C_0 N	Mass g
	15	28	6	9	6	0 −0.009	LM6UU	206	265	34
	18	32	6	11	8		LM8UU	265	402	52
	22	37	8	13	10		LM10UU	373	549	92
	25	39	8	14	12		LM12UU	412	598	102
	26	41	8	15	13		LM13UU	510	775	123
	35	46	9	19.5	16		LM16UU	775	1180	189
	36	52	11	21	20	0 −0.010	LM20UU	863	1370	237
	41	68	12	25.5	25		LM25UU	980	1570	555
	49	72	15	29.5	30		LM30UU	1570	2750	685

Description of Each Option⇒A-549 Dimensions⇒B-461

Models SC35 to 50



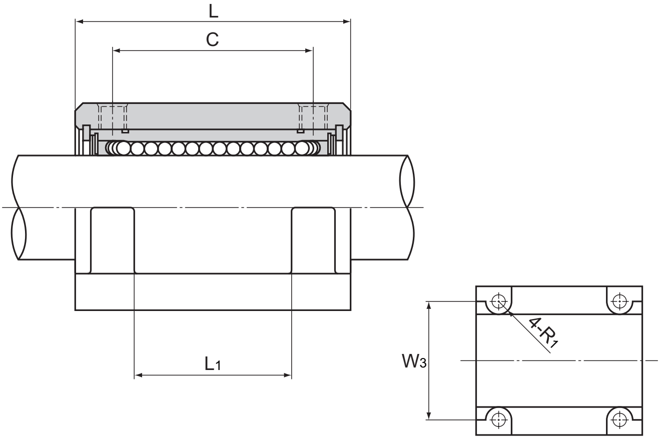
Models SC35 to 50

Model No.	Outer dimensions			LM casing dimensiones							
	Height	Width	Length	Mounting hole position			Tap	Through bolt	Center height		
	M	W	L	B	B_1	C	S×ℓ	model No,S_2	J ±0.02	W_1 ±0.02	K
SC 35UU	68	90	80	70	10	60	M8×18	M6	34	45	54
SC 40UU	78	102	90	80	11	60	M10×25	M8	40	51	62
SC 50UU	102	122	110	100	11	80	M10×25	M8	52	61	80

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
A stainless steel Linear Bushing model LM-MG, which is highly corrosion resistant, can also be incorporated at your request.
(Model SC50 does not include a stainless type.)

Example of Model Number for Use in Combination with Linear Bushing Units

Linear Bushing to be combined	Examle of model No.	
Both end attached with seal	SC 40UU	Standard stock
Without seal	SC 40	Build to order
Made of stainless steel; both end attached with seal	SC 40MUU	Build to order

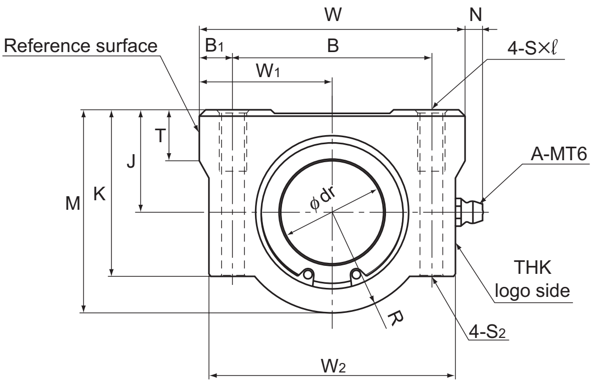


Unit: mm

									Model No. of Linear Bushing to be combined	Basic load rating		Unit
	W₂	W₃	L₁	T	R	R₁	Inscribed bore diameter			C	C₀	Mass
							dr	Tolerance		N	N	g
	85	60	42	18	34	5	35	0 −0.012	LM35UU	1670	3140	1100
	96	80	44	20	38	8	40		LM40UU	2160	4020	1600
	116	100	64	25	50	8	50		LM50UU	3820	7940	3350

Description of Each Option⇒A-549 Dimensions⇒B-461

Model SL



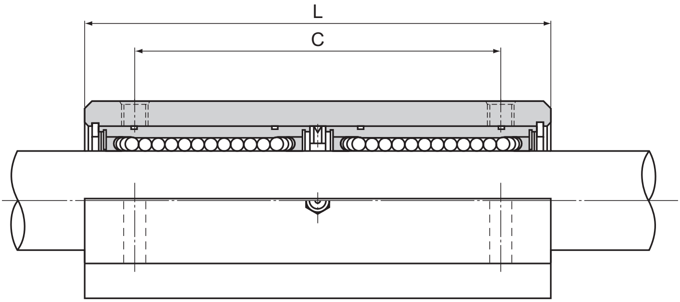
Model SL

Model No.	Outer dimensions			LM casing dimensiones						
	Height	Width	Length	Mounting hole position			Tap	Through bolt	Center height	
	M	W	L	B	B_1	C	S×ℓ	model No,S_2	J ±0.02	W_1 ±0.02
SL 6UU	18	30	48	20	5	36	M4×8	M3	9	15
SL 8UU	22	34	58	24	5	42	M4×8	M3	11	17
SL 10UU	26	40	68	28	6	46	M5×12	M4	13	20
SL 12UU	29	42	70	30.5	5.75	50	M5×12	M4	15	21
SL 13UU	30	44	75	33	5.5	50	M5×12	M4	15	22
SL 16UU	38.5	50	85	36	7	60	M5×12	M4	19	25
SL 20UU	42	54	96	40	7	70	M6×12	M5	21	27
SL 25UU	51.5	76	130	54	11	100	M8×18	M6	26	38
SL 30UU	59.5	78	140	58	10	110	M8×18	M6	30	39

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
A stainless steel Linear Bushing model LM-MG, which is highly corrosion resistant, can also be incorporated at your request.

Example of Model Number for Use in Combination with Linear Bushing Units

Linear Bushing to be combined	Examle of model No.	
Both end attached with seal	SL 13UU	Standard stock
Without seal	SL 13	Build to order
Made of stainless steel; both end attached with seal	SL 13MUU	Build to order

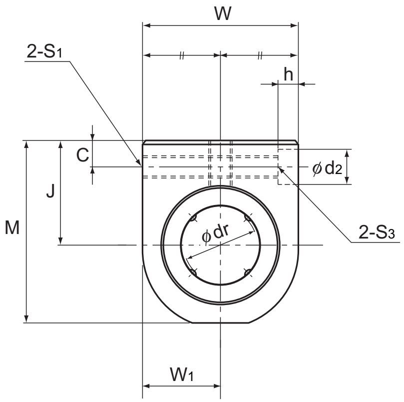


Unit: mm

						Inscribed bore diameter		Model No. of Linear Bushing to be combined	Basic load rating		Unit
									C	C_0	Mass
	K	W_2	T	R	N	dr	Tolerance		N	N	g
	15	28	6	9	7	6	0 −0.009	LM6U	324	529	68
	18	32	6	11	7	8		LM8U	431	784	105
	22	37	8	13	7	10		LM10U	588	1100	185
	25	39	8	14	6.5	12		LM12U	657	1200	205
	26	41	8	15	6.5	13		LM13U	814	1570	242
	35	46	9	19.5	6	16		LM16U	1230	2350	403
	36	52	11	21	7	20	0 −0.010	LM20U	1400	2750	520
	41	68	12	25.5	4	25		LM25U	1560	3140	1120
	49	72	15	29.5	5	30		LM30U	2490	5490	1440

Description of Each Option⇒A-549 Dimensions⇒B-461

Model SH



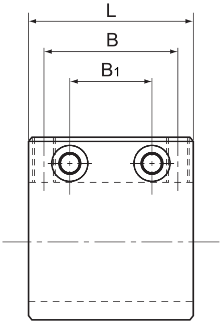
Model SH

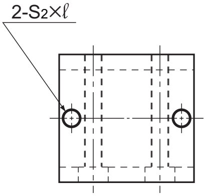
Model No.	Outer dimensions			LM casing dimensiones					
	Height	Width	Length	Mounting hole position			Tap		Through bolt
	M	W	L	B	B_1	C	S_1	$S_2 \times \ell$	model No,S_3
SH 3UU	14	10	13	—	8	3	M3	M3×5.5	M2
SH 4UU	16	12	15	—	10	3	M3	M3×6	M2
SH 5UU	18	14	17	—	12	3	M3	M3×6	M2
SH 6UU	22	16	24	18	9	5	M4	M4×8	M3
SH 8UU	26	20	27	20	10	5	M4	M5×8.5	M3
SH 10UU	32	26	35	27	15	6	M5	M6×9.5	M4
SH 12UU	34	28	35	27	15	6	M5	M6×9.5	M4
SH 13UU	36	30	36	28	16	6	M5	M6×9.5	M4
SH 16UU	42	36	40	32	18	6	M5	M6×10	M4
SH 20UU	49	42	44	36	22	7	M6	M6×12	M5

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
A stainless steel Linear Bushing model LM-MG, which is highly corrosion resistant, can also be incorporated at your request.

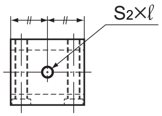
Example of Model Number for Use in Combination with Linear Bushing Units

Linear Bushing to be combined	Examle of model No.	
Both end attached with seal	SH 13UU	Standard stock
Without seal	SH 13	Build to order
Made of stainless steel; both end attached with seal	SH 13MUU	Build to order





Top surface of models SH6 to SH20



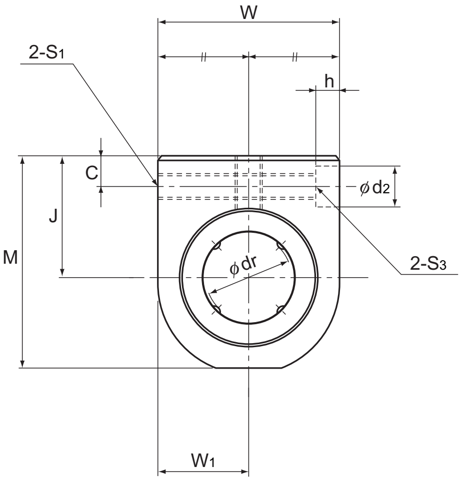
Top surface of models SH3 to SH5

Unit: mm

	Center height J ±0.02	W_1 ±0.02	d_2	h	Inscribed bore diameter		Model No. of Linear Bushing to be combined	Basic load rating		Unit
					dr	Tolerance		C	C_0	Mass
								N	N	g
	9	5	4.2	1.5	3	0 −0.008	LM3UU	88.2	108	4.5
	10	6	4.2	1.5	4		LM4UU	88.2	127	7
	11	7	4.2	1.5	5		LM5UU	167	206	11
	14	8	6.5	3.3	6	0 −0.009	LM6UU	206	265	21.6
	16	10	6.5	3.3	8		LM8UU	265	402	32
	19	13	8	4.4	10		LM10UU	373	549	65
	20	14	8	4.4	12		LM12UU	412	598	81
	21	15	8	4.4	13		LM13UU	510	775	90
	24	18	8	4.4	16		LM16UU	775	1180	150
	28	21	9.5	5.4	20	0 −0.010	LM20UU	863	1370	215

Description of Each Option⇒A-549 Dimensions⇒B-461

Model SH-L



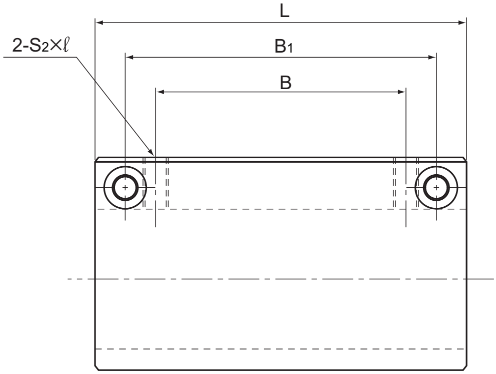
Model SH-L

Model No.	Outer dimensions			LM casing dimensiones					
	Height	Width	Length	Mounting hole position			Tap		Through bolt
	M	W	L	B	B_1	C	S_1	$S_2 \times \ell$	model No,S_3
SH 3LUU	14	10	23	10	18	3	M3	M3×5.5	M2
SH 4LUU	16	12	27	14	22	3	M3	M3×6	M2
SH 5LUU	18	14	32	18	26	3	M3	M3×6	M2
SH 6LUU	22	16	40	20	30	5	M4	M4×8	M3
SH 8LUU	26	20	52	30	42	5	M4	M5×8.5	M3
SH 10LUU	32	26	60	36	50	6	M5	M6×9.5	M4
SH 12LUU	34	28	62	36	50	6	M5	M6×9.5	M4
SH 13LUU	36	30	66	40	54	6	M5	M6×9.5	M4
SH 16LUU	42	36	76	52	66	6	M5	M6×10	M4
SH 20LUU	49	42	86	58	72	7	M6	M6×12	M5

Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
A stainless steel Linear Bushing model LM-MG, which is highly corrosion resistant, can also be incorporated at your request.

Example of Model Number for Use in Combination with Linear Bushing Units

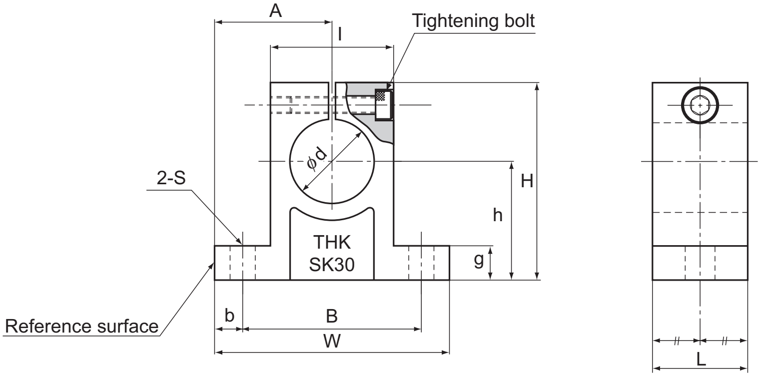
Linear Bushing to be combined	Examle of model No.	
Both end attached with seal	SH 13LUU	Standard stock
Without seal	SH 13L	Build to order
Made of stainless steel; both end attached with seal	SH 13MLUU	Build to order



Unit: mm

						Model No. of Linear Bushing to be combined	Basic load rating		Unit
Center height J ±0.02	W1 ±0.02	d2	h	Inscribed bore diameter			C	C0	Mass
				dr	Tolerance		N	N	g
9	5	4.2	1.5	3	0 −0.008	LM3U	139	216	8.5
10	6	4.2	1.5	4		LM4U	139	254	13
11	7	4.2	1.5	5		LM5U	263	412	22
14	8	6.5	3.3	6	0 −0.009	LM6U	324	529	35
16	10	6.5	3.3	8		LM8U	431	784	65
19	13	8	4.4	10		LM10U	588	1100	125
20	14	8	4.4	12		LM12U	657	1200	155
21	15	8	4.4	13		LM13U	814	1570	190
24	18	8	4.4	16		LM16U	1230	2350	295
28	21	9.5	5.4	20	0 −0.010	LM20U	1400	2750	425

Model SK



Unit: mm

Model No.	Main dimensions													Mass
	H	W	L	B	S	Mounting bolt model No.	h ±0.02	A ±0.05	b	g	l	Shaft diameter d	Tightening bolt model No.	g
SK 10	32.8	42	14	32	5.5	M5	20	21	5	6	18	10	M4	24
SK 12	37.5	42	14	32	5.5	M5	23	21	5	6	20	12	M4	30
SK 13	37.5	42	14	32	5.5	M5	23	21	5	6	20	13	M4	30
SK 16	44	48	16	38	5.5	M5	27	24	5	8	25	16	M4	40
SK 20	51	60	20	45	6.6	M6	31	30	7.5	10	30	20	M5	70
SK 25	60	70	24	56	6.6	M6	35	35	7	12	38	25	M6	130
SK 30	70	84	28	64	9	M8	42	42	10	12	44	30	M6	180
SK 35	83	98	32	74	11	M10	50	49	12	15	50	35	M8	270
SK 40	96	114	36	90	11	M10	60	57	12	15	60	40	M8	420

Dedicated Shafts for Model LM

The LM shaft of the Linear Bushing needs to be manufactured with much consideration for hardness, surface roughness and dimensional accuracy of the shaft since balls roll directly on it.

THK manufactures dedicated LM shafts for the Linear Bushing. See the specification table for standard LM shafts on B-460.

Among other factors, the surface hardness of an LM shaft affects the service life of your Linear Bushing system most significantly. Therefore, take much care in selecting a material and a heat treatment method when assembling the system. In addition, as the surface hardness of the LM shaft greatly affects the service life as stated above, use care in selecting and/or handling a material and heat treatment.

[Material]

Generally, the following materials are used for surface hardening through induction-hardening.

- SUJ2 (JIS G 4805: high-carbon chromium bearing steel)
- SK3 to 6 (JIS G 4401: carbon tool steel)
- S55C (JIS G 4051: carbon steel for machine structural use)

For special applications, martensite stainless steel SUS440C, which is corrosion resistant, may also be used.

[Hardness]

We recommend surface hardness of 58 HRC (≒653 HV) or higher. The depth of the hardened layer is determined by the size of the Linear Bushing; we recommend approximately 2 mm for general use.

[Surface Roughness]

To achieve smooth motion, the surface should preferably be finished to 0.40a or less.

[Dimensions of Hollow LM Shafts]

If a hollow LM shaft is required for purposes such as weight reduction, use the desired material from Table1 for the dimensions of hollow LM shafts that THK keeps in stock.

Models marked with " ＊ " are build-to-order items.

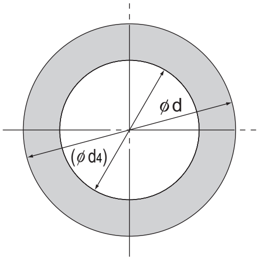


Table1 Dimensions of Hollow LM Shafts

Unit: mm

Supported model numbers	LM shaft outer diameter d	Inner diameter (ϕd_4)	Mass (kg/m)
LM 8	8	3	0.4
LM 10	10	4	0.6
LM 12	12	6	0.7
LM 13	13	7	0.8
LM 16	16	9	1.1
LM 20	20	10	1.9
LM 20	20	14	1.3
LM 25	25	15	2.5
LM 30	30	16	4
LM 35	35	20	5.1
＊ LM 38	38	22	6
LM 40	40	22	6.9
LM 50	50	25	11.6
LM 60	60	32	16
＊ LM 80	80	52.5	22.6
＊ LM 100	100	67.5	33.7

Standard LM Shafts

THK manufactures high quality, dedicated LM shafts for Linear Bushing model LM series.

Model number coding

SF25 g6 -500L K

SF25: Model number
g6: LM shaft outer diameter tolerance
-500L: Overall LM shaft length (in mm)
K: Special symbol*
no symbol: solid shaft K: standard hollow shaft
M: special material F: with surface treatment

*If two or more symbols are given, they are shown in an alphabetical order.

(1) [Major materials]
THK5SP (THK standard material)
SUJ2 (high-carbon chromium bearing steel)
[Hardness]
HRC58 to 64
[Hardened layer depth]
0.8 to 2.5mm(varies with shaft diameter)
[Surface roughness]
0.20a to 0.40a
[Straightness of the LM shaft]
50 μm/300 mm or less

(2) Precision-grade LM shafts with shaft diameter tolerance of g5 or h5 are also manufactured as standard.

(3) Corrosion resistance, martensite stainless steel LM shafts are also available.

(4) When asking an estimate or placing an order, refer to the model number coding shown on the left.

Model No.	Shaft diameter		Overall LM shaft length: L mm														Supported model numbers
	d	Tolerance g6μm	100	200	300	400	500	600	700	800	1000	1200	1300	1500	2000	3000	
SF 3	3	−2 −8	◎	◎													LM 3
SF 4	4	−4 −12	◎	◎													LM 4
SF 5	5		◎	◎	◎												LM 5
SF 6	6		◎	◎	◎	◎											LM 6
SF 8	8	−5 −14	◎	◎	◎	◎	◎										LM 8, 8S
SF 10	10		◎	◎	◎	◎	◎	◎	◎	◎							LM 10
SF 12	12	−6 −17		◎	◎	◎	◎	◎		◎	◎						LM 12
SF 13	13		◎	◎	◎	◎	◎	◎	◎	◎	◎						LM 13
SF 16	16		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎		◎			LM 16
SF 20	20	−7 −20		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎			LM 20
SF 25	25			◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎			LM 25
SF 30	30				◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎		LM 30
SF 35	35	−9 −25					◎	◎		◎	◎	◎		◎	◎		LM 35
SF 38	38							○			○	○			○		LM 38
SF 40	40						◎	◎	◎	◎	◎	◎	◎	◎	◎	○	LM 40
SF 50	50						◎	◎		◎	◎	◎	◎	◎	◎	○	LM 50
SF 60	60	−10 −29									○	○			○	○	LM 60
SF 80	80										○	○			○	○	LM 80
SF 100	100	−12 −34									○	○			○	○	LM 100

Note) ◎ indicates standard stock; ○ indicates semi-standard stock.

Felt Seal Model FLM

Linear Bushing model LM series include types equipped with a special synthetic rubber seal (LM···UU, U). If there is a need for additional contamination protection, or a need to lower the seal resistance, use the felt seal model FLM. (See Table1.)

[Dimensions of the Felt Seal]

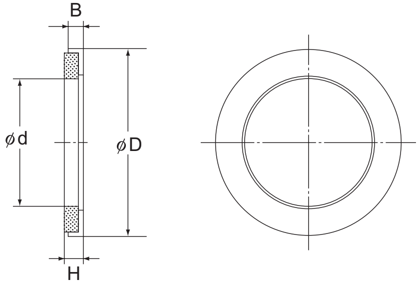


Table1 Major Dimensions of FLM

Unit: mm

Supported model numbers	Main dimensions				Suboprted linear bushing model
	d	D	B	H	
FLM 6	6	12	2	2	LM 6
FLM 8	8	15	2	2	LM 8
FLM 10	10	19	3	3	LM 10
FLM 12	12	21	3	3	LM 12
FLM 13	13	23	3	3	LM 13
FLM 16	16	28	4	5	LM 16
FLM 20	20	32	4	5	LM 20
FLM 25	25	40	5	6	LM 25
FLM 30	30	45	5	5	LM 30
FLM 35	35	52	5	6	LM 35
FLM 38	38	57	5	6	LM 38
FLM 40	40	60	5	6	LM 40
FLM 50	50	80	10	11	LM 50
FLM 60	60	90	10	11	LM 60
FLM 80	80	120	10	11	LM 80
FLM 100	100	150	10	11	LM 100

LM Stroke

THK General Catalog

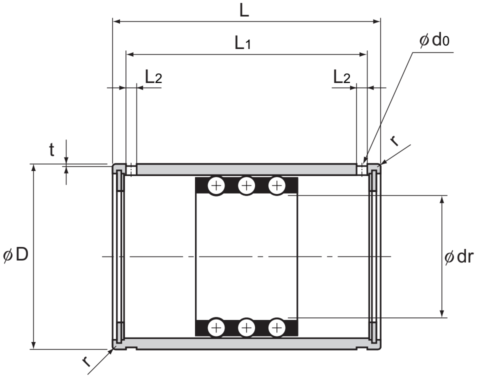
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

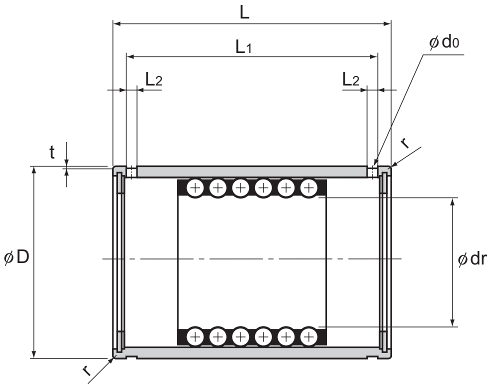
* Please see the separate "A Technical Descriptions of the Products".

Models ST / ST-B



Model ST
(For light load)

Model No.	Maximum stroke				
		Inscribed bore diameter		Outer diameter	
		dr	Tolerance	D	Tolerance
ST 6	14	6	+0.018 +0.010	12	0 −0.008
ST 8	24	8	+0.022 +0.013	15	
ST 8B	8				
ST 10	30	10		19	0 −0.009
ST 10B	8				
ST 12	32	12	+0.027 +0.016	23	
ST 12B	8				
ST 16	40	16		28	
ST 16B	16				
ST 20	54	20	+0.033 +0.020	32	0 −0.011
ST 20B	28				
ST 25	54	25		37	
ST 25B	28				
ST 30	82	30		45	
ST 30B	44				
ST 35	92	35	+0.041 +0.025	52	0 −0.013
ST 35B	54				



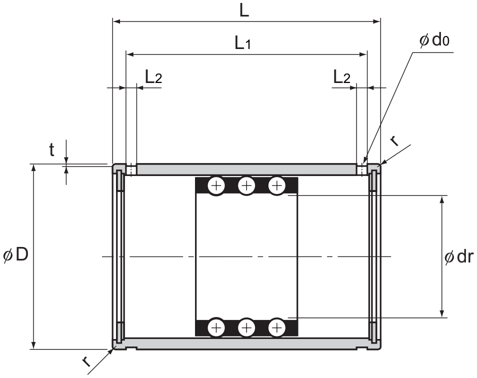
Model ST-B

(For medium load)

Unit: mm

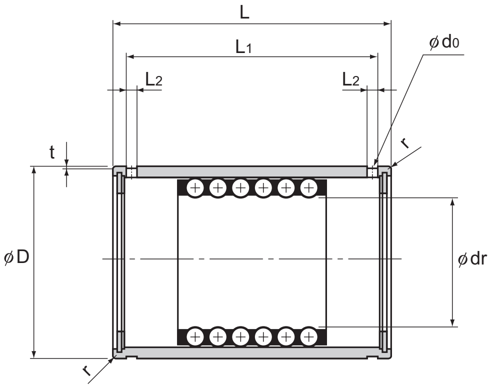
	Length							Basic dynamic load rating	Basic static load rating	Mass
	L	Tolerance	L_1	L_2	t	d_0	r	C kN	C_0 kN	g
	19	0 −0.2	13.5	1.1	0.25	—	0.3	0.98	0.23	8
	24		20.1	1.5	0.5	1.5	0.5	0.98 2.06	0.27 0.55	16.4 17.6
	30		25.7	1.5	0.5	1.5	0.5	2.35 4.61	0.62 1.27	31.5 34.5
	32		27.5	1.5	0.5	1.5	0.5	4.02 8.14	1.08 2.25	47 53.5
	37		32.1	1.5	0.5	1.5	0.5	4.02 8.04	1.27 2.65	77 85
	45		39.8	2	0.5	2	0.5	4.12 8.33	1.57 3.24	109 120
	45	0 −0.3	39.8	2	0.5	2	1	4.12 8.14	1.76 3.63	128 142
	65		58.5	2.5	0.5	2.5	1	9.31 18.7	4.12 8.14	240 275
	70		63.5	2.5	0.7	2.5	1.5	9.41 18.7	4.51 9.02	370 410

Models ST / ST-B



Model ST
(For light load)

Model No.	Maximum stroke				
		Inscribed bore diameter		Outer diameter	
		dr	Tolerance	D	Tolerance
ST 40 ST 40B	108 66	40	+0.041 +0.025	60	0 −0.013
ST 45 ST 45B	108 66	45		65	
ST 50 ST 50B	138 88	50		72	
ST 55 ST 55B	138 88	55	+0.049 +0.030	80	
ST 60 ST 60B	138 88	60		85	0 −0.015
ST 70 ST 70B	138 88	70		95	
ST 80 ST 80B	132 76	80		110	
ST 90 ST 90B	132 76	90	+0.058 +0.036	120	
ST 100 ST 100B	132 76	100		130	0 −0.018

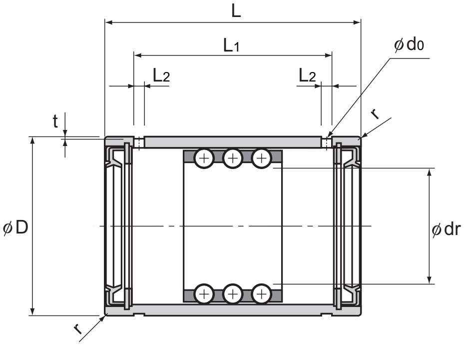


Model ST-B
(For medium load)

Unit: mm

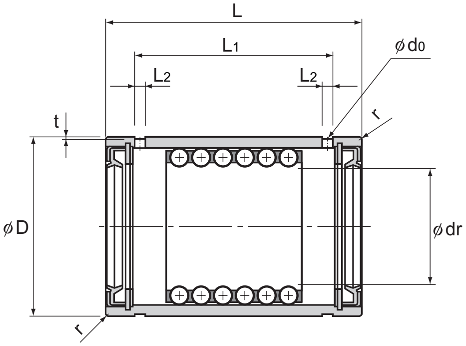
	Length							Basic dynamic load rating	Basic static load rating	Mass
	L	Tolerance	L_1	L_2	t	d_0	r	C kN	C_0 kN	g
	80	0 −0.3	73.3	2.5	0.7	2.5	1.5	12.5 25	6.18 12.4	570 635
	80		73.3	2.5	0.7	2.5	1.5	12.6 25.2	6.76 13.5	625 695
	100		92.4	3	1	3	1.5	16.3 32.5	8.82 17.7	910 1020
	100		92.4	3	1	3	2	16.6 33	9.71 19.3	1270 1380
	100		92.4	3	1	3	2	16.8 33.6	10.5 21	1360 1480
	100	0 −0.4	92.4	3	1	3	2	16.9 33.8	11.7 23.3	1530 1670
	100		92	3	1.5	3	2	21.3 42.5	15.3 30.6	2220 2430
	100		92	3	1.5	3	2	21.7 43.3	16.9 33.7	2440 2670
	100		92	3	1.5	3	2	22 43.9	18.3 36.8	2670 2910

Models ST…UU/ST…UUB



Model ST…UU
(For light load)

Model No.	Maximum stroke				
		Inscribed bore diameter		Outer diameter	
		dr	Tolerance	D	Tolerance
ST 8UU	14	8	+0.022 +0.013	15	0 −0.008
ST 10UU	16	10		19	0 −0.009
ST 12UU	17	12	+0.027 +0.016	23	
ST 16UU	24	16		28	
ST 20UU ST 20UUB	32 12	20	+0.033 +0.020	32	0 −0.011
ST 25UU ST 25UUB	32 12	25		37	
ST 30UU ST 30UUB	65 27	30		45	
ST 35UU ST 35UUB	75 37	35	+0.041 +0.025	52	0 −0.013
ST 40UU ST 40UUB	91 49	40		60	
ST 45UU ST 45UUB	91 49	45		65	

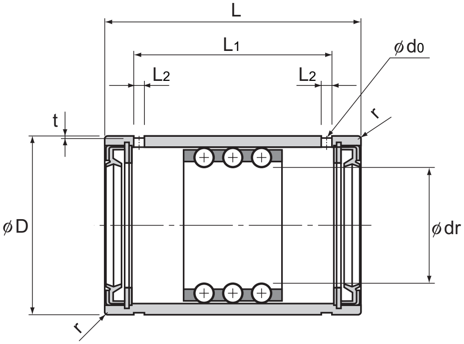


Model ST···UUB
(For medium load)

Unit: mm

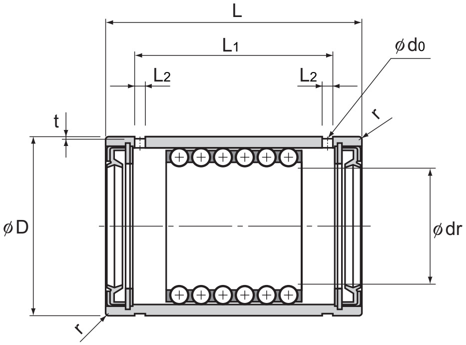
	Length L	Length Tolerance	L1	L2	t	d0	r	Basic dynamic load rating C kN	Basic static load rating C0 kN	Mass g
	24	0 −0.2	15.3	1.5	0.5	1.5	0.5	0.98	0.27	17
	30		18.5	1.5	0.5	1.5	0.5	2.35	0.62	31
	32		20.1	1.5	0.5	1.5	0.5	4.02	1.08	49
	37		24.1	1.5	0.5	1.5	0.5	4.02	1.27	80
	45		30.8	2	0.5	2	0.5	4.12 8.33	1.57 3.24	112 125
	45	0 −0.3	30.8	2	0.5	2	1	4.12 8.14	1.76 3.63	132 145
	65		50.1	2.5	0.5	2.5	1	9.31 18.7	4.12 8.14	245 280
	70		55.1	2.5	0.7	2.5	1.5	9.41 18.7	4.51 9.02	375 420
	80		64.9	2.5	0.7	2.5	1.5	12.5 25	6.18 12.4	580 640
	80		64.9	2.5	0.7	2.5	1.5	12.6 25.2	6.76 13.5	635 705

Models ST···UU/ST···UUB



Model ST···UU
(For light load)

Model No.	Maximum stroke				
		Inscribed bore diameter		Outer diameter	
		dr	Tolerance	D	Tolerance
ST 50UU ST 50UUB	120 70	50	+0.041 +0.025	72	0 −0.013
ST 55UU ST 55UUB	120 70	55	+0.049 +0.030	80	
ST 60UU ST 60UUB	120 70	60		85	0 −0.015
ST 70UU ST 70UUB	120 70	70		95	
ST 80UU ST 80UUB	114 58	80		110	
ST 90UU ST 90UUB	114 58	90	+0.058 +0.036	120	
ST 100UU ST 100UUB	114 58	100		130	0 −0.018



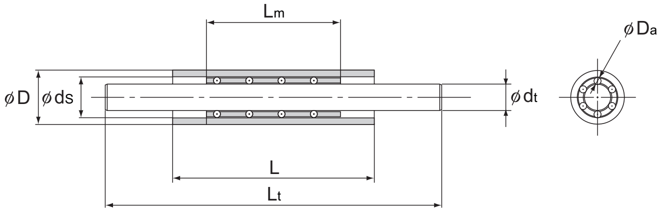
Model ST···UUB

(For medium load)

Unit: mm

	Length							Basic dynamic load rating	Basic static load rating	Mass
	L	Tolerance	L_1	L_2	t	d_0	r	C kN	C_0 kN	g
	100	0 −0.3	83.4	3	1	3	1.5	16.3 32.5	8.82 17.7	920 1030
	100		83.4	3	1	3	2	16.6 33	9.71 19.3	1280 1400
	100		83.4	3	1	3	2	16.8 33.6	10.5 21	1370 1490
	100	0 −0.4	83.4	3	1	3	2	16.9 33.8	11.7 23.3	1540 1680
	100		83	3	1.5	3	2	21.3 42.5	15.3 30.6	2240 2450
	100		83	3	1.5	3	2	21.7 43.3	16.9 33.7	2470 2700
	100		83	3	1.5	3	2	22 43.9	18.3 36.8	2700 2940

Model MST



Combined model No.	Ball cage					Nut	
	Model No.	Da	Lm (A)	Permissible load C_0 N	Mass g	Model No.	D
MST 3-A･B･C	M3510 M3515 M3520	1	10 15 20	68.6 98 137	0.7 1.1 1.4	S5710 S5720 S5730	7 $^{\ 0}_{-0.006}$
MST 4-A･B･C	M4610 M4615 M4620	1	10 15 20	78.4 118 157	0.9 1.4 1.9	S6810 S6820 S6830	8 $^{\ 0}_{-0.006}$
MST 5-A･B･C	M5710 M5715 M5720	1	10 15 20	98 137 186	1.1 1.7 2.3	S71010 S71020 S71030	10 $^{\ 0}_{-0.006}$
MST 6-A･B･C	M6810 M6815 M6820	1	10 15 20	108 157 216	1.2 2.0 2.6	S81120 S81130 S81140	11 $^{\ 0}_{-0.011}$

Note) If the radial clearance needs to be zero or below, add symbol "C1" at the end of the model number.

(Example) MST5-203080 C1

C1: Combined radial clearance
Symbol for zero or below

MST5-203080: Combination of models M5720, S71030 and T580.

Model number coding

MST 4-10 20 60 M

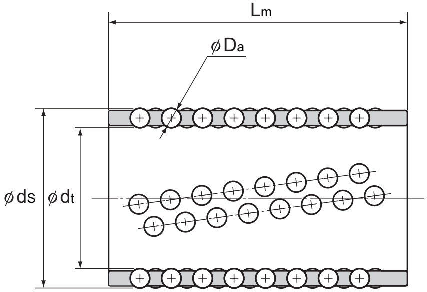
- MST: Combined model number
(ball cage): M4610 (nut): S6820 (ST shaft): T460 Combination of these components
- 4: ST shaft outer diameter dimension (mm)
- 10: Ball cage length (mm) (A)
- 20: Nut length (mm) (B)
- 60: ST shaft length (mm) (C)
- M: Using stainless steel

Note) The model numbers of ball cage, nut and ST shaft are indicated in the corresponding specification table.

Unit: mm

Nut				ST shaft				Combined radial clearance µm
	d_s	L (B)	Mass g	Model No.	d_t	L_t (C)	Mass g	
	5 ±0.002	10 20 30	1.4 2.9 4.5	T350 T360	$3\ ^{0}_{-0.003}$	50 60	2.8 3.3	−2 to +5
	6 ±0.002	10 20 30	1.7 3.6 5.0	T450 T460	$4\ ^{0}_{-0.003}$	50 60	4.5 5.6	−2 to +5
	7 ±0.002	10 20 30	2.9 6.3 10.0	T550 T580	$5\ ^{0}_{-0.003}$	50 80	7.1 12.6	−2 to +5
	8 ±0.002	20 30 40	7.1 10.0 12.6	T650 T680	$6\ ^{0}_{-0.003}$	50 80	10.0 16.6	−2 to +5

Models KS / BS



Unit: mm

Combined model No.	Main dimensions				Radial clearance tolerance	Basic load rating		Mass
	d_t	D_a (inch)	d_s	L_m	μm	C kN	C_0 kN	g
KS 1955	19	3	25	55	–7	10.3	3.82	31.7
BS 1955	19	3.175 (1/8)	25.35	55	–7	11.7	4.22	33.2
KS 2260	22	3	28	60	–7	10.7	4.22	37.6
BS 2260	22	3.175 (1/8)	28.35	60	–7	12.2	4.71	39.1
KS 2565	25	3	31	65	–7	11.7	5	45.4
BS 2565	25	3.175 (1/8)	31.35	65	–7	13.2	5.59	47.1
KS 2870	28	4	36	70	–9	18	7.65	80.4
BS 2870	28	3.969 (5/32)	35.938	70	–9	17.7	7.55	80.0
KS 3275	32	4	40	75	–9	19.7	9.12	96.5
BS 3275	32	3.969 (5/32)	39.938	75	–9	19.3	8.92	96.0
KS 3880	38	5	48	80	–10	25	12	156
BS 3880	38	4.762 (3/16)	47.525	80	–10	22.5	10.9	150

Note) The outer surface of model BS has a groove to help distinguish it from KS.
Shafts for models KS and BS are also manufactured. Contact THK for details.

Precision Linear Pack

THK General Catalog

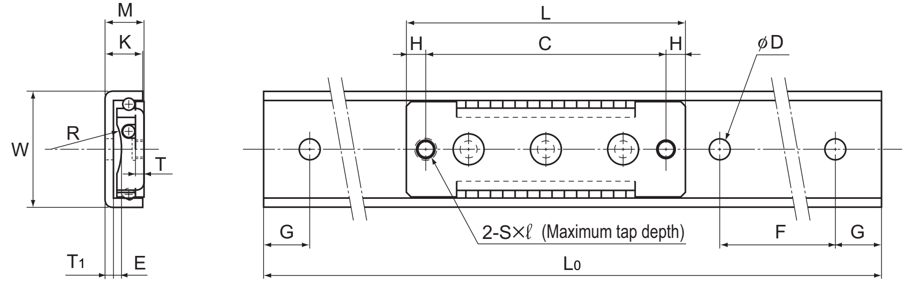
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model ER



Model No.	Inner block dimensions									
	Width W	Height M ±0.05	Length L	C	H	E	R	S	Maximum tap depth ℓ	T
ER 513	13	4.5	22	7	7.5	1.1	4.2	M2	1.3	0.9
ER 616	15.6	6	36	29	3.5	1.7	9.2	M3	1.8	1.1
ER 920	20	8.5	46	40	3	2.3	7.3	M3	2.5	1.9
ER 1025	25	10	56	48	4	2.9	9.3	M4	2.8	2.2

Model number coding

2 ER616 C1 +95L

Model number

Outer rail length (in mm)

Radial clearance symbol (*1)

Number of inner blocks used on the same rail

(*1) See A-569.

Unit: mm

Outer rail dimensions						Basic load rating		Mass	
						C	C_0	Inner block	Outer rail
K	T_1	D	L_0	F	G	N	N	g	g/m
4	1.1	2.4	40, 60, 80	20	10	54.9	72.5	2.4	166
5.5	1.4	2.9	45, 70, 95	25	10	71.6	125	5.6	268
7.5	1.9	3.5	50, 80, 110	30	10	144	201	14.4	474
9	2.2	4.5	60, 100, 140	40	10	215	315	27	677

Note) To fix the outer rail of models ER513 and ER616, use cross-recessed screws for precision equipment (No. 0 screw).

Model No.	Type	Nominal name of screw × pitch
ER 513	No. 0 pan-head screw (class 1)	M2×0.4
ER 616		M2.6×0.45

Japan Camera Industry Association Standard JCIS 10-70
Cross-recessed screw for precision equipment (No. 0 screw)

Cross Roller Guide/Ball Guide

THK General Catalog

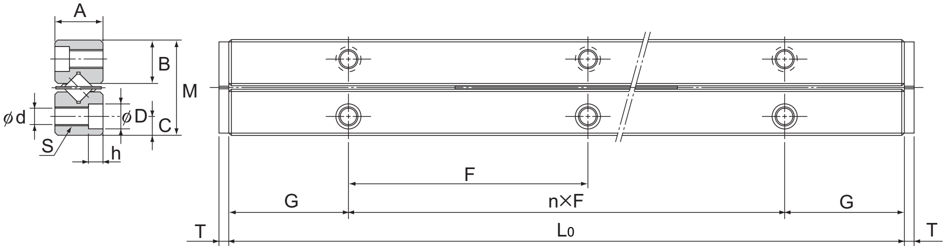
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Cross Roller Guide Model VR (VR1)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR 1-20×5Z	12	8.5	4	20	1×10	5	3.9	1.8	M2	1.65
VR 1-30×7Z	22			30	2×10					
VR 1-40×10Z	27			40	3×10					
VR 1-50×13Z	32			50	4×10					
VR 1-60×16Z	37			60	5×10					
VR 1-70×19Z	42			70	6×10					
VR 1-80×21Z	52			80	7×10					

Model number coding

VR1 -30 H × 8Z

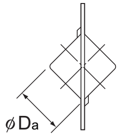
Number of rollers or balls

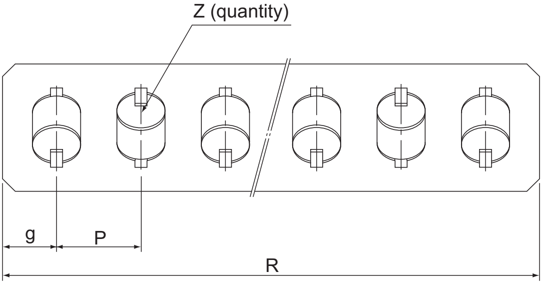
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 40/50)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	3	1.4	1.6	1.5	14	2	2.5	5	−2	0.098	0.069	0.11
					19			7				
					26.5			10				
					34			13				
					41.5			16				
					49			19				
					54			21				

Note) When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB1-50H x 12Z
└── Number of balls

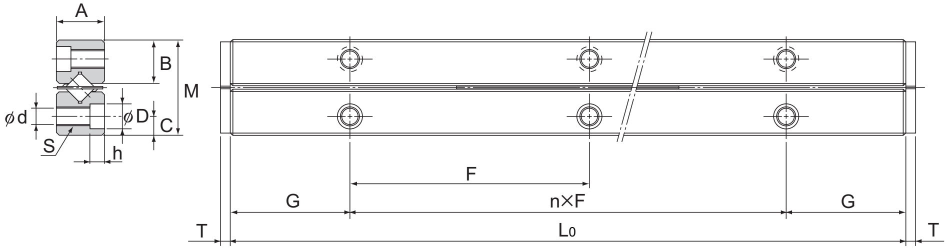
The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR1M)
To fix the dedicated rail of model VR1, use cross-recessed screws for precision equipment (No. 0 screw).

Model No.	Type	Nominal name of screw × pitch
For model VR1	No. 0 pan-head screw (class 3)	M1.4×0.3

Japan Camera Industry Association Standard JCIS 10-70
Cross-recessed screw for precision equipment (No. 0 screw)

Description of Each Option⇒A-581 Dimensions⇒B-499

Cross Roller Guide Model VR (VR2)



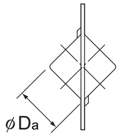
Model No.	Maximum stroke	Main								
		Combined dimensions				Mounting				
		M	A	L0	n×F	G	B	C	S	d
VR 2- 30×5Z	18	12	6	30	1×15	7.5	5.6	2.5	M3	2.55
VR 2- 45×8Z	24			45	2×15					
VR 2- 60×11Z	30			60	3×15					
VR 2- 75×13Z	44			75	4×15					
VR 2- 90×16Z	50			90	5×15					
VR 2-105×18Z	64			105	6×15					
VR 2-120×21Z	70			120	7×15					
VR 2-135×23Z	84			135	8×15					
VR 2-150×26Z	90			150	9×15					
VR 2-165×29Z	96			165	10×15					
VR 2-180×32Z	102			180	11×15					

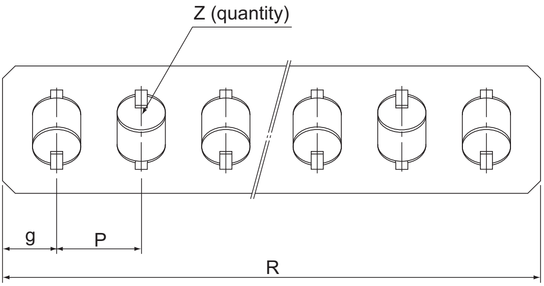
Model number coding

VR2 -30 H × 6Z

- VR2: Combined model number (for Ball Guide: VB)
- -30: Dedicated rail dimension in mm (example of indication for a combination of different overall lengths: 90/105)
- H: Accuracy symbol
- 6Z: Number of rollers or balls

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	4.4	2	1.5	2	21	2.5	4	5	−3	0.176	0.127	0.23
					33			8				
					45			11				
					53			13				
					65			16				
					73			18				
					85			21				
					93			23				
					105			26				
					117			29				
					129			32				

Note) When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB2-90H x 15Z
Number of balls

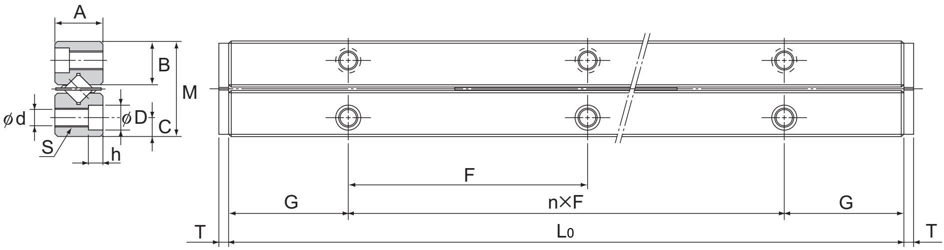
The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR2M)
To fix the dedicated rail of model VR2, use cross-recessed screws for precision equipment (No. 0 screw).

Model No.	Type	Nominal name of screw × pitch
For model VR2	Pan Head Screw	M2×0.4

Cross-recessed screw JIS B 1111 (pan head screw)

Description of Each Option⇒A-581 Dimensions⇒B-499

Cross Roller Guide Model VR (VR3)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR 3- 50×7Z	28	18	8	50	1×25	12.5	8.3	3.5	M4	3.3
VR 3- 75×10Z	48			75	2×25					
VR 3-100×14Z	58			100	3×25					
VR 3-125×17Z	78			125	4×25					
VR 3-150×21Z	88			150	5×25					
VR 3-175×24Z	108			175	6×25					
VR 3-200×28Z	118			200	7×25					
VR 3-225×31Z	138			225	8×25					
VR 3-250×35Z	148			250	9×25					
VR 3-275×38Z	168			275	10×25					
VR 3-300×42Z	178			300	11×25					

Model number coding

VR3 -75 H × 9Z

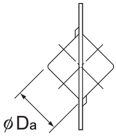
Number of rollers or balls

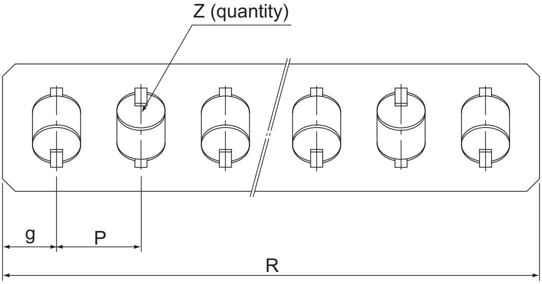
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 100/125)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

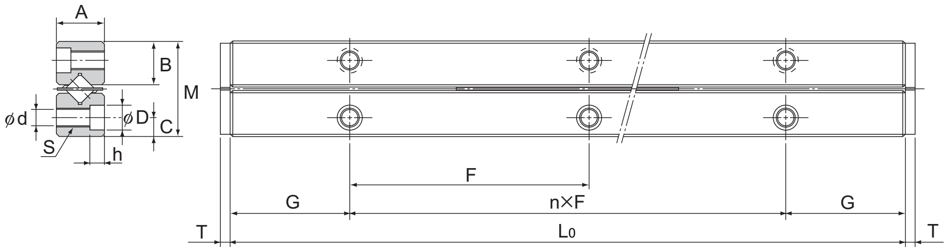
dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	6	3.1	2	3	36	3	5	7	−4	0.363	0.275	0.45
					51			10				
					71			14				
					86			17				
					106			21				
					121			24				
					141			28				
					156			31				
					176			35				
					191			38				
					211			42				

Note) When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB3-150H x 20Z
Number of balls

The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR3M)

Cross Roller Guide Model VR (VR4)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR 4- 80×7Z	58	22	11	80	1×40	20	10.2	4.5	M5	4.3
VR 4-120×11Z	82			120	2×40					
VR 4-160×15Z	106			160	3×40					
VR 4-200×19Z	130			200	4×40					
VR 4-240×23Z	154			240	5×40					
VR 4-280×27Z	178			280	6×40					
VR 4-320×31Z	202			320	7×40					
VR 4-360×35Z	226			360	8×40					
VR 4-400×39Z	250			400	9×40					
VR 4-440×43Z	274			400	10×40					
VR 4-480×47Z	298			480	11×40					

Model number coding

VR4 -80 P × 9Z

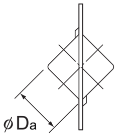
Number of rollers or balls

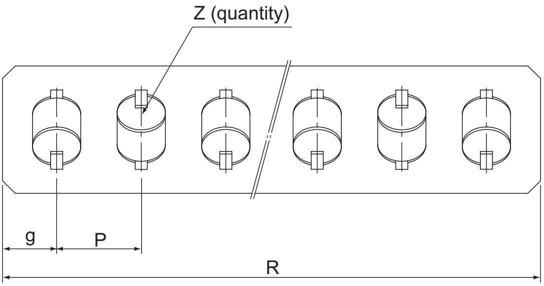
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 120/160)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

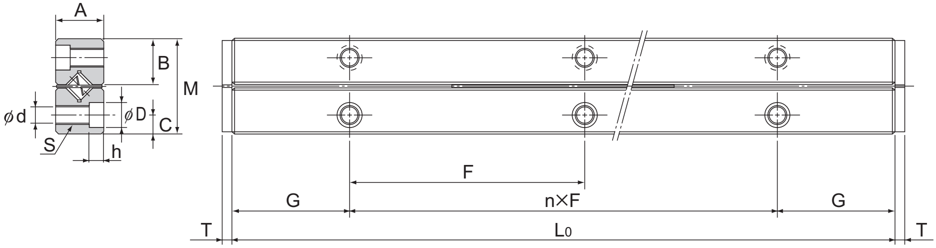
dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	Cz	C_{0z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	8	4.2	2	4	51	4.5	7	7	−5	0.764	0.637	0.8
					79			11				
					107			15				
					135			19				
					163			23				
					191			27				
					219			31				
					247			35				
					275			39				
					303			43				
					331			47				

Note) When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB4-200H x 17Z
Number of balls

The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR4M)

Cross Roller Guide Model VR (VR6)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L0	n×F	G	B	C	S	d
VR 6-100×7Z	56	30	15	100	1×50	25	14.4	6	M6	5.2
VR 6-150×10Z	96			150	2×50					
VR 6-200×13Z	136			200	3×50					
VR 6-250×17Z	156			250	4×50					
VR 6-300×20Z	196			300	5×50					
VR 6-350×24Z	216			350	6×50					
VR 6-400×27Z	256			400	7×50					
VR 6-450×31Z	276			450	8×50					
VR 6-500×34Z	316			500	9×50					
VR 6-550×38Z	336			550	10×50					
VR 6-600×41Z	376			600	11×50					

Model number coding

VR6 -100 P × 6Z

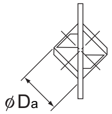
Number of rollers or balls

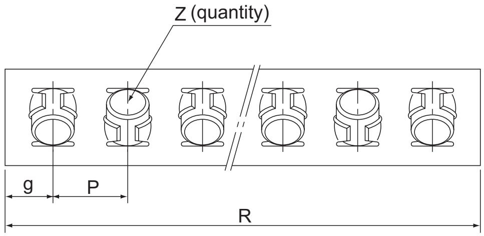
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 300/400)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

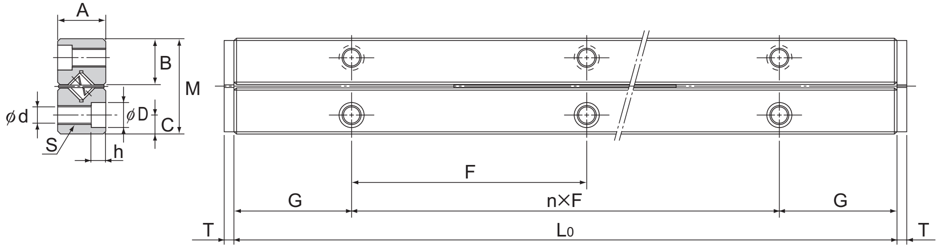
dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	µm	kN	kN	kg/m
	9.5	5.2	3.2	6	72	6	10	7	−7	1.91	1.76	1.5
					102			10				
					132			13				
					172			17				
					202			20				
					242			24				
					272			27				
					312			31				
					342			34				
					382			38				
					412			41				

Note) When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB6-300H x18Z
Number of balls

The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR6M)

Cross Roller Guide Model VR (VR9)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR 9- 200×10Z	118	40 (40.74)	20	200	1×100	50	19.2	8	M8	6.8
VR 9- 300×15Z	178			300	2×100					
VR 9- 400×20Z	238			400	3×100					
VR 9- 500×25Z	298			500	4×100					
VR 9- 600×30Z	358			600	5×100					
VR 9- 700×35Z	418			700	6×100					
VR 9- 800×40Z	478			800	7×100					
VR 9- 900×45Z	538			900	8×100					
VR 9-1000×50Z	598			1000	9×100					
VR 9-1100×55Z	658			1100	10×100					
VR 9-1200×60Z	718			1200	11×100					

Model number coding

VR9 -600 H × 30Z

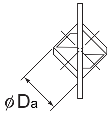
Number of rollers or balls

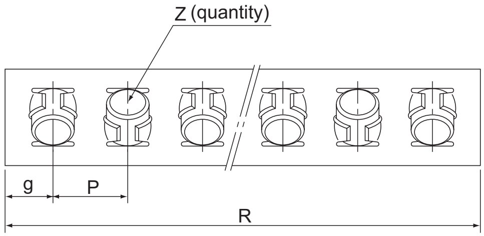
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 300/400)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

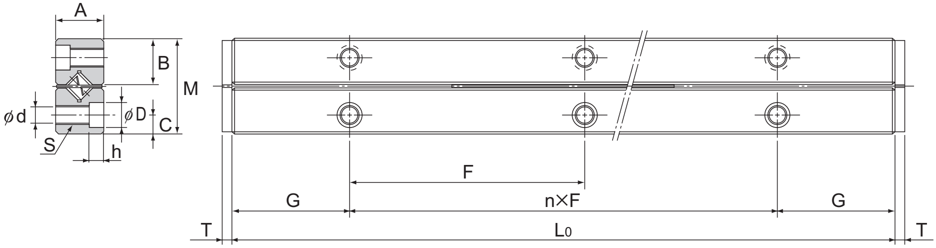
dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	10.5	6.2	4	9 (9.525)	141	7.5	14	10	−10	4.31	4.36	3.2
					211			15				
					281			20				
					351			25				
					421			30				
					491			35				
					561			40				
					631			45				
					701			50				
					771			55				
					841			60				

Note) The dimensions in the parentheses above indicate the dimensions of the Ball Guide.
When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB9-700H x 33Z
Number of balls

The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR9M)

Cross Roller Guide Model VR (VR12)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR12- 200× 7Z	110	58 (57.86)	28	200	1×100	50	28	12	M10	8.5
VR12- 300×10Z	190			300	2×100					
VR12- 400×14Z	230			400	3×100					
VR12- 500×17Z	310			500	4×100					
VR12- 600×21Z	350			600	5×100					
VR12- 700×24Z	430			700	6×100					
VR12- 800×28Z	470			800	7×100					
VR12- 900×31Z	550			900	8×100					
VR12-1000×34Z	630			1000	9×100					
VR12-1100×38Z	670			1100	10×100					
VR12-1200×41Z	750			1200	11×100					

Model number coding

VR12 -200 P × 9Z

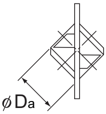
Number of rollers or balls

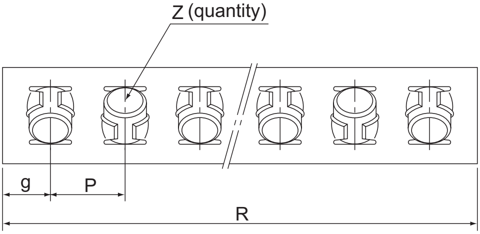
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 300/400)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	14	8.2	5	12 (11.906)	145	12.5	20	7	−13	7.25	7.65	5.3
					205			10				
					285			14				
					345			17				
					425			21				
					485			24				
					565			28				
					625			31				
					685			34				
					765			38				
					825			41				

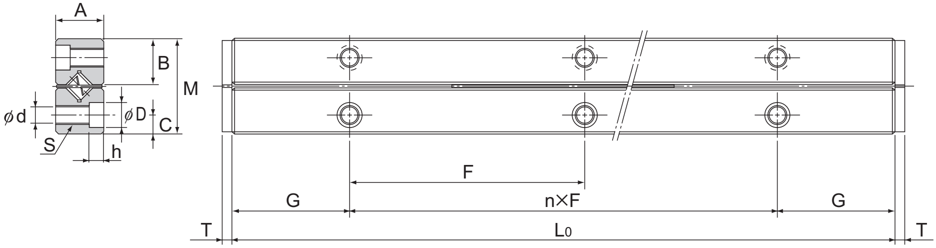
Note) The dimensions in the parentheses above indicate the dimensions of the Ball Guide.
When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB12-700H x 20Z
Number of balls

The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR12M)

Description of Each Option⇒A-581 Dimensions⇒B-499

Cross Roller Guide Model VR (VR15)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR15- 300× 8Z	190	71 (71.11)	36	300	2×100	50	34.4	14	M12	10.5
VR15- 400×11Z	240			400	3×100					
VR15- 500×13Z	340			500	4×100					
VR15- 600×16Z	390			600	5×100					
VR15- 700×19Z	440			700	6×100					
VR15- 800×22Z	490			800	7×100					
VR15- 900×25Z	540			900	8×100					
VR15-1000×27Z	640			1000	9×100					
VR15-1100×30Z	690			1100	10×100					
VR15-1200×33Z	740			1200	11×100					

Model number coding

VR15 -300 H × 10Z

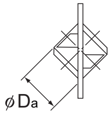
Number of rollers or balls

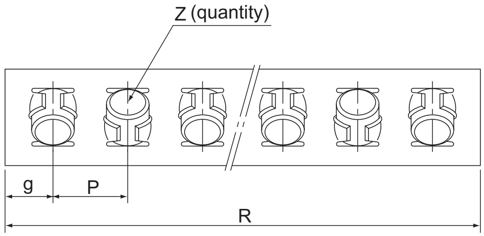
Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 300/400)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.





Unit: mm

dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	17.5	10.2	6	15 (15.081)	205	15	25	8	−16	11.3	12.4	8.3
					280			11				
					330			13				
					405			16				
					480			19				
					555			22				
					630			25				
					680			27				
					755			30				
					830			33				

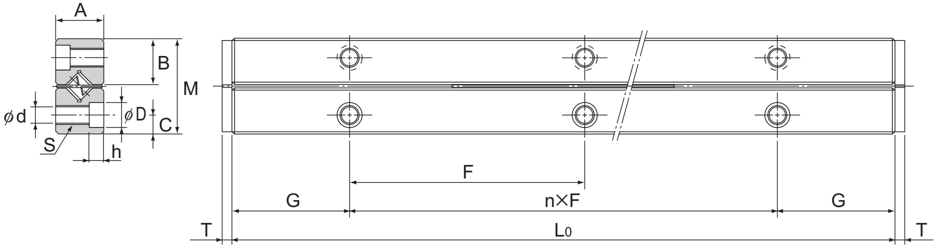
Note) The dimensions in the parentheses above indicate the dimensions of the Ball Guide.
When desiring a Ball Guide in combination with a ball cage, refer to Ball Cage Model B on B-498 and indicate the required number of balls.

(Example) VB15-800H x 20Z
Number of balls

The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR15M)

Description of Each Option⇒A-581 Dimensions⇒B-499

Cross Roller Guide Model VR (VR18)



Model No.	Maximum stroke	Main								
		Combined dimensions			Mounting					
		M	A	L_0	n×F	G	B	C	S	d
VR18- 300× 6Z	228	83	40	300	2×100	50	40.2	18	M14	12.5
VR18- 400× 9Z	248			400	3×100					
VR18- 500×11Z	328			500	4×100					
VR18- 600×13Z	408			600	5×100					
VR18- 700×16Z	428			700	6×100					
VR18- 800×18Z	508			800	7×100					
VR18- 900×20Z	588			900	8×100					
VR18-1000×23Z	608			1000	9×100					
VR18-1100×25Z	688			1100	10×100					
VR18-1200×27Z	768			1200	11×100					

Model number coding

VR18 -400 H × 10Z

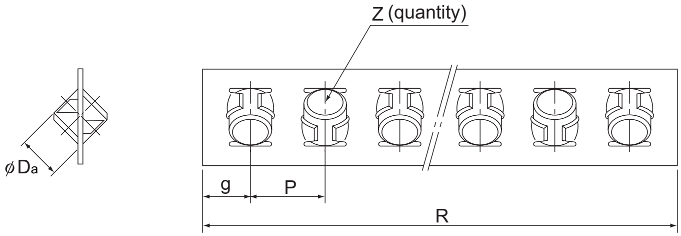
Number of rollers or balls

Accuracy symbol

Dedicated rail dimension in mm
(example of indication for a combination of different overall lengths: 300/400)

Combined model number (for Ball Guide: VB)

Note) "One set" in the model No. above indicates a combination of four rails and two cages.

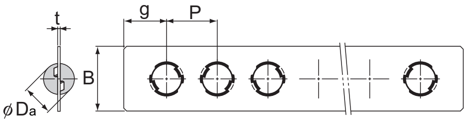


Unit: mm

dimensions									Permissible preload	Basic load rating (per roller)		Mass (rail)
dimensions								No. of rollers	δ	C_Z	C_{0Z}	
	D	h	T	D_a	R	g	P	Z	μm	kN	kN	kg/m
	20	12.2	6	18	186	18	30	6	−18	15.9	17.8	10.5
					276			9				
					336			11				
					396			13				
					486			16				
					546			18				
					606			20				
					696			23				
					756			25				
					816			27				

Note) The mass in the table indicates the value per rail/m.
Stainless steel type with high corrosion resistance is also available. (symbol M, e.g., VR18M)

Ball Cage Model B



Unit: mm

Model No.	Main dimensions					Basic load rating (per ball)		Combined rail
	D_a	t	B	P	g	C_z N	C_{0z} N	
B 1	1.5	0.2	3.5	2.5	2	7.84	21.6	V1
B 2	2	0.3	5	4	3	12.7	39.2	V2
B 3	3	0.4	7	6	4.5	27.5	87.3	V3
B 4	4	0.5	9	7	4.5	45.1	155	V4
B 6	6	0.6	13.5	10	6	98	353	V6
B 9	9.525	1	19	14	8.5	216	784	V9
B 12	11.906	1	25	20	12.5	324	1420	V12
B 15	15.081	1.2	31	25	15	490	2160	V15

Dedicated Mounting Bolt

To mount the rail where normal clearance is to be adjusted, use the screw hole drilled on the rail as shown in Fig.1. The holes of the bolt (d_1 and D_1) must be machined so that they are greater by the adjustment allowance.

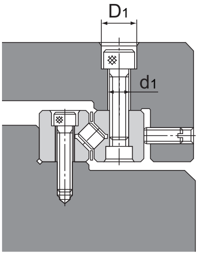


Fig.1

If it is inevitable to adopt a mounting method like the one shown in Fig.2 for a structural reason, use the dedicated mounting bolt (S) indicated in Fig.3.

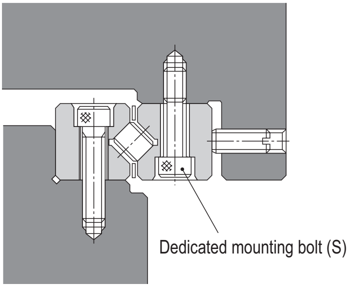


Fig.2

Table1 Dedicated Mounting Bolt

Unit: mm

Model No.	S	d	D	H	L	B	Supported rail
S 3	M3	2.3	5	3	12	2.5	V3
S 4	M4	3.1	5.8	4	15	3	V4
S 6	M5	3.9	8	5	20	4	V6
S 9	M6	4.6	8.5	6	30	5	V9
S 12	M8	6.25	11.3	8	40	6	V12
S 15	M10	7.9	13.9	10	45	8	V15
S 18	M12	9.6	15.8	12	50	10	V18

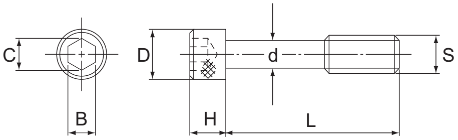


Fig.3 Dedicated Mounting Bolt

Cross Roller Table

THK General Catalog

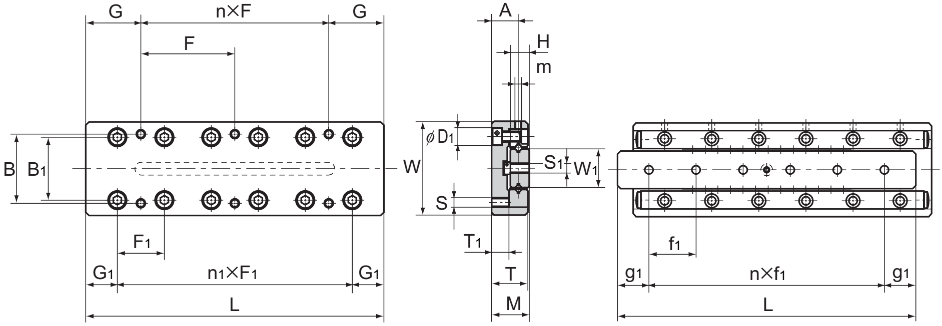
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model VRT Miniature Type (Tapped Base Type)

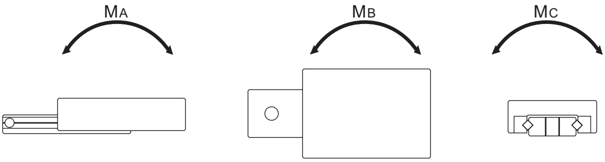


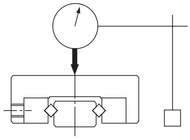
Model No.	Main dimensions					Table surface dimensions							
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass g	Table mounting tap position				n_1×F_1	B_1	D_1	G_1
						B	n×F	G	S				
VRT 1025	12	20	8	25	23	14	1×18	3.5	M2.6	1×10	12.4	4.1	7.5
VRT 1035	18			35	32		1×28	3.5		2×10			
VRT 1045	25			45	42		1×20	12.5		3×10			
VRT 1055	32			55	52		1×30	12.5		4×10			
VRT 1065	40			65	62		2×20	12.5		5×10			
VRT 1075	45			75	72		1×30	22.5		6×10			
VRT 1085	50			85	82		2×30	12.5		7×10			
VRT 2035	18	30	12	35	78	22	1×28	3.5	M3	1×15	20	6	10
VRT 2050	30			50	113		1×43	3.5		2×15			
VRT 2065	40			65	147		1×30	17.5		3×15			
VRT 2080	50			80	184		1×45	17.5		4×15			
VRT 2095	60			95	220		2×30	17.5		5×15			
VRT 2110	70			110	257		1×45	32.5		6×15			
VRT 2125	80			125	290		2×45	17.5		7×15			
VRT 3055	30	40	16	55	229	30	1×40	7.5	M4	1×25	28.4	7.5	15
VRT 3080	45			80	336		1×65	7.5		2×25			
VRT 3105	60			105	442		1×50	27.5		3×25			
VRT 3130	75			130	551		1×75	27.5		4×25			
VRT 3155	90			155	657		2×50	27.5		5×25			
VRT 3180	105			180	766		1×75	52.5		6×25			
VRT 3205	130			205	871		2×75	27.5		7×25			

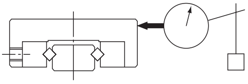
Note) All stainless steel type with high corrosion resistance is also available.

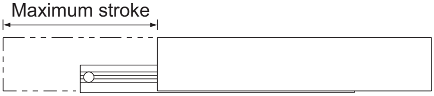
(Example) VRT 2035 M

Symbol for stainless steel type




Accuracy: ΔC

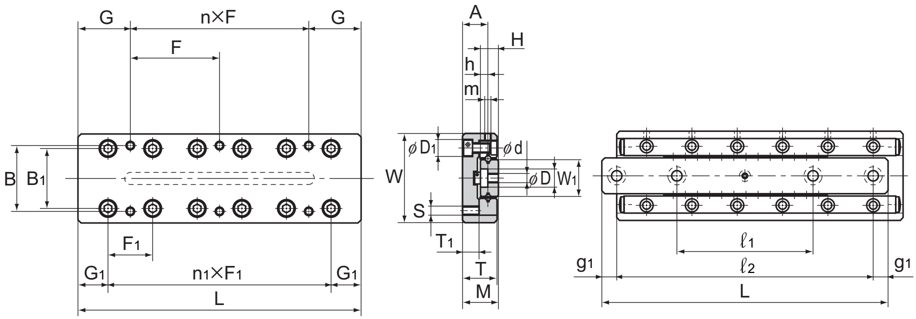

Accuracy: ΔD



Unit: mm

	Side surface dimensions						Base surface dimensions Mounting hole position				Basic load rating		Static permissible moment			Accuracy µm	
	T	T₁	H	W₁	A	m	S₁	n×f₁	g₁	No. of rollers Z	C kN	C₀ kN	MA N-m	MB N-m	MC N-m	ΔC	ΔD
	7.5	3.5	4	6.7	5.5	M2	M2.6	2×7.5	5	5	0.28	0.27	0.75	0.46	0.69	2	4
								2×10	7.5	7	0.38	0.41	1.23	0.85	1.03		5
								3×10		10	0.56	0.69	2.18	1.67	1.72		
								4×10		12	0.65	0.82	2.97	2.35	2.06		
								5×10		14	0.73	0.96	3.87	3.17	2.4		
								6×10		18	0.87	1.27	6.05	5.16	3.19		
								7×10		20	0.94	1.37	7.32	6.37	3.43		
	11.5	5.5	6	12.2	8.5		M3	1×20		5	0.51	0.51	2.29	1.37	2.21		4
								2×15	10	7	0.69	0.76	3.76	2.65	3.32		5
								3×15		9	0.85	0.98	5.62	4.22	4.25		
								4×15		12	0.98	1.27	9.1	7.26	5.52		
								5×15		14	1.18	1.57	11.8	9.71	6.8		
								6×15		17	1.47	2.06	16.7	14.1	8.93		
								7×15		19	1.57	2.25	20.4	17.5	9.77		
	15.5	7.5	8	16	11.5		M4	1×35		6	1.27	1.37	9.85	6.57	7.97		
								2×35	15	10	2.16	2.84	22.2	17	16.5	3	6
								3×25		13	2.94	4.22	34.8	28.1	24.4		
								4×25		17	3.63	5.69	55.8	47.1	33.3		
								5×25		20	3.92	6.37	74.7	64.6	36.9		
								6×25		24	4.02	6.57	104	92.3	38.1		
								7×25		26	4.22	7.16	120	107	41.5		

Model VRT-A Miniature Type (Tapped Base Type)

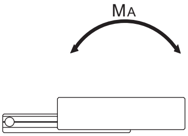


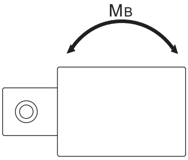
Model No.	Main dimensions					Table surface dimensions							
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass g	Table mounting tap position				n_1×F_1	B_1	D_1	G_1
						B	n×F	G	S				
VRT 1025A	12	20	8	25	23	14	1×18	3.5	M2.6	1×10	12.4	4.1	7.5
VRT 1035A	18			35	32		1×28	3.5		2×10			
VRT 1045A	25			45	42		1×20	12.5		3×10			
VRT 1055A	32			55	52		1×30	12.5		4×10			
VRT 1065A	40			65	62		2×20	12.5		5×10			
VRT 1075A	45			75	72		1×30	22.5		6×10			
VRT 1085A	50			85	82		2×30	12.5		7×10			
VRT 2035A	18	30	12	35	78	22	1×28	3.5	M3	1×15	20	6	10
VRT 2050A	30			50	113		1×43	3.5		2×15			
VRT 2065A	40			65	147		1×30	17.5		3×15			
VRT 2080A	50			80	181		1×45	17.5		4×15			
VRT 2095A	60			95	217		2×30	17.5		5×15			
VRT 2110A	70			110	254		1×45	32.5		6×15			
VRT 2125A	80			125	287		2×45	17.5		7×15			
VRT 3055A	30	40	16	55	226	30	1×40	7.5	M4	1×25	28.4	7.5	15
VRT 3080A	45			80	333		1×65	7.5		2×25			
VRT 3105A	60			105	439		1×50	27.5		3×25			
VRT 3130A	75			130	548		1×75	27.5		4×25			
VRT 3155A	90			155	652		2×50	27.5		5×25			
VRT 3180A	105			180	761		1×75	52.5		6×25			
VRT 3205A	130			205	866		2×75	27.5		7×25			

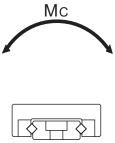
Note) All stainless steel type with high corrosion resistance is also available.

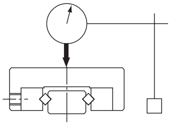
(Example) VRT 2035A M

Symbol for stainless steel type

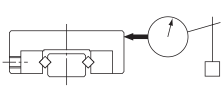




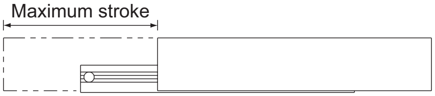




Accuracy: ΔC



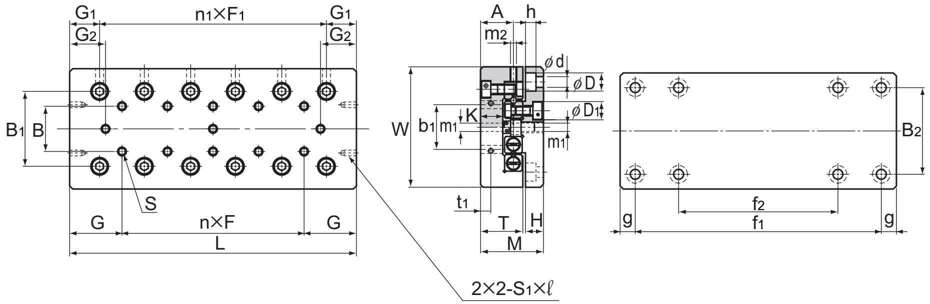
Accuracy: ΔD



Unit: mm

	Side surface dimensions						Base surface dimensions Mounting hole position				Basic load rating		Static permissible moment			Accuracy μm	
	T	T_1	H	W_1	A	m	d×D×h	ℓ_1	ℓ_2	g_1	No. of rollers Z	C kN	C_0 kN	M_A N-m	M_B N-m	M_C N-m	ΔC	ΔD
	7.5	3.5	4	6.7	5.5	M2	2.5×4.1×2.2	—	18	3.5	5	0.28	0.27	0.75	0.46	0.69	2	4
								—	25	5	7	0.38	0.41	1.23	0.85	1.03		
								25	38	3.5	10	0.56	0.69	2.18	1.67	1.72		5
								29	48	3.5	12	0.65	0.82	2.97	2.35	2.06		
								31	55	5	14	0.73	0.96	3.87	3.17	2.4		
								35	65	5	18	0.87	1.27	6.05	5.16	3.19		
								40	75	5	20	0.94	1.37	7.32	6.37	3.43		
	11.5	5.5	6	12.2	8.5		3.5×6×3.2	—	25	5	5	0.51	0.51	2.29	1.37	2.21		4
								—	35	7.5	7	0.69	0.76	3.76	2.65	3.32		
								33	55	5	9	0.85	0.98	5.62	4.22	4.25		5
								40	70	5	12	0.98	1.27	9.1	7.26	5.52		
								45	85	5	14	1.18	1.57	11.8	9.71	6.8		
								50	95	7.5	17	1.47	2.06	16.7	14.1	8.93		
								55	110	7.5	19	1.57	2.25	20.4	17.5	9.77		
	15.5	7.5	8	16	11.5		4.5×7.5×4.2	—	40	7.5	6	1.27	1.37	9.85	6.57	7.97		
								43	68	6	10	2.16	2.84	22.2	17	16.5		
								55	90	7.5	13	2.94	4.22	34.8	28.1	24.4	3	6
								65	115		17	3.63	5.69	55.8	47.1	33.3		
								95	140		20	3.92	6.37	74.7	64.6	36.9		
								85	165		24	4.02	6.57	104.3	92.3	38.1		
								90	190		26	4.22	7.16	120.8	107.9	41.5		

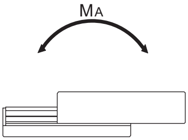
Model VRU

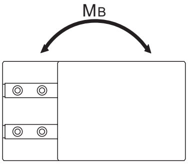


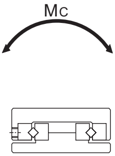
Model No.	Main dimensions					Table surface dimensions										
	Maximum stroke	Width W $^{-0.2}_{-0.4}$	Height M ±0.1	Length L	Mass(Note) kg	Table mounting tap position				Side surface mounting tap position						
						B	n×F	G	S	B_1	$n_1 \times F_1$	G_1	G_2	b_1	t_1	$S_1 \times \ell$
VRU 1025	12	30	17	25	0.08(0.04)	10	—	12.5	M2	18.4	1×10	7.5	2.5	12	2.5	M2×4
VRU 1035	18			35	0.11(0.05)		1×10				2×10		4.5			
VRU 1045	25			45	0.15(0.07)		2×10				3×10		6			
VRU 1055	32			55	0.18(0.09)		3×10				4×10		7.5			
VRU 1065	40			65	0.21(0.1)		4×10				5×10		8.5			
VRU 1075	45			75	0.24(0.12)		5×10				6×10		11			
VRU 1085	50			85	0.27(0.13)		6×10				7×10		13.5			
VRU 2035	18	40	21	35	0.2(0.09)	15	—	17.5	M3	25	1×15	10	3	16	3.4	
VRU 2050	30			50	0.26(0.13)		1×15				2×15		4.5			
VRU 2065	40			65	0.34(0.17)		2×15				3×15		7			
VRU 2080	50			80	0.42(0.21)		3×15				4×15		9.5			
VRU 2095	60			95	0.5(0.25)		4×15				5×15		12			
VRU 2110	70			110	0.58(0.29)		5×15				6×15		14.5			
VRU 2125	80			125	0.66(0.33)		6×15				7×15		17			

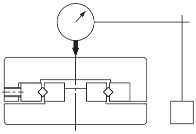
Note) Stainless steel type with high corrosion resistance is also available.
The value in the parentheses represents the mass of a stainless steel type.

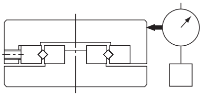
(Example) VRU 2035 M
Symbol for stainless steel type
(table base: aluminum)

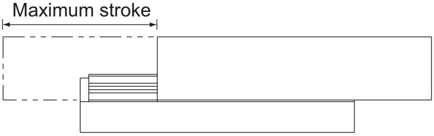







Accuracy: ΔC

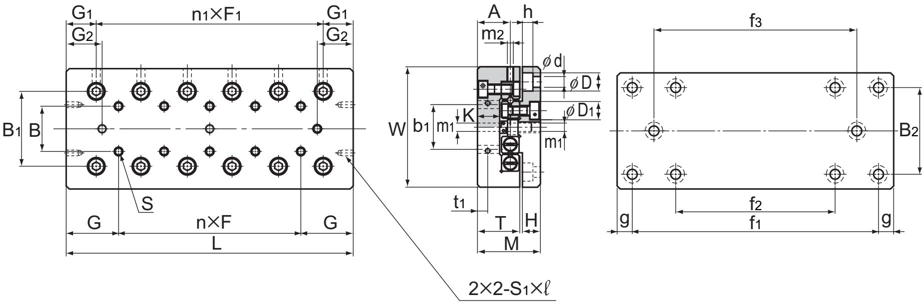

Accuracy: ΔD



Unit: mm

									Base surface dimensions Mounting hole position					Basic load rating		Static permissible moment			Accuracy µm	
													No. of rollers	C	C₀	MA	MB	MC		
	T	H	K	d×D×h	D₁	m₁	A	m₂	B₂	f₁	f₂	g	Z	kN	kN	N-m	N-m	N-m	ΔC	ΔD
	11	5.5	6.5	2.55×4.1×2.5	4.1	M2	9	M2	22	18	—	3.5	5	0.28	0.27	0.75	0.46	1.24	2	4
										28	—		7	0.38	0.41	1.23	0.85	1.85		
										38	—		10	0.56	0.69	2.18	1.67	3.09		
										48	28		12	0.65	0.82	2.97	2.35	3.71		5
										58	38		14	0.73	0.96	3.87	3.17	4.33		
										68	48		18	0.87	1.27	6.05	5.16	5.74		
										78	58		20	0.94	1.37	7.32	6.34	6.18		
	14	6.5	7.5	3.5×6×3.5	6	M3	11	M3	30	25	—	5	5	0.51	0.51	2.29	1.4	3.06		4
										40	—		7	0.69	0.76	3.76	2.6	4.59		
										55	—		9	0.85	0.98	5.62	4.17	5.89		5
										70	40		12	1.18	1.57	9.1	7.22	9.42		
										85	55		14	1.27	1.76	11.8	9.7	10.5		
										100	70		17	1.47	2.06	16.7	14.1	12.3	3	6
										115	85		19	1.57	2.25	20.4	17.5	13.5		

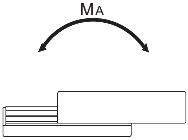
Model VRU

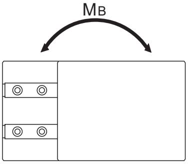


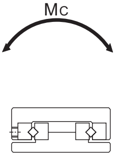
Model No.	Main dimensions					Table surface dimensions										
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass* kg	Table mounting tap position				Side surface mounting tap position						
						B	n×F	G	S	B_1	$n_1 \times F_1$	G_1	G_2	b_1	t_1	$S_1 \times \ell$
VRU 3055	30	60	28	55	0.57(0.3)	25	—	27.5	M4	39	1×25	15	5.5	40	5.5	M3×6
VRU 3080	45			80	0.8(0.4)		1×25				2×25		10.5			
VRU 3105	60			105	1.03(0.6)		2×25				3×25		15.5			
VRU 3130	75			130	1.26(0.7)		3×25				4×25		20.5			
VRU 3155	90			155	1.49(0.9)		4×25				5×25		25.5			
VRU 3180	105			180	1.72(1)		5×25				6×25		30.5			
VRU 3205	130			205	1.95(1.1)		6×25				7×25		30.5			
VRU 4085	50	80	35	85	1.5(0.8)	40	—	42.5	M5	53	1×40	22.5	10.5	55	6.5	
VRU 4125	75			125	2.3(1.2)		1×40				2×40		18			
VRU 4165	105			165	3.1(1.5)		2×40				3×40		23			
VRU 4205	135			205	3.8(1.9)		3×40				4×40		30.5			
VRU 4245	155			245	4.6(2.2)		4×40				5×40		38			
VRU 4285	185			285	5.3(2.6)		5×40				6×40		43			

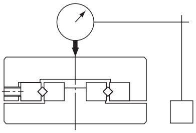
Note) Stainless steel type with high corrosion resistance is also available.
The value in the parentheses represents the mass of a stainless steel type.

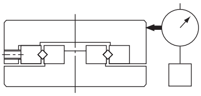
(Example) VRU 3080 M
Symbol for stainless steel type
(table base: aluminum)

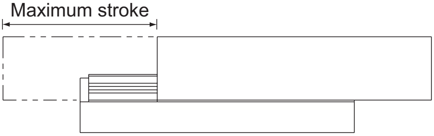








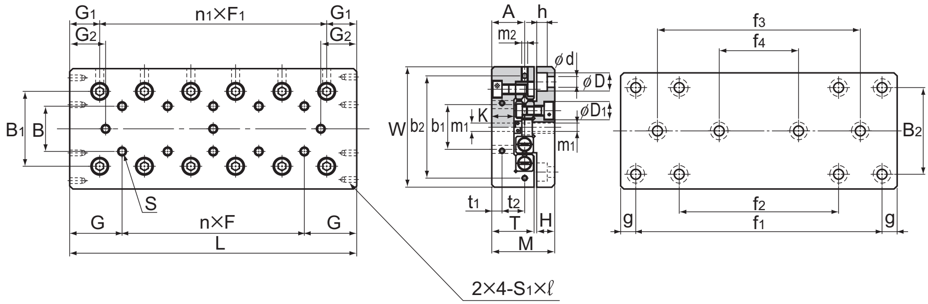




Unit: mm

									Base surface dimensions Mounting hole position						Basic load rating		Static permissible moment			Accuracy µm	
														No. of rollers	C	C₀	MA	MB	MC		
	T	H	K	d×D×h	D₁	m₁	A	m₂	B₂	f₁	f₂	f₃	g	Z	kN	kN	N-m	N-m	N-m	ΔC	ΔD
	18.5	9	10	4.5×7.5×5	7.5	M4	14.5	M4	40	35	—	—	10	6	1.47	1.67	9.85	6.54	15.5	2	5
										60	—	—		10	2.06	2.75	22.2	17	25.6		
										85	—	—		13	2.35	3.33	34.8	28.1	31.1	3	6
										110	—	—		17	2.94	4.41	55.8	47.1	41.2		
										135	—	85		20	3.53	5.49	74.7	64.6	51.2		
										160	—	110		24	4.02	6.57	104	92.3	61.3		7
										185	85	135		26	4.22	7.16	120	107	66.8		
	24	10.5	12.5	5.5×9.5×6	9.5		18.5		60	65	—	—	10	7	3.53	4.8	48.7	33.7	64	2	5
										80	—	—	22.5	11	5.2	8.04	101	79.1	107	3	6
										120	—	—		14	6.77	11.3	153	125	150		7
										160	80	—		18	8.14	14.5	239	204	193		
										200	120	—		22	9.42	17.7	344	302	235		
										240	160	—		26	10.7	20.9	468	418	278		

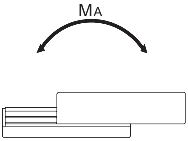
Model VRU

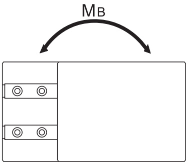


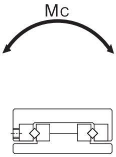
Model No.	Main dimensions					Table surface dimensions												
						Table mounting tap position				Side surface mounting tap position								
	Maximum stroke	Width W ±0.1	Height M ±0.1	Length L	Mass* kg	B	n×F	G	S	B_1	n_1×F_1	G_1	G_2	b_1	b_2	t_1	t_2	S_1×ℓ
VRU 6110	60	100	45	110	3.2(1.7)	50	—	55	M6	63	1×50	30	16	60	92	8	15	M4×8
VRU 6160	95			160	4.6(2.5)		1×50				2×50		23.5					
VRU 6210	130			210	6(3.2)		2×50				3×50		31					
VRU 6260	165			260	7.4(4)		3×50				4×50		38.5					
VRU 6310	200			310	8.7(4.8)		4×50				5×50		46					
VRU 6360	235			360	10.1(5.6)		5×50				6×50		53.5					
VRU 6410	265			410	11.5(6.4)		6×50				7×50		63.5					
VRU 9210	130	145	60	210	12(7.1)	85	—	105	M8	96	1×100	55	27	90	135	11	20	
VRU 9310	180			310	17.6(7.9)		1×100				2×100		52					
VRU 9410	350			410	23.2(—)		2×100				3×100		17					
VRU 9510	450			510	28.8(—)		3×100				4×100							
VRU 9610	550			610	34.4(—)		4×100				5×100							
VRU 9710	650			710	40(—)		5×100				6×100							
VRU 9810	750			810	45.6(—)		6×100				7×100							
* VRU 9910	850			910	51.2(—)		7×100				8×100							
* VRU 91010	950			1010	56.8(—)		8×100				9×100							

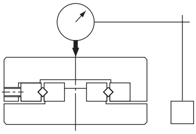
Note) Stainless steel type with high corrosion resistance is also available.
The value in the parentheses represents the mass of a stainless steel type.
Models VRU9910 and VRU91010 are build to order.

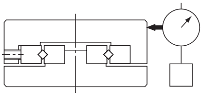
(Example) VRU 6310 M
Symbol for stainless steel type
(table base: aluminum)

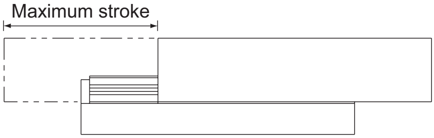







Accuracy: ΔC


Accuracy: ΔD



Unit: mm

									Base surface dimensions Mounting hole position						Basic load rating		Static permissible moment			Accuracy µm	
														No. of rollers	C	C_0	M_A	M_B	M_C		
T	H	K	d×D×h	D_1	m_1	A	m_2	B_2	f_1	f_2	f_3	f_4	g	Z	kN	kN	N-m	N-m	N-m	ΔC	ΔD
31	13	15	7×11×7	11	M5	23.5	M5	60	90	—	—	—	10	6	7.45	10.6	121	80.5	158	3	6
									140	—	—	—		9	9.31	14.1	231	171	211	3	6
									190	—	90	—		13	12.5	21.1	428	345	317	3	7
									240	—	140	—		16	15.6	28.2	616	516	423	3	7
									290	—	190	—		19	17.1	31.8	838	720	476	4	8
									340	140	240	—		22	19.8	38.8	1090	958	582	4	8
									390	190	290	—		26	22.5	45.9	1480	1320	688	4	8
43	16	21	9×14×9	14	M8	32	M6	90	100	—	—	—	55	9	20.9	34.9	837	622	838	3	7
									200	—	—	—		14	31.9	61.1	1760	1440	1460	3	7
									300	—	100	—		15	31.9	61.1	1990	1650	1460	4	8
									400	—	200	—		19	38.4	78.5	3030	2600	1880	4	8
									500	100	300	—		22	44.7	96	3950	3460	2300	4	9
									600	200	400	—		26	50.6	114	5380	4810	2730	4	9
									700	300	500	100		29	53.5	123	6600	5960	2940	5	10
									800	400	600	200		33	59.1	139	8410	7680	3340	5	10
									900	500	700	300		37	64.6	157	10400	9620	3760	5	10

Linear Ball Slide

THK General Catalog

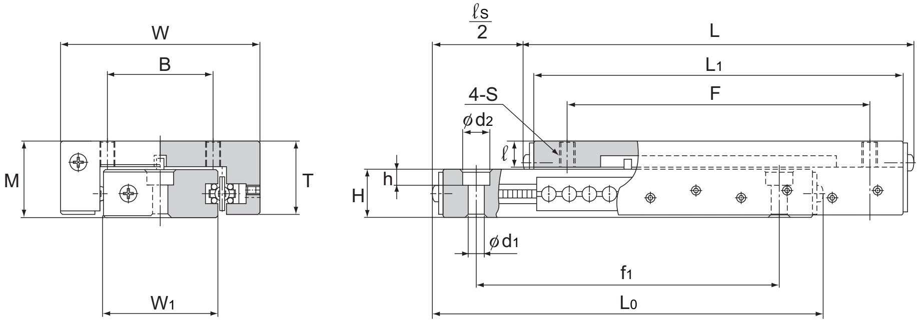
B Product Specifications

Dimensional Drawing, Dimensional Table

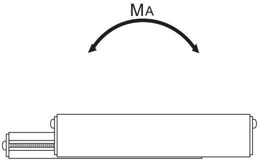
A Technical Descriptions of the Products (Separate)

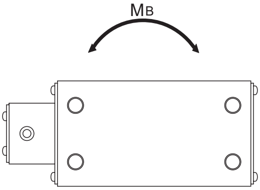
* Please see the separate "A Technical Descriptions of the Products".

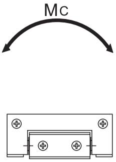
Model LSP



Model No.	Slider dimensions								
	Max. Stroke ℓs	Height M ±0.25	Width W ±0.25	Length L	T	L_1	B	F	S×ℓ
LSP 1340	15	13	25	42.6	12.5	39	11	30	M3×5
LSP 1365	25	13	25	67.6	12.5	64	11	55	M3×5
LSP 1390	50	13	25	92.6	12.5	89	11	80	M3×5
LSP 2050	25	20	44	54	18.3	47	20	35	M5×8.4
LSP 2080	50	20	44	84	18.3	77	20	65	M5×8.4
LSP 20100	75	20	44	104	18.3	97	20	85	M5×8.4
LSP 25100	50	25	66	105.2	24	97	35	75	M5×8.5
LSP 25125	75	25	66	130.2	24	122	35	100	M5×8.5
LSP 25150	100	25	66	155.2	24	147	35	125	M5×8.5





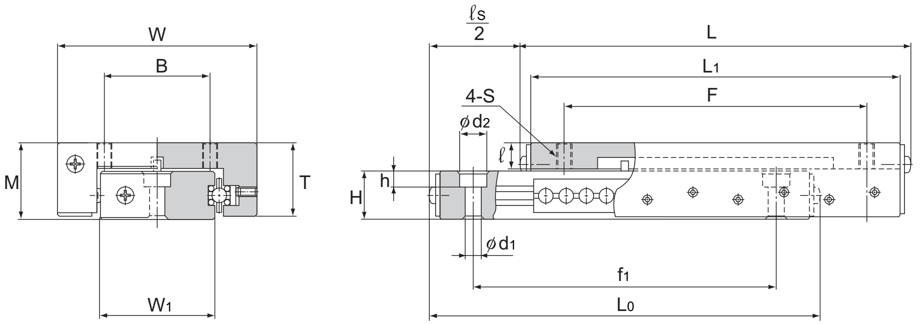


Unit: mm

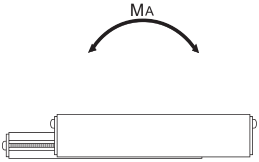
Base dimensions					Static permissible moment*		Basic load rating		Mass
Width W_1	Height H	$d_1 \times d_2 \times h$	Length L_0	f_1	M_A, M_B N-m	M_C N-m	C N	C_0 N	g
12.2	7.7	3.3×6×3.3	42.6	30	0.88	0.49	68.6	118	37
12.2	7.7	3.3×6×3.3	67.6	55	1.76	0.98	118	206	60
12.2	7.7	3.3×6×3.3	92.6	80	3.04	1.27	157	275	85
22.3	11	5.3×9×5.3	54	35	1.37	2.25	157	284	114
22.3	11	5.3×9×5.3	84	65	3.53	4.51	304	559	184
22.3	11	5.3×9×5.3	104	85	5	5.69	392	706	231
38	16	5.3×9×5.3	105.2	75	9.22	14.5	588	1069	433
38	16	5.3×9×5.3	130.2	100	12.9	18.1	735	1333	547
38	16	5.3×9×5.3	155.2	125	17.5	21.9	882	1598	652

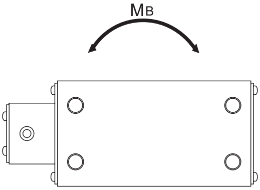
Note) *M_A, M_B and M_C each indicate the permissible moment per LM system, as shown in the figure above.

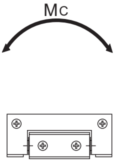
Model LS



Model No.	Slider dimensions								
	Max. Stroke ℓs	Height M ±0.25	Width W ±0.25	Length L	T	L_1	B	F	S×ℓ
LS 827	13	8	14.2	29.6	7.6	26	5.5	16	M2×2.7
LS 852	25	8	14.2	54.6	7.6	51	5.5	41	M2×2.7
LS 877	50	8	14.2	79.6	7.6	76	5.5	66	M2×2.7
LS 1027	13	10	19	29.6	9.2	26	8.5	16	M3×3.2
LS 1052	25	10	19	54.6	9.2	51	8.5	41	M3×3.2
LS 1077	50	10	19	79.6	9.2	76	8.5	66	M3×3.2





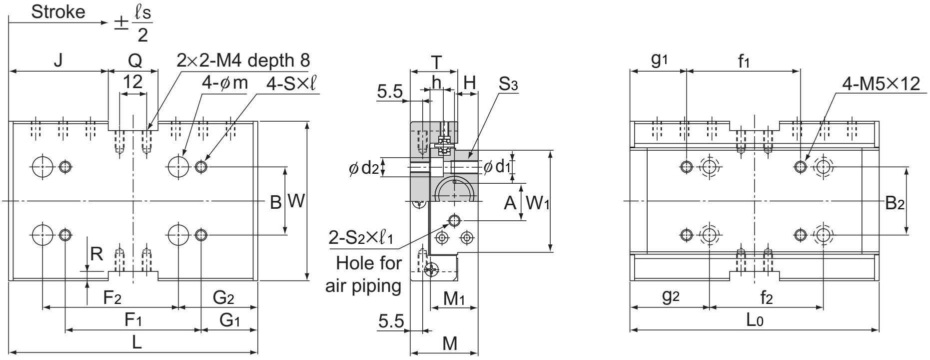


Unit: mm

	Base dimensions					Static permissible moment*		Basic load rating		Mass
	Width W_1	Height H	$d_1 \times d_2 \times h$	Length L_0	f_1	M_A, M_B N-m	M_C N-m	C N	C_0 N	g
	6.2	4.7	2.2×3.9×1.4	29.6	19	0.2	0.29	39.2	68.6	9
	6.2	4.7	2.2×3.9×1.4	54.6	35	0.49	0.39	68.6	118	15
	6.2	4.7	2.2×3.9×1.4	79.6	60	0.88	0.59	98	167	21
	9.6	6.2	3.3×6×3.1	29.6	19	0.29	0.59	58.8	108	13
	9.6	6.2	3.3×6×3.1	54.6	35	0.78	1.08	108	186	23
	9.6	6.2	3.3×6×3.1	79.6	60	1.47	1.57	157	275	34

Note) *M_A, M_B and M_C each indicate the permissible moment per LM system, as shown in the figure above.

Model LSC



Model No.	Max. Stroke ℓs +0.5 0	Cylinder Inner diameter	Slider dimensions Theoretical thrust (at 500 kPa) N	Height M ±0.05	Width W	L	T	B
LSC 1015	15	10	38.2	25	50	80	24	20
LSC 1515	15	15	86.3	30	70	80	21	30
LSC 1530	30	15	86.3	30	70	110	21	30
LSC 1550	50	15	86.3	30	70	150	21	30

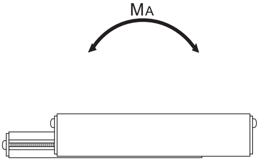
Model No.	L_0	B_2	Slider dimensions f_2	g_2	f_1	g_1	Base dimensions $d_1 \times d_2 \times h$	A	S_3
LSC 1015	80	20	40	20	—	—	3.3×5.5×3.5	13	M4
LSC 1515	80	30	40	21	23	29.5	5.2×9×5.5	17	M6
LSC 1530	110	30	60	25	40	35	5.2×9×5.5	17	M6
LSC 1550	150	30	100	25	78	36	5.2×9×5.5	17	M6

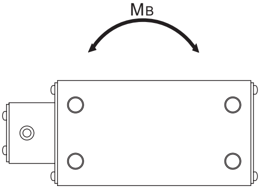
Model number coding

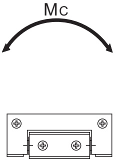
LSC1515 B S L

Model number
With unit base
With external stopper
With limit switch

Note) Unit base, external stopper and limit switch are not available for model LSC1015.
The speed controller is optional.







Unit: mm

Slider dimensions									
F_1	G_1	S×ℓ	m	G_2	F_2	J	Q	R	M_1
40	20	M4×7	5.5	12.5	40	—	—	—	16.5
40	19	M5×8	9	28.5	40	29	22	4	21
60	25	M5×8	9	35	60	44	22	4	21
100	25	M5×8	9	50	50	64	22	4	21

Base dimensions			Static permissible moment*		Basic load rating		Mass
W_1	H	S_2×$ℓ_1$	M_A, M_B N-m	M_C N-m	C N	C_0 N	kg
31.2	5.5	M5×5	4.9	7.45	392	676	0.25
45	10.5	M5×4.5	4.9	11.1	392	676	0.37
45	10.5	M5×4.5	8.43	15.4	549	951	0.52
45	10.5	M5×4.5	15.4	22.1	794	1350	0.72

Note) *M_A, M_B and M_C each indicate the permissible moment per LM system, as shown in the figure above.

Speed Controller

Fig.1 shows the shape of the speed controller.

Note) The speed controller is optional.
(control method: meter out)

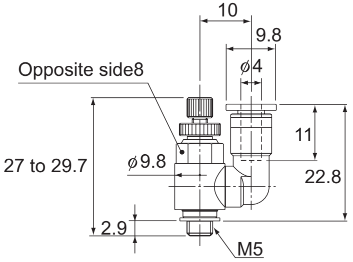


Fig.1 Shape of the Speed Controller (common to all model numbers)

Dedicated Unit Base Model B

With Linear Ball Slide model LSC, a limit switch for detecting the stroke end can be mounted using a dedicated unit base (Fig.2). When fine positioning is required, a dedicated stopper can be mounted on the unit base to adjust the position. (excluding model LSC1015)

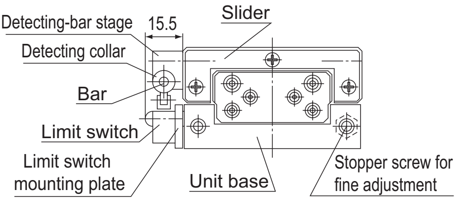
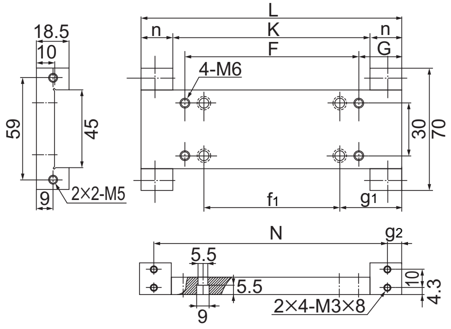
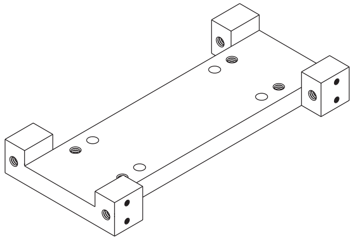


Fig.2 Unit Base and Limit Switch Installation





Unit: mm

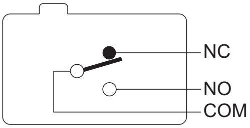
Unit base Model B	Unit base dimensions									Mass
	Length L	F	G	f_1	g_1	K	n	N	g_2	kg
LSC1515	80	40	21	23	29.5	56	12	68	6	0.12
LSC1530	110	60	25	40	35	74	18	94	8	0.16
LSC1550	150	100	25	78	36	114	18	134	8	0.21

Limit Switch

The specifications of the limit switch are as follows.

<Limit switch specifications>

Type	D2VW-5L2A-1 (Omron)
Contact type	contact (1C contact)



<Rated Specifications>

Type	Rated voltage (V)		Non-inductive load (A)				Inductive load (A)	
			Resistance load		Ramp load		Inductive load	
			Normally closed	Normally open	Normally closed	Normally open	Normally closed	Normally open
D2VW-5	AC	125	5		0.5		4	
		250	5		0.5		4	
	DC	30	5		3		4	
		125	0.4		0.1		0.4	

Note1) The above figures indicate the constant current.
Note2) Inductive load refers to power factor of 0.7 or greater (alternate current) and time constant of 7 ms or less (direct current).
Note3) Ramp load implies a rush current 10 times greater.
Note4) The above rated values apply when a test is conducted with the following conditions in accordance with JIS C 4505.
(1) Ambient temperature: 20℃± 2℃
(2) Ambient humidity: 65% ± 5% RH
(3) Operating frequency: 30 times/min

Note) For applications under a minute load (5 to 24 VDC), a minute-load type is available. Contact THK for details.

LM Roller

THK General Catalog

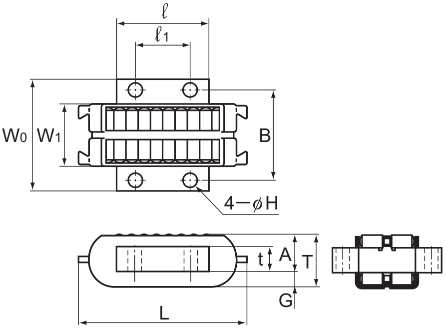
B Product Specifications

Dimensional Drawing, Dimensional Table

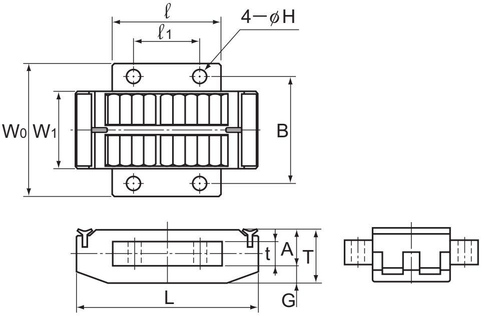
A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Models LR and LR-Z



Model LR

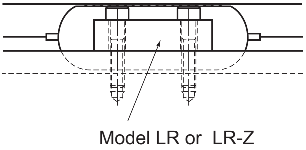


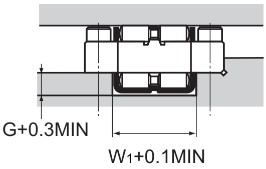
Model LR-Z

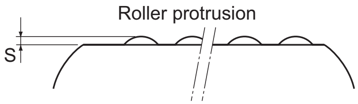
Unit: mm

Model No.	Main dimensions													Mass	Basic dynamic load rating	Basic static load rating
	W_1	Length	Thick-ness	Width				ℓ	Mounting hole pitch				Mounting bolt		C	C_0
	0 −0.1	L	T	W_0	A	t	G	0 −0.2	$ℓ_1$	B	H	S		g	kN	kN
LR 1547Z	15	47	16	30	11	7	5	20	12	23	3.4	0.2	M3*	60	15.2	17.6
LR 2055Z	20	55	17.3	36	12	8	5.3	30	18	29	4.5	0.2	M4*	110	26	37.8
LR 2565Z	25	65	20.6	45	14	9	6.6	35	20	36	5.5	0.1	M5*	190	40.4	61.1
LR 3275Z	32	75	21.6	55	15	10	6.6	45	27	44	5.5	0.1	M5*	320	52.5	91
LR 4095	40	95	30	68	21	14	9	55	35	54	6.6	0.3	M6	800	84.5	140
LR 50130	50	130	42	82	30	20	12	78	50	66	9	0.3	M8	1810	149	255

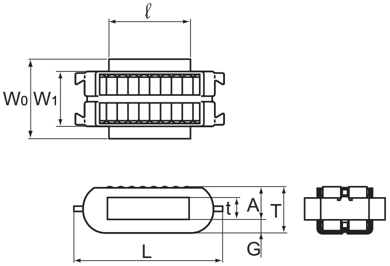
Note) Using a hexagonal-socket-head type bolt as the mounting bolt marked with * may cause interference.



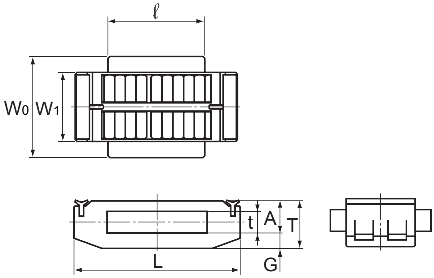




Models LRA and LRA-Z



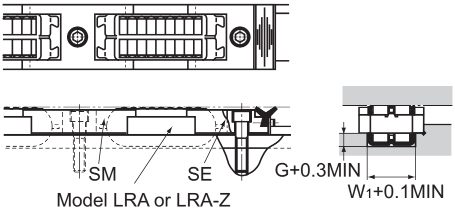
Model LRA



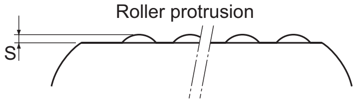
Model LRA-Z

Unit: mm

Model No.	Main dimensions									Mass	Basic dynamic load rating	Basic static load rating
	W_1 0 −0.1	Length L	Thickness T	Width W_0	A	t	G	ℓ 0 −0.2	S	g	C kN	C_0 kN
LRA 1547Z	15	47	16	22.2	11	7	5	20	0.2	54	15.2	17.6
LRA 2055Z	20	55	17.3	30	12	8	5.3	30	0.2	104	26	37.8
LRA 2565Z	25	65	20.6	38.1	14	9	6.6	35	0.1	180	40.4	61.1
LRA 3275Z	32	75	21.6	45	15	10	6.6	45	0.1	310	52.5	91
LRA 4095	40	95	30	55	21	14	9	55	0.3	740	84.5	140
LRA 50130	50	130	42	76.2	30	20	12	78	0.3	1770	149	255

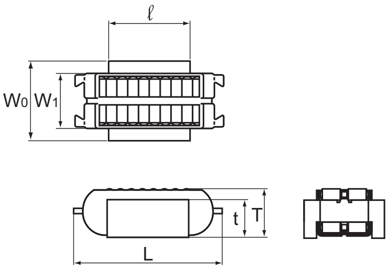


Model LRA or LRA-Z

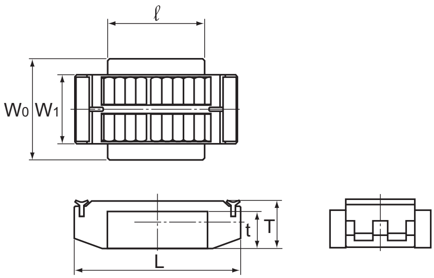


Description of Each Option⇒A-617 Dimensions⇒B-528

Models LRB and LRB-Z



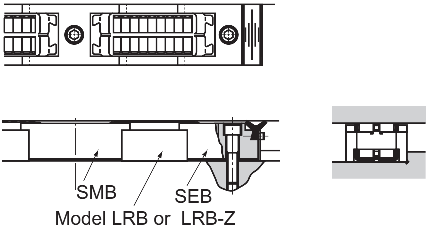
Model LRB

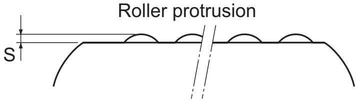


Model LRB-Z

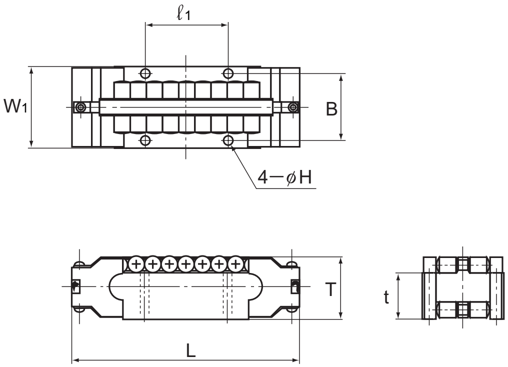
Unit: mm

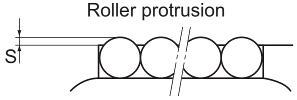
Model No.	Main dimensions							Mass	Basic dynamic load rating	Basic static load rating
	W_1 $^{0}_{-0.1}$	Length L	Width W_0	Thickness T	t	ℓ $^{0}_{-0.2}$	S	g	C kN	C_0 kN
LRB 1547Z	15	47	22.2	17	13	20	0.2	60	15.2	17.6
LRB 2055Z	20	55	30	18	14	30	0.2	117	26	37.8
LRB 2565Z	25	65	38.1	21	16	35	0.1	205	40.4	61.1
LRB 3275Z	32	75	45	22	17	45	0.1	340	52.5	91
LRB 4095	40	95	55	31	24	55	0.3	800	84.5	140
LRB 50130	50	130	76.2	43	33	78	0.3	1970	149	255





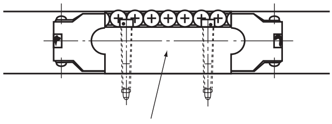
Model LRU

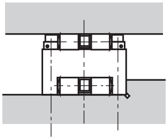




Unit: mm

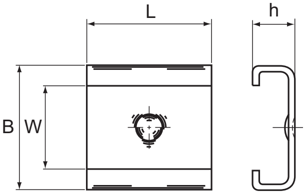
Model No.	Main dimensions									Mass	Basic dynamic load rating	Basic static load rating
	Thickness	Width			Length						C	C_0
	T	W_1	Tolerance	t	L	ℓ_1	B	H	S	kg	kN	kN
LRU 22.2	14.283	22.23	0 −0.050	10.48	51	19.05	17.07	3	0.253	0.09	11.9	14.5
LRU 25.4	19.05	25.4	0 −0.050	13.97	73	25.4	20.6	3.4	0.2	0.22	28.1	39.8
LRU 38.1	28.573	38.1	0 −0.050	20.953	101.6	38.1	30.96	4.5	0.22	0.7	59.4	88.2
LRU 50.8	38.098	50.8	0 −0.075	27.938	139.7	50.8	41.28	5.6	0.46	1.7	103	159
LRU 76.2	57.15	76.2	0 −0.075	41.15	206.4	76.2	61.9	6.6	0.5	5.7	245	402





Description of Each Option⇒A-617 Dimensions⇒B-528

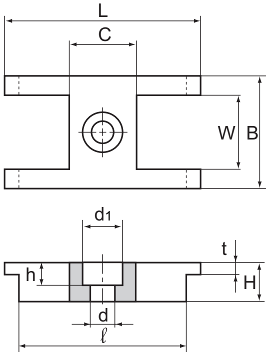
Spring Pad Model PA



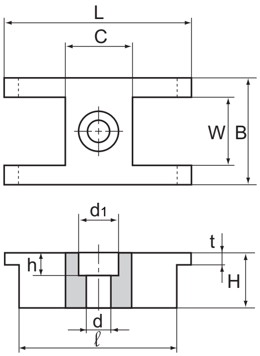
Unit: mm

Model No.	Main dimensions				Installation related dimensions(see A-618)					Maximum permissible load	Spring constant	Supported LM Roller
	W	B	L	h	H	S $^{+0.15}_{+0.05}$	F	P	Adjust-ment bolt	kN	kN/mm	
PA 15	15	22.2	20	9	21	22.2	11.5	65	M5	1.02	5.4	LRA 1547Z
PA 20	20	30	30	9.5	22.5	30	12	75	M6	2.74	7.5	LRA 2055Z
PA 25	25	38.1	35	12	27	38.1	14.5	90	M8	4.11	9.1	LRA 2565Z
PA 32	32	45	45	12.5	28.5	45	15	100	M8	4.11	11.2	LRA 3275Z
PA 40	40	55	55	16	38	55	18.5	126	M10	4.8	15.3	LRA 4095
PA 50	50	76.2	78	21	52	76.2	23.5	170	M12	6.86	15.5	LRA 50130

Fixtures Models SM/SMB



Model SM

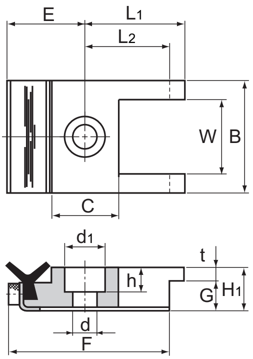


Model SMB

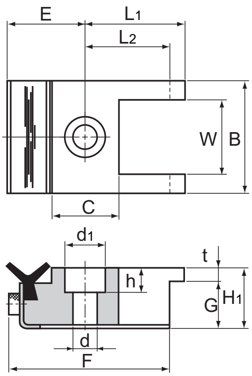
Unit: mm

Model No.	Main dimensions										Mass
	W	B	L	C	ℓ	H	t	d	d_1	h	g
SM 15	15	22.2	53	16	45	9	3	5.5	9.5	5.4	38
SMB 15	15	22.2	53	16	45	15	3	5.5	9.5	5.4	60
SM 20	20	30	53	18	45	10	3	6.6	11	6.5	60
SMB 20	20	30	53	18	45	16	3	6.6	11	6.5	95
SM 25	25	38.1	65	23	55	12	4	9	14	8.6	115
SMB 25	25	38.1	65	23	55	19	4	9	14	8.6	120
SM 32	32	45	65	23	55	13	4	9	14	8.6	135
SMB 32	32	45	65	23	55	20	4	9	14	8.6	215
SM 40	40	55	81	28	71	19	6	11	17.5	10.8	290
SMB 40	40	55	81	28	71	29	6	11	17.5	10.8	455
SM 50	50	76.2	102	38	92	28	9	14	20	13	890
SMB 50	50	76.2	102	38	92	41	9	14	20	13	1320

Fixtures Models SE/SEB



Model SE



Model SEB

Unit: mm

Model No.	Main dimensions													Mass
	W	B	L_1	L_2	E	F	C	H_1	G	t	d	d_1	h	g
SE 15	15	22.2	26.5	22.5	18	40.5	16	10	7	3	5.5	9.5	5.4	35
SEB 15	15	22.2	26.5	22.5	18	40.5	16	16	13	3	5.5	9.5	5.4	64
SE 20	20	30	26.5	22.5	19	41.5	18	11	8	3	6.6	11	6.5	60
SEB 20	20	30	26.5	22.5	19	41.5	18	17	14	3	6.6	11	6.5	105
SE 25	25	38.1	32.5	27.5	21.5	49	23	13	9	4	9	14	8.6	110
SEB 25	25	38.1	32.5	27.5	21.5	49	23	20	16	4	9	14	8.6	175
SE 32	32	45	32.5	27.5	21.5	49	23	14	10	4	9	14	8.6	140
SEB 32	32	45	32.5	27.5	21.5	49	23	21	17	4	9	14	8.6	220
SE 40	40	55	40.5	35.5	24	59.5	28	20	14	6	11	17.5	10.8	295
SEB 40	40	55	40.5	35.5	24	59.5	28	30	24	6	11	17.5	10.8	415
SE 50	50	76.2	51	46	29	75	38	29	20	9	14	20	13	840
SEB 50	50	76.2	51	46	29	75	38	42	33	9	14	20	13	1245

Flat Roller

THK General Catalog

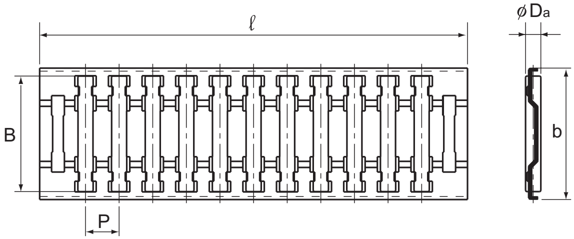
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model FT



Unit: mm

Model No.	Main dimensions		Roller dimensions				Basic dynamic load rating	Basic static load rating	Mass
	Width b	Length ℓ	Diameter D_a	Length B	No. of rollers Z	Pitch P	C kN	C_0 kN	g
FT 2010-32	10	32	2	7.8	7	4	5.2	10.4	1.9
FT 2515-45	15	45	2.5	11.8	7	4.75	10.9	25.2	5.6
FT 3020-60	20	60	3	15.8	8	5.51	17.4	42.8	12.5
FT 3525-75	25	75	3.5	19.8	8	7	27.4	72.7	23
FT 4030-150	30	150	4	25.8	18	7.3	55.7	176	73
FT 4035-150	35	150	4	30.8	18	7.3	64.2	212	86
FT 4026V-150	26	150	2.828	22.8	22	6	45.1	155	45
FT 5038-250	38	250	5	32.8	21	11	109	387	195
FT 5043-250	43	250	5	37.8	21	11	122	449	200
FT 5030V-250	30	250	3.535	21.8	33	7	78	290	103
FT 10054-400	54	400	10	46	24	15.8	279	1000	870
FT 10080-500	80	500	10	71.8	29	16	459	1900	1610
FT 10060V-500	60	500	7.071	52.8	35	13.5	301	1270	870

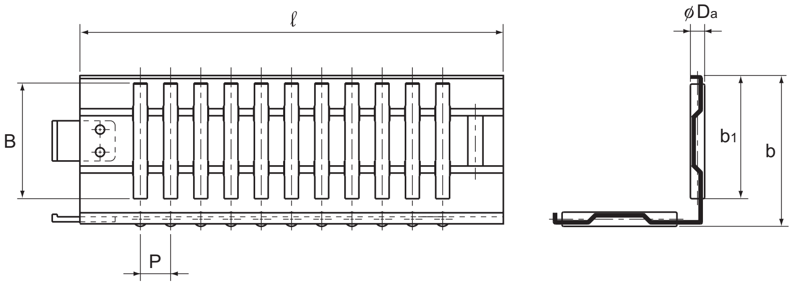
Model number coding

FT5038 P1 -750L

FT5038	P1	-750L
Model number	Accuracy indication symbol (*1)	Overall cage length (in mm)

(*1) See A-628.

Model FTW



Unit: mm

Model No.	Main dimensions			Roller dimensions				Basic dynamic load rating	Basic static load rating	Mass
	Width b	b_1	Length ℓ	Diameter D_a	Length B	No. of rollers Z	Pitch P	C kN	C_0 kN	g
FTW 4030V-150	30	24.5	150	2.828	22.8	22×2	6	59	220	94
FTW 5045-250	45	35.5	250	5	32.8	21×2	11.1	142	548	410
FTW 5050-250	50	40.5	250	5	37.8	23×2	10	160	634	460
FTW 5035V-250	35	29	250	3.535	26.8	33×2	7	102	411	220
FTW 6022.4-320	22.4	14.4	320	6	12.8	16×2	19	53	141	180
FTW 10036V-380	36	26.6	380	7.071	25	23×2	16	149	507	700
FTW 10043.5V-380	43.5	34	380	7.071	31.8	23×2	16	182	660	845
FTW 10070V-500	70	56.5	500	7.071	52.8	35×2	13.5	394	1804	1790

Model number coding

FTW5050 P1 -750L

FTW5050	P1	-750L
Model number	Accuracy indication symbol (*1)	Overall cage length (in mm)

(*1) See A-628.

Slide Pack

THK General Catalog

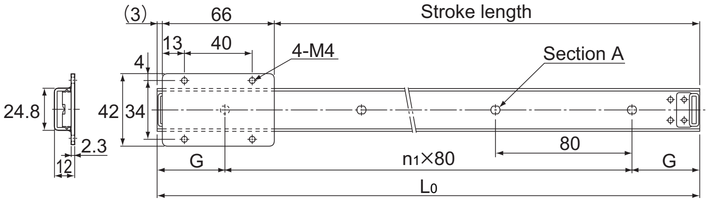
B Product Specifications

A Technical Descriptions of the Products (Separate)

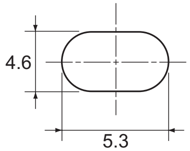
* Please see the separate "A Technical Descriptions of the Products".

Models FBW 2560R and 3590R

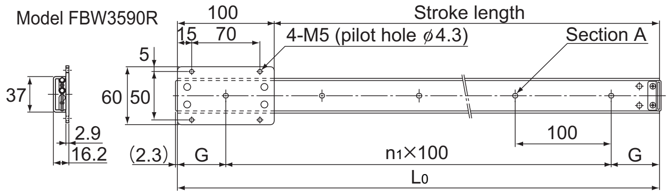
Model FBW2560R



Magnified view of section A



Model FBW3590R



[Model FBW 2560R (Made of Stainless Steel)]

Unit: mm

Slide rail length L_0	Main dimensions		Stroke length		Slide rail mass g (70)
	n_1	G	Without seal	With seal	
160	1	40	88	83	70
240	2	40	168	163	110
320	3	40	248	243	140
400	4	40	328	323	180
480	5	40	408	403	210
560	6	40	488	483	250
640	7	40	568	563	290
720	8	40	648	643	320
800	9	40	728	723	360
880	10	40	808	803	390
960	11	40	888	883	430
1040	12	40	968	963	460
1200	14	40	1128	1123	540

Note) THK also manufactures a long-size type at your request.
The values in the parentheses each indicate a slider mass.

[Model FBW 3590R]

Unit: mm

Slide rail length L_0	Main dimensions		Stroke length		Slide rail mass g (250)
	n_1	G	Without seal	With seal	
300	2	50	200	195	260
350	3	25	250	245	300
400	3	50	300	295	350
450	4	25	350	345	390
500	4	50	400	395	430
550	5	25	450	445	480
600	5	50	500	495	520
650	6	25	550	545	560
700	6	50	600	595	600
750	7	25	650	645	650
800	7	50	700	695	690
900	8	50	800	795	780
1000	9	50	900	895	860
1200	11	50	1100	1095	1000
1500	14	50	1400	1395	1300
1800	17	50	1700	1695	1600

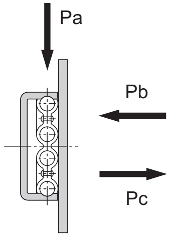
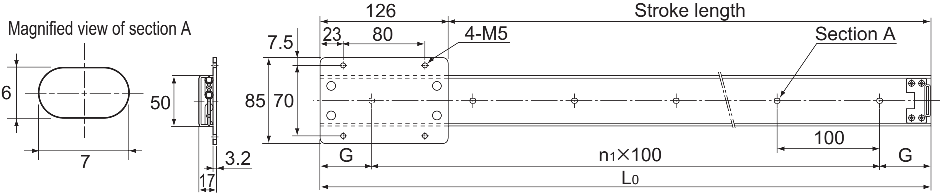


Table1 Static Permissible Load Unit: N

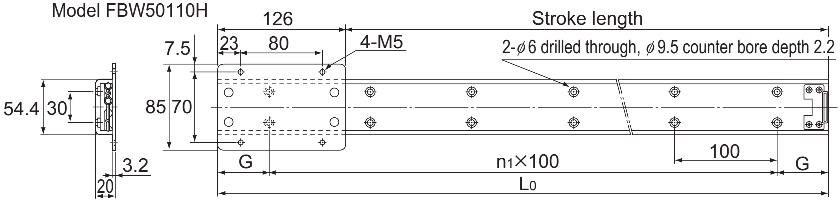
Model No.	Static permissible load		
	Pa	Pb	Pc
FBW 2560R	590	150	70
FBW 3590R	880	200	100
FBW 50110R	1960	500	390
FBW 50110H			

Models FBW 50110R and 50110H

Model FBW50110R



Model FBW50110H



[Models FBW 50110R and 50110H]

Unit: mm

Slide rail length L_0	Main dimensions		Stroke length		Slide rail mass g	
	n_1	G	Without seal	With seal	FBW50110R (420)	FBW50110H (420)
300	2	50	170	164	360	740
350	3	25	220	214	420	870
400	3	50	270	264	480	990
450	4	25	320	314	540	1100
500	4	50	370	364	600	1200
600	5	50	470	464	720	1400
700	6	50	570	564	840	1700
800	7	50	670	664	960	2000
900	8	50	770	764	1100	2200
1000	9	50	870	864	1200	2500
1200	11	50	1070	1064	1400	3000
1500	14	50	1370	1364	1800	3700
1800	17	50	1670	1664	2200	4400

Note) THK also manufactures a long-size type at your request.
The values in the parentheses each indicate a slider mass.

Model number coding

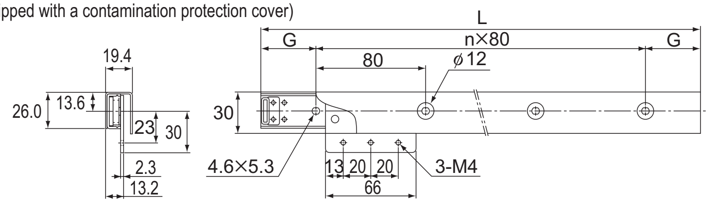
2 FBW50110R UU +800L - T

- 2: No. of sliders connected on the same rail (no symbol for a single slider)
- FBW50110R: Model number
- UU: With seal (no symbol for without seal)
- +800L: Overall slide rail length (in mm)
- T: Jointed slide rails symbol

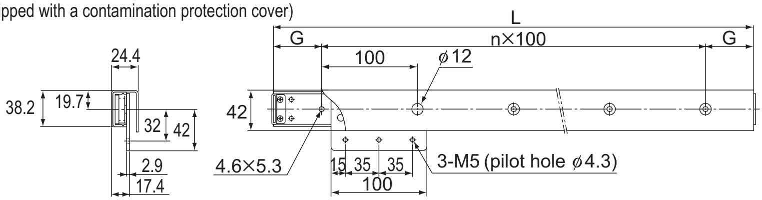
Metal Dustproof Cover

For Slide Pack model FBW, steel covers that cover the whole slide rail to prevent foreign material from entering the slide are available.

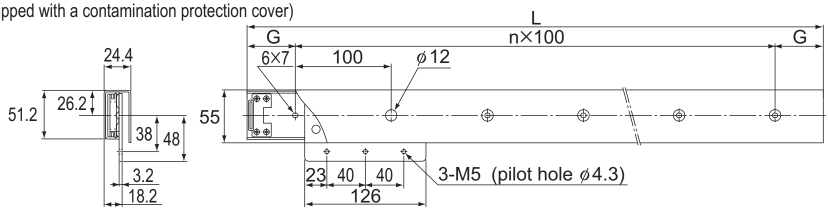
Model FBW2560RG
(Equipped with a contamination protection cover)



Model FBW3590RG
(Equipped with a contamination protection cover)



Model FBW50110RG
(Equipped with a contamination protection cover)



Note) For models equipped with a contamination protection cover, the rubber seal is not available.

Installation

[Groove Dimensions]

Fig.1 shows the dimensions of grooves for applications where model FBW-R (H) is installed in a groove.

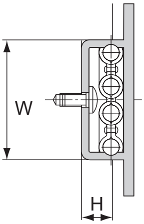


Fig.1

Unit: mm

Model No.	W	H
FBW 2560R	24.8 $^{+0.15}_{+0.1}$	7.4
FBW 3590R	37 $^{+0.15}_{+0.1}$	10
FBW 50110R	50 $^{+0.15}_{+0.1}$	10
FBW 50110H	54.4 $^{+0.15}_{+0.1}$	13

Slide Rail

THK General Catalog

B Product Specifications

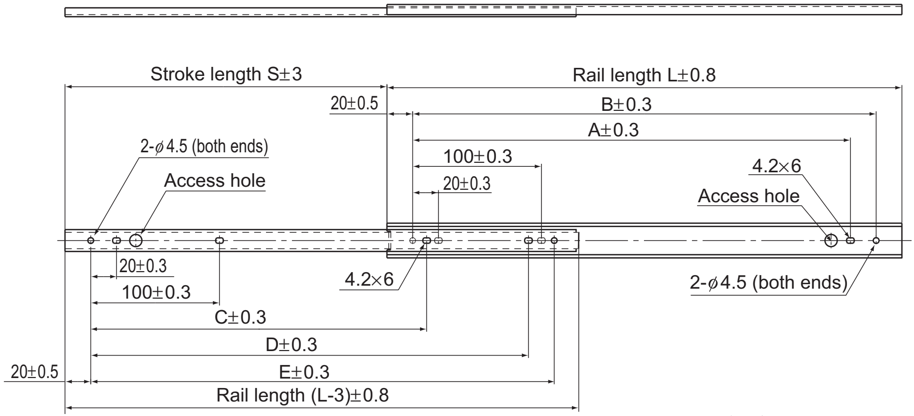
Dimensional Drawing, Dimensional Table

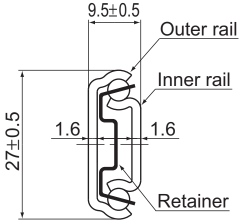
A Technical Descriptions of the Products (Separate)

Features and Types

* Please see the separate "A Technical Descriptions of the Products".

Model FBL 27S





Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions					Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	Inner rail	Outer rail		
200	135	140.0	160.0	—	140.0	160.0	5	5	260	0.32
250	185	190.0	210.0	150.0	190.0	210.0	6	5	240	0.40
300	222	240.0	260.0	190.0	240.0	260.0	6	5	240	0.48
350	260	290.0	310.0	225.0	290.0	310.0	6	5	230	0.56
400	297	340.0	360.0	265.0	340.0	360.0	6	5	210	0.64
450	334	390.0	410.0	300.0	390.0	410.0	6	5	200	0.72
500	371	440.0	460.0	337.0	440.0	460.0	6	5	180	0.80

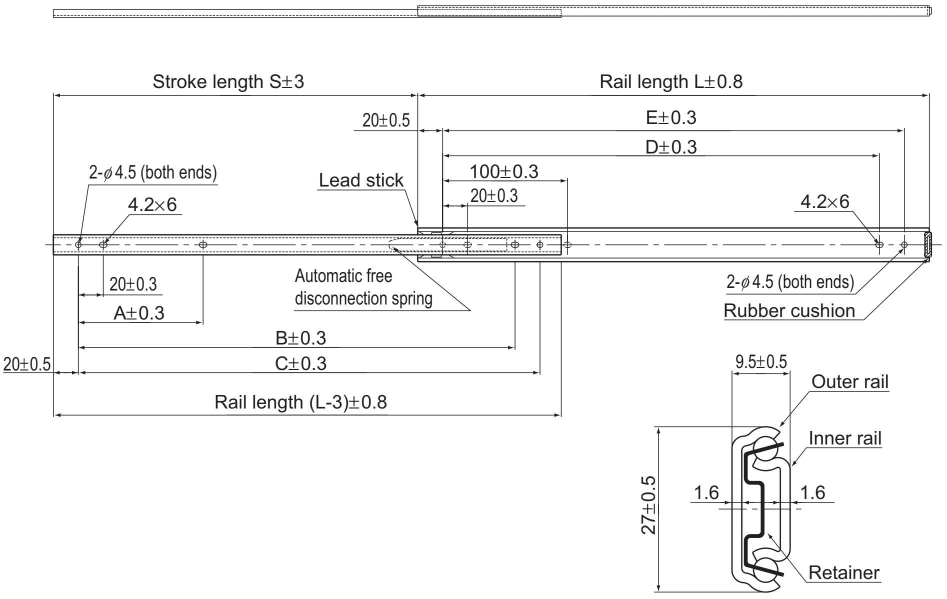
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL27S +300L

Model number — Overall rail length (in mm)

Model FBL 27S-P14



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions					Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	Inner rail	Outer rail		
200	116	65.0	—	170.0	140.0	160.0	4	5	260	0.32
250	152	100.0	—	210.0	190.0	210.0	4	5	240	0.40
300	202	100.0	—	260.0	240.0	260.0	4	5	240	0.48
350	251	100.0	—	310.0	290.0	310.0	4	5	230	0.56
400	297	100.0	—	360.0	340.0	360.0	4	5	210	0.64
450	332	100.0	390.0	410.0	390.0	410.0	5	5	210	0.72
500	371	100.0	440.0	460.0	440.0	460.0	5	5	200	0.80
550	407	100.0	490.0	510.0	490.0	510.0	5	5	180	0.80

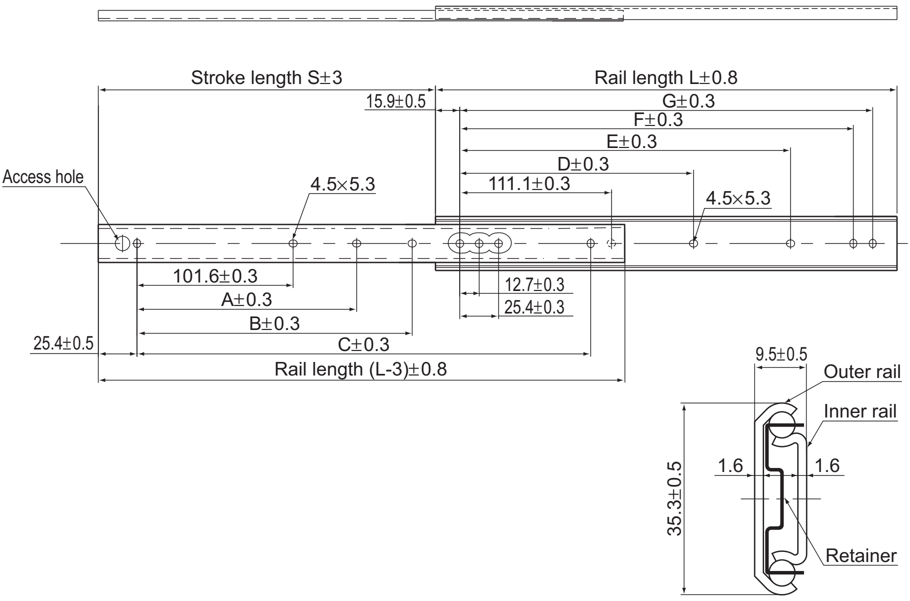
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL27S-P14 +500L

FBL27S-P14	+500L
Model number	Overall rail length (in mm)

Model FBL 35S



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	229	—	152.4	254.0	—	149.2	260.3	273.0	4	7	490	0.6
356	279	—	203.2	304.8	—	200.0	311.1	323.8	4	7	400	0.7
406	305	—	254.0	355.6	—	250.8	361.9	374.6	4	7	390	0.8
457	330	203.2	304.8	406.4	212.7	301.6	412.7	425.4	5	8	380	0.9
508	381	228.6	355.6	457.2	238.1	352.4	463.5	476.2	5	8	330	1.0
559	406	254.0	406.4	508.0	263.5	403.2	514.3	527.0	5	8	320	1.1
610	432	279.4	457.2	558.8	288.9	454.0	565.1	577.8	5	8	310	1.2
660	483	304.8	508.0	609.6	314.3	504.8	615.9	628.6	5	8	280	1.3
711	508	330.2	558.8	660.4	339.7	555.6	666.7	679.4	5	8	270	1.4

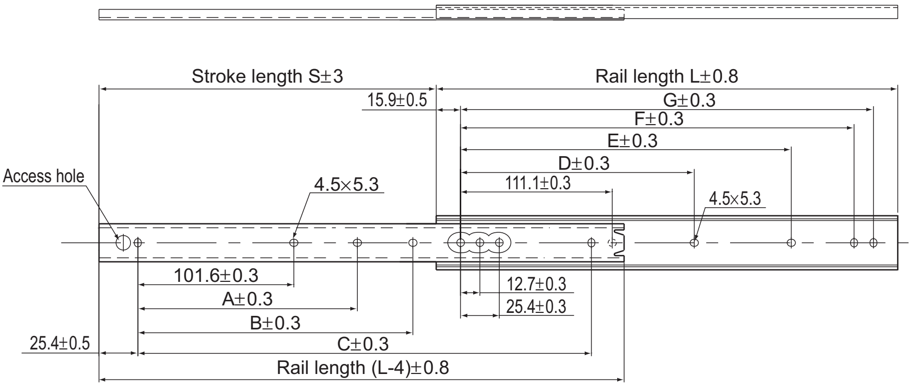
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

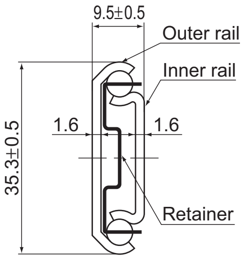
Model number coding

FBL35S **+457L**

Model number — Overall rail length (in mm)

Model FBL 35M





Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	229	—	152.4	254.0	—	149.2	260.3	273.0	4	7	490	0.6
356	279	—	203.2	304.8	—	200.0	311.1	323.8	4	7	400	0.7
406	305	—	254.0	355.6	—	250.8	361.9	374.6	4	7	390	0.8
457	330	203.2	304.8	406.4	212.7	301.6	412.7	425.4	5	8	380	0.9
508	381	228.6	355.6	457.2	238.1	352.4	463.5	476.2	5	8	330	1.0
559	406	254.0	406.4	508.0	263.5	403.2	514.3	527.0	5	8	320	1.1
610	432	279.4	457.2	558.8	288.9	454.0	565.1	577.8	5	8	310	1.2
660	483	304.8	508.0	609.6	314.3	504.8	615.9	628.6	5	8	280	1.3
711	508	330.2	558.8	660.4	339.7	555.6	666.7	679.4	5	8	270	1.4

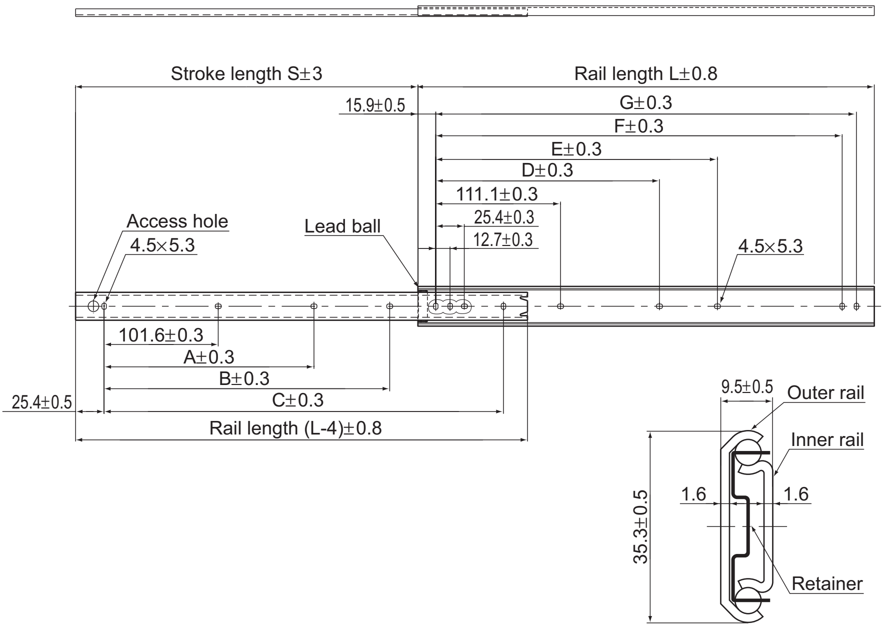
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35M +406L

Model number — Overall rail length (in mm)

Model FBL 35J



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	229	—	152.4	254.0	—	149.2	260.3	273.0	4	7	490	0.6
356	279	—	203.2	304.8	—	200.0	311.1	323.8	4	7	400	0.7
406	305	—	254.0	355.6	—	250.8	361.9	374.6	4	7	390	0.8
457	330	203.2	304.8	406.4	212.7	301.6	412.7	425.4	5	8	380	0.9
508	381	228.6	355.6	457.2	238.1	352.4	463.5	476.2	5	8	330	1.0
559	406	254.0	406.4	508.0	263.5	403.2	514.3	527.0	5	8	320	1.1
610	432	279.4	457.2	558.8	288.9	454.0	565.1	577.8	5	8	310	1.2
660	483	304.8	508.0	609.6	314.3	504.8	615.9	628.6	5	8	280	1.3
711	508	330.2	558.8	660.4	339.7	555.6	666.7	679.4	5	8	270	1.4

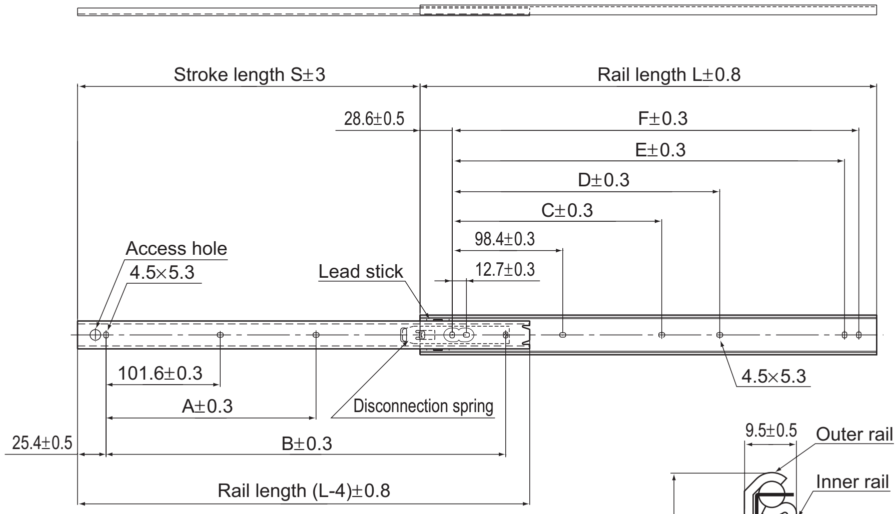
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

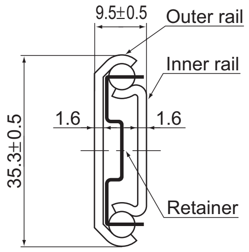
Model number coding

FBL35J +660L

Model number — Overall rail length (in mm)

Model FBL 35J-P13





Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions						Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	Inner rail	Outer rail		
305	224	152.4	—	136.5	—	247.6	260.3	3	6	490	0.6
356	275	203.2	—	187.3	—	298.4	311.1	3	6	400	0.72
406	315	254.0	—	238.1	—	349.2	361.9	3	6	390	0.84
457	330	203.2	406.4	200.0	228.9	400.0	412.7	4	7	380	0.96
508	381	228.6	457.2	225.4	339.7	450.8	463.5	4	7	330	1.04
559	406	254.0	508.0	250.8	390.5	501.6	514.3	4	7	320	1.16
610	432	279.4	558.8	276.2	441.3	552.4	565.1	4	7	310	1.24
660	483	304.8	609.6	301.6	492.1	603.2	615.9	4	7	280	1.36
711	493	330.2	660.4	327.0	542.9	654.0	666.7	4	7	270	1.48

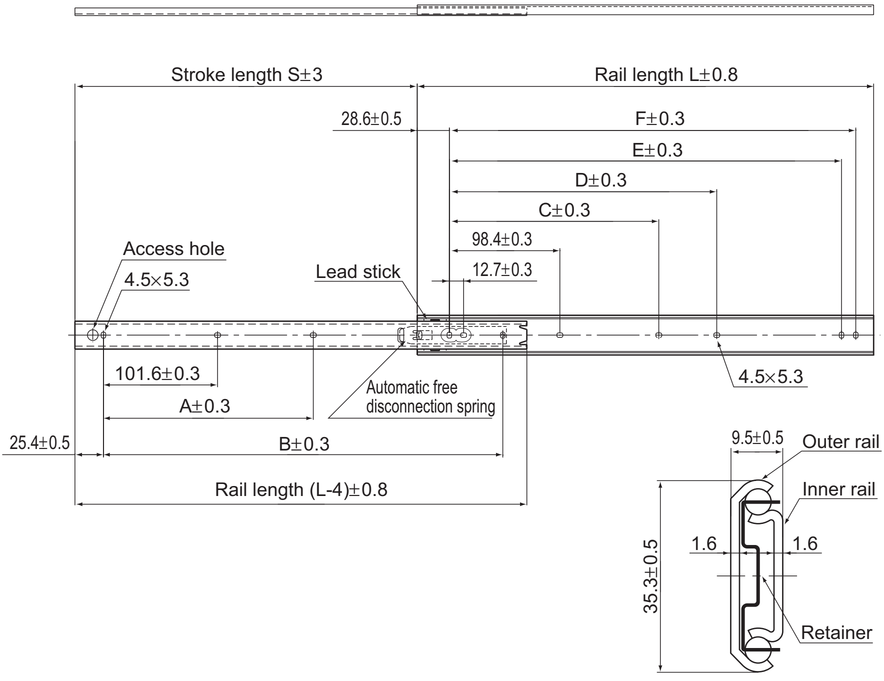
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35J-P13 +559L

Model number — Overall rail length (in mm)

Model FBL 35J-P14



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions						Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	Inner rail	Outer rail		
305	224	152.4	—	136.5	—	247.6	260.3	3	6	490	0.6
356	275	203.2	—	187.3	—	298.4	311.1	3	6	400	0.72
406	315	254.0	—	238.1	—	349.2	361.9	3	6	390	0.84
457	330	203.2	406.4	200.0	228.9	400.0	412.7	4	7	380	0.96
508	381	228.6	457.2	225.4	339.7	450.8	463.5	4	7	330	1.04
559	406	254.0	508.0	250.8	390.5	501.6	514.3	4	7	320	1.16
610	432	279.4	558.8	276.2	441.3	552.4	565.1	4	7	310	1.24
660	483	304.8	609.6	301.6	492.1	603.2	615.9	4	7	280	1.36
711	493	330.2	660.4	327.0	542.9	654.0	666.7	4	7	270	1.48

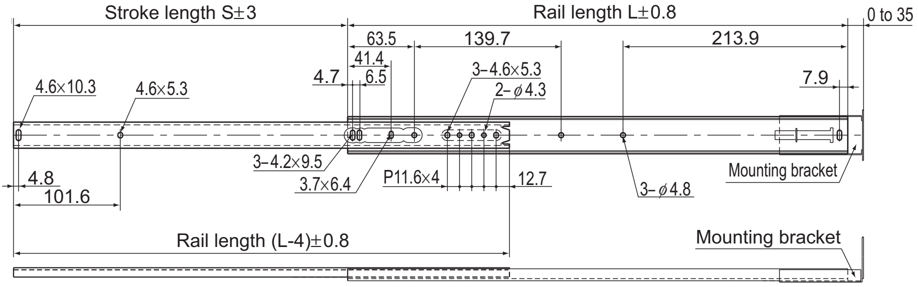
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

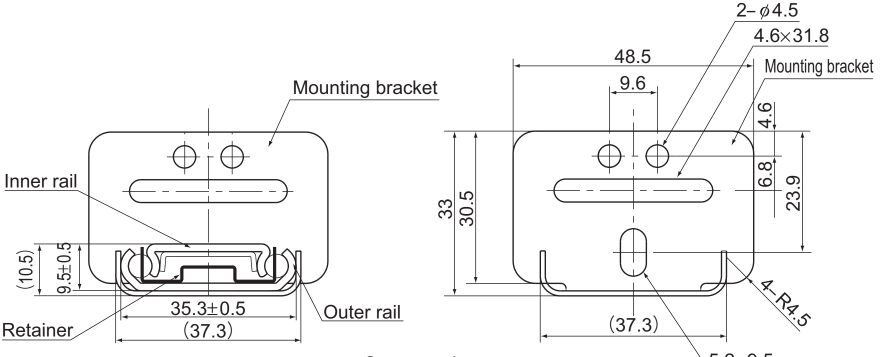
Model number coding

FBL35J-P14 **+559L**

Model number — Overall rail length (in mm)

Model FBL 35B





Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole		Permissible load N/pair	Mass kg/pair
		Inner rail	Outer rail		
324	216	7	7	115	0.8
375	267	7	7	105	0.92
425	305	7	7	100	1
476	318	7	7	90	1.12
527	368	7	7	83	1.24
578	419	7	7	73	1.32
629	445	7	7	66	1.44
679	495	7	7	61	1.6

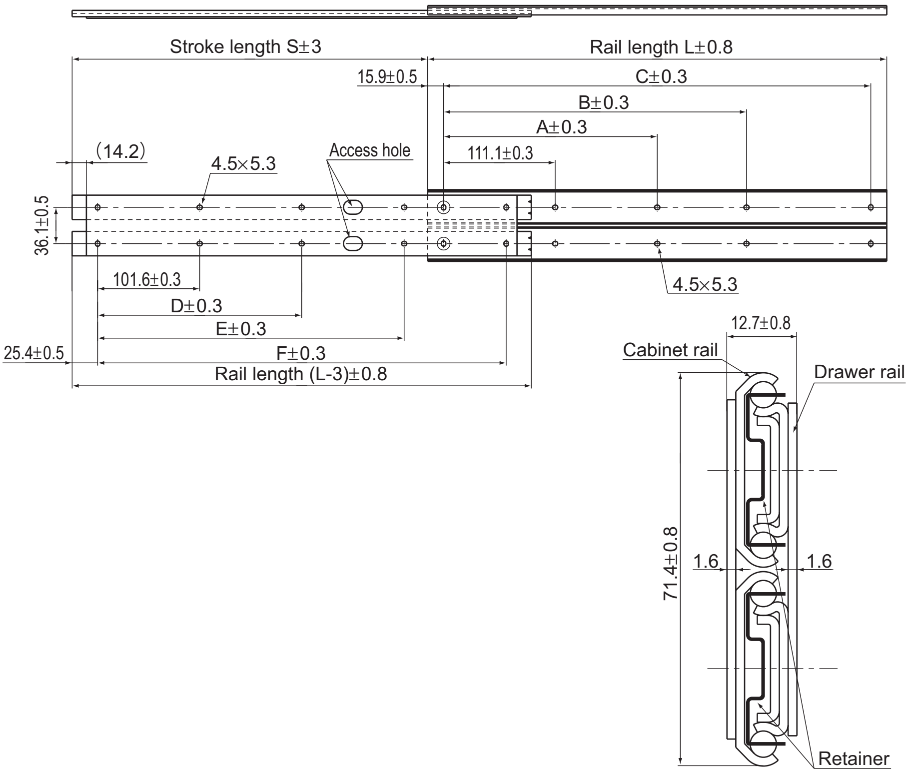
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35B +375L

Model number Overall rail length (in mm)

Model FBL 35T



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions						Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	Inner rail	Outer rail		
305	227	—	149.2	273.0	—	152.8	254.4	4	4	1120	2.16
356	278	—	200.0	323.8	—	203.6	305.2	4	4	1070	2.56
406	303	—	250.8	374.6	—	254.4	356.0	4	4	1020	2.96
457	354	212.7	301.6	425.4	203.2	305.2	406.8	5	5	1000	3.3
508	367	238.1	352.4	476.2	228.6	356.0	457.6	5	5	971	3.64
559	430	263.5	403.2	527.0	254.0	406.8	508.4	5	5	922	4.04
610	456	288.9	454.0	577.8	279.4	457.6	559.2	5	5	873	4.32
660	468	314.3	504.8	628.6	304.8	508.4	610.0	5	5	843	4.72
711	506	339.7	555.6	679.4	330.2	559.2	660.8	5	5	784	5.1

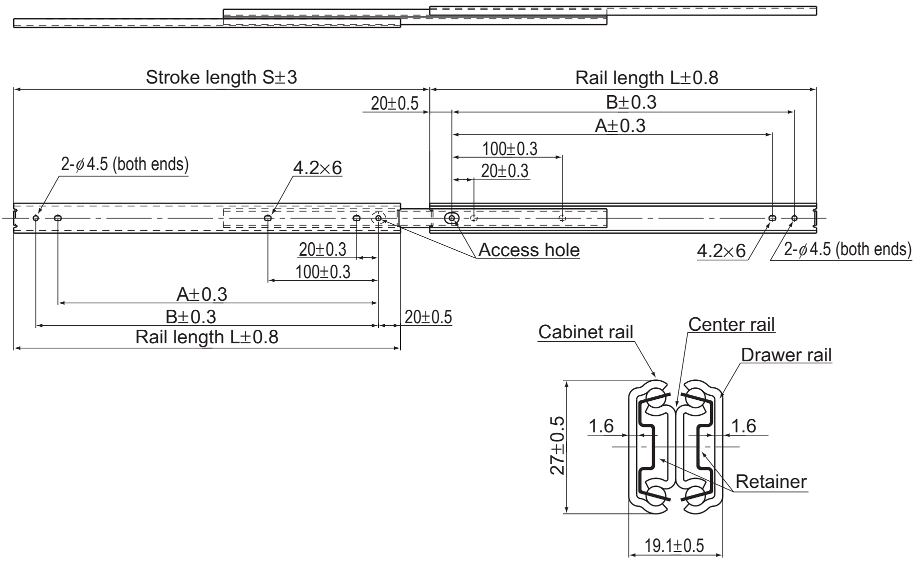
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35T +559L

Model number — Overall rail length (in mm)

Model FBL 27D



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions		Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	Drawer rail	Cabinet rail		
200	229	140.0	160.0	5	5	370	0.64
250	276	190.0	210.0	5	5	360	0.8
300	327	240.0	260.0	5	5	350	0.96
350	376	290.0	310.0	5	5	330	1.12
400	426	340.0	360.0	5	5	310	1.28
450	475	390.0	410.0	5	5	290	1.46
500	524	440.0	460.0	5	5	280	1.6

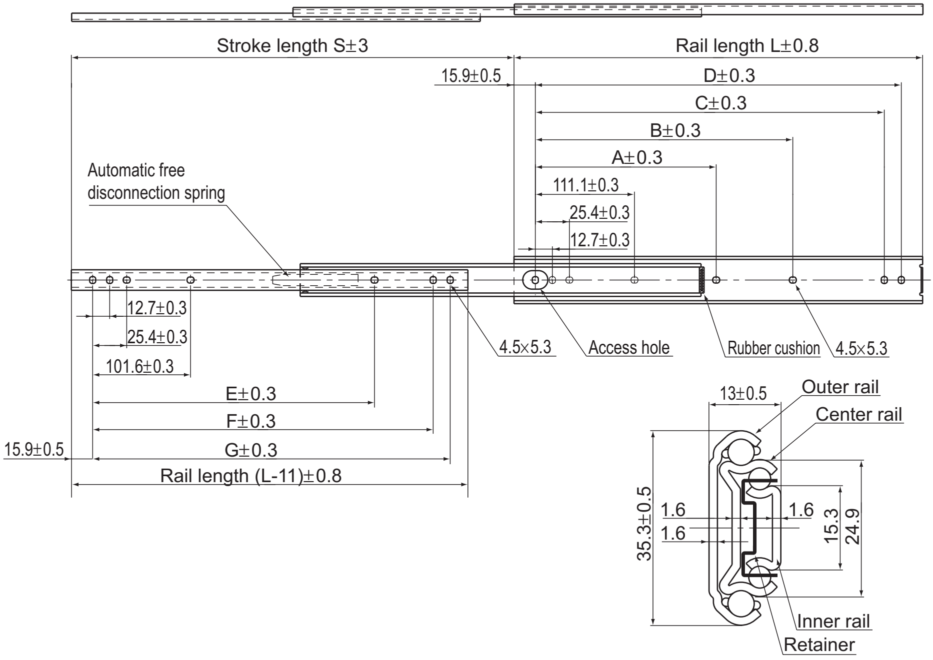
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL27D +200L

Model number — Overall rail length (in mm)

Model FBL 35E-P14



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	—	149.2	260.3	273.0	233.1	254.0	266.7	7	7	294	0.88
356	381	—	200.0	311.1	323.8	258.5	304.8	317.5	7	7	284	1.04
406	432	—	250.8	361.9	374.6	283.9	355.6	368.3	7	7	275	1.16
457	483	212.7	301.6	412.7	425.4	309.3	406.4	419.1	7	8	255	1.32
508	533	238.1	352.4	463.5	476.2	334.7	457.2	469.9	7	8	235	1.48

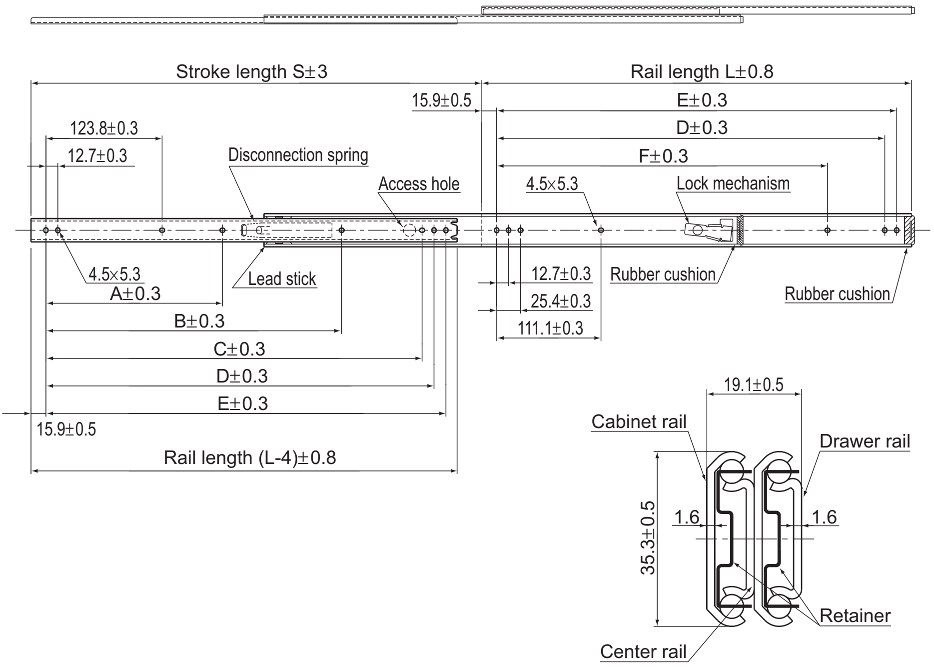
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35E-P14 +508L

Model number — Overall rail length (in mm)

Model FBL 35G-P13



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions						Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	Drawer rail	Cabinet rail		
305	327	—	—	—	260.3	273.0	—	5	6	623	1.2
356	378	—	—	298.4	311.1	323.8	—	6	6	586	1.4
406	429	—	—	349.2	361.9	374.6	250.8	6	7	555	1.6
457	480	212.7	—	400.0	412.7	425.4	301.6	7	7	516	1.8
508	530	238.1	365.1	450.8	463.5	476.2	352.4	8	7	475	2
559	581	263.5	415.9	501.6	514.3	527.0	403.2	8	7	444	2.2
610	632	288.9	466.7	552.4	565.1	577.8	454.0	8	7	413	2.4
660	683	314.3	517.5	603.2	615.9	628.6	504.8	8	7	382	2.6
711	734	339.7	568.3	654.0	666.7	679.4	555.6	8	7	355	2.8

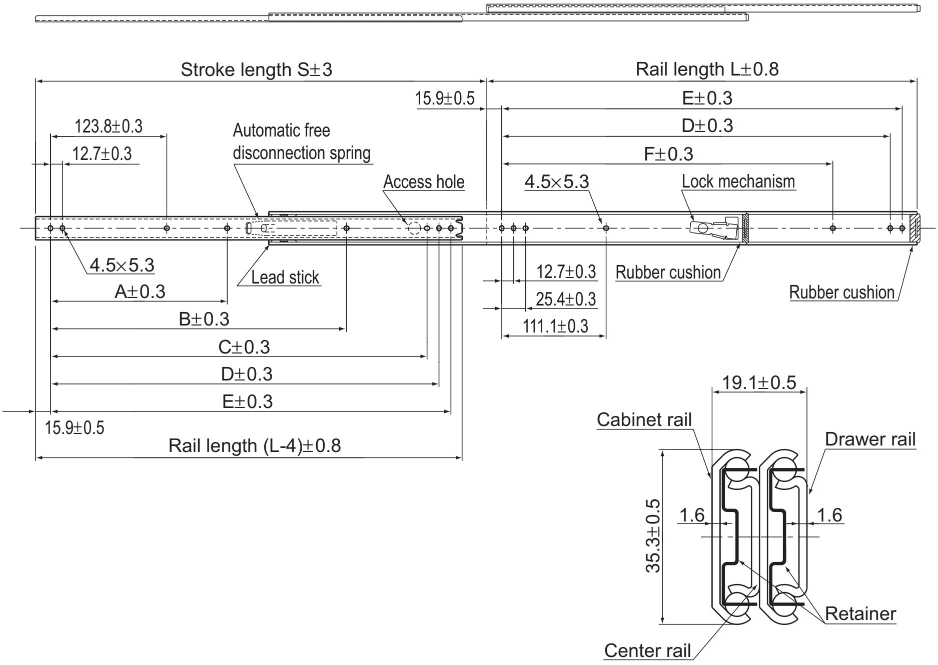
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35G-P13 +356L

Model number — Overall rail length (in mm)

Model FBL 35G-P14



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions						Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	Drawer rail	Cabinet rail		
305	327	—	—	—	260.3	273.0	—	5	6	623	1.2
356	378	—	—	298.4	311.1	323.8	—	6	6	586	1.4
406	429	—	—	349.2	361.9	374.6	250.8	6	7	555	1.6
457	480	212.7	—	400.0	412.7	425.4	301.6	7	7	516	1.8
508	530	238.1	365.1	450.8	463.5	476.2	352.4	8	7	475	2
559	581	263.5	415.9	501.6	514.3	527.0	403.2	8	7	444	2.2
610	632	288.9	466.7	552.4	565.1	577.8	454.0	8	7	413	2.4
660	683	314.3	517.5	603.2	615.9	628.6	504.8	8	7	382	2.6
711	734	339.7	568.3	654.0	666.7	679.4	555.6	8	7	355	2.8

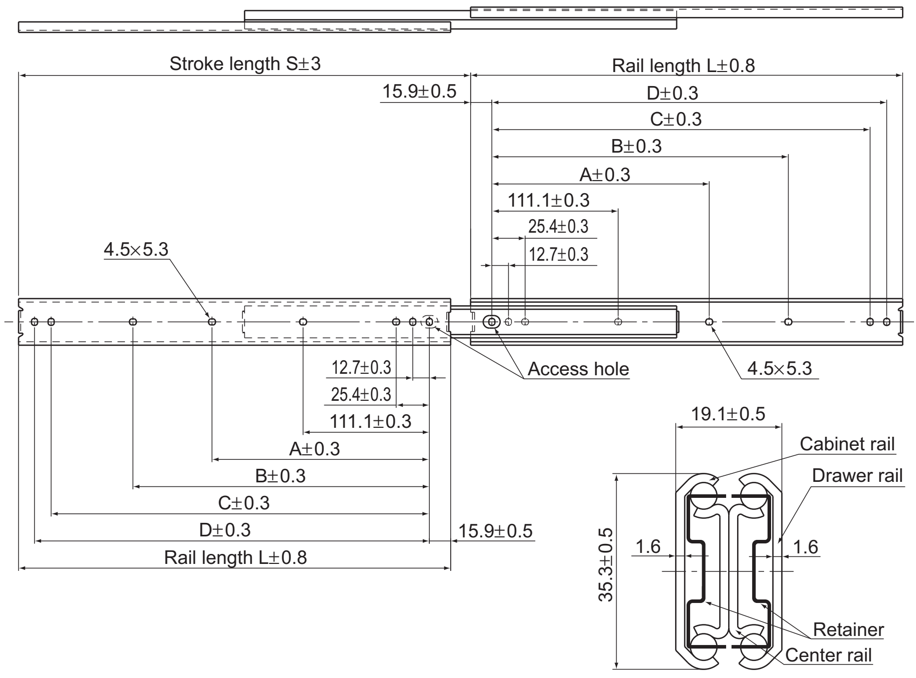
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35G-P14 +610L

Model number — Overall rail length (in mm)

Model FBL 35D



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions				Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	Drawer rail	Cabinet rail		
305	327	—	149.2	260.3	273.0	7	7	588	1.28
356	378	—	200.0	311.1	323.8	7	7	578	1.48
406	429	—	250.8	361.9	374.6	7	7	559	1.72
457	480	212.7	301.6	412.7	425.4	8	8	549	1.96
508	530	238.1	352.4	463.5	476.2	8	8	529	2.12
559	581	263.5	403.2	514.3	527.0	8	8	500	2.4
610	632	288.9	454.0	565.1	577.8	8	8	480	2.56
660	683	314.3	504.8	615.9	628.6	8	8	461	2.8
711	734	339.7	555.6	666.7	679.4	8	8	441	3

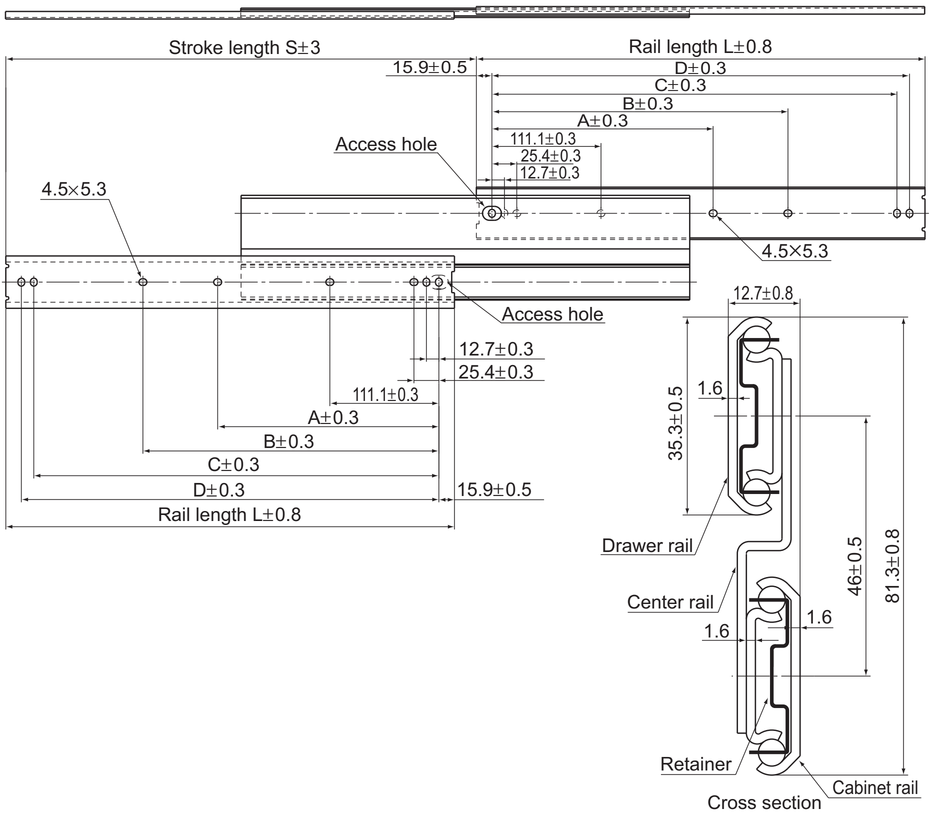
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35D +711L

Model number — Overall rail length (in mm)

Model FBL 35W



Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions				Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	Drawer rail	Cabinet rail		
305	327	—	149.2	260.4	273.1	7	7	706	1.68
356	378	—	200.0	311.2	323.9	7	7	676	2
406	429	—	250.8	362.0	374.7	7	7	637	2.32
457	480	225.4	301.6	412.8	425.5	8	8	598	2.64
508	530	250.8	352.4	463.6	476.3	8	8	569	2.88
559	581	276.2	403.2	514.4	527.1	8	8	520	3.2
610	632	301.6	454.0	565.2	577.9	8	8	480	3.52
660	683	327.0	504.8	616.0	628.7	8	8	422	3.84
711	734	352.4	555.6	666.8	679.5	8	8	353	4.12

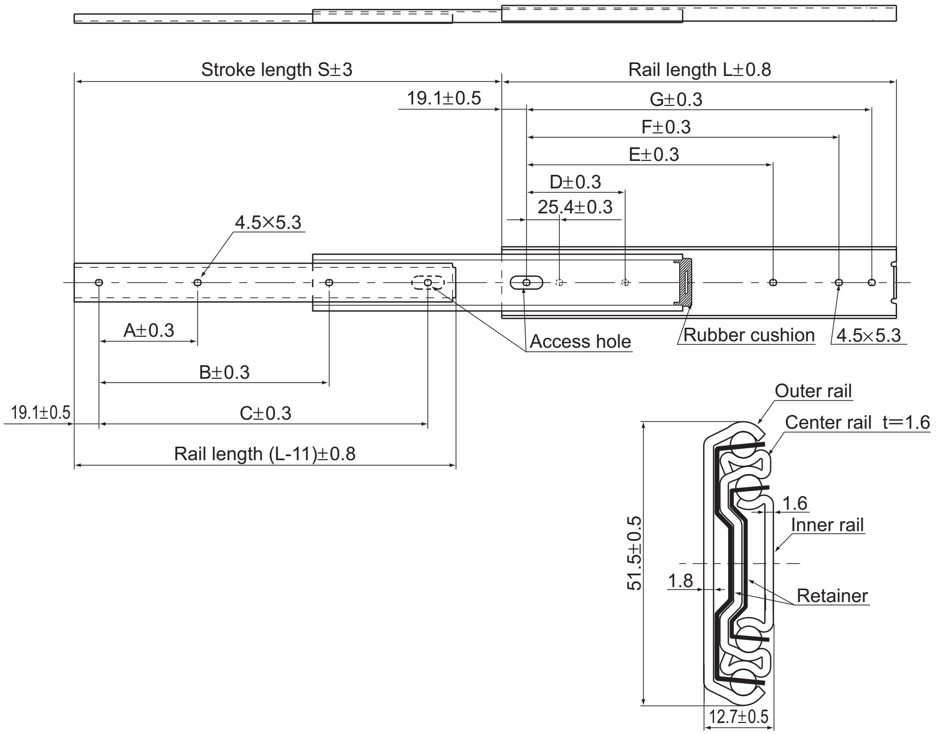
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35W +356L

Model number — Overall rail length (in mm)

Model FBL 51H



Cross section

Unit: mm

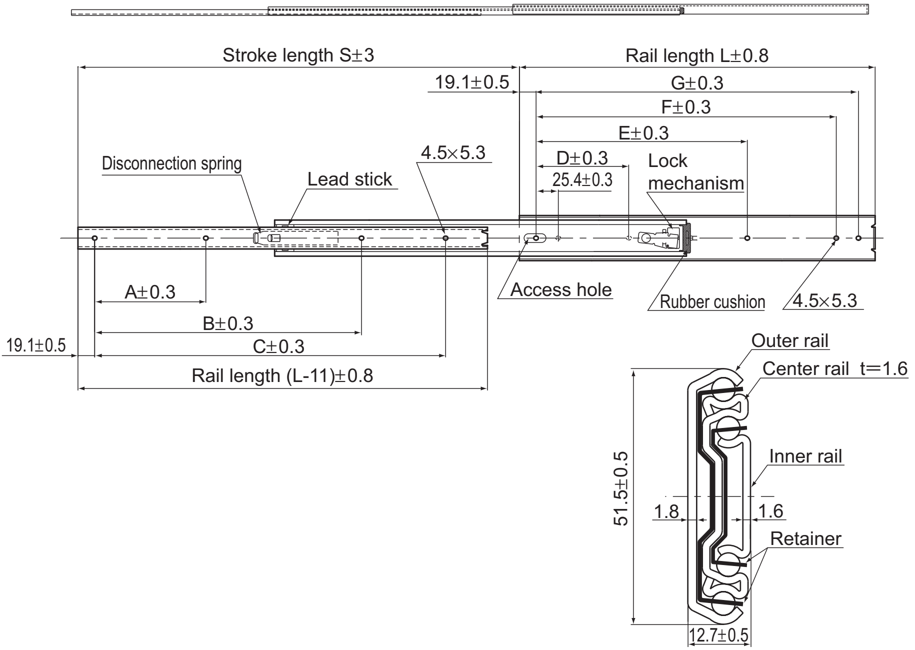
Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	76.2	177.8	254.0	76.2	190.5	241.3	266.7	4	6	850	1.46
356	381	101.6	203.2	304.8	88.9	215.9	292.1	317.5	4	6	820	1.72
406	432	127.0	228.6	355.6	127.0	241.3	342.9	368.3	4	6	770	1.89
457	483	127.0	279.4	406.4	127.0	292.1	393.7	419.1	4	6	730	2.26
508	533	152.4	304.8	457.2	152.4	317.5	444.5	469.9	4	6	710	2.52
559	584	177.8	330.2	508.0	177.8	342.9	495.3	520.7	4	6	690	2.72
610	635	177.8	381.0	558.8	177.8	393.7	546.1	571.5	4	6	660	3.00
660	686	203.2	406.4	609.6	203.2	419.1	596.9	622.3	4	6	630	3.25
711	737	228.6	431.8	660.4	228.6	444.5	647.7	673.1	4	6	610	3.54
762	787	228.6	457.2	711.2	228.6	469.9	698.5	723.9	4	6	580	3.86

Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL51H	+610L
Model number	Overall rail length (in mm)

Model FBL 51H-P13



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	76.2	—	190.5	76.2	190.5	241.3	266.7	3	6	850	1.46
356	381	101.6	—	266.7	88.9	215.9	292.1	317.5	3	6	820	1.72
406	432	127.0	—	304.8	127.0	241.3	342.9	368.3	3	6	770	1.89
457	483	127.0	317.5	368.3	127.0	292.1	393.7	419.1	4	6	730	2.26
508	533	152.4	355.6	406.4	152.4	317.5	444.5	469.9	4	6	710	2.52
559	584	177.8	381.0	457.2	177.8	342.9	495.3	520.7	4	6	690	2.72
610	635	177.8	430.8	508.0	177.8	393.7	546.1	571.5	4	6	660	3.00
660	686	203.2	457.2	558.8	203.2	419.1	596.9	622.3	4	6	630	3.25
711	737	228.6	508.0	609.6	228.6	444.5	647.7	673.1	4	6	610	3.54
762	787	228.6	533.4	660.4	228.6	469.9	698.5	723.9	4	6	580	3.86

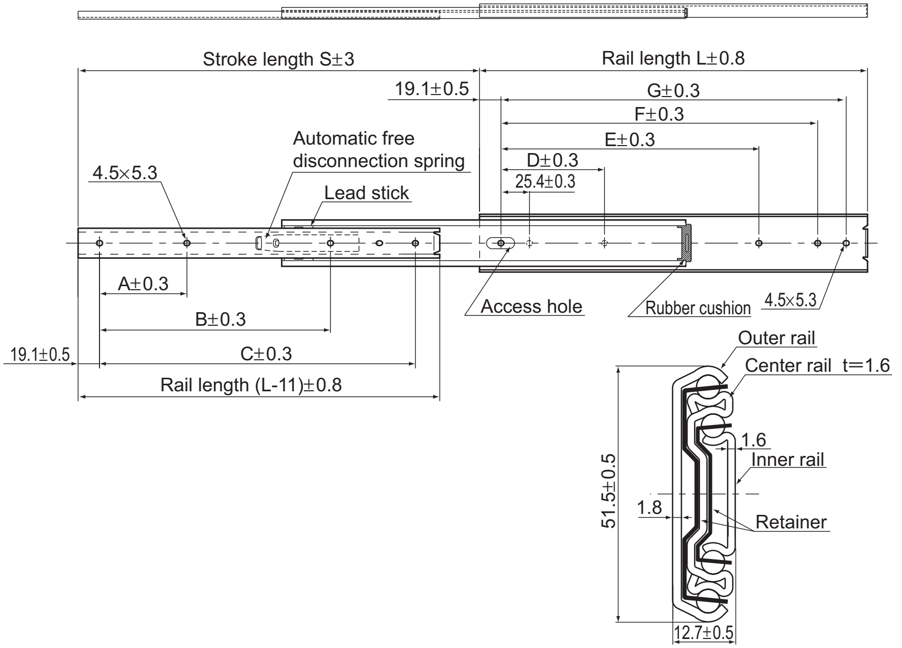
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL51H-P13 **+559L**

Model number — Overall rail length (in mm)

Model FBL 51H-P14



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	76.2	—	254.0	76.2	190.5	241.3	266.7	3	6	850	1.46
356	381	127.0	—	304.8	88.9	215.9	292.1	317.5	3	6	820	1.72
406	432	152.4	317.5	355.6	127.0	241.3	342.9	368.3	4	6	770	1.89
457	483	177.8	368.3	406.4	127.0	292.1	393.7	419.1	4	6	730	2.26
508	533	152.4	419.1	457.2	152.4	317.5	444.5	469.9	4	6	710	2.52
559	584	177.8	469.9	508.0	177.8	342.9	495.3	520.7	4	6	690	2.72
610	635	177.8	520.7	558.8	177.8	393.7	546.1	571.5	4	6	660	3.00
660	686	203.2	571.5	609.6	203.2	419.1	596.9	622.3	4	6	630	3.25
711	737	228.6	622.3	660.4	228.6	444.5	647.7	673.1	4	6	610	3.54
762	787	228.6	673.1	711.2	228.6	469.9	698.5	723.9	4	6	580	3.86

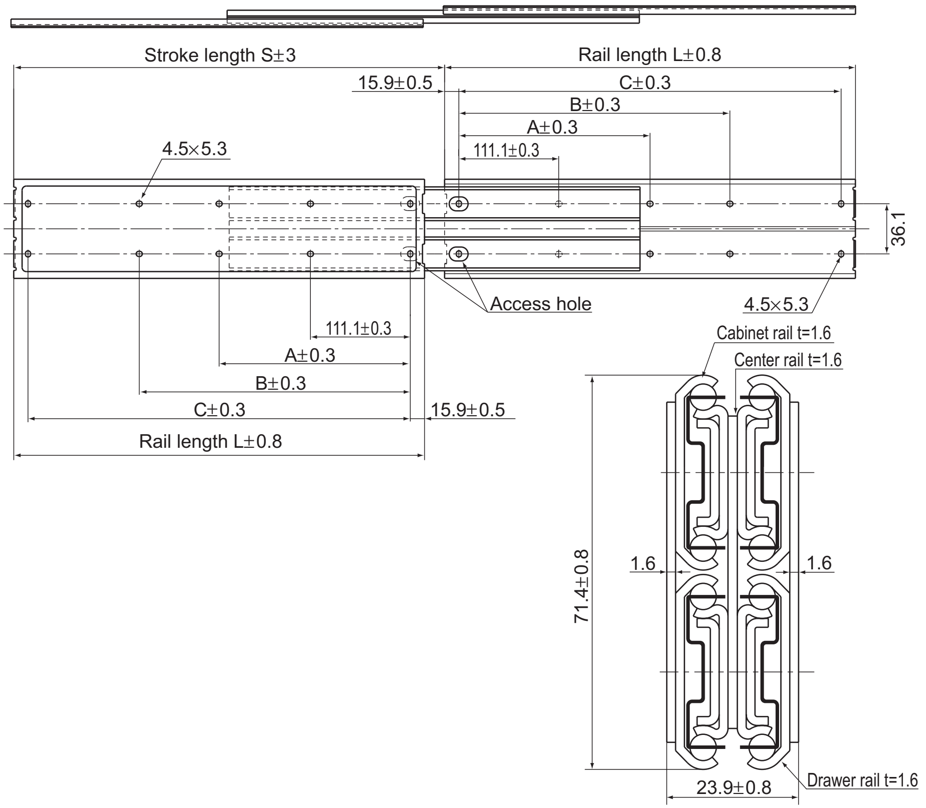
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL51H-P14 **+305L**

Model number — Overall rail length (in mm)

Model FBL 35K



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions			Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	Drawer rail	Cabinet rail		
305	327	—	149.2	273.0	4	4	2670	4.04
356	378	—	200.0	323.8	4	4	2630	4.8
406	429	—	250.8	374.6	4	4	2540	5.6
457	480	212.7	301.6	425.4	5	5	2450	6.04
508	530	238.1	352.4	476.2	5	5	2360	6.92
559	581	263.5	403.2	527.0	5	5	2250	7.56
610	632	288.9	454.0	577.8	5	5	2120	8.4
660	683	314.3	504.8	628.6	5	5	1960	9
711	734	339.7	555.6	679.4	5	5	1780	9.68

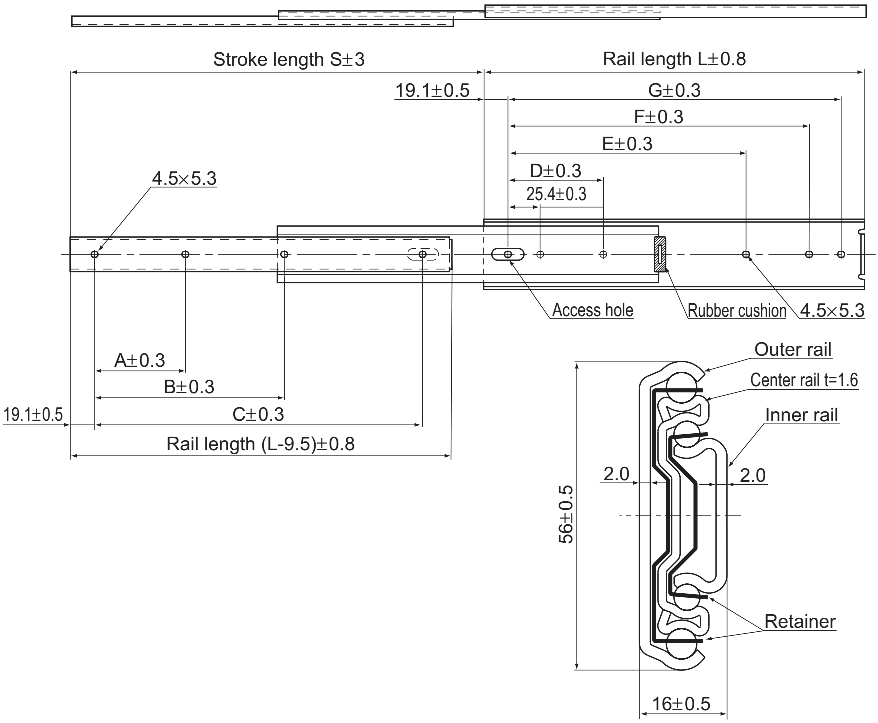
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL35K +711L

Model number Overall rail length (in mm)

Model FBL 56H



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	76.2	177.8	254.0	76.2	190.5	241.3	266.7	4	6	961	1.76
356	381	101.6	203.2	304.8	88.9	215.9	292.1	317.5	4	6	951	2.04
406	432	127.0	228.6	355.6	127.0	241.3	342.9	368.3	4	6	941	2.36
457	483	127.0	279.4	406.4	127.0	292.1	393.7	419.1	4	6	922	2.64
508	533	152.4	304.8	457.2	152.4	317.5	444.5	469.9	4	6	902	2.96
559	584	177.8	330.2	508.0	177.8	342.9	495.3	520.7	4	6	882	3.24
610	635	177.8	381.0	558.8	177.8	393.7	546.1	571.5	4	6	863	3.6
660	686	203.2	406.4	609.6	203.2	419.1	596.9	622.3	4	6	843	3.84
711	737	228.6	431.8	660.4	228.6	444.5	647.7	673.1	4	6	824	4.06
762	787	228.6	457.2	711.2	228.6	469.9	698.5	723.9	4	6	784	4.44

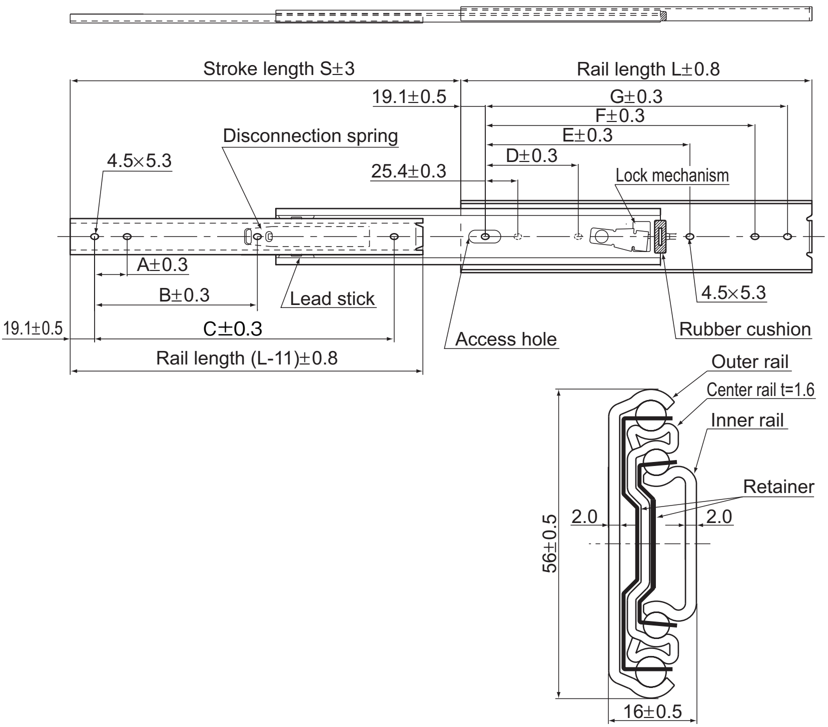
Note) The permissible load and the mass each indicate the value for a pair of 2 units.

Model number coding

FBL56H **+406L**

Model number Overall rail length (in mm)

Model FBL 56H-P13



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	76.2	—	254.0	76.2	190.5	241.3	266.7	3	6	961	1.76
356	381	127.0	—	304.8	88.9	215.9	292.1	317.5	3	6	951	2.04
406	432	152.4	317.5	355.6	127.0	241.3	342.9	368.3	4	6	941	2.36
457	483	177.8	368.3	406.4	127.0	292.1	393.7	419.1	4	6	922	2.64
508	533	152.4	419.1	457.2	152.4	317.5	444.5	469.9	4	6	902	2.96
559	584	177.8	469.9	508.0	177.8	342.9	495.3	520.7	4	6	882	3.24
610	635	177.8	520.7	558.8	177.8	393.7	546.1	571.5	4	6	863	3.6
660	686	203.2	571.5	609.6	203.2	419.1	596.9	622.3	4	6	843	3.84
711	737	228.6	622.3	660.4	228.6	444.5	647.7	673.1	4	6	824	4.06
762	787	228.6	673.1	711.2	228.6	469.9	698.5	723.9	4	6	784	4.44

Note) The permissible load and the mass each indicate the value for a pair of 2 units.

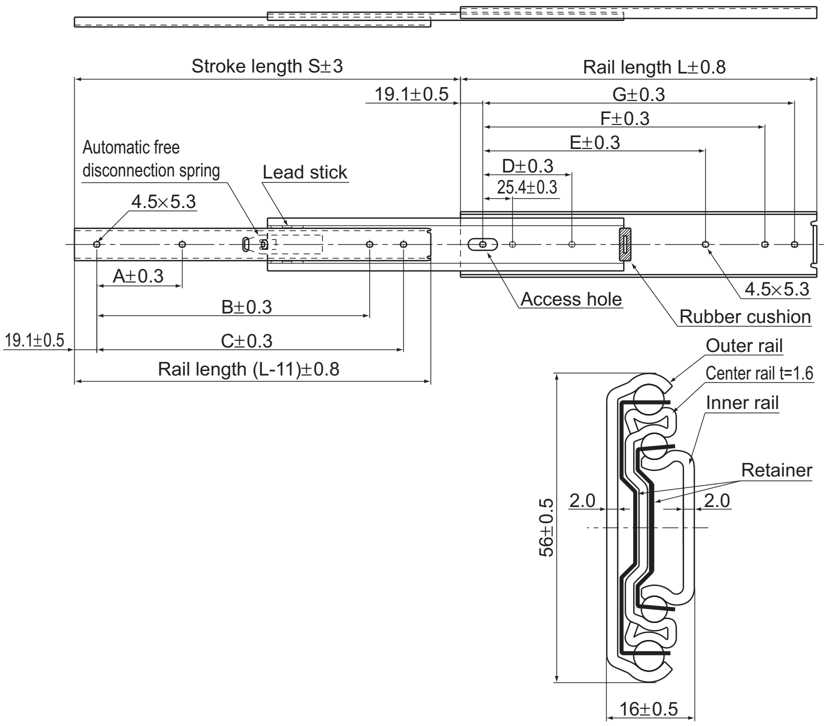
Model number coding

FBL56H-P13 +762L

Model number

Overall rail length (in mm)

Model FBL 56H-P14



Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions							Mounting hole		Permissible load N/pair	Mass kg/pair
		A	B	C	D	E	F	G	Inner rail	Outer rail		
305	330	76.2	—	254.0	76.2	190.5	241.3	266.7	3	6	961	1.76
356	381	127.0	—	304.8	88.9	215.9	292.1	317.5	3	6	951	2.04
406	432	152.4	317.5	355.6	127.0	241.3	342.9	368.3	4	6	941	2.36
457	483	177.8	368.3	406.4	127.0	292.1	393.7	419.1	4	6	922	2.64
508	533	152.4	419.1	457.2	152.4	317.5	444.5	469.9	4	6	902	2.96
559	584	177.8	469.9	508.0	177.8	342.9	495.3	520.7	4	6	882	3.24
610	635	177.8	520.7	558.8	177.8	393.7	546.1	571.5	4	6	863	3.6
660	686	203.2	571.5	609.6	203.2	419.1	596.9	622.3	4	6	843	3.84
711	737	228.6	622.3	660.4	228.6	444.5	647.7	673.1	4	6	824	4.06
762	787	228.6	673.1	711.2	228.6	469.9	698.5	723.9	4	6	784	4.44

Note) The permissible load and the mass each indicate the value for a pair of 2 units.

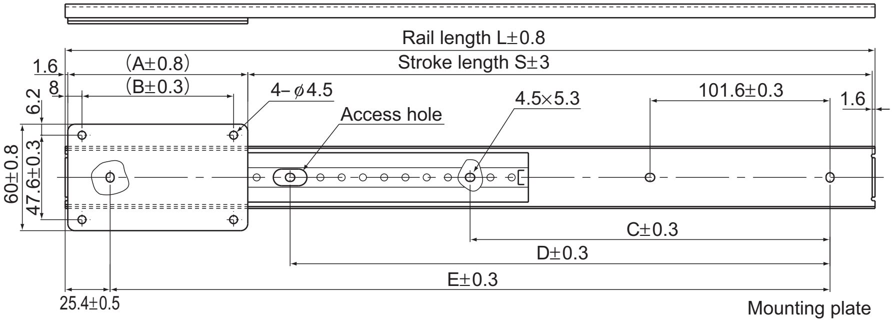
Model number coding

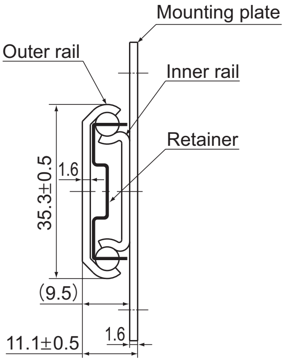
FBL56H-P14 +457L

Model number

Overall rail length (in mm)

Model FBL 35F





Cross section

Unit: mm

Mounting plate	Model No.	#3	#4	#5	#6	#7	#8	Dimension of the outer rail mounting hole (±0.3)		
	Length (A±0.8)	76.2	101.6	127	152.4	177.8	203.2			
Rail length L(±0.8)		Stroke length S (±3) * Varies with the combination with the mounting plate above.						C	D	E
305		225.4	200.0	174.6	149.2	—	—	—	152.4	254.0
356		276.2	250.8	225.4	200.0	174.6	149.2	—	203.2	304.8
406		327.0	301.6	276.2	250.8	225.4	200.0	—	254.0	355.6
457		377.8	352.4	327.0	301.6	276.2	250.8	203.2	304.8	406.4
508		428.6	403.2	377.8	352.4	327.0	301.6	228.6	355.6	457.2
559		479.4	454.0	428.6	403.2	377.8	352.4	254.0	406.4	508.0
610		530.2	504.8	479.4	454.0	428.6	403.2	279.4	457.2	558.8
660		581.0	555.6	530.2	504.8	479.4	454.0	304.8	508.0	609.6
711		631.8	606.4	581.0	555.6	530.2	504.8	330.2	558.8	660.4
762		682.6	657.2	631.8	606.4	581.0	555.6	355.6	609.6	711.2
Pitch of the mounting plate mounting hole (B±0.3)		60.2	85.6	111.0	136.4	161.8	187.2	—	—	—
Permissible load (N/pair)		294	392	490	588	686	784	—	—	—

Note) The permissible load indicates the value for a pair of 2 units.

Model number coding

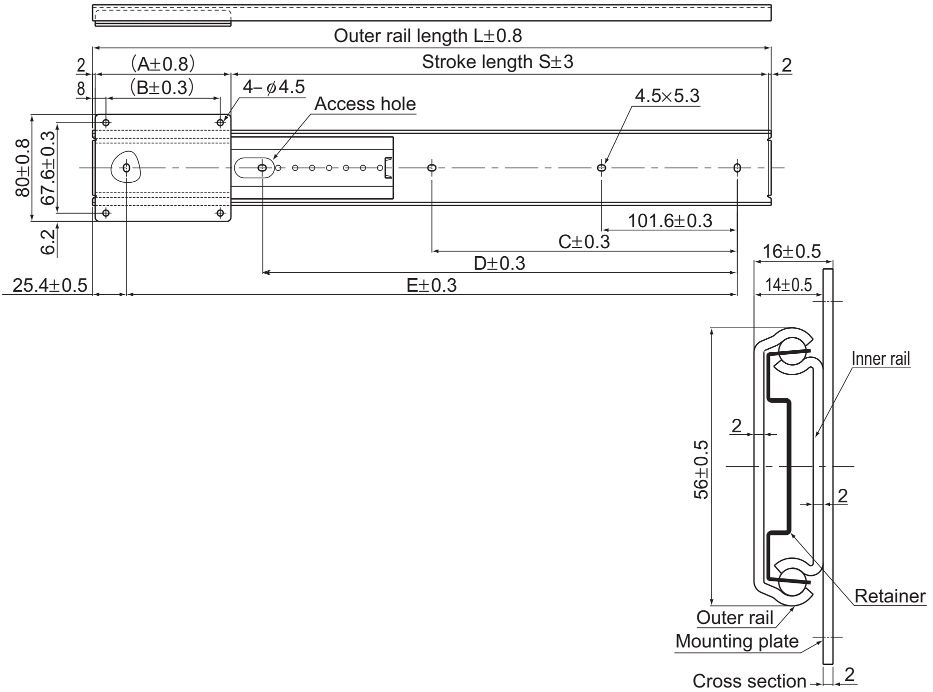
FBL35F +356L #5

Model number

Model number of mounting plate

Overall rail length (in mm)

Model FBL 56F



Unit: mm

Mounting plate	Model No.	#3	#4	#5	#6	#7	#8	Dimension of the outer rail mounting hole (±0.3)		
	Length (A±0.8)	76.2	101.6	127	152.4	177.8	203.2			
Rail length L(±0.8)		Stroke length S (±3) * Varies with the combination with the mounting plate above.						C	D	E
305		224.6	199.2	173.8	148.4	—	—	—	152.4	254.0
356		275.4	250.0	224.6	199.2	173.8	148.4	—	203.2	304.8
406		326.2	300.8	275.4	250.0	224.6	199.2	—	254.0	355.6
457		377.0	351.6	326.2	300.8	275.4	250.0	203.2	304.8	406.4
508		427.8	402.4	377.0	351.6	326.2	300.8	228.6	355.6	457.2
559		478.6	453.2	427.8	402.4	377.0	351.6	254.0	406.4	508.0
610		529.4	504.0	478.6	453.2	427.8	402.4	279.4	457.2	558.8
660		580.2	554.8	529.4	504.0	478.6	453.2	304.8	508.0	609.6
711		631.0	605.6	580.2	554.8	529.4	504.0	330.2	558.8	660.4
762		681.8	656.4	631.0	605.6	580.2	554.8	355.6	609.6	711.2
Pitch of the mounting plate mounting hole (B±0.3)		60.2	85.6	111.0	136.4	161.8	187.2	—	—	—
Permissible load (N/pair)		588	784	980	1176	1372	1568	—	—	—

Note) The permissible load indicates the value for a pair of 2 units.

Model number coding

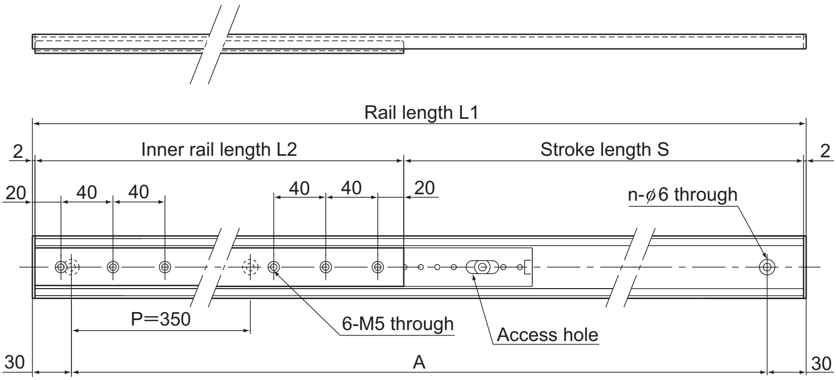
FBL56F +305L #6

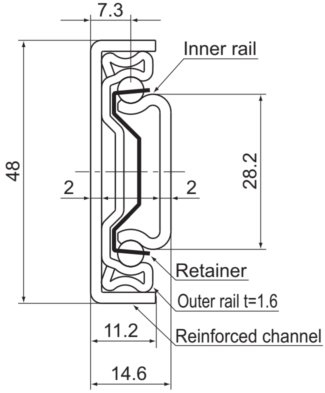
FBL56F: Model number

+305L: Overall rail length (in mm)

#6: Model number of mounting plate

Model FBL 48DR





Cross section

Unit: mm

Outer rail length L1	Inner rail length L2	Stroke length S	Mounting hole pitch A	No. of mounting holes n
1110	496	610	P350×3	4
1110	696	410	P350×3	4
1460	496	960	P350×4	5
1460	696	760	P350×4	5
1810	696	1110	P350×5	6
2160	496	1660	P350×6	7
2160	696	1460	P350×6	7

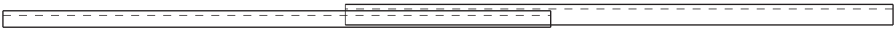
Model number coding

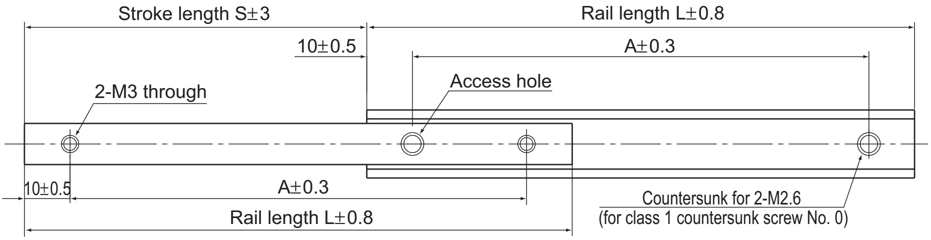
FBL48DR +1810/696L

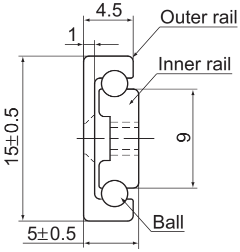
Model number — FBL48DR

Overall rail length (in mm) — +1810/696L

Model E15







Cross section

Unit: mm

Rail length L(±0.8)	Stroke S (±3)	Mounting hole dimensions A±0.3	Permissible load N/pair
50	20	30.0	5
80	45	60.0	8
100	60	80.0	10
120	75	100.0	10

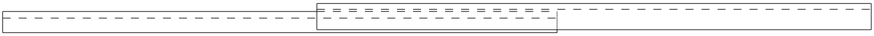
Note) The permissible load indicates the value for a pair of 2 units.

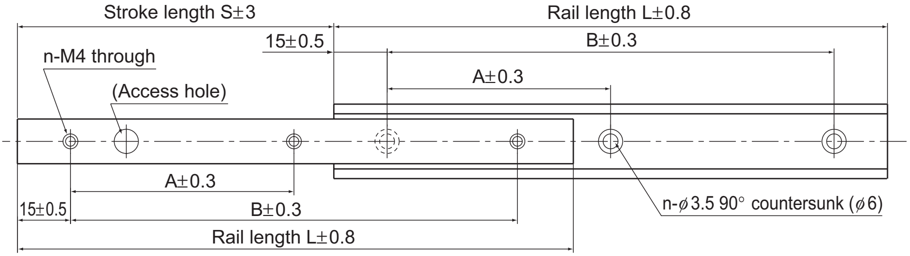
Model number coding

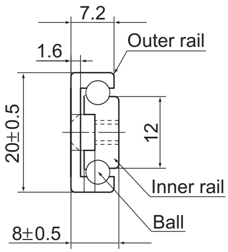
E15 +100L

Model number Overall rail length (in mm)

Model E20







Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions			Permissible load N/pair
		A±0.3	B±0.3	n (pcs)	
80	45	50.0	—	2	20
100	60	70.0	—	2	30
150	85	60.0	120.0	3	80
200	120	85.0	170.0	3	140
300	180	135.0	270.0	3	145

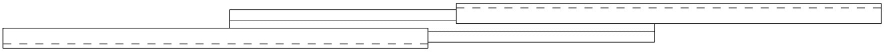
Note) The permissible load indicates the value for a pair of 2 units.

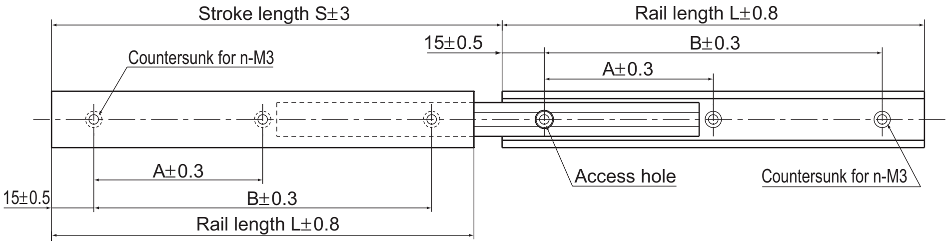
Model number coding

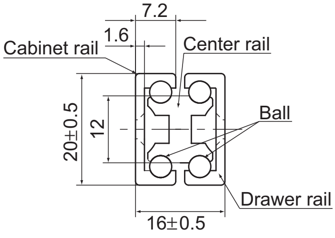
E20 +150L

Model number Overall rail length (in mm)

Model D20







Cross section

Unit: mm

Rail length L (±0.8)	Stroke S (±3)	Mounting hole dimensions			Permissible load N/pair
		A±0.3	B±0.3	n (pcs)	
80	80	50.0	—	2	20
100	100	70.0	—	2	30
150	160	60.0	120.0	3	80
200	223	85.0	170.0	3	140
300	345	135.0	270.0	3	145

Note) The permissible load indicates the value for a pair of 2 units.

Model number coding

D20 +300L

Model number — D20
Overall rail length (in mm) — +300L

Ball Screw

THK General Catalog

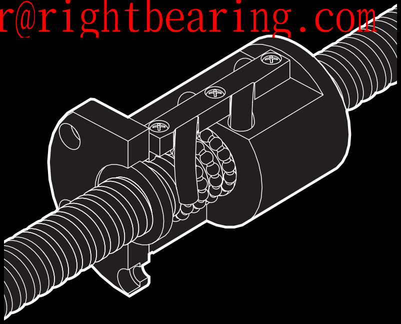
Ball Screw

THK General Catalog

B Product Specifications

A Technical Descriptions of the Products (Separate)

*** Please see the separate "A Technical Descriptions of the Products".**



Precision, Caged Ball Screw
Models SBN, SBK and HBN

Ball Screw

B Product Specifications

Dimensional Drawing, Dimensional Table

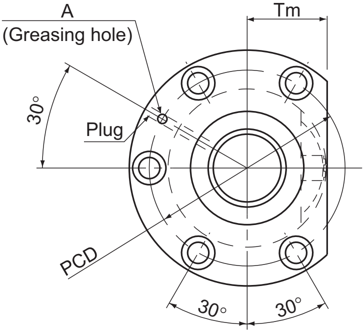
Options

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model SBN



Model No.	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity
	d	Ph	dp	dc	Rows x turns	Ca kN	C_0a kN	K N/μm
○ SBN 3210-7	32	10	33.75	26.4	1×3.5	43	73.1	836.7
○ SBN 3212-5	32	12	34	26.1	1×2.5	37.4	58.7	612.2
○ SBN 3610-7	36	10	37.75	30.4	1×3.5	45.6	82.3	920.9
○ SBN 3612-7	36	12	38	30.1	1×3.5	53.2	92.6	934.5
○ SBN 3616-5	36	16	38	30.1	1×2.5	39.7	66.4	676
○ SBN 4012-5	40	12	42	34.1	1×2.5	42	73.6	735.4
○ SBN 4016-5	40	16	42	34.1	1×2.5	41.9	73.8	736.6
○ SBN 4512-5	45	12	47	39.2	1×2.5	44.4	82.9	809.1
○ SBN 4516-5	45	16	47	39.2	1×2.5	44.3	83.1	810.1
○ SBN 5012-5	50	12	52	44.1	1×2.5	46.6	92.2	880.9
○ SBN 5016-5	50	16	52	44.1	1×2.5	46.6	92.4	881.7
○ SBN 5020-5	50	20	52	44.1	1×2.5	46.5	92.6	882.8

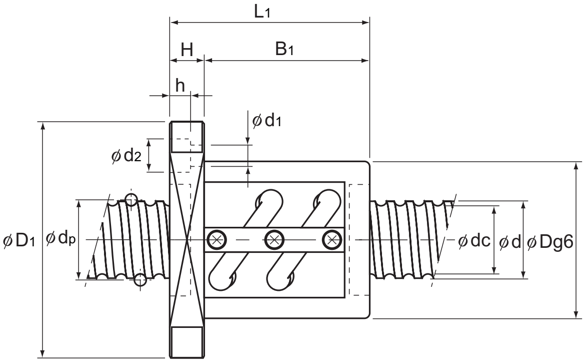
Note) With model SBN, the raising of both ends of the thread groove is not available. When designing your system this way, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring. For dimensions of the ball screw nut with either accessory being attached, see B-778.

Model number coding

SBN4012-5 RR G0 +1400L C5

SBN4012-5: Model number
RR: Seal symbol (*1)
G0: Clearance in the axial direction (G0 for all SBN variations) (*2)
+1400L: Overall screw shaft length (in mm)
C5: Accuracy symbol (*3)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Unit: mm

	Nut dimensions									Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter	Flange diameter	Overall length						Greasing hole			
	D	D_1	L_1	H	B_1	PCD	$d_1\times d_2\times h$	Tm	A	kg•cm²/mm	kg	kg/m
	74	108	120	15	105	90	9×14×8.5	38	M6	8.08×10^{-3}	3.1	3.6
	76	121	117	18	99	98	11×17.5×11	39	M6	8.08×10^{-3}	3.7	3.5
	77	120	123	18	105	98	11×17.5×11	40	M6	1.29×10^{-2}	3.8	5.0
	81	124	140	18	122	102	11×17.5×11	42	M6	1.29×10^{-2}	4.7	4.8
	81	124	140	18	122	102	11×17.5×11	42	M6	1.29×10^{-2}	4.7	5.6
	84	126	119	18	101	104	11×17.5×11	43	M6	1.97×10^{-2}	4.2	6.4
	84	126	144	18	126	104	11×17.5×11	43	M6	1.97×10^{-2}	4.9	7.3
	90	130	119	18	101	110	11×17.5×11	46	PT 1/8	3.16×10^{-2}	4.6	8.6
	90	130	140	18	122	110	11×17.5×11	46	PT 1/8	3.16×10^{-2}	5.3	9.6
	95	141	119	22	97	117	14×20×13	48	PT 1/8	4.82×10^{-2}	5.3	11.1
	95	141	143	22	121	117	14×20×13	48	PT 1/8	4.82×10^{-2}	6.1	12.2
	95	141	169	22	147	117	14×20×13	48	PT 1/8	4.82×10^{-2}	7.0	12.8

Note) The rigidity values in the table represent the spring constants obtained from the load and the elastic deformation when providing a preload 10% of the basic dynamic load rating (Ca) and applying an axial load three times greater than the preload.

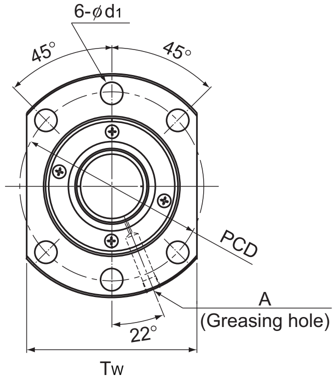
These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value.

If the applied preload (Fa_0) is not 0.1 Ca, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K\left(\frac{Fa_0}{0.1Ca}\right)^{\frac{1}{3}}$$

K: Rigidity value in the dimensional table.

Model SBK



Model No.	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity
						Ca	C0a	K
	d	Ph	dp	dc	Rows x turns	kN	kN	N/μm
SBK 3620-7.6	36	20	37.75	30.4	2×3.8	48.5	85	870
SBK 4020-7.6	40	20	42	34.1	2×3.8	59.7	112.7	970
SBK 4030-7.6	40	30	42	34.1	2×3.8	59.2	107.5	970
SBK 5020-7.6	50	20	52	44.1	2×3.8	66.8	141.9	1170
SBK 5030-7.6	50	30	52	44.1	2×3.8	66.5	135	1170
SBK 5036-7.6	50	36	52	44.1	2×3.8	65.9	135	1170
SBK 5520-7.6	55	20	57	49.1	2×3.8	69.8	156.4	1250
SBK 5530-7.6	55	30	57	49.1	2×3.8	69.2	147	1250
SBK 5536-7.6	55	36	57	49.1	2×3.8	69.1	148.7	1260

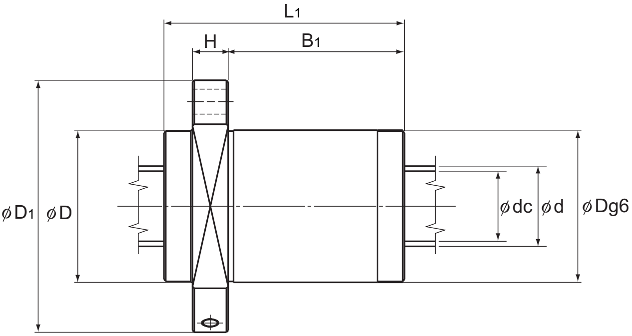
Note) With model SBK, the raising of both ends of the thread groove is not available. When designing your system this way, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring. For dimensions of the ball screw nut with either accessory being attached, see B-778.

Model number coding

SBK3620-7.6 RR G0 +1500L C5

- SBK3620-7.6: Model number
- RR: Seal symbol (*1)
- G0: Symbol for clearance in the axial direction (*2)
- +1500L: Overall screw shaft length (in mm)
- C5: Accuracy symbol (*3)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Unit: mm

	Nut dimensions									Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	PCD	d_1	T_W	Greasing hole A	kg•cm²/mm	kg	kg/m
	73	114	110	18	81	93	11	86	PT 1/8	1.29×10^{-2}	3.4	5.0
	80	136	110	20	79	112	14	103	PT 1/8	1.97×10^{-2}	4.5	5.7
	80	136	148	20	117	112	14	103	PT 1/8	1.97×10^{-2}	5.6	7.0
	90	146	110	22	77	122	14	110	PT 1/8	4.82×10^{-2}	5.3	10.2
	90	146	149	22	116	122	14	110	PT 1/8	4.82×10^{-2}	6.6	11.9
	90	146	172	22	139	122	14	110	PT 1/8	4.82×10^{-2}	7.4	12.5
	96	152	110	22	77	128	14	114	PT 1/8	7.05×10^{-2}	5.7	13.0
	96	152	149	22	116	128	14	114	PT 1/8	7.05×10^{-2}	7.2	14.8
	96	152	172	22	139	128	14	114	PT 1/8	7.05×10^{-2}	8.1	15.5

Note) The rigidity values in the table represent the spring constants obtained from the load and the elastic deformation when providing a preload 10% of the basic dynamic load rating (Ca) and applying an axial load three times greater than the preload.

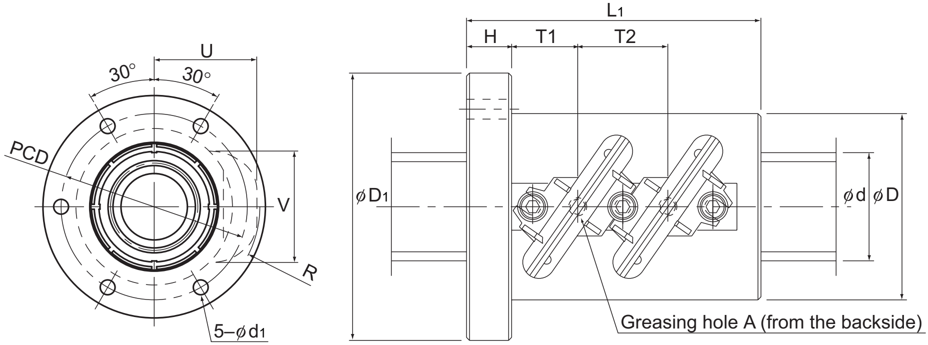
These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value.

If the applied preload (Fa_0) is not 0.1 Ca, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K\left(\frac{Fa_0}{0.1Ca}\right)^{\frac{1}{3}}$$

K: Rigidity value in the dimensional table.

Model HBN



Models HBN3210 to 3612

Model No.	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C_0a kN	Permissible load* F_P kN	Rigidity K N/μm
HBN 3210-5	32	10	34	26	2×2.5	102.9	191.3	31.9	1077
HBN 3610-5	36	10	38	30	2×2.5	108.2	220.4	33.5	1176
HBN 3612-5	36	12	38.4	29	2×2.5	141.1	267.7	43.7	1207
HBN 4010-7.5	40	10	42	34	3×2.5	162.6	336	50.4	1910
HBN 4012-7.5	40	12	42.4	33	3×2.5	212.4	441.6	65.8	1922
HBN 5010-7.5	50	10	52	44	3×2.5	179.1	462.7	55.5	2279
HBN 5012-7.5	50	12	52.4	43	3×2.5	235.7	572.2	73.1	2345
HBN 5016-7.5	50	16	53	39.6	3×2.5	379.6	820.9	117.7	2392
HBN 6316-7.5	63	16	66	52.6	3×2.5	427.1	1043.8	132.4	2898
HBN 6316-10.5	63	16	66	52.6	3×3.5	577.1	1461.3	178.9	4029
HBN 6320-7.5	63	20	66.5	49.6	3×2.5	578.8	1283.1	179.4	3030

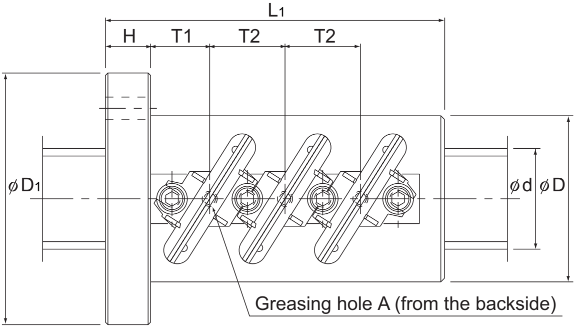
Note) The permissible load F_P* indicates the maxim axial load that the Ball Screw can receive.
This model is capable of achieving a longer service life than the conventional Ball Screw under a high load.
For the axial clearance, this model has clearance G2 as the standard. Other clearance is also available at your request.
Contact THK for details.

Model number coding

HBN3210-5 RR G2 +1200L C7

HBN3210-5: Model number
RR: Seal symbol (*1)
G2: Symbol for clearance in the axial direction (*2)
+1200L: Overall screw shaft length (in mm)
C7: Accuracy symbol (*3)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Models HBN4010 to 6320

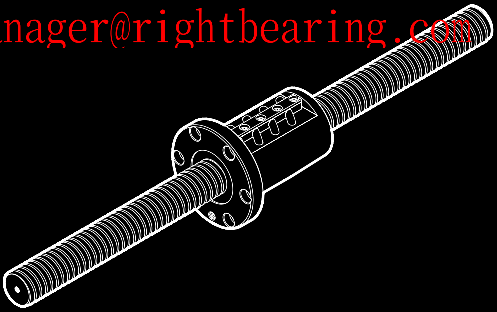
Unit: mm

	Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter	Flange diameter	Overall length									Greasing hole			
	D	D_1	L_1	H	PCD	d_1	T1	T2	U_{MAX}	V_{MAX}	R_{MAX}	A	kg・cm^2/mm	kg	kg/m
	58	85	98	15	71	6.6	22	30	43	46	43.5	M6	8.08×10^{-3}	1.8	2.9
	62	89	98	15	75	6.6	22	30	45	50	46	M6	1.29×10^{-2}	1.9	4.2
	66	100	116	18	82	9	26	36	49	52.5	50	M6	1.29×10^{-2}	2.8	3.2
	66	100	135	18	82	9	23.5	30	46.5	54	48	M6	1.97×10^{-2}	2.9	5.7
	70	104	152	18	86	9	26	36	51	56	52	M6	1.97×10^{-2}	3.7	4.6
	78	112	135	18	94	9	23.5	30	52	63.5	54.5	M6	4.82×10^{-2}	3.7	10.2
	80	114	152	18	96	9	26	36	56	66	58.5	M6	4.82×10^{-2}	4.4	8.9
	95	135	211	28	113	9	37.5	48	64.5	69.6	65.2	PT 1/8	4.82×10^{-2}	10.0	5.0
	105	139	211	28	122	9	37.5	48	70.5	82	72.5	PT 1/8	1.21×10^{-1}	10.6	11.5
	105	139	259	28	122	9	53.5	64	70.5	82	73	PT 1/8	1.21×10^{-1}	17.4	11.5
	117	157	252	32	137	11	44	60	79	86.5	80	PT 1/8	1.21×10^{-1}	17.2	8.1

Note) The rigidity values in the table represent the spring constants obtained from the load and the elastic deformation when providing an axial load, 30% of the basic dynamic load rating (Ca).
These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value.
If the axial load (Fa) is not 0.3 Ca, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K\left(\frac{Fa}{0.3Ca}\right)^{\frac{1}{3}}$$

K: Rigidity value in the dimensional table.



Standard-Stock Precision Ball Screw Unfinished Shaft Ends
Models BIF, BNFN, MDK, MBF and BNF

Ball Screw

B Product Specifications

Dimensional Drawing, Dimensional Table

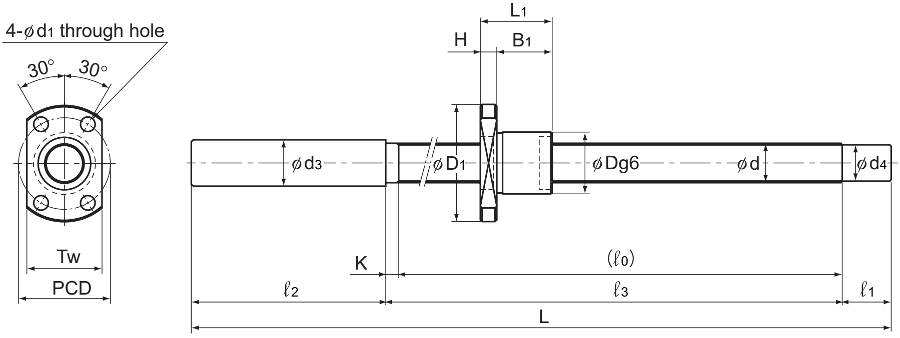
Options

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Unfinished Shaft Ends



Model MDK

Model No.	Ball screw specifications							Nut			
	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Outer diameter	Flange diameter	Overall length	
						Ca	C0a				
	d	Ph	dp	dc	Rows x turns	kN	kN	D	D1	L1	H
MDK 0401-3	4	1	4.15	3.4	3×1	0.29	0.42	9	19	13	3
MBF 0401-3.7	4	1	4.15	3.2	1×3.7	0.59	0.93	11	24	18	4
MDK 0601-3	6	1	6.2	5.3	3×1	0.54	1	11	23	14.5	3.5
MBF 0601-3.7	6	1	6.15	5.2	1×3.7	0.74	1.5	13	30	21	5

Note) Models MDK/MBF 0401 and 0601 are not provided with a labyrinth seal.

Model number coding

MDK0401-3 GT +95L C5 A

Model number

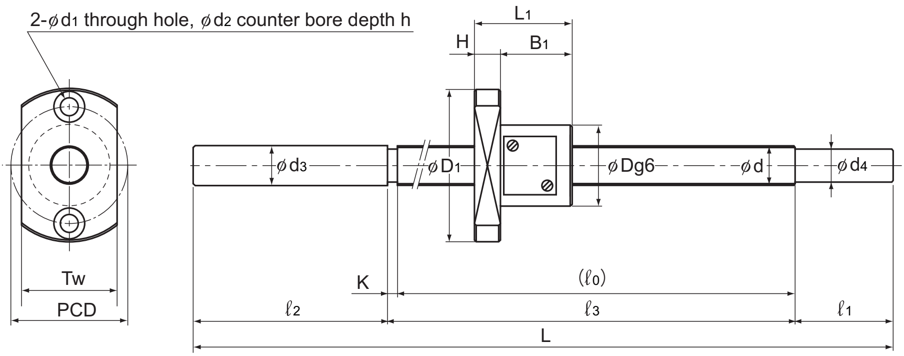
Symbol for clearance in the axial direction (*1)

Overall screw shaft length (in mm)

Accuracy symbol (*2)

Symbol for standard-stock type (A: with unfinished shaft ends)

(*1) See A-685. (*2) See A-678.

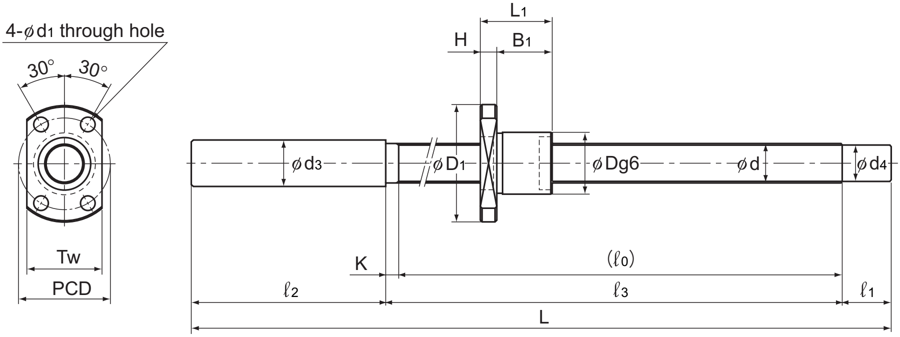


Model MBF

Unit: mm

Dimensions							Screw shaft dimensions									Nut mass	Shaft mass
	B_1	PCD	d_1	d_2	h	Tw	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	ℓ_3	d_3	d_4	K	kg	kg/m
	10	14	2.9	—	—	13	A	95	47	10	35	50	6.2	3.2	3	0.01	0.07
								115	67	10	35	70	6.2	3.2	3	0.01	0.07
								145	97	10	35	100	6.2	3.2	3	0.01	0.07
	14	17	3.4	6.5	2.5	13	A	90	48	10	30	50	4.3	3.2	2	0.02	0.07
								110	68	10	30	70	4.3	3.2	2	0.02	0.07
								130	88	10	30	90	4.3	3.2	2	0.02	0.07
	11	17	3.4	—	—	15	A	120	67	10	40	70	8.2	5.3	3	0.02	0.14
								150	97	10	40	100	8.2	5.3	3	0.02	0.14
								180	127	10	40	130	8.2	5.3	3	0.02	0.14
	16	21.5	3.4	6.5	3	17	A	131	58	20	50	61	6.3	5.2	3	0.04	0.14
								161	88	20	50	91	6.3	5.2	3	0.04	0.14
								201	128	20	50	131	6.3	5.2	3	0.04	0.14

Unfinished Shaft Ends



Model MDK

Model No.	Ball screw specifications							Nut			
	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Outer diameter	Flange diameter	Overall length	
						Ca	C0a				
	d	Ph	dp	dc	Rows x turns	kN	kN	D	D1	L1	H
MDK 0801-3	8	1	8.2	7.3	3×1	0.64	1.4	13	26	15	4
MDK 0802-3	8	2	8.3	7	3×1	1.4	2.3	15	28	22	5
MBF 0802-3.7	8	2	8.3	6.4	1×3.7	2.5	4.2	20	40	28	6

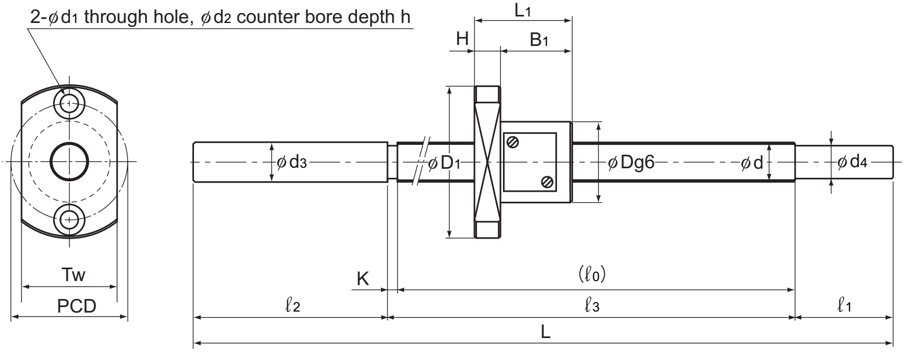
Note) Model MDK 0801 is not provided with a labyrinth seal.

Model number coding

MBF0802-3.7 RR GT +218L C5 A

- MBF0802-3.7: Model number
- RR: Seal symbol (*1)
- GT: Symbol for clearance in the axial direction (*2)
- +218L: Overall screw shaft length (in mm)
- C5: Accuracy symbol (*3)
- A: Symbol for standard-stock type (A: with unfinished shaft ends)

(*1) See A-816. (*2) See A-685. (*3) See A-678.

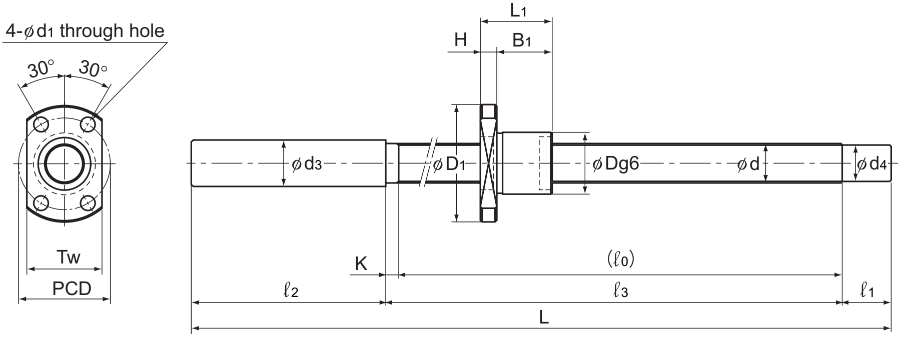


Model MBF

Unit: mm

Dimensions							Screw shaft dimensions									Nut mass	Shaft mass
	B_1	PCD	d_1	d_2	h	Tw	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	ℓ_3	d_3	d_4	K	kg	kg/m
	11	20	3.4	—	—	17	A	130	67	15	45	70	10.2	7.3	3	0.02	0.29
								160	97	15	45	100	10.2	7.3	3	0.02	0.29
								190	127	15	45	130	10.2	7.3	3	0.02	0.29
								240	177	15	45	180	10.2	7.3	3	0.02	0.29
	17	22	3.4	—	—	19	A	140	76	15	45	80	10.2	7	4	0.04	0.27
								170	106	15	45	110	10.2	7	4	0.04	0.27
								200	136	15	45	140	10.2	7	4	0.04	0.27
								250	186	15	45	190	10.2	7	4	0.04	0.27
	22	30	4.5	8	4	24	A	168	85	25	55	88	8.3	6.2	3	0.1	0.19
								193	110	25	55	113	8.3	6.2	3	0.1	0.19
								218	135	25	55	138	8.3	6.2	3	0.1	0.19

Description of Each Option⇒A-815 Dimensions⇒B-777



Model MDK

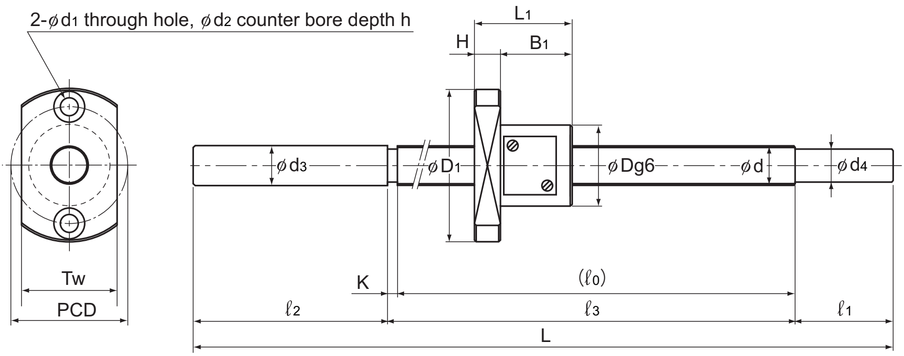
Model No.	Ball screw specifications							Nut			
	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Outer diameter	Flange diameter	Overall length	
						Ca	C_0a				
	d	Ph	dp	dc	Rows x turns	kN	kN	D	D_1	L_1	H
MDK 1002-3	10	2	10.3	9	3×1	1.5	2.9	17	34	22	5
MBF 1002-3.7	10	2	10.3	8.6	1×3.7	2.8	5.3	23	43	28	6
MDK 1202-3	12	2	12.3	11	3×1	1.7	3.6	19	36	22	5
MBF 1202-3.7	12	2	12.3	10.6	1×3.7	3	6.5	25	47	30	8

Model number coding

MDK1202-3 RR GT +165L C5 A

- MDK1202-3: Model number
- RR: Seal symbol (*1)
- GT: Symbol for clearance in the axial direction (*2)
- +165L: Overall screw shaft length (in mm)
- C5: Accuracy symbol (*3)
- A: Symbol for standard-stock type (A: with unfinished shaft ends)

(*1) See A-816. (*2) See A-685. (*3) See A-678.

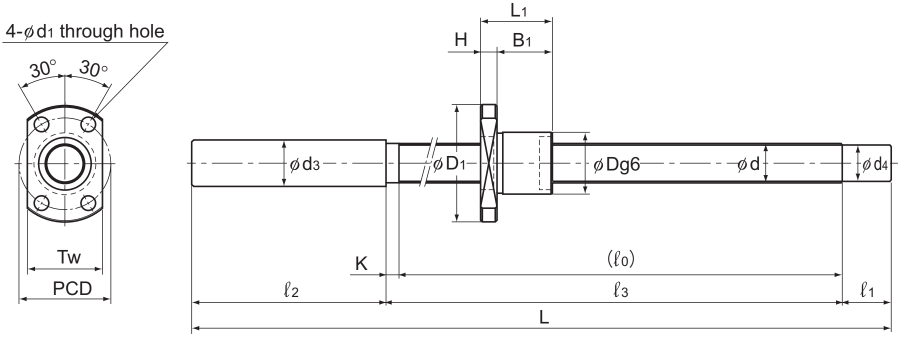


Model MBF

Unit: mm

Dimensions							Screw shaft dimensions										Nut mass	Shaft mass
	B1	PCD	d1	d2	h	Tw	Standard-stock symbol	Overall length L	ℓ0	ℓ1	ℓ2	ℓ3	d3	d4	K		kg	kg/m
	17	26	4.5	—	—	21	A	160	86	15	55	90	12.2	9	4		0.05	0.47
								210	136	15	55	140	12.2	9	4		0.05	0.47
								260	186	15	55	190	12.2	9	4		0.05	0.47
								310	236	15	55	240	12.2	9	4		0.05	0.47
	22	33	4.5	8	4	27	A	183	95	25	60	98	10.3	8.2	3		0.11	0.36
								223	135	25	60	138	10.3	8.2	3		0.11	0.36
								273	185	25	60	188	10.3	8.2	3		0.11	0.36
	17	28	4.5	—	—	23	A	165	86	15	60	90	14.2	11	4		0.05	0.71
								215	136	15	60	140	14.2	11	4		0.05	0.71
								265	186	15	60	190	14.2	11	4		0.05	0.71
								315	236	15	60	240	14.2	11	4		0.05	0.71
								365	286	15	60	290	14.2	11	4		0.05	0.71
	22	36	5.5	9.5	5.5	29	A	210	117	30	60	120	12.3	10.2	3		0.15	0.58
								235	142	30	60	145	12.3	10.2	3		0.15	0.58
								285	192	30	60	195	12.3	10.2	3		0.15	0.58

Unfinished Shaft Ends



Model MDK

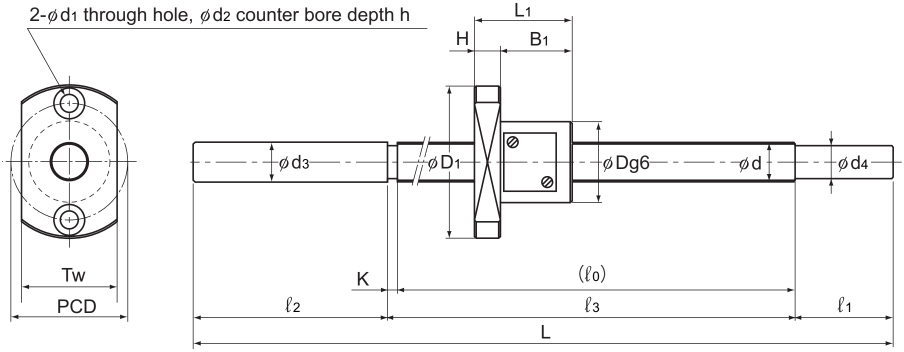
Model No.	Ball screw specifications							Nut			
	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	C0a kN	Outer diameter D	Flange diameter D1	Overall length L1	H
MDK 1402-3	14	2	14.3	13	3×1	1.8	4.3	21	40	23	6
MBF 1402-3.7	14	2	14.3	12.5	1×3.7	3.3	7.5	26	48	30	8

Model number coding

MBF1402-3.7 RR GT +245L C3 A

Model number
Seal symbol (*1)
Symbol for clearance in the axial direction (*2)
Overall screw shaft length (in mm)
Accuracy symbol (*3)
Symbol for standard-stock type (A: with unfinished shaft ends)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



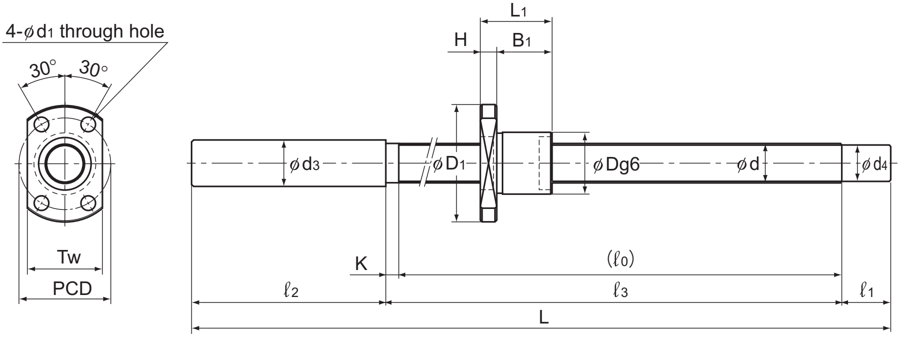
Model MBF

Unit: mm

Dimensions							Screw shaft dimensions									Nut mass	Shaft mass
	B_1	PCD	d_1	d_2	h	Tw	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	ℓ_3	d_3	d_4	K	kg	kg/m
	17	31	5.5	—	—	26	A	175	86	25	60	90	15.2	13	4	0.07	1.0
								225	136	25	60	140	15.2	13	4	0.07	1.0
								275	186	25	60	190	15.2	13	4	0.07	1.0
								325	236	25	60	240	15.2	13	4	0.07	1.0
								425	336	25	60	340	15.2	13	4	0.07	1.0
	22	37	5.5	9.5	5.5	32	A	205	102	40	60	105	14.3	12.2	3	0.16	0.85
								245	142	40	60	145	14.3	12.2	3	0.16	0.85
								295	192	40	60	195	14.3	12.2	3	0.16	0.85
								345	242	40	60	245	14.3	12.2	3	0.16	0.85

Description of Each Option⇒A-815 Dimensions⇒B-777

Unfinished Shaft Ends



Model MDK

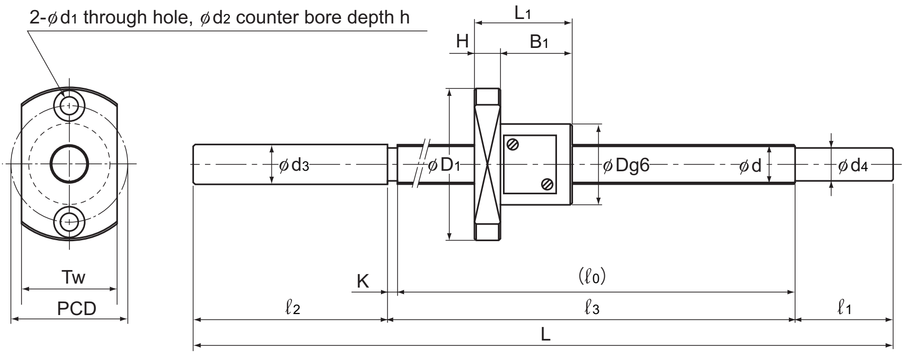
Model No.	Ball screw specifications							Nut			
	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C0a kN	Outer diameter D	Flange diameter D1	Overall length L1	H
MDK 1404-3	14	4	14.65	11.9	3×1	4.2	7.6	26	45	33	6
MBF 1404-3.7	14	4	14.3	11.8	1×3.7	5.7	11.1	30	54	38	8
MDK 1405-3	14	5	14.75	11.2	3×1	7	11.6	26	45	42	10

Model number coding

MDK1404-3 RR G2 +240L C7 A

- MDK1404-3: Model number
- RR: Seal symbol (*1)
- G2: Symbol for clearance in the axial direction (*2)
- +240L: Overall screw shaft length (in mm)
- C7: Accuracy symbol (*3)
- A: Symbol for standard-stock type (A: with unfinished shaft ends)

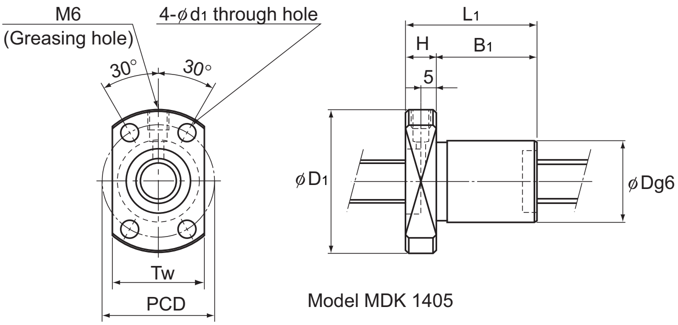
(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model MBF

Unit: mm

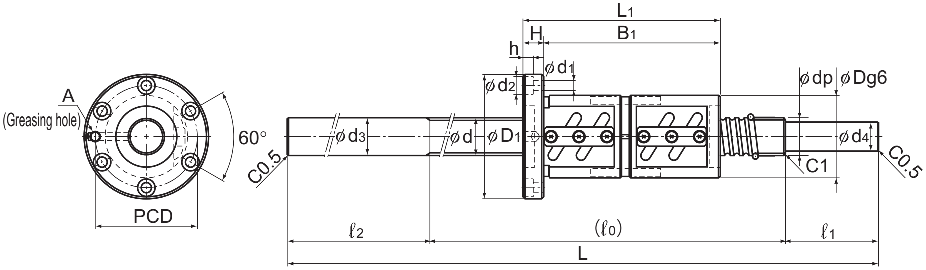
Dimensions							Screw shaft dimensions									Nut mass	Shaft mass
	B_1	PCD	d_1	d_2	h	Tw	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	ℓ_3	d_3	d_4	K	kg	kg/m
	27	36	5.5	—	—	28	A	240	150	25	60	155	15.2	11.9	5	0.14	0.8
								290	200	25	60	205	15.2	11.9	5	0.14	0.8
								340	250	25	60	255	15.2	11.9	5	0.14	0.8
								440	350	25	60	355	15.2	11.9	5	0.14	0.8
								540	450	25	60	455	15.2	11.9	5	0.14	0.8
	30	42	5.5	9.5	5.5	34	A	233	129	40	60	133	14.3	11.2	4	0.25	1.2
								293	189	40	60	193	14.3	11.2	4	0.25	1.2
								353	249	40	60	253	14.3	11.2	4	0.25	1.2
								413	309	40	60	313	14.3	11.2	4	0.25	1.2
	32	36	5.5	—	—	28	A	250	160	25	60	165	14	11.2	5	0.19	1.2
								300	210	25	60	215	14	11.2	5	0.19	1.2
								350	260	25	60	265	14	11.2	5	0.19	1.2
								450	360	25	60	365	14	11.2	5	0.19	1.2
								550	460	25	60	465	14	11.2	5	0.19	1.2



Model MDK 1405

Description of Each Option⇒A-815 Dimensions⇒B-777

Unfinished Shaft Ends



Model BNFN

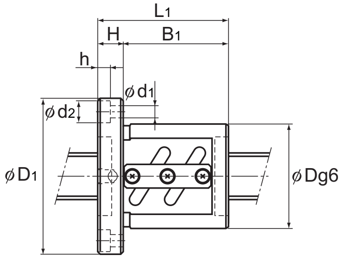
Model No.	Ball screw specifications								Nut			
	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C0a kN	Applied preload N	Outer diameter D	Flange diameter D1	Overall length L1	Mass kg
BNFN 1605-2.5 BNF 1605-2.5 BIF 1605-5	16	5	16.75	13.2	1×2.5	7.4	13.9	390 — 390	40	60	76 41 56	0.6 0.37 0.48
BNFN 1810-2.5 BNF 1810-2.5 BIF 1810-3	18	10	18.8	15.5	1×2.5 1×2.5 1×1.5	7.8 7.8 5.1	15.9 15.9 9.6	390 — 250	42	65	119 69 75	1.0 0.67 0.75
BNFN 2005-5 BNF 2005-5 BIF 2005-5	20	5	20.75	17.2	2×2.5 2×2.5 1×2.5	15.1 15.1 8.3	35 35 17.4	740 — 440	44	67	106 56 56	0.9 0.57 0.57

Model number coding

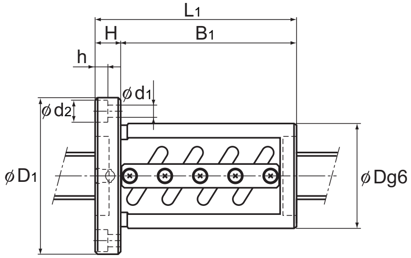
BNFN2005-5 RR G0 +610L C5 A

- BNFN2005-5: Model number
- RR: Seal symbol (*1)
- G0: Symbol for clearance in the axial direction (*2)
- +610L: Overall screw shaft length (in mm)
- C5: Accuracy symbol (*3)
- A: Symbol for standard-stock type (symbol A or B)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model BNF

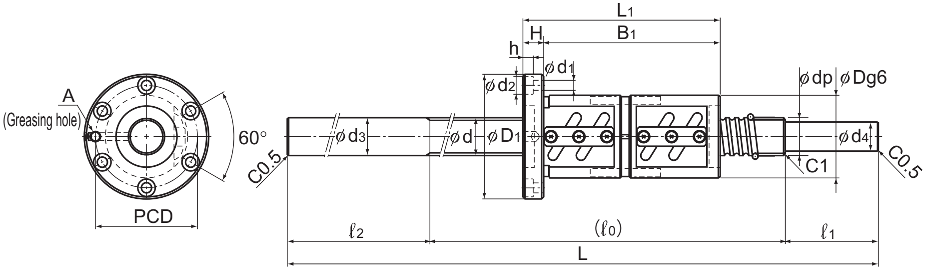


Model BIF

Unit: mm

Dimensions								Screw shaft dimensions							Shaft mass
	H	B_1	PCD	d_1	d_2	h	Greasing hole A	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	d_3	d_4	kg/m
	10	66 31 46	50	4.5	8	4.5	M6	A	410	200	50	160	16	12.8	0.92
									510	300	50	160	16	12.8	0.92
									610	400	50	160	16	12.8	0.92
									710	500	50	160	16	12.8	0.92
	12	107 57 63	53	5.5	9.5	5.5	M6	A	410	200	50	160	18	15.3	1.62
									510	300	50	160	18	15.3	1.62
									610	400	50	160	18	15.3	1.62
									710	500	50	160	18	15.3	1.62
									810	600	50	160	18	15.3	1.62
	11	95 45 45	55	5.5	9.5	5.5	M6	A	410	200	50	160	20	15.3	1.65
									510	300	50	160	20	15.3	1.65
									610	400	50	160	20	15.3	1.65
									710	500	50	160	20	15.3	1.65
									810	600	50	160	20	16.8	1.65
									1010	800	50	160	20	16.8	1.65
								B	610	300	50	260	20	16.8	1.65
									710	400	50	260	20	16.8	1.65

Unfinished Shaft Ends



Model BNFN

Model No.	Ball screw specifications								Nut			
	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C0a kN	Applied preload N	Outer diameter D	Flange diameter D1	Overall length L1	Mass kg
BNFN 2505-5 BNF 2505-5 BIF 2505-5	25	5	25.75	22.2	2×2.5 2×2.5 1×2.5	16.7 16.7 9.2	44 44 22	830 — 440	50	73	105 55 55	1.2 0.75 0.75
BNFN 2510A-2.5 BNF 2510A-2.5 BIF 2510A-5	25	10	26.3	21.4	1×2.5	15.8	33	780 — 780	58	85	120 70 100	2.0 1.43 1.87

Model number coding

BIF2505-5 RR G0 +720L C5 B

Model number

Seal symbol (*1)

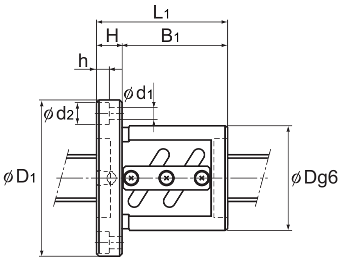
Symbol for clearance in the axial direction (*2)

Overall screw shaft length (in mm)

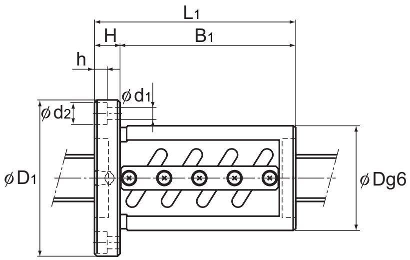
Accuracy symbol (*3)

Symbol for standard-stock type (symbol A or B)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model BNF



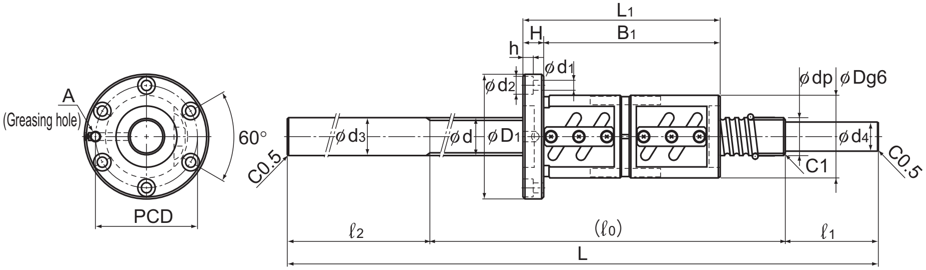
Model BIF

Unit: mm

Dimensions								Screw shaft dimensions							Shaft mass
	H	B_1	PCD	d_1	d_2	h	Greasing hole A	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	d_3	d_4	kg/m
	11	94 44 44	61	5.5	9.5	5.5	M6	A	520	300	60	160	25	20.3	2.84
									620	400	60	160	25	20.3	2.84
									720	500	60	160	25	20.3	2.84
									820	600	60	160	25	20.3	2.84
									1020	800	60	160	25	21.8	2.84
									1220	1000	60	160	25	21.8	2.84
									1420	1200	60	160	25	21.8	2.84
								B	720	400	60	260	25	21.8	2.84
									820	500	60	260	25	21.8	2.84
	18	102 52 82	71	6.6	11	6.5	M6	A	620	400	60	160	25	20.3	2.68
									820	600	60	160	25	20.3	2.68
									1020	800	60	160	25	20.3	2.68
									1220	1000	60	160	25	20.3	2.68
									1420	1200	60	160	25	20.3	2.68

Description of Each Option⇒A-815 Dimensions⇒B-777

Unfinished Shaft Ends



Model BNFN

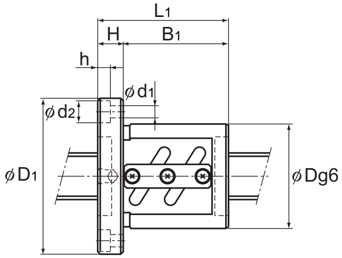
Model No.	Ball screw specifications								Nut			
	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C0a kN	Applied preload N	Outer diameter D	Flange diameter D1	Overall length L1	Mass kg
BNFN 2806-5	28	6	28.75	25.2	2×2.5	17.5	49.4	880	55	85	122	1.7
BNF 2806-5					2×2.5	17.5	49.4	—			68	1.13
BIF 2806-5					1×2.5	9.6	24.6	490			68	1.0
BIF 2806-10					2×2.5	17.5	49.4	880			104	1.57
BNFN 3205-5	32	5	32.75	29.2	2×2.5	18.5	56.4	930	58	85	106	1.54
BNF 3205-5					2×2.5	18.5	56.4	—			56	0.93
BIF 3205-5					1×2.5	10.2	28.1	490			56	0.87
BIF 3205-10					2×2.5	18.5	56.4	930			86	1.32

Model number coding

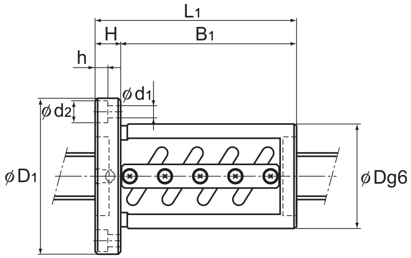
BNFN2806-5 RR G0 +1020L C5 A

Model number
Seal symbol (*1)
Overall screw shaft length (in mm)
Symbol for standard-stock type (symbol A or B)
Symbol for clearance in the axial direction (*2)
Accuracy symbol (*3)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model BNF

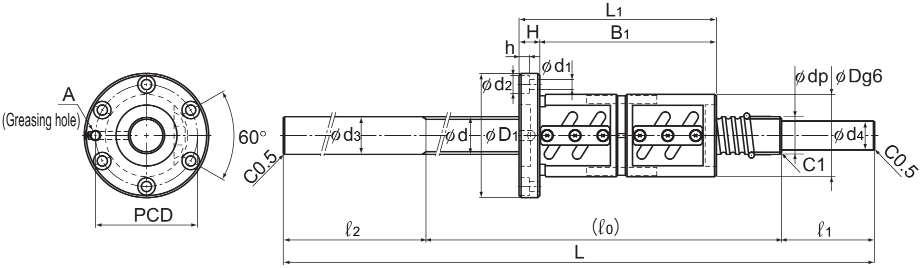


Model BIF

Unit: mm

Dimensions								Screw shaft dimensions							Shaft mass
	H	B_1	PCD	d_1	d_2	h	Greasing hole A	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	d_3	d_4	kg/m
	12	110 56 56 92	69	6.6	11	6.5	M6	A	520	300	60	160	28	20.3	3.89
									620	400	60	160	28	20.3	3.89
									720	500	60	160	28	20.3	3.89
									920	700	60	160	28	20.3	3.89
									1020	800	60	160	28	24.8	3.89
									1220	1000	60	160	28	24.8	3.89
									1420	1200	60	160	28	24.8	3.89
								B	720	400	70	250	28	24.8	3.89
									920	500	70	350	28	24.8	3.89
									1100	700	70	330	28	24.8	3.89
	12	94 44 44 74	71	6.6	11	6.5	M6	A	730	500	70	160	32	25.3	5.03
									930	700	70	160	32	25.3	5.03
									1230	1000	70	160	32	25.3	5.03
									1430	1200	70	160	32	25.3	5.03
									1630	1400	70	160	32	27.8	5.03
									1830	1600	70	160	32	27.8	5.03

Unfinished Shaft Ends



Model BNFN

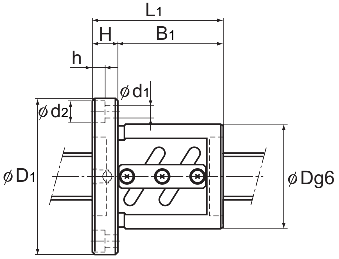
Model No.	Ball screw specifications								Nut			
	Screw shaft outer diameter d	Lead Ph	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C_{0a} kN	Applied preload N	Outer diameter D	Flange diameter D_1	Overall length L_1	Mass kg
BNFN 3206-5 BNF 3206-5 BIF 3206-5 BIF 3206-10	32	6	33	28.4	2×2.5 2×2.5 1×2.5 2×2.5	25.2 25.2 13.9 25.2	70.4 70.4 35.2 70.4	1270 — 690 1270	62	89	123 63 63 99	2.0 1.2 1.2 1.76
BNFN 3210A-5 BNF 3210A-5 BIF 3210A-5	32	10	33.75	26.4	2×2.5 2×2.5 1×2.5	47.2 47.2 26.1	112.7 112.7 56.2	2350 — 1270	74	108	190 100 100	5.5 2.8 2.8

Model number coding

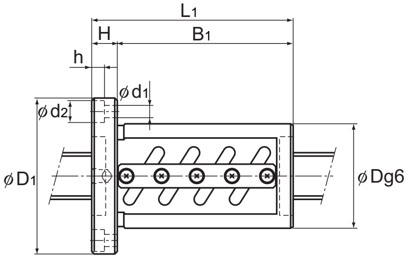
BNFN3206-5 RR G0 +1100L C5 B

Model number
Seal symbol (*1)
Symbol for clearance in the axial direction (*2)
Overall screw shaft length (in mm)
Accuracy symbol (*3)
Symbol for standard-stock type (symbol A or B)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model BNF

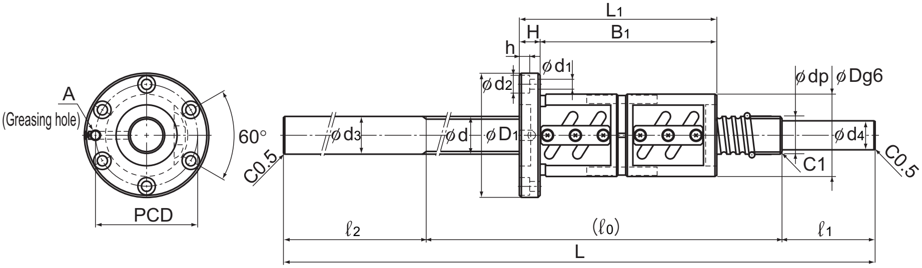


Model BIF

Unit: mm

Dimensions								Screw shaft dimensions							Shaft mass
	H	B_1	PCD	d_1	d_2	h	Greasing hole A	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	d_3	d_4	kg/m
	12	111 51 51 87	75	6.6	11	6.5	M6	A	730	500	70	160	32	25.3	4.63
									930	700	70	160	32	25.3	4.63
									1230	1000	70	160	32	25.3	4.63
									1430	1200	70	160	32	25.3	4.63
									1630	1400	70	160	32	27.8	4.63
									1830	1600	70	160	32	27.8	4.63
								B	930	500	70	360	32	27.8	4.63
									1100	700	70	330	32	27.8	4.63
									1430	1000	70	360	32	27.8	4.63
	15	175 85 85	90	9	14	8.5	M6	A	730	500	70	160	32	25.3	3.66
									930	700	70	160	32	25.3	3.66
									1430	1200	70	160	32	25.3	3.66
									1830	1600	70	160	32	25.3	3.66

Unfinished Shaft Ends



Model BNFN

Model No.	Ball screw specifications								Nut			
	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Applied preload	Outer diameter	Flange diameter	Overall length	Mass
						Ca	C0a					
	d	Ph	dp	dc	Rows x turns	kN	kN	N	D	D1	L1	kg
BNFN 3610-5 BNF 3610-5 BIF 3610-5 BIF 3610-10	36	10	37.75	30.5	2×2.5 2×2.5 1×2.5 2×2.5	50.1 50.1 27.6 50.1	126.4 126.4 63.3 126.4	2500 — 1370 2500	75	120	201 111 111 171	6.0 3.4 3.4 4.8
BNFN 4010-5 BNF 4010-5 BIF 4010-5 BIF 4010-10	40	10	41.75	34.4	2×2.5 2×2.5 1×2.5 2×2.5	52.7 52.7 29 52.7	141.1 141.1 70.4 141.1	2650 — 1470 2650	82	124	193 103 103 163	6.8 3.58 3.58 5.18

Model number coding

BIF3610-5 RR G0 +1830L C5 A

Model number

Seal symbol (*1)

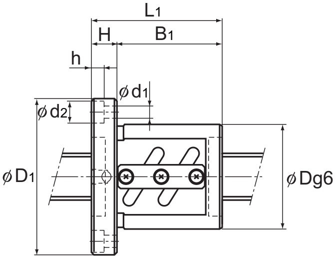
Symbol for clearance in the axial direction (*2)

Overall screw shaft length (in mm)

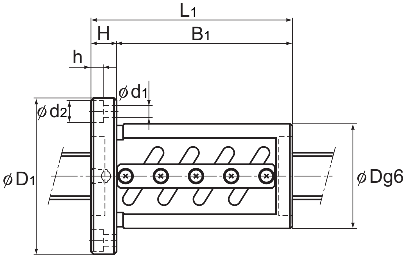
Accuracy symbol (*3)

Symbol for standard-stock type (symbol A or B)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model BNF



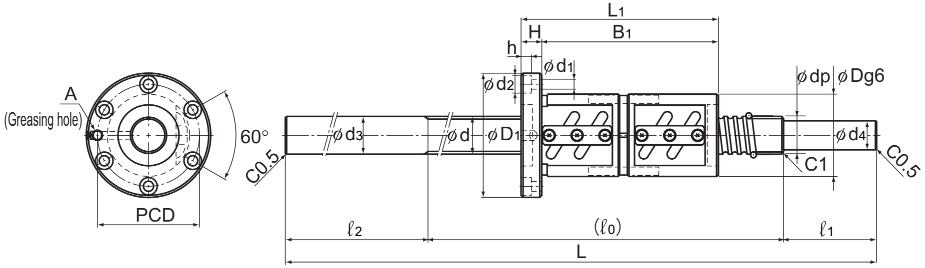
Model BIF

Unit: mm

Dimensions								Screw shaft dimensions							Shaft mass
	H	B_1	PCD	d_1	d_2	h	Greasing hole A	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	d_3	d_4	kg/m
	18	183 93 93 153	98	11	17.5	11	M6	A	730	500	70	160	36	30.3	5.03
									930	700	70	160	36	30.3	5.03
									1430	1200	70	160	36	30.3	5.03
									1830	1600	70	160	36	30.3	5.03
								B	930	500	100	330	36	30.3	5.03
									1100	700	100	300	36	30.3	5.03
									1830	1200	100	530	36	30.3	5.03
	18	175 85 85 145	102	11	17.5	11	M6	A	1230	1000	70	160	40	30.3	6.59
									1730	1500	70	160	40	30.3	6.59
									2030	1800	70	160	40	30.3	6.59
									2230	2000	70	160	40	30.3	6.59

Description of Each Option⇒A-815 Dimensions⇒B-777

Unfinished Shaft Ends



Model BNFN

Model No.	Ball screw specifications								Nut			
	Screw shaft outer diameter	Lead	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Applied preload	Outer diameter	Flange diameter	Overall length	Mass
						Ca	C0a					
	d	Ph	dp	dc	Rows x turns	kN	kN	N	D	D1	L1	kg
BNFN 4012-5 BNF 4012-5 BIF 4012-5 BIF 4012-10	40	12	42	34.1	2×2.5 2×2.5 1×2.5 2×2.5	61.6 61.6 33.9 61.6	158.8 158.8 79.2 158.8	3090 — 1720 3090	84	126	227 119 119 191	6.3 4.2 4.2 6.24
BNFN 5010-5 BNF 5010-5 BIF 5010-5 BIF 5010-10	50	10	51.75	44.4	2×2.5 2×2.5 1×2.5 2×2.5	58.2 58.2 32 58.2	176.4 176.4 88.2 176.4	2890 — 1620 2890	93	135	193 103 103 163	7.2 4.4 4.4 6.35

Model number coding

BNFN4012-5 RR G0 +1230L C5 A

Model number

Seal symbol (*1)

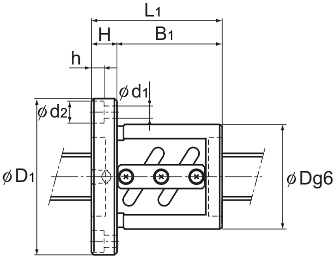
Overall screw shaft length (in mm)

Symbol for standard-stock type (symbol A or B)

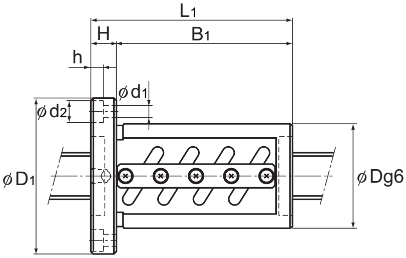
Symbol for clearance in the axial direction (*2)

Accuracy symbol (*3)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Model BNF

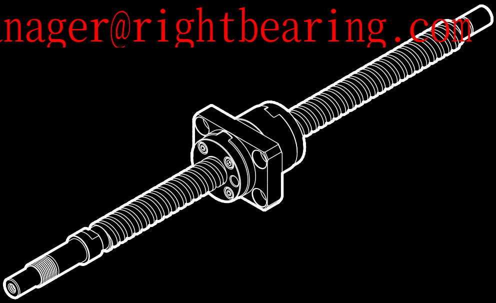


Model BIF

Unit: mm

Dimensions								Screw shaft dimensions							Shaft mass
	H	B_1	PCD	d_1	d_2	h	Greasing hole A	Standard-stock symbol	Overall length L	ℓ_0	ℓ_1	ℓ_2	d_3	d_4	kg/m
	18	209 101 101 173	104	11	17.5	11	M6	A	1230	1000	70	160	40	30.3	6.39
									1730	1500	70	160	40	30.3	6.39
									2030	1800	70	160	40	30.3	6.39
									2230	2000	70	160	40	30.3	6.39
								B	1730	1200	100	430	40	33.8	6.39
									2030	1200	100	730	40	33.8	6.39
	18	175 85 85 145	113	11	17.5	11	PT 1/8	A	1300	1000	100	200	50	40.3	11.36
									1800	1500	100	200	50	40.3	11.36
									2300	2000	100	200	50	40.3	11.36
									2800	2500	100	200	50	40.3	11.36

Description of Each Option⇒A-815 Dimensions⇒B-777



Standard-Stock Precision Ball Screw Finished Shaft Ends
Model BNK

Ball Screw

B Product Specifications

Dimensional Drawing, Dimensional Table

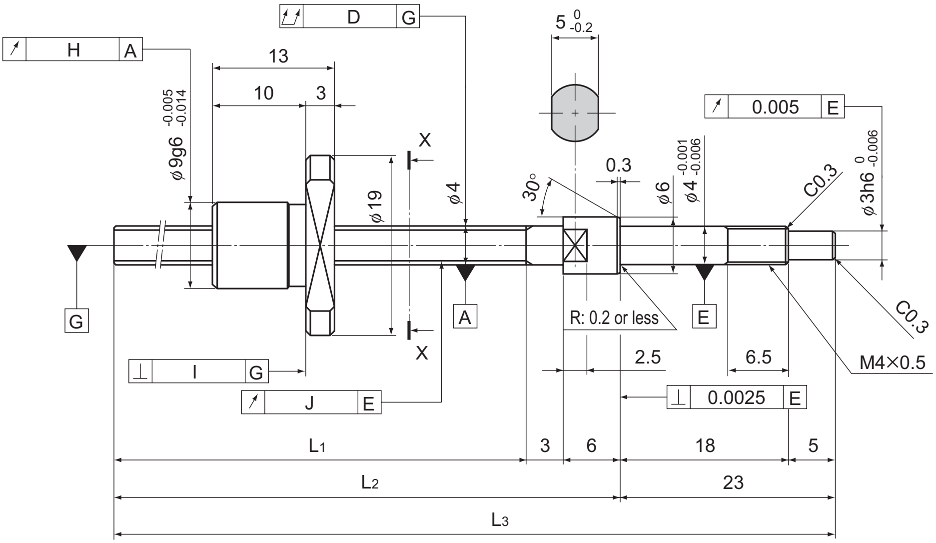
Options

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

BNK0401-3 Shaft diameter: 4; lead: 1



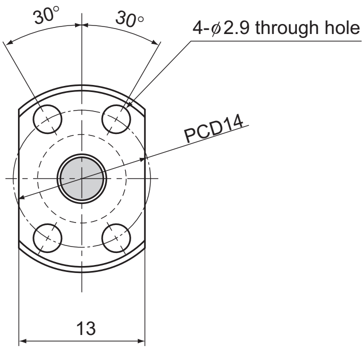
Model No.	Stroke	Screw shaft length		
		L₁	L₂	L₃
BNK 0401-3G0+77LC3Y	20	45	54	77
BNK 0401-3G0+77LC5Y				
BNK 0401-3G2+77LC7Y				
BNK 0401-3G0+97LC3Y	40	65	74	97
BNK 0401-3G0+97LC5Y				
BNK 0401-3G2+97LC7Y				
BNK 0401-3G0+127LC3Y	70	95	104	127
BNK 0401-3G0+127LC5Y				
BNK 0401-3G2+127LC7Y				

Note) A stainless steel type is also available for model BNK0401. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK0401-3G0+77LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

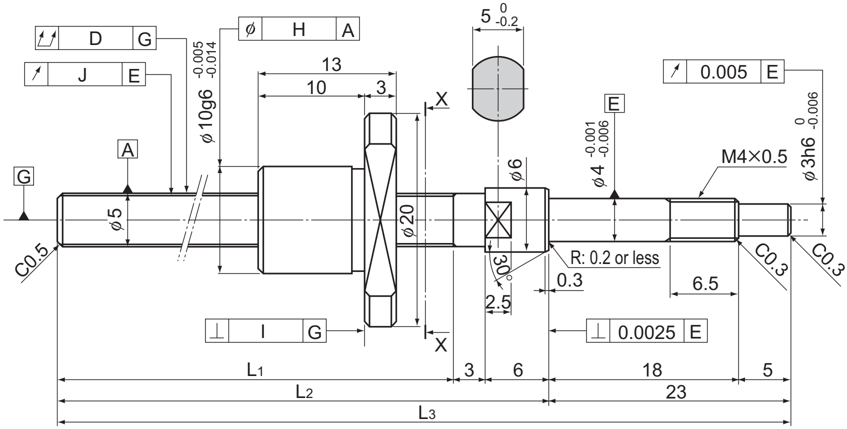
Ball Screw Specifications			
Lead (mm)	1		
BCD(mm)	4.15		
Thread minor diameter (mm)	3.4		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	0.29	0.29	0.29
Basic static load rating C_{0a}(kN)	0.42	0.42	0.42
Preload torque (N-m)	to 9.8×10^{-3}	—	—
Spacer ball	None	None	None
Rigidity value(N/µm)	35		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.015	0.009	0.008	0.008	±0.008	0.008	0.01	0.07
	0.025	0.012	0.01	0.01	±0.018	0.018	0.01	0.07
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.01	0.07
	0.02	0.009	0.008	0.008	±0.008	0.008	0.01	0.07
	0.025	0.012	0.01	0.01	±0.018	0.018	0.01	0.07
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.01	0.07
	0.025	0.009	0.008	0.008	±0.008	0.008	0.01	0.07
	0.035	0.012	0.01	0.01	±0.018	0.018	0.01	0.07
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.01	0.07

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK0501-3 Shaft diameter: 5; lead: 1



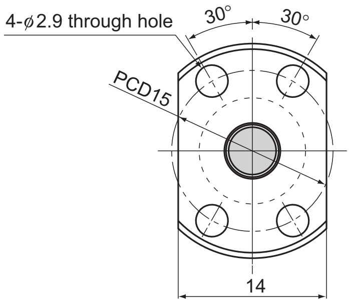
Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 0501-3G0+77LC3Y	20	45	54	77
BNK 0501-3G0+77LC5Y				
BNK 0501-3G2+77LC7Y				
BNK 0501-3G0+97LC3Y	40	65	74	97
BNK 0501-3G0+97LC5Y				
BNK 0501-3G2+97LC7Y				
BNK 0501-3G0+127LC3Y	70	95	104	127
BNK 0501-3G0+127LC5Y				
BNK 0501-3G2+127LC7Y				

Note) A stainless steel type is also available for model BNK0501. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK0501-3G0+77LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

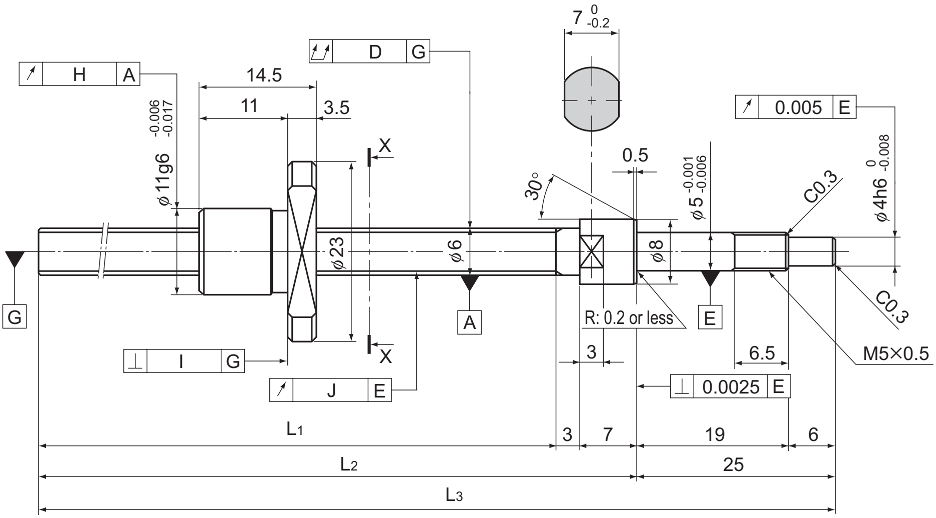
Ball Screw Specifications			
Lead (mm)	1		
BCD(mm)	5.15		
Thread minor diameter (mm)	4.4		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	0.32	0.32	0.32
Basic static load rating C_0a(kN)	0.55	0.55	0.55
Preload torque (N-m)	to 9.8×10^{-3}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	47		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.015	0.009	0.008	0.008	±0.008	0.008	0.012	0.11
	0.025	0.012	0.01	0.01	±0.018	0.018	0.012	0.11
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.012	0.11
	0.02	0.009	0.008	0.008	±0.008	0.008	0.012	0.11
	0.025	0.012	0.01	0.01	±0.018	0.018	0.012	0.11
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.012	0.11
	0.025	0.009	0.008	0.008	±0.008	0.008	0.012	0.11
	0.035	0.012	0.01	0.01	±0.018	0.018	0.012	0.11
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.012	0.11

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK0601-3 Shaft diameter: 6; lead: 1



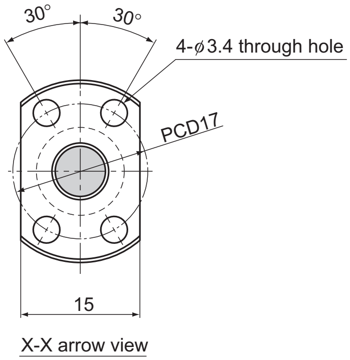
Model No.	Stroke	Screw shaft length		
		L₁	L₂	L₃
BNK 0601-3G0+100LC3Y	40	65	75	100
BNK 0601-3G0+100LC5Y				
BNK 0601-3G2+100LC7Y				
BNK 0601-3G0+130LC3Y	70	95	105	130
BNK 0601-3G0+130LC5Y				
BNK 0601-3G2+130LC7Y				
BNK 0601-3G0+160LC3Y	100	125	135	160
BNK 0601-3G0+160LC5Y				
BNK 0601-3G2+160LC7Y				

Note) A stainless steel type is also available for model BNK0501. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK0601-3G0+100LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

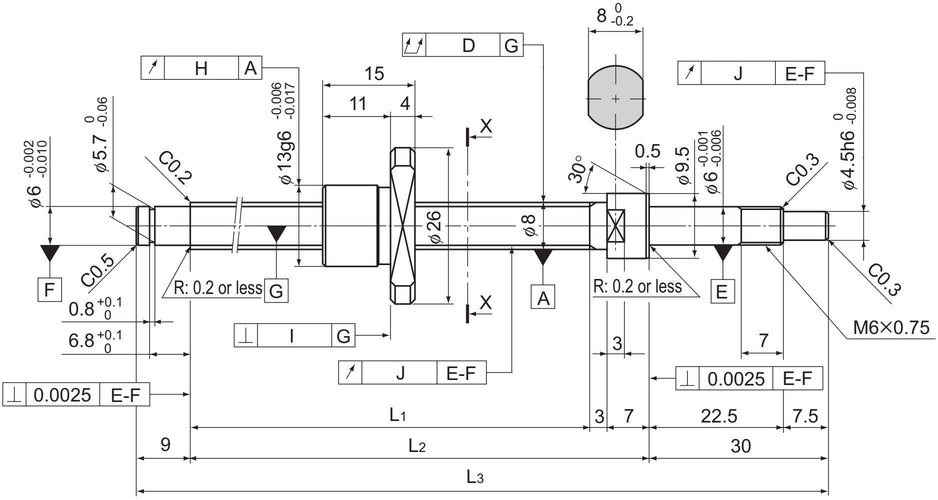
Ball Screw Specifications			
Lead (mm)	1		
BCD(mm)	6.2		
Thread minor diameter (mm)	5.3		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	0.54	0.54	0.54
Basic static load rating C_0a(kN)	0.94	0.94	0.94
Preload torque (N-m)	to 1.3×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	60		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.015	0.009	0.008	0.008	±0.008	0.008	0.017	0.14
	0.025	0.012	0.01	0.01	±0.018	0.018	0.017	0.14
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.017	0.14
	0.02	0.009	0.008	0.008	±0.008	0.008	0.017	0.14
	0.035	0.012	0.01	0.01	±0.018	0.018	0.017	0.14
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.017	0.14
	0.025	0.009	0.008	0.008	±0.01	0.008	0.017	0.14
	0.035	0.012	0.01	0.01	±0.02	0.018	0.017	0.14
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.017	0.14

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK0801-3 Shaft diameter: 8; lead: 1



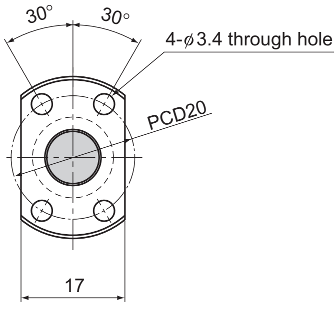
Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 0801-3G0+115LC3Y	40	66	76	115
BNK 0801-3G0+115LC5Y				
BNK 0801-3G2+115LC7Y				
BNK 0801-3G0+145LC3Y	70	96	106	145
BNK 0801-3G0+145LC5Y				
BNK 0801-3G2+145LC7Y				
BNK 0801-3G0+175LC3Y	100	126	136	175
BNK 0801-3G0+175LC5Y				
BNK 0801-3G2+175LC7Y				
BNK 0801-3G0+225LC3Y	150	176	186	225
BNK 0801-3G0+225LC5Y				
BNK 0801-3G2+225LC7Y				

Note) A stainless steel type is also available for model BNK0601. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK0801-3G0+115LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

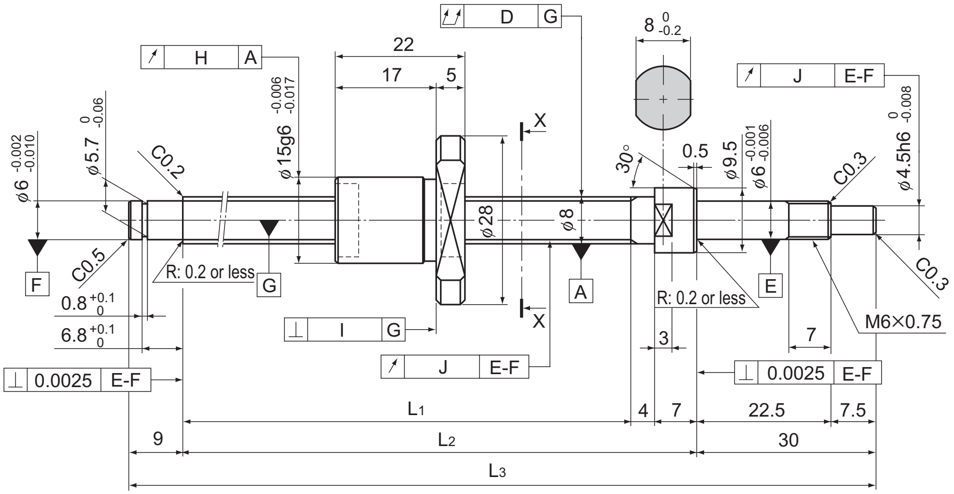
Ball Screw Specifications			
Lead (mm)	1		
BCD(mm)	8.2		
Thread minor diameter (mm)	7.3		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	0.64	0.64	0.64
Basic static load rating C_{0a}(kN)	1.4	1.4	1.4
Preload torque (N-m)	to 1.8×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	80		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.025	0.009	0.008	0.008	±0.008	0.008	0.024	0.29
	0.025	0.012	0.01	0.01	±0.018	0.018	0.024	0.29
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.024	0.29
	0.03	0.009	0.008	0.008	±0.008	0.008	0.024	0.29
	0.035	0.012	0.01	0.01	±0.018	0.018	0.024	0.29
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.024	0.29
	0.03	0.009	0.008	0.008	±0.01	0.008	0.024	0.29
	0.035	0.012	0.01	0.01	±0.02	0.018	0.024	0.29
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.024	0.29
	0.035	0.009	0.008	0.008	±0.01	0.008	0.024	0.29
	0.05	0.012	0.01	0.01	±0.02	0.018	0.024	0.29
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.024	0.29

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK0802-3 Shaft diameter: 8; lead: 2



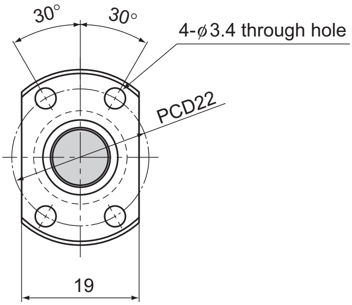
Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 0802-3RRG0+125LC3Y	40	75	86	125
BNK 0802-3RRG0+125LC5Y				
BNK 0802-3RRG2+125LC7Y				
BNK 0802-3RRG0+155LC3Y	70	105	116	155
BNK 0802-3RRG0+155LC5Y				
BNK 0802-3RRG2+155LC7Y				
BNK 0802-3RRG0+185LC3Y	100	135	146	185
BNK 0802-3RRG0+185LC5Y				
BNK 0802-3RRG2+185LC7Y				
BNK 0802-3RRG0+235LC3Y	150	185	196	235
BNK 0802-3RRG0+235LC5Y				
BNK 0802-3RRG2+235LC7Y				

Note) A stainless steel type is also available for model BNK0801. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK0802-3RRG0+125LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

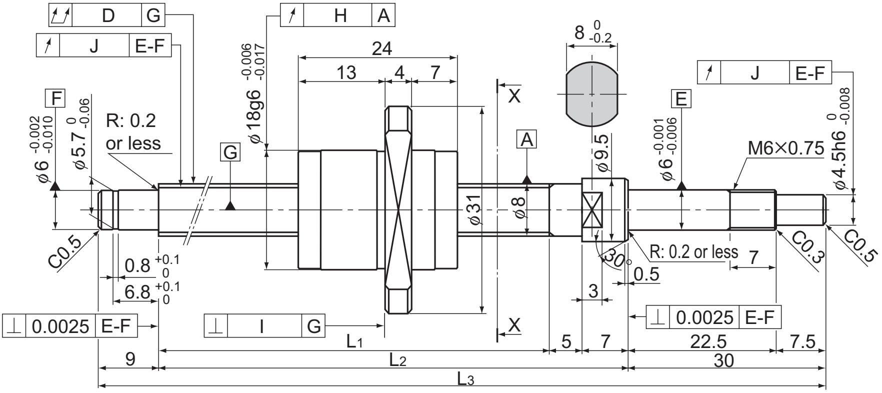
Ball Screw Specifications			
Lead (mm)	2		
BCD(mm)	8.3		
Thread minor diameter (mm)	7		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	1.4	1.4	1.4
Basic static load rating C_{0a}(kN)	2.3	2.3	2.3
Preload torque (N-m)	to 2×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	100		
Circulation method	Deflector		

Unit: mm

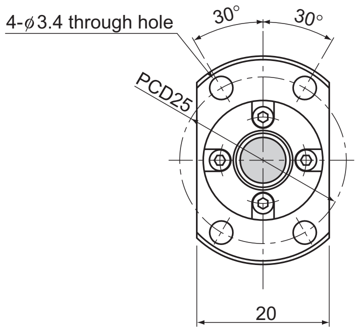
	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.025	0.009	0.008	0.008	±0.008	0.008	0.034	0.27
	0.025	0.012	0.01	0.01	±0.018	0.018	0.034	0.27
	0.035	0.02	0.014	0.014	Travel distance: ±0.05/300		0.034	0.27
	0.03	0.009	0.008	0.008	±0.01	0.008	0.034	0.27
	0.035	0.012	0.01	0.01	±0.02	0.018	0.034	0.27
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.034	0.27
	0.03	0.009	0.008	0.008	±0.01	0.008	0.034	0.27
	0.035	0.012	0.01	0.01	±0.02	0.018	0.034	0.27
	0.05	0.02	0.014	0.014	Travel distance: ±0.05/300		0.034	0.27
	0.035	0.009	0.008	0.008	±0.01	0.008	0.034	0.27
	0.05	0.012	0.01	0.01	±0.02	0.018	0.034	0.27
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.034	0.27

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK0810-3 Shaft diameter: 8; lead: 10



Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 0810-3GT+205LC5Y	100	154	166	205
BNK 0810-3G2+205LC7Y				
BNK 0810-3GT+255LC5Y	150	204	216	255
BNK 0810-3G2+255LC7Y				
BNK 0810-3GT+305LC5Y	200	254	266	305
BNK 0810-3G2+305LC7Y				
BNK 0810-3GT+355LC5Y	250	304	316	355
BNK 0810-3G2+355LC7Y				
BNK 0810-3GT+405LC5Y	300	354	366	405
BNK 0810-3G2+405LC7Y				



X-X arrow view

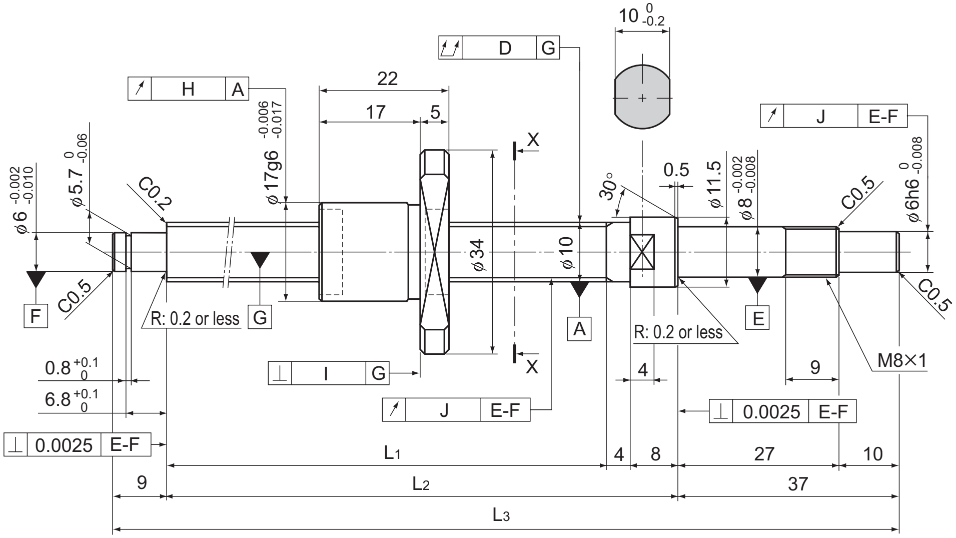
Ball Screw Specifications		
Lead (mm)	10	
BCD(mm)	8.4	
Thread minor diameter (mm)	6.7	
Threading direction, No. of threaded grooves	Rightward, 2	
No. of circuits	1.5 turns × 2 rows	
Clearance symbol	GT	G2
Axial clearance (mm)	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	2.16	2.16
Basic static load rating C_0a(kN)	3.82	3.82
Preload torque (N-m)	—	—
Spacer ball	None	None
Rigidity value(N/μm)	100	
Circulation method	End cap	

Unit: mm

	Runout of the screw shaft axis	Runout of the nut circumference	Flange perpendicularity	Runout of the thread groove surface	Lead angle accuracy		Nut mass	Shaft mass
	D	H	I	J	Representative travel distance error	Fluctuation	kg	kg/m
	0.05	0.012	0.01	0.01	±0.02	0.018	0.049	0.30
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.049	0.30
	0.05	0.012	0.01	0.01	±0.023	0.018	0.049	0.30
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.049	0.30
	0.05	0.012	0.01	0.01	±0.023	0.018	0.049	0.30
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.049	0.30
	0.06	0.012	0.01	0.01	±0.023	0.018	0.049	0.30
	0.075	0.02	0.014	0.014	Travel distance: ±0.05/300		0.049	0.30
	0.07	0.012	0.01	0.01	±0.025	0.018	0.049	0.30
	0.09	0.02	0.014	0.014	Travel distance: ±0.05/300		0.049	0.30

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1002-3 Shaft diameter: 10; lead: 2



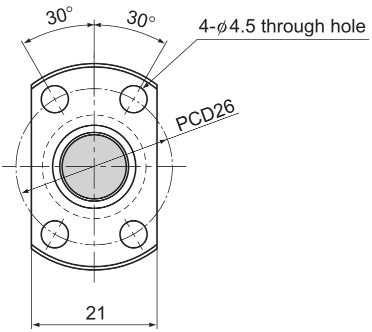
Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 1002-3RRG0+143LC3Y	50	85	97	143
BNK 1002-3RRG0+143LC5Y				
BNK 1002-3RRG2+143LC7Y				
BNK 1002-3RRG0+193LC3Y	100	135	147	193
BNK 1002-3RRG0+193LC5Y				
BNK 1002-3RRG2+193LC7Y				
BNK 1002-3RRG0+243LC3Y	150	185	197	243
BNK 1002-3RRG0+243LC5Y				
BNK 1002-3RRG2+243LC7Y				
BNK 1002-3RRG0+293LC3Y	200	235	247	293
BNK 1002-3RRG0+293LC5Y				
BNK 1002-3RRG2+293LC7Y				

Note) A stainless steel type is also available for model BNK1002. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK1002-3RRG0+143LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

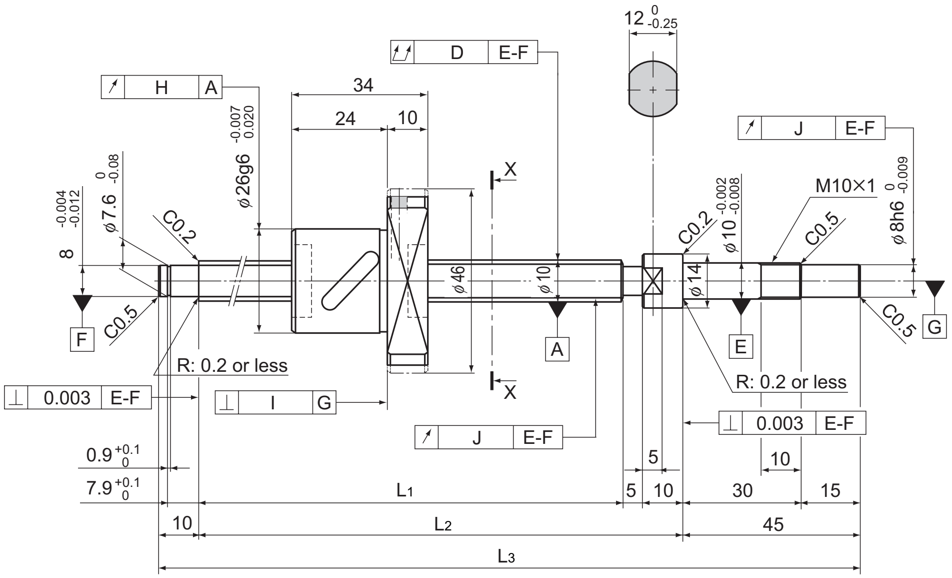
Ball Screw Specifications			
Lead (mm)	2		
BCD(mm)	10.3		
Thread minor diameter (mm)	9		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	1.5	1.5	1.5
Basic static load rating $C_{0}a$(kN)	2.9	2.9	2.9
Preload torque (N-m)	to 2.5×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	100		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.02	0.009	0.008	0.007	±0.008	0.008	0.045	0.47
	0.035	0.012	0.01	0.011	±0.018	0.018	0.045	0.47
	0.04	0.02	0.014	0.014	Travel distance: ±0.05/300		0.045	0.47
	0.03	0.009	0.008	0.007	±0.01	0.008	0.045	0.47
	0.035	0.012	0.01	0.011	±0.02	0.018	0.045	0.47
	0.04	0.02	0.014	0.014	Travel distance: ±0.05/300		0.045	0.47
	0.03	0.009	0.008	0.007	±0.01	0.008	0.045	0.47
	0.04	0.012	0.01	0.011	±0.02	0.018	0.045	0.47
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.045	0.47
	0.03	0.009	0.008	0.007	±0.012	0.008	0.045	0.47
	0.04	0.012	0.01	0.011	±0.023	0.018	0.045	0.47
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.045	0.47

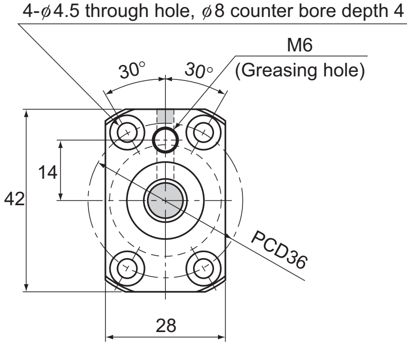
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1004-2.5 Shaft diameter: 10; lead: 4



Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 1004-2.5RRG0+180LC3Y	50	110	125	180
BNK 1004-2.5RRG0+180LC5Y				
BNK 1004-2.5RRG2+180LC7Y				
BNK 1004-2.5RRG0+230LC3Y	100	160	175	230
BNK 1004-2.5RRG0+230LC5Y				
BNK 1004-2.5RRG2+230LC7Y				
BNK 1004-2.5RRG0+280LC3Y	150	210	225	280
BNK 1004-2.5RRG0+280LC5Y				
BNK 1004-2.5RRG2+280LC7Y				
BNK 1004-2.5RRG0+330LC3Y	200	260	275	330
BNK 1004-2.5RRG0+330LC5Y				
BNK 1004-2.5RRG2+330LC7Y				
BNK 1004-2.5RRG0+380LC3Y	250	310	325	380
BNK 1004-2.5RRG0+380LC5Y				
BNK 1004-2.5RRG2+380LC7Y				

Note) For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

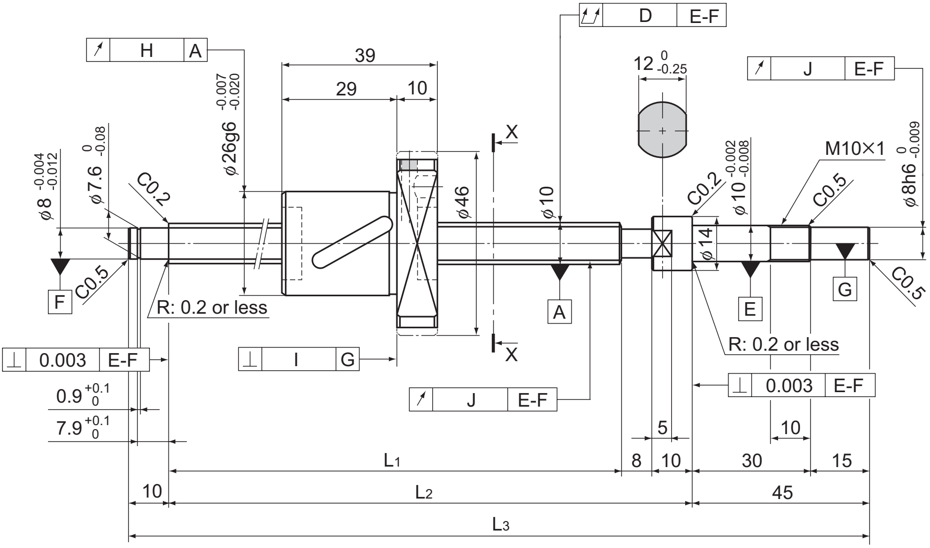
Ball Screw Specifications			
Lead (mm)	4		
BCD(mm)	10.5		
Thread minor diameter (mm)	7.8		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	2.5 turns × 1 row		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	2.1	3.4	3.4
Basic static load rating C_0a(kN)	2.7	5.4	5.4
Preload torque (N-m)	9.8×10^{-3} to 4.9×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	50	100	
Circulation method	Return pipe		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.02	0.009	0.008	0.008	±0.01	0.008	0.15	0.32
	0.035	0.012	0.01	0.011	±0.02	0.018	0.15	0.32
	0.04	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	0.32
	0.03	0.009	0.008	0.008	±0.01	0.008	0.15	0.32
	0.04	0.012	0.01	0.011	±0.02	0.018	0.15	0.32
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	0.32
	0.03	0.009	0.008	0.008	±0.012	0.008	0.15	0.32
	0.04	0.012	0.01	0.011	±0.023	0.018	0.15	0.32
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	0.32
	0.04	0.009	0.008	0.008	±0.012	0.008	0.15	0.32
	0.05	0.012	0.01	0.011	±0.023	0.018	0.15	0.32
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	0.32
	0.04	0.009	0.008	0.008	±0.012	0.008	0.15	0.32
	0.05	0.012	0.01	0.011	±0.023	0.018	0.15	0.32
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	0.32

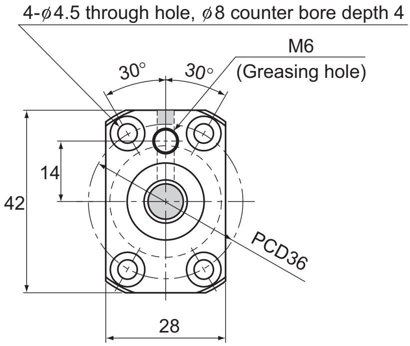
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1010-1.5 Shaft diameter: 10; lead: 10



Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 1010-1.5RRG0+240LC5Y	100	167	185	240
BNK 1010-1.5RRG2+240LC7Y				
BNK 1010-1.5RRG0+290LC5Y	150	217	235	290
BNK 1010-1.5RRG2+290LC7Y				
BNK 1010-1.5RRG0+340LC5Y	200	267	285	340
BNK 1010-1.5RRG2+340LC7Y				
BNK 1010-1.5RRG0+390LC5Y	250	317	335	390
BNK 1010-1.5RRG2+390LC7Y				
BNK 1010-1.5RRG0+440LC5Y	300	367	385	440
BNK 1010-1.5RRG2+440LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.



X-X arrow view

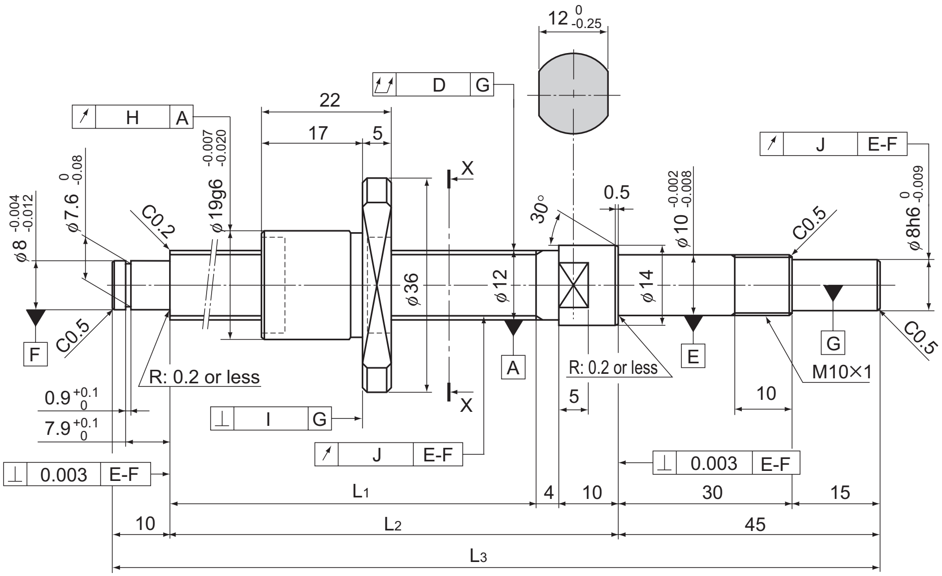
Ball Screw Specifications			
Lead (mm)	10		
BCD(mm)	10.5		
Thread minor diameter (mm)	7.8		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1.5 turns × 1 row		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	1.3	2.1	2.1
Basic static load rating C_{0a}(kN)	1.6	3.1	3.1
Preload torque (N-m)	9.8×10^{-3} to 4.9×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	70	140	
Circulation method	Return pipe		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.04	0.012	0.01	0.011	±0.02	0.018	0.17	0.5
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.17	0.5
	0.04	0.012	0.01	0.011	±0.023	0.018	0.17	0.5
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.17	0.5
	0.05	0.012	0.01	0.011	±0.023	0.018	0.17	0.5
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.17	0.5
	0.05	0.012	0.01	0.011	±0.025	0.02	0.17	0.5
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.17	0.5
	0.065	0.012	0.01	0.011	±0.025	0.02	0.17	0.5
	0.08	0.02	0.014	0.014	Travel distance: ±0.05/300		0.17	0.5

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1202-3 Shaft diameter: 12; lead: 2



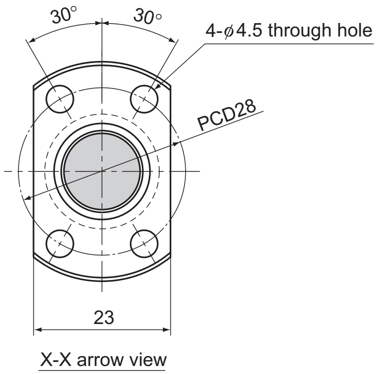
Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 1202-3RRG0+154LC3Y	50	85	99	154
BNK 1202-3RRG0+154LC5Y				
BNK 1202-3RRG2+154LC7Y				
BNK 1202-3RRG0+204LC3Y	100	135	149	204
BNK 1202-3RRG0+204LC5Y				
BNK 1202-3RRG2+204LC7Y				
BNK 1202-3RRG0+254LC3Y	150	185	199	254
BNK 1202-3RRG0+254LC5Y				
BNK 1202-3RRG2+254LC7Y				
BNK 1202-3RRG0+304LC3Y	200	235	249	304
BNK 1202-3RRG0+304LC5Y				
BNK 1202-3RRG2+304LC7Y				
BNK 1202-3RRG0+354LC3Y	250	285	299	354
BNK 1202-3RRG0+354LC5Y				
BNK 1202-3RRG2+354LC7Y				

Note) A stainless steel type is also available for model BNK1202. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK1202-3RRG0+154LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



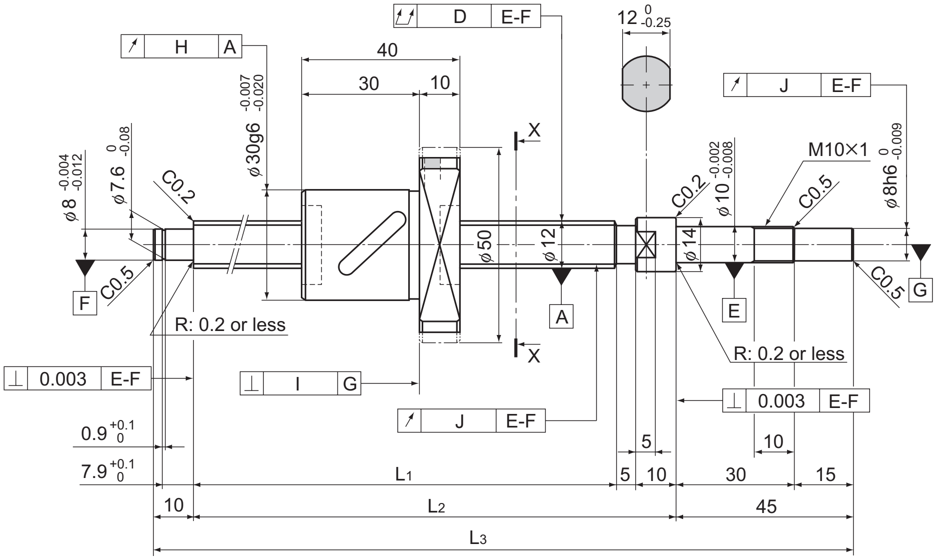
X-X arrow view

Ball Screw Specifications			
Lead (mm)	2		
BCD(mm)	12.3		
Thread minor diameter (mm)	11		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	1.7	1.7	1.7
Basic static load rating C_0a(kN)	3.6	3.6	3.6
Preload torque (N-m)	9.8×10^{-3} to 3.4×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	120		
Circulation method	Deflector		

Unit: mm

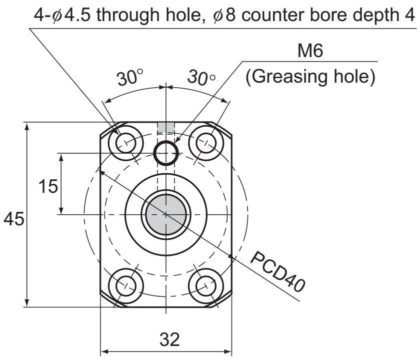
Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
				Representative travel distance error	Fluctuation		
0.02	0.01	0.008	0.007	±0.008	0.008	0.05	0.71
0.035	0.012	0.01	0.011	±0.018	0.018	0.05	0.71
0.04	0.02	0.014	0.014	Travel distance: ±0.05/300		0.05	0.71
0.03	0.01	0.008	0.007	±0.01	0.008	0.05	0.71
0.04	0.012	0.01	0.011	±0.02	0.018	0.05	0.71
0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.05	0.71
0.03	0.01	0.008	0.007	±0.01	0.008	0.05	0.71
0.04	0.012	0.01	0.011	±0.02	0.018	0.05	0.71
0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.05	0.71
0.04	0.01	0.008	0.007	±0.012	0.008	0.05	0.71
0.05	0.012	0.01	0.011	±0.023	0.018	0.05	0.71
0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.05	0.71
0.04	0.01	0.008	0.007	±0.012	0.008	0.05	0.71
0.05	0.012	0.01	0.011	±0.023	0.018	0.05	0.71
0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.05	0.71

BNK1205-2.5 Shaft diameter: 12; lead: 5



Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 1205-2.5RRG0+180LC3Y	50	110	125	180
BNK 1205-2.5RRG0+180LC5Y				
BNK 1205-2.5RRG2+180LC7Y				
BNK 1205-2.5RRG0+230LC3Y	100	160	175	230
BNK 1205-2.5RRG0+230LC5Y				
BNK 1205-2.5RRG2+230LC7Y				
BNK 1205-2.5RRG0+280LC3Y	150	210	225	280
BNK 1205-2.5RRG0+280LC5Y				
BNK 1205-2.5RRG2+280LC7Y				
BNK 1205-2.5RRG0+330LC3Y	200	260	275	330
BNK 1205-2.5RRG0+330LC5Y				
BNK 1205-2.5RRG2+330LC7Y				
BNK 1205-2.5RRG0+380LC3Y	250	310	325	380
BNK 1205-2.5RRG0+380LC5Y				
BNK 1205-2.5RRG2+380LC7Y				

Note) For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

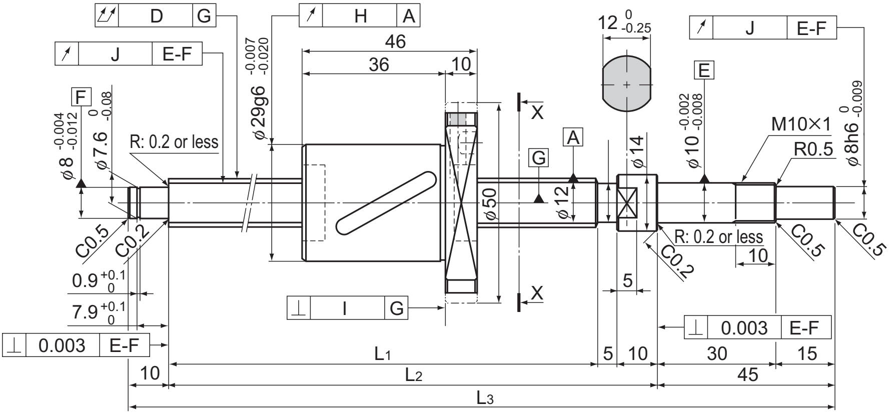
Ball Screw Specifications			
Lead (mm)	5		
BCD(mm)	12.3		
Thread minor diameter (mm)	9.6		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	2.5 turns × 1 row		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	2.3	3.7	3.7
Basic static load rating C_0a(kN)	3.2	6.4	6.4
Preload torque (N-m)	9.8×10^{-3} to 4.9×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	60	120	
Circulation method	Return pipe		

Unit: mm

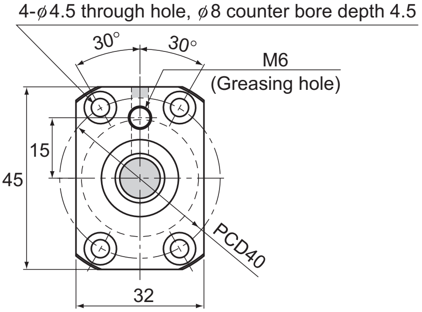
	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.02	0.009	0.008	0.008	±0.01	0.008	0.22	0.61
	0.035	0.012	0.01	0.011	±0.02	0.018	0.22	0.61
	0.04	0.02	0.014	0.014	Travel distance: ±0.05/300		0.22	0.61
	0.03	0.009	0.008	0.008	±0.01	0.008	0.22	0.61
	0.04	0.012	0.01	0.011	±0.02	0.018	0.22	0.61
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.22	0.61
	0.03	0.009	0.008	0.008	±0.012	0.008	0.22	0.61
	0.04	0.012	0.01	0.011	±0.023	0.018	0.22	0.61
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.22	0.61
	0.04	0.009	0.008	0.008	±0.012	0.008	0.22	0.61
	0.05	0.012	0.01	0.011	±0.023	0.018	0.22	0.61
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.22	0.61
	0.04	0.009	0.008	0.008	±0.012	0.008	0.22	0.61
	0.05	0.012	0.01	0.011	±0.023	0.018	0.22	0.61
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300		0.22	0.61

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1208-2.6 Shaft diameter: 12; lead: 8



Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 1208-2.6RRG2+180LC7Y	50	110	125	180
BNK 1208-2.6RRG2+230LC7Y	100	160	175	230
BNK 1208-2.6RRG2+280LC7Y	150	210	225	280
BNK 1208-2.6RRG2+330LC7Y	200	260	275	330
BNK 1208-2.6RRG2+380LC7Y	250	310	325	380



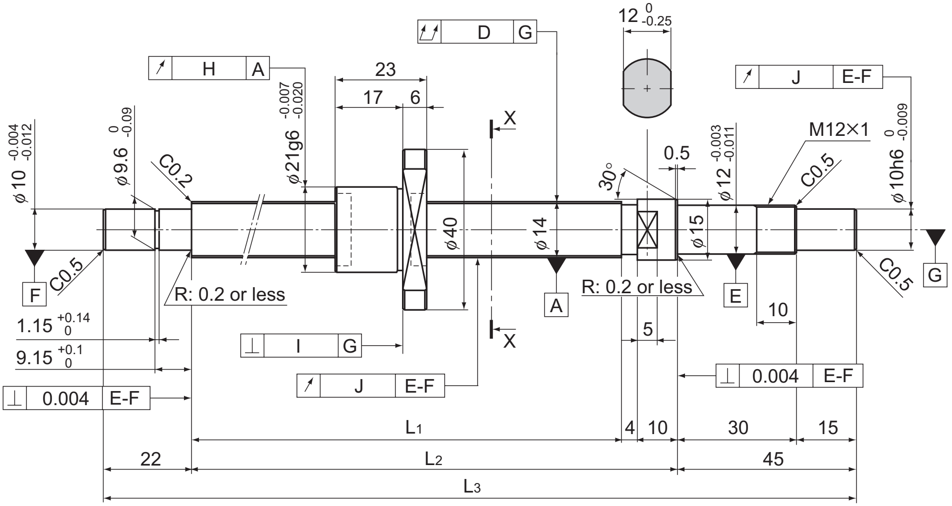
X-X arrow view

Ball Screw Specifications	
Lead (mm)	8
BCD(mm)	12.65
Thread minor diameter (mm)	9.7
Threading direction, No. of threaded grooves	Rightward, 1
No. of circuits	2.6 turns × 1 row
Clearance symbol	G2
Axial clearance (mm)	0.02 or less
Basic dynamic load rating Ca (kN)	4.7
Basic static load rating C_0a(kN)	7.5
Preload torque (N-m)	—
Spacer ball	None
Rigidity value(N/μm)	127
Circulation method	Return pipe

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy	Nut mass kg	Shaft mass kg/m
	0.04	0.02	0.014	0.014	Travel distance: ±0.05/300	0.269	0.64
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300	0.269	0.64
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300	0.269	0.64
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300	0.269	0.64
	0.065	0.02	0.014	0.014	Travel distance: ±0.05/300	0.269	0.64

BNK1402-3 Shaft diameter: 14; lead: 2



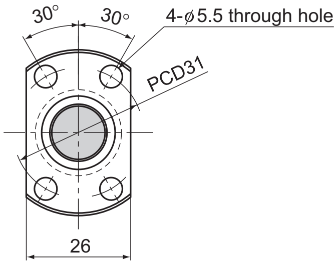
Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 1402-3RRG0+166LC3Y	50	85	99	166
BNK 1402-3RRG0+166LC5Y				
BNK 1402-3RRG2+166LC7Y				
BNK 1402-3RRG0+216LC3Y	100	135	149	216
BNK 1402-3RRG0+216LC5Y				
BNK 1402-3RRG2+216LC7Y				
BNK 1402-3RRG0+266LC3Y	150	185	199	266
BNK 1402-3RRG0+266LC5Y				
BNK 1402-3RRG2+266LC7Y				
BNK 1402-3RRG0+316LC3Y	200	235	249	316
BNK 1402-3RRG0+316LC5Y				
BNK 1402-3RRG2+316LC7Y				
BNK 1402-3RRG0+416LC3Y	300	335	349	416
BNK 1402-3RRG0+416LC5Y				
BNK 1402-3RRG2+416LC7Y				

Note) A stainless steel type is also available for model BNK1402. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK1402-3RRG0+166LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

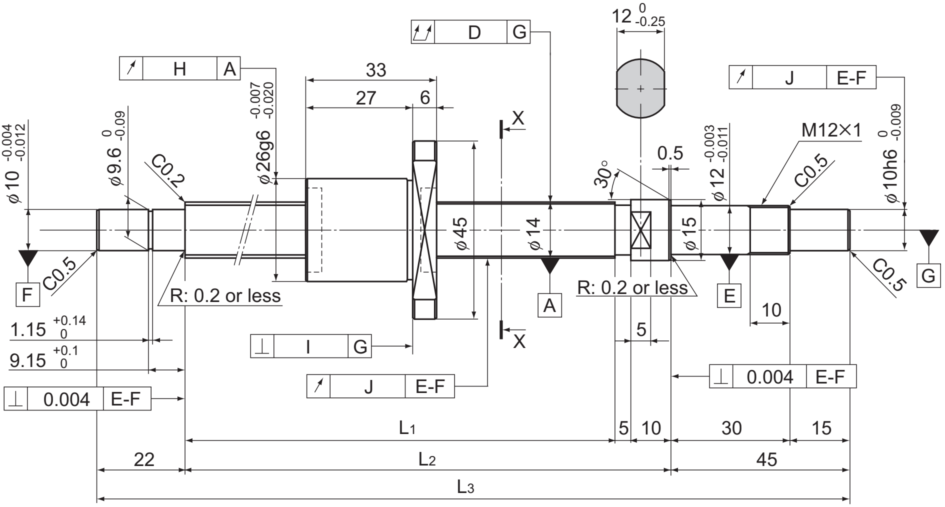
Ball Screw Specifications			
Lead (mm)	2		
BCD(mm)	14.3		
Thread minor diameter (mm)	13		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	1.8	1.8	1.8
Basic static load rating C_0a(kN)	4.3	4.3	4.3
Preload torque (N-m)	4.9×10^{-3} to 4.9×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	140		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.02	0.01	0.008	0.009	±0.008	0.008	0.15	1.0
	0.025	0.012	0.01	0.012	±0.018	0.018	0.15	1.0
	0.04	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	1.0
	0.025	0.01	0.008	0.009	±0.01	0.008	0.15	1.0
	0.03	0.012	0.01	0.012	±0.02	0.018	0.15	1.0
	0.045	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	1.0
	0.025	0.01	0.008	0.009	±0.01	0.008	0.15	1.0
	0.03	0.012	0.01	0.012	±0.02	0.018	0.15	1.0
	0.045	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	1.0
	0.03	0.01	0.008	0.009	±0.012	0.008	0.15	1.0
	0.04	0.012	0.01	0.012	±0.023	0.018	0.15	1.0
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	1.0
	0.04	0.01	0.008	0.009	±0.013	0.01	0.15	1.0
	0.05	0.012	0.01	0.012	±0.025	0.02	0.15	1.0
	0.06	0.02	0.014	0.014	Travel distance: ±0.05/300		0.15	1.0

Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1404-3 Shaft diameter: 14; lead: 4



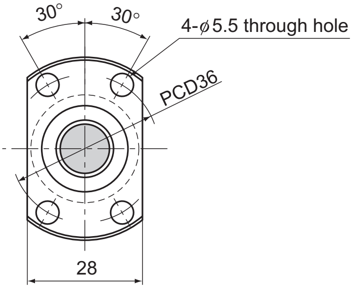
Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 1404-3RRG0+230LC3Y	100	148	163	230
BNK 1404-3RRG0+230LC5Y				
BNK 1404-3RRG2+230LC7Y				
BNK 1404-3RRG0+280LC3Y	150	198	213	280
BNK 1404-3RRG0+280LC5Y				
BNK 1404-3RRG2+280LC7Y				
BNK 1404-3RRG0+330LC3Y	200	248	263	330
BNK 1404-3RRG0+330LC5Y				
BNK 1404-3RRG2+330LC7Y				
BNK 1404-3RRG0+430LC3Y	300	348	363	430
BNK 1404-3RRG0+430LC5Y				
BNK 1404-3RRG2+430LC7Y				
BNK 1404-3RRG0+530LC3Y	400	448	463	530
BNK 1404-3RRG0+530LC5Y				
BNK 1404-3RRG2+530LC7Y				

Note) A stainless steel type is also available for model BNK1404. When placing an order, add symbol "M" to the end of the model number.

(Example) BNK1404-3RRG0+230LC3Y M

Symbol for stainless steel type

For accuracy grades C3 and C5, clearance GT is also available as standard.



X-X arrow view

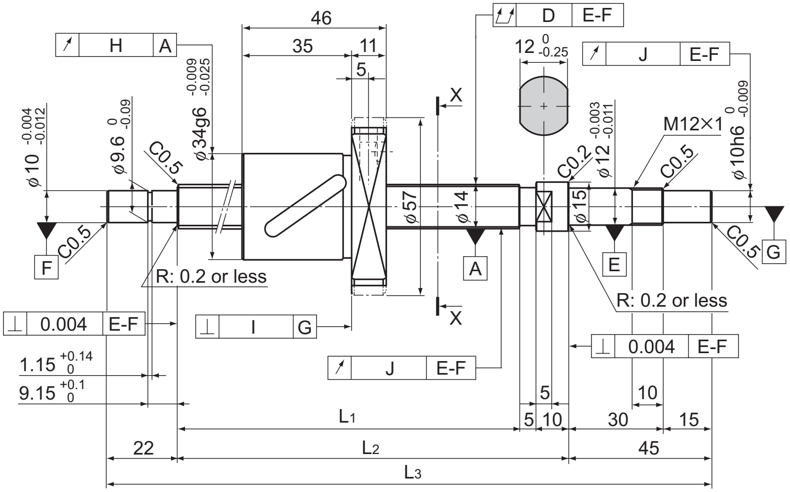
Ball Screw Specifications			
Lead (mm)	4		
BCD(mm)	14.65		
Thread minor diameter (mm)	12.2		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	1 turn × 3 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	4.2	4.2	4.2
Basic static load rating C_0a(kN)	7.6	7.6	7.6
Preload torque (N-m)	9.8×10^{-3} to 6.9×10^{-2}	—	—
Spacer ball	None	None	None
Rigidity value(N/μm)	190		
Circulation method	Deflector		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.025	0.01	0.008	0.009	±0.01	0.008	0.13	0.8
	0.03	0.012	0.01	0.012	±0.02	0.018	0.13	0.8
	0.045	0.02	0.014	0.014	Travel distance: ±0.05/300		0.13	0.8
	0.025	0.01	0.008	0.009	±0.01	0.008	0.13	0.8
	0.03	0.012	0.01	0.012	±0.02	0.018	0.13	0.8
	0.045	0.02	0.014	0.014	Travel distance: ±0.05/300		0.13	0.8
	0.03	0.01	0.008	0.009	±0.012	0.008	0.13	0.8
	0.04	0.012	0.01	0.012	±0.023	0.018	0.13	0.8
	0.055	0.02	0.014	0.014	Travel distance: ±0.05/300		0.13	0.8
	0.04	0.01	0.008	0.009	±0.013	0.01	0.13	0.8
	0.05	0.012	0.01	0.012	±0.025	0.02	0.13	0.8
	0.06	0.02	0.014	0.014	Travel distance: ±0.05/300		0.13	0.8
	0.045	0.01	0.008	0.009	±0.015	0.01	0.13	0.8
	0.055	0.012	0.01	0.012	±0.027	0.02	0.13	0.8
	0.075	0.02	0.014	0.014	Travel distance: ±0.05/300		0.13	0.8

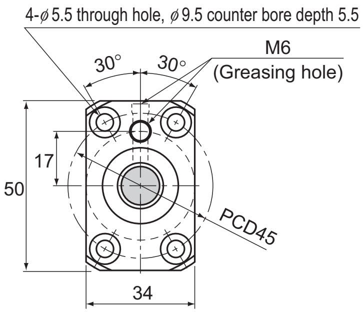
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1408-2.5 Shaft diameter: 14; lead: 8



Model No.	Stroke	Screw shaft length		
		L₁	L₂	L₃
BNK 1408-2.5RRG0+321LC5Y	150	239	254	321
BNK 1408-2.5RRG2+321LC7Y				
BNK 1408-2.5RRG0+371LC5Y	200	289	304	371
BNK 1408-2.5RRG2+371LC7Y				
BNK 1408-2.5RRG0+421LC5Y	250	339	354	421
BNK 1408-2.5RRG2+421LC7Y				
BNK 1408-2.5RRG0+471LC5Y	300	389	404	471
BNK 1408-2.5RRG2+471LC7Y				
BNK 1408-2.5RRG0+521LC5Y	350	439	454	521
BNK 1408-2.5RRG2+521LC7Y				
BNK 1408-2.5RRG0+571LC5Y	400	489	504	571
BNK 1408-2.5RRG2+571LC7Y				
BNK 1408-2.5RRG0+621LC5Y	450	539	554	621
BNK 1408-2.5RRG2+621LC7Y				
BNK 1408-2.5RRG0+671LC5Y	500	589	604	671
BNK 1408-2.5RRG2+671LC7Y				
BNK 1408-2.5RRG0+721LC5Y	550	639	654	721
BNK 1408-2.5RRG2+721LC7Y				
BNK 1408-2.5RRG0+771LC5Y	600	689	704	771
BNK 1408-2.5RRG2+771LC7Y				
BNK 1408-2.5RRG0+871LC5Y	700	789	804	871
BNK 1408-2.5RRG2+871LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.
Plug the unused oil hole before using the product.



X-X arrow view

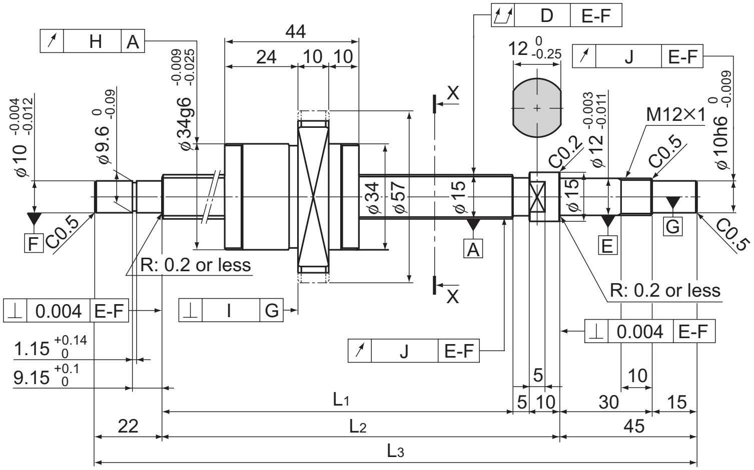
Ball Screw Specifications			
Lead (mm)	8		
BCD(mm)	14.75		
Thread minor diameter (mm)	11.2		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	2.5 turns × 1 row		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	4.3	6.9	6.9
Basic static load rating C_{0a}(kN)	5.8	11.5	11.5
Preload torque (N-m)	2×10^{-2} to 7.8×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	80	150	
Circulation method	Return pipe		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy: Representative travel distance error	Lead angle accuracy: Fluctuation	Nut mass kg	Shaft mass kg/m
	0.035	0.015	0.011	0.012	±0.023	0.018	0.29	0.84
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.035	0.015	0.011	0.012	±0.023	0.018	0.29	0.84
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.04	0.015	0.011	0.012	±0.025	0.02	0.29	0.84
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.04	0.015	0.011	0.012	±0.025	0.02	0.29	0.84
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.05	0.015	0.011	0.012	±0.027	0.02	0.29	0.84
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.05	0.015	0.011	0.012	±0.027	0.02	0.29	0.84
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.05	0.015	0.011	0.012	±0.03	0.023	0.29	0.84
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.065	0.015	0.011	0.012	±0.03	0.023	0.29	0.84
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.065	0.015	0.011	0.012	±0.035	0.025	0.29	0.84
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.065	0.015	0.011	0.012	±0.035	0.025	0.29	0.84
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84
	0.085	0.015	0.011	0.012	±0.035	0.025	0.29	0.84
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.29	0.84

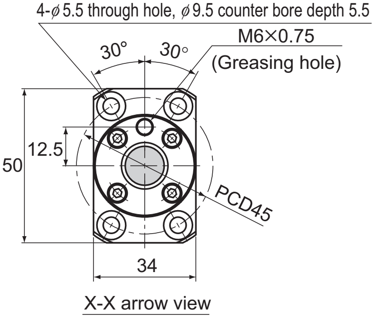
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1510-5.6 Shaft diameter: 15; lead: 10



Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 1510-5.6G0+321LC5Y	150	239	254	321
BNK 1510-5.6G2+321LC7Y				
BNK 1510-5.6G0+371LC5Y	200	289	304	371
BNK 1510-5.6G2+371LC7Y				
BNK 1510-5.6G0+421LC5Y	250	339	354	421
BNK 1510-5.6G2+421LC7Y				
BNK 1510-5.6G0+471LC5Y	300	389	404	471
BNK 1510-5.6G2+471LC7Y				
BNK 1510-5.6G0+521LC5Y	350	439	454	521
BNK 1510-5.6G2+521LC7Y				
BNK 1510-5.6G0+571LC5Y	400	489	504	571
BNK 1510-5.6G2+571LC7Y				
BNK 1510-5.6G0+621LC5Y	450	539	554	621
BNK 1510-5.6G2+621LC7Y				
BNK 1510-5.6G0+671LC5Y	500	589	604	671
BNK 1510-5.6G2+671LC7Y				
BNK 1510-5.6G0+721LC5Y	550	639	654	721
BNK 1510-5.6G2+721LC7Y				
BNK 1510-5.6G0+771LC5Y	600	689	704	771
BNK 1510-5.6G2+771LC7Y				
BNK 1510-5.6G0+871LC5Y	700	789	804	871
BNK 1510-5.6G2+871LC7Y				
BNK 1510-5.6G0+971LC5Y	800	889	904	971
BNK 1510-5.6G2+971LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.



X-X arrow view

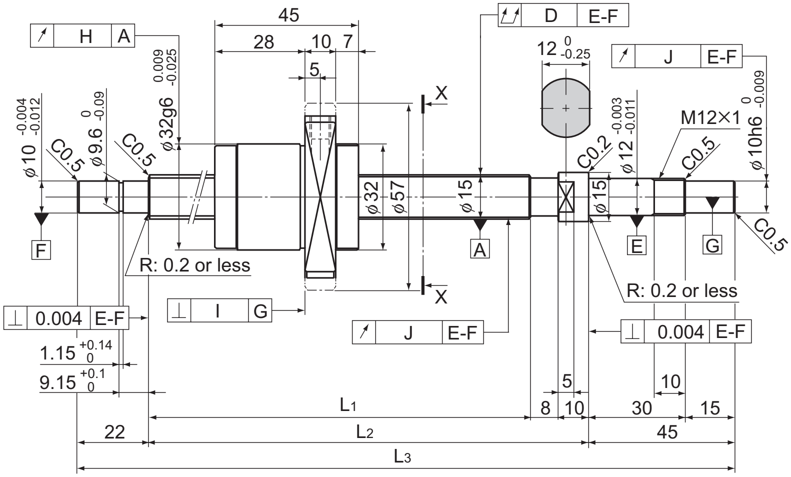
Ball Screw Specifications			
Lead (mm)	10		
BCD(mm)	15.75		
Thread minor diameter (mm)	12.5		
Threading direction, No. of threaded grooves	Rightward, 2		
No. of circuits	2.8 turns × 2 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	9	14.3	14.3
Basic static load rating C_0a(kN)	13.9	27.9	27.9
Preload torque (N-m)	2×10^{-2} to 9.8×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	190	350	
Circulation method	End cap		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.035	0.015	0.011	0.012	±0.023	0.018	0.22	0.76
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.035	0.015	0.011	0.012	±0.023	0.018	0.22	0.76
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.04	0.015	0.011	0.012	±0.025	0.02	0.22	0.76
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.04	0.015	0.011	0.012	±0.025	0.02	0.22	0.76
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.05	0.015	0.011	0.012	±0.027	0.02	0.22	0.76
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.05	0.015	0.011	0.012	±0.027	0.02	0.22	0.76
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.05	0.015	0.011	0.012	±0.03	0.023	0.22	0.76
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.065	0.015	0.011	0.012	±0.03	0.023	0.22	0.76
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.065	0.015	0.011	0.012	±0.035	0.025	0.22	0.76
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.065	0.015	0.011	0.012	±0.035	0.025	0.22	0.76
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.085	0.015	0.011	0.012	±0.035	0.025	0.22	0.76
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76
	0.085	0.015	0.011	0.012	±0.04	0.027	0.22	0.76
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.22	0.76

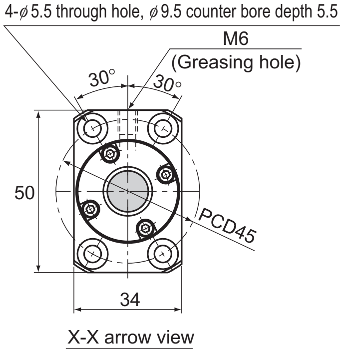
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK1520-3 Shaft diameter: 15; lead: 20



Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 1520-3G0+321LC5Y	150	236	254	321
BNK 1520-3G2+321LC7Y				
BNK 1520-3G0+371LC5Y	200	286	304	371
BNK 1520-3G2+371LC7Y				
BNK 1520-3G0+421LC5Y	250	336	354	421
BNK 1520-3G2+421LC7Y				
BNK 1520-3G0+471LC5Y	300	386	404	471
BNK 1520-3G2+471LC7Y				
BNK 1520-3G0+521LC5Y	350	436	454	521
BNK 1520-3G2+521LC7Y				
BNK 1520-3G0+571LC5Y	400	486	504	571
BNK 1520-3G2+571LC7Y				
BNK 1520-3G0+621LC5Y	450	536	554	621
BNK 1520-3G2+621LC7Y				
BNK 1520-3G0+671LC5Y	500	586	604	671
BNK 1520-3G2+671LC7Y				
BNK 1520-3G0+721LC5Y	550	636	654	721
BNK 1520-3G2+721LC7Y				
BNK 1520-3G0+771LC5Y	600	686	704	771
BNK 1520-3G2+771LC7Y				
BNK 1520-3G0+871LC5Y	700	786	804	871
BNK 1520-3G2+871LC7Y				
BNK 1520-3G0+971LC5Y	800	886	904	971
BNK 1520-3G2+971LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.



X-X arrow view

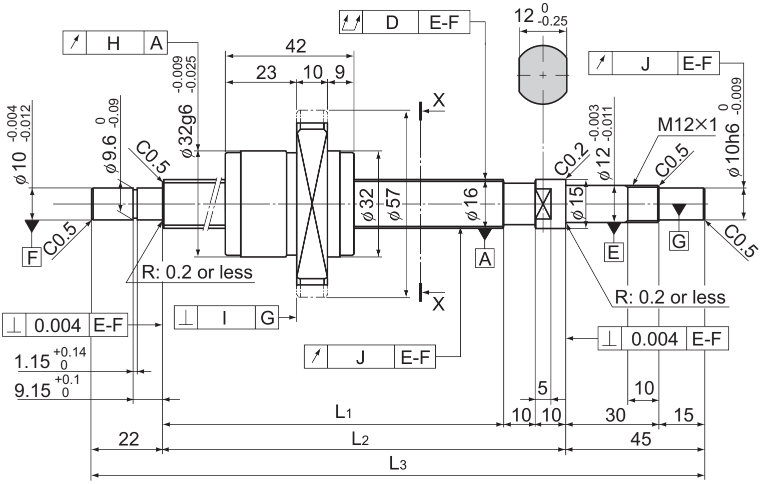
Ball Screw Specifications			
Lead (mm)	20		
BCD(mm)	15.75		
Thread minor diameter (mm)	12.5		
Threading direction, No. of threaded grooves	Rightward, 2		
No. of circuits	1.5 turns × 2 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	5.1	8	8
Basic static load rating C_{0a}(kN)	7.9	15.8	15.8
Preload torque (N-m)	2×10^{-2} to 8.8×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	110	200	
Circulation method	End cap		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.035	0.015	0.011	0.012	±0.023	0.018	0.32	1.05
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.035	0.015	0.011	0.012	±0.023	0.018	0.32	1.05
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.04	0.015	0.011	0.012	±0.025	0.02	0.32	1.05
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.04	0.015	0.011	0.012	±0.025	0.02	0.32	1.05
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.05	0.015	0.011	0.012	±0.027	0.02	0.32	1.05
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.05	0.015	0.011	0.012	±0.027	0.02	0.32	1.05
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.05	0.015	0.011	0.012	±0.03	0.023	0.32	1.05
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.065	0.015	0.011	0.012	±0.03	0.023	0.32	1.05
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.065	0.015	0.011	0.012	±0.035	0.025	0.32	1.05
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.065	0.015	0.011	0.012	±0.035	0.025	0.32	1.05
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.085	0.015	0.011	0.012	±0.035	0.025	0.32	1.05
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05
	0.085	0.015	0.011	0.012	±0.04	0.027	0.32	1.05
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.32	1.05

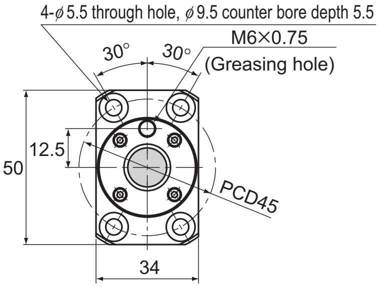
Description of Each Option⇒A-815 **Dimensions⇒B-777**

BNK1616-3.6 Shaft diameter: 16; lead: 16



Model No.	Stroke	Screw shaft length		
		L_1	L_2	L_3
BNK 1616-3.6G0+321LC5Y	150	234	254	321
BNK 1616-3.6G2+321LC7Y				
BNK 1616-3.6G0+371LC5Y	200	284	304	371
BNK 1616-3.6G2+371LC7Y				
BNK 1616-3.6G0+421LC5Y	250	334	354	421
BNK 1616-3.6G2+421LC7Y				
BNK 1616-3.6G0+471LC5Y	300	384	404	471
BNK 1616-3.6G2+471LC7Y				
BNK 1616-3.6G0+521LC5Y	350	434	454	521
BNK 1616-3.6G2+521LC7Y				
BNK 1616-3.6G0+571LC5Y	400	484	504	571
BNK 1616-3.6G2+571LC7Y				
BNK 1616-3.6G0+621LC5Y	450	534	554	621
BNK 1616-3.6G2+621LC7Y				
BNK 1616-3.6G0+671LC5Y	500	584	604	671
BNK 1616-3.6G2+671LC7Y				
BNK 1616-3.6G0+721LC5Y	550	634	654	721
BNK 1616-3.6G2+721LC7Y				
BNK 1616-3.6G0+771LC5Y	600	684	704	771
BNK 1616-3.6G2+771LC7Y				
BNK 1616-3.6G0+871LC5Y	700	784	804	871
BNK 1616-3.6G2+871LC7Y				
BNK 1616-3.6G0+971LC5Y	800	884	904	971
BNK 1616-3.6G2+971LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.



X-X arrow view

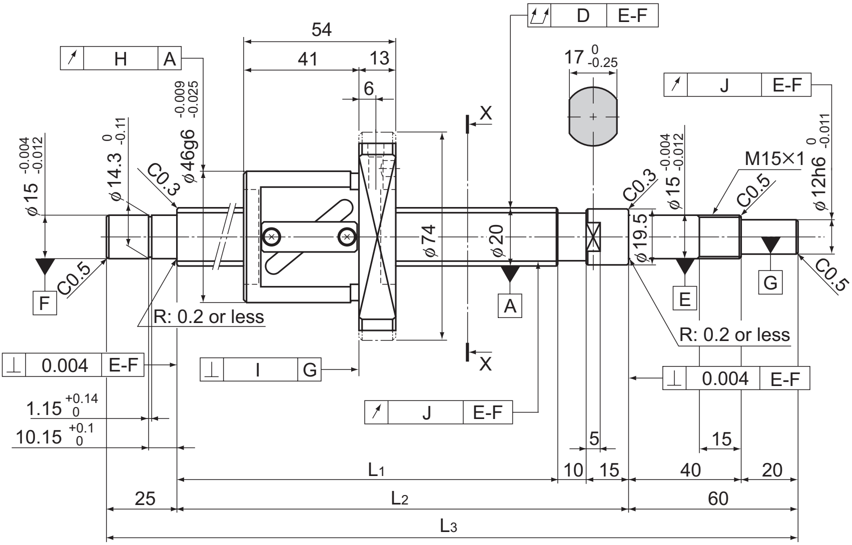
Ball Screw Specifications			
Lead (mm)	16		
BCD(mm)	16.65		
Thread minor diameter (mm)	13.7		
Threading direction, No. of threaded grooves	Rightward, 2		
No. of circuits	1.8 turns × 2 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	4.4	7.1	7.1
Basic static load rating C_0a(kN)	7.2	14.3	14.3
Preload torque (N-m)	2×10^{-2} to 9.8×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	120	230	
Circulation method	End cap		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.035	0.015	0.011	0.012	±0.023	0.018	0.2	1.25
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.035	0.015	0.011	0.012	±0.023	0.018	0.2	1.25
	0.055	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.04	0.015	0.011	0.012	±0.025	0.02	0.2	1.25
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.04	0.015	0.011	0.012	±0.025	0.02	0.2	1.25
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.05	0.015	0.011	0.012	±0.027	0.02	0.2	1.25
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.05	0.015	0.011	0.012	±0.027	0.02	0.2	1.25
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.05	0.015	0.011	0.012	±0.03	0.023	0.2	1.25
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.065	0.015	0.011	0.012	±0.03	0.023	0.2	1.25
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.065	0.015	0.011	0.012	±0.035	0.025	0.2	1.25
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.065	0.015	0.011	0.012	±0.035	0.025	0.2	1.25
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.085	0.015	0.011	0.012	±0.035	0.025	0.2	1.25
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25
	0.085	0.015	0.011	0.012	±0.04	0.027	0.2	1.25
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.2	1.25

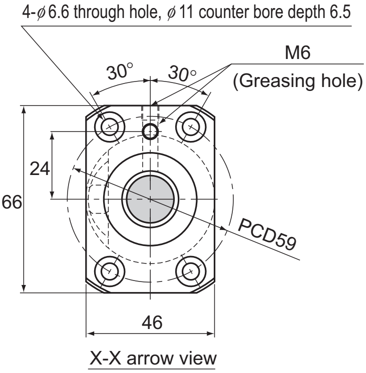
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK2010-2.5 Shaft diameter: 20; lead: 10



Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 2010-2.5RRG0+499LC5Y	300	389	414	499
BNK 2010-2.5RRG2+499LC7Y				
BNK 2010-2.5RRG0+599LC5Y	400	489	514	599
BNK 2010-2.5RRG2+599LC7Y				
BNK 2010-2.5RRG0+699LC5Y	500	589	614	699
BNK 2010-2.5RRG2+699LC7Y				
BNK 2010-2.5RRG0+799LC5Y	600	689	714	799
BNK 2010-2.5RRG2+799LC7Y				
BNK 2010-2.5RRG0+899LC5Y	700	789	814	899
BNK 2010-2.5RRG2+899LC7Y				
BNK 2010-2.5RRG0+999LC5Y	800	889	914	999
BNK 2010-2.5RRG2+999LC7Y				
BNK 2010-2.5RRG0+1099LC5Y	900	989	1014	1099
BNK 2010-2.5RRG2+1099LC7Y				
BNK 2010-2.5RRG0+1199LC5Y	1000	1089	1114	1199
BNK 2010-2.5RRG2+1199LC7Y				
BNK 2010-2.5RRG0+1299LC5Y	1100	1189	1214	1299
BNK 2010-2.5RRG2+1299LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.
Plug the unused oil hole before using the product.



X-X arrow view

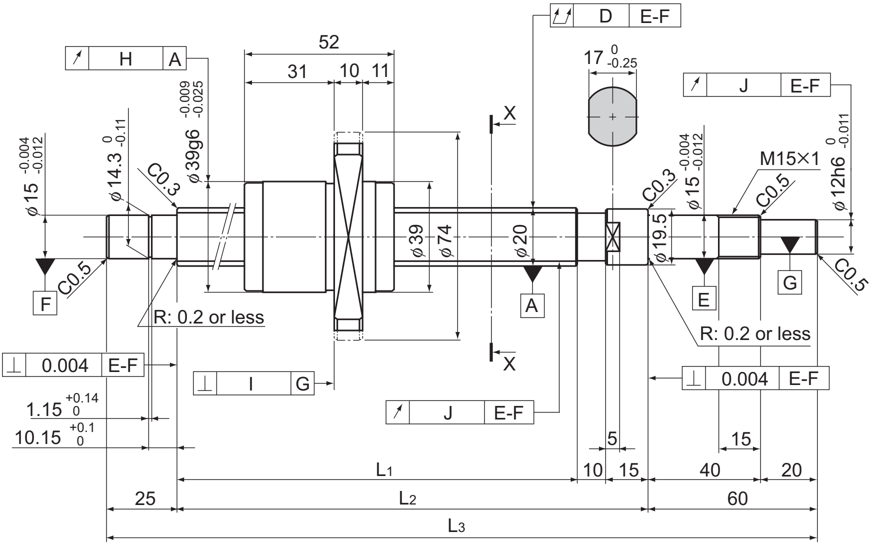
Ball Screw Specifications			
Lead (mm)	10		
BCD(mm)	21		
Thread minor diameter (mm)	16.4		
Threading direction, No. of threaded grooves	Rightward, 1		
No. of circuits	2.5 turns × 1 row		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	7	11.1	11.1
Basic static load rating C_0a(kN)	11	22	22
Preload torque (N-m)	2×10^{-2} to 9.8×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	110	210	
Circulation method	Return pipe		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.04	0.015	0.011	0.012	±0.025	0.02	0.58	1.81
	0.06	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.05	0.015	0.011	0.012	±0.027	0.02	0.58	1.81
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.065	0.015	0.011	0.012	±0.03	0.023	0.58	1.81
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.065	0.015	0.011	0.012	±0.035	0.025	0.58	1.81
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.085	0.015	0.011	0.012	±0.035	0.025	0.58	1.81
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.085	0.015	0.011	0.012	±0.04	0.027	0.58	1.81
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.11	0.015	0.011	0.012	±0.04	0.027	0.58	1.81
	0.15	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.11	0.015	0.011	0.012	±0.046	0.03	0.58	1.81
	0.15	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81
	0.15	0.015	0.011	0.012	±0.046	0.03	0.58	1.81
	0.19	0.03	0.018	0.014	Travel distance: ±0.05/300		0.58	1.81

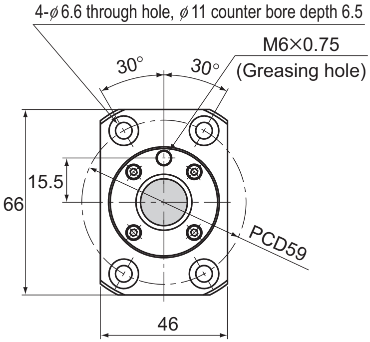
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK2020-3.6 Shaft diameter: 20; lead: 20



Model No.	Stroke	Screw shaft length		
		L₁	L₂	L₃
BNK 2020-3.6G0+520LC5Y	300	410	435	520
BNK 2020-3.6G2+520LC7Y				
BNK 2020-3.6G0+620LC5Y	400	510	535	620
BNK 2020-3.6G2+620LC7Y				
BNK 2020-3.6G0+720LC5Y	500	610	635	720
BNK 2020-3.6G2+720LC7Y				
BNK 2020-3.6G0+820LC5Y	600	710	735	820
BNK 2020-3.6G2+820LC7Y				
BNK 2020-3.6G0+920LC5Y	700	810	835	920
BNK 2020-3.6G2+920LC7Y				
BNK 2020-3.6G0+1020LC5Y	800	910	935	1020
BNK 2020-3.6G2+1020LC7Y				
BNK 2020-3.6G0+1120LC5Y	900	1010	1035	1120
BNK 2020-3.6G2+1120LC7Y				
BNK 2020-3.6G0+1220LC5Y	1000	1110	1135	1220
BNK 2020-3.6G2+1220LC7Y				
BNK 2020-3.6G0+1320LC5Y	1100	1210	1235	1320
BNK 2020-3.6G2+1320LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.



X-X arrow view

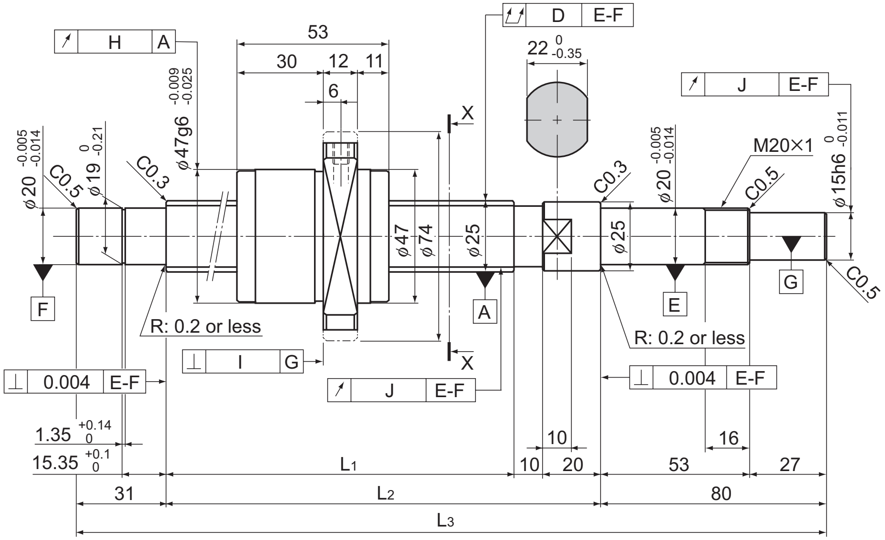
Ball Screw Specifications			
Lead (mm)	20		
BCD(mm)	20.75		
Thread minor diameter (mm)	17.5		
Threading direction, No. of threaded grooves	Rightward, 2		
No. of circuits	1.8 turns × 2 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	7	11.1	11.1
Basic static load rating C_0a(kN)	12.3	24.7	24.7
Preload torque (N-m)	2×10^{-2} to 9.8×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	160	290	
Circulation method	End cap		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy		Nut mass kg	Shaft mass kg/m
					Representative travel distance error	Fluctuation		
	0.05	0.015	0.011	0.012	±0.027	0.02	0.39	2.04
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.05	0.015	0.011	0.012	±0.03	0.023	0.39	2.04
	0.075	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.065	0.015	0.011	0.012	±0.03	0.023	0.39	2.04
	0.09	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.085	0.015	0.011	0.012	±0.035	0.025	0.39	2.04
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.085	0.015	0.011	0.012	±0.04	0.027	0.39	2.04
	0.12	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.11	0.015	0.011	0.012	±0.04	0.027	0.39	2.04
	0.15	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.11	0.015	0.011	0.012	±0.046	0.03	0.39	2.04
	0.15	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.11	0.015	0.011	0.012	±0.046	0.03	0.39	2.04
	0.15	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04
	0.15	0.015	0.011	0.012	±0.046	0.03	0.39	2.04
	0.19	0.03	0.018	0.014	Travel distance: ±0.05/300		0.39	2.04

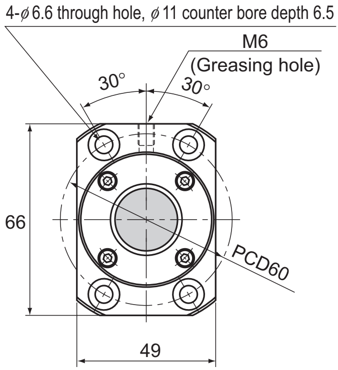
Description of Each Option⇒A-815 Dimensions⇒B-777

BNK2520-3.6 Shaft diameter: 25; lead: 20



Model No.	Stroke	Screw shaft length		
		L1	L2	L3
BNK 2520-3.6G0+751LC5Y	500	610	640	751
BNK 2520-3.6G2+751LC7Y				
BNK 2520-3.6G0+851LC5Y	600	710	740	851
BNK 2520-3.6G2+851LC7Y				
BNK 2520-3.6G0+1051LC5Y	800	910	940	1051
BNK 2520-3.6G2+1051LC7Y				
BNK 2520-3.6G0+1251LC5Y	1000	1110	1140	1251
BNK 2520-3.6G2+1251LC7Y				
BNK 2520-3.6G0+1451LC5Y	1200	1310	1340	1451
BNK 2520-3.6G2+1451LC7Y				
BNK 2520-3.6G0+1651LC5Y	1400	1510	1540	1651
BNK 2520-3.6G2+1651LC7Y				
BNK 2520-3.6G0+1851LC5Y	1600	1710	1740	1851
BNK 2520-3.6G2+1851LC7Y				

Note) For accuracy grade C5, clearance GT is also standardized.



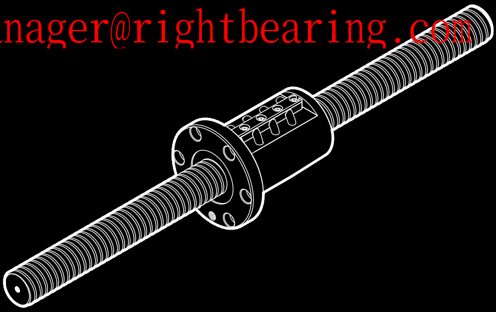
X-X arrow view

Ball Screw Specifications			
Lead (mm)	20		
BCD(mm)	26		
Thread minor diameter (mm)	21.9		
Threading direction, No. of threaded grooves	Rightward, 2		
No. of circuits	1.8 turns × 2 rows		
Clearance symbol	G0	GT	G2
Axial clearance (mm)	0	0.005 or less	0.02 or less
Basic dynamic load rating Ca (kN)	10.5	16.7	16.7
Basic static load rating C_0a(kN)	19	38	38
Preload torque (N-m)	4.9×10^{-2} to 2.2×10^{-2}	—	—
Spacer ball	1 : 1	None	None
Rigidity value(N/μm)	190	360	
Circulation method	End cap		

Unit: mm

	Runout of the screw shaft axis D	Runout of the nut circumference H	Flange perpendicularity I	Runout of the thread groove surface J	Lead angle accuracy: Representative travel distance error	Lead angle accuracy: Fluctuation	Nut mass kg	Shaft mass kg/m
	0.055	0.015	0.011	0.013	±0.03	0.023	0.53	3.03
	0.07	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03
	0.065	0.015	0.011	0.013	±0.035	0.025	0.53	3.03
	0.085	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03
	0.085	0.015	0.011	0.013	±0.04	0.027	0.53	3.03
	0.1	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03
	0.11	0.015	0.011	0.013	±0.046	0.03	0.53	3.03
	0.13	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03
	0.11	0.015	0.011	0.013	±0.054	0.035	0.53	3.03
	0.13	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03
	0.14	0.015	0.011	0.013	±0.054	0.035	0.53	3.03
	0.17	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03
	0.14	0.015	0.011	0.013	±0.065	0.04	0.53	3.03
	0.17	0.03	0.018	0.02	Travel distance: ±0.05/300		0.53	3.03

Description of Each Option⇒A-815 Dimensions⇒B-777



Precision Ball Screw Models BIF, DIK, BNFN, DKN, BLW, BNF, DK, MDK, BLK/WGF and BNT

Ball Screw

B Product Specifications

Dimensional Drawing, Dimensional Table

Options

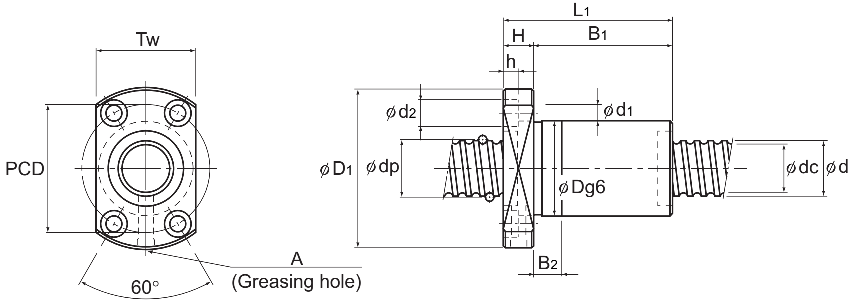
A Technical Descriptions of the Products (Separate)

Technical Descriptions

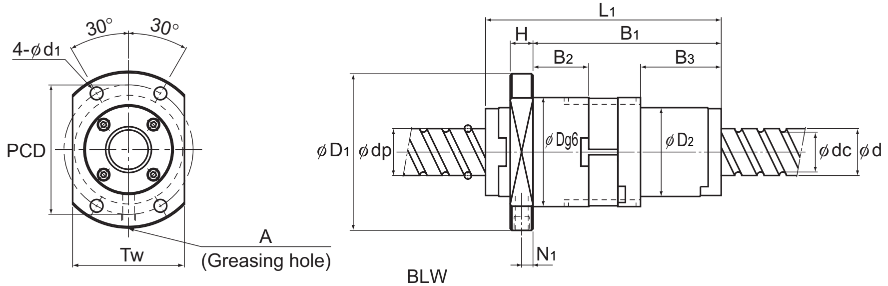
* Please see the separate "A Technical Descriptions of the Products".

Preload Type of Precision Ball Screw

Screw shaft outer diameter	14 to 18
Lead	4 to 16



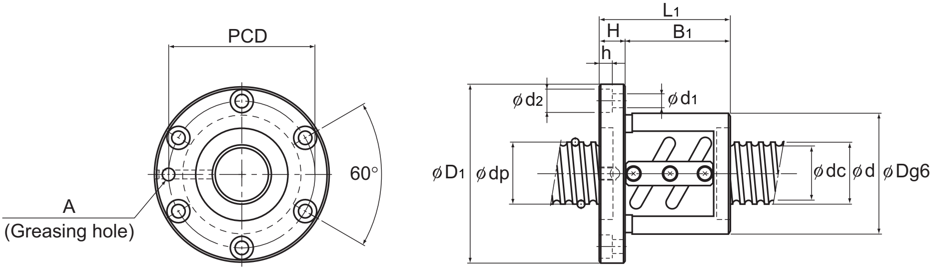
DIK (1404 to 2510)



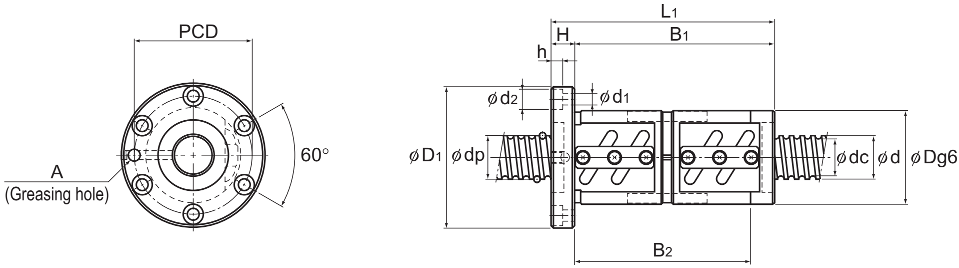
BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity			
d	Ph		dp	dc	Rows x turns	Ca kN	C0a kN	K N/μm	Outer diameter D	Flange diameter D1	D2
14	4	DIK 1404-4	14.5	11.8	2×1	3	5.1	190	26	45	—
		DIK 1404-6	14.5	11.8	3×1	4.2	7.7	280	26	45	—
15	10	BLW 1510-5.6	15.75	12.5	2×2.8	14.3	27.8	680	43	64	34
16	4	BNFN 1604-3	16.5	13.8	2×1.5	5.1	10.5	350	36	59	—
	5	BIF 1605-5	16.75	13.2	1×2.5	7.4	13.9	330	40	60	—
		DIK 1605-6	16.75	13.2	3×1	7.4	13	310	30	49	—
		BNFN 1605-2.5	16.75	13.2	1×2.5	7.4	13.9	330	40	60	—
		BNFN 1605-3	16.75	13.2	2×1.5	8.7	16.8	390	40	60	—
		BNFN 1605-5	16.75	13.2	2×2.5	13.5	27.8	640	40	60	—
	6	BIF 1606-5	16.8	13.2	1×2.5	7.5	14	330	40	60	—
	10	BNFN 1610-1.5	16.8	13.2	1×1.5	4.8	8.5	210	40	63	—
	16	BLW 1616-3.6	16.65	13.7	2×1.8	7.1	14.3	440	41	60	32
18	10	BIF 1810-3	18.8	15.5	1×1.5	5.1	9.6	230	42	65	—
		BNFN 1810-2.5	18.8	15.5	1×2.5	7.8	15.9	360	42	65	—
		BNFN 1810-3	18.8	15.5	2×1.5	9.2	19.1	430	42	65	—

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.
Model BLW cannot be attached with seal.



BIF



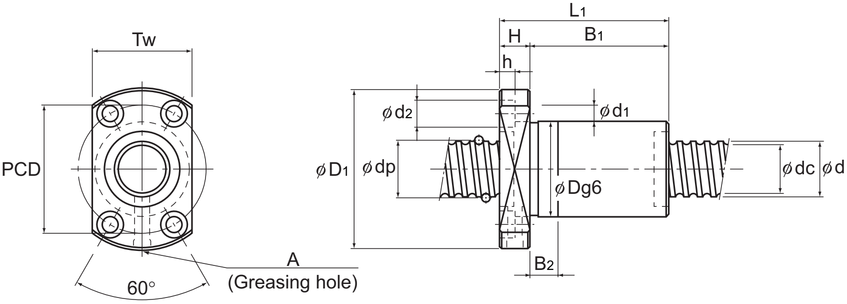
BNFN

Unit: mm

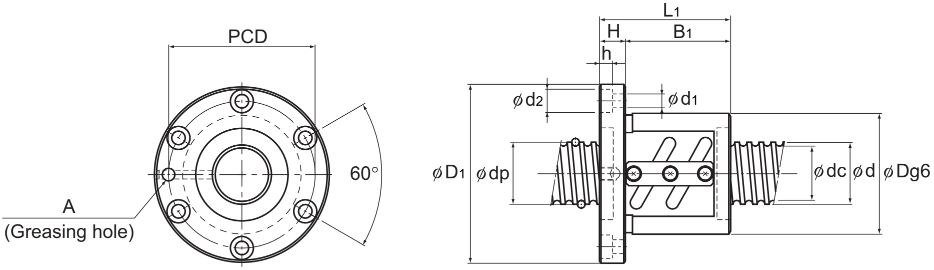
Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	B_3	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	$kg\cdot cm^2/mm$	kg	kg/m
48	10	38	10	—	35	4.5	8	4.5	29	—	M6	2.96×10^{-4}	0.2	1.0
60	10	50	10	—	35	4.5	8	4.5	29	—	M6	2.96×10^{-4}	0.23	1.0
89	10	69	18.7	28.6	52	5.5	—	—	46	5	M6	3.9×10^{-4}	0.81	1.07
85	11	74	—	—	47	5.5	9.5	5.5	—	—	M6	5.05×10^{-4}	0.67	1.35
56	10	46	—	—	50	4.5	8	4.5	—	—	M6	5.05×10^{-4}	0.56	1.25
60	10	50	10	—	39	4.5	8	4.5	31	—	M6	5.05×10^{-4}	0.3	1.25
76	10	66	55	—	50	4.5	8	4.5	—	—	M6	5.05×10^{-4}	0.66	1.25
96	10	86	75	—	50	4.5	8	4.5	—	—	M6	5.05×10^{-4}	0.81	1.25
106	10	96	85	—	50	4.5	8	4.5	—	—	M6	5.05×10^{-4}	0.88	1.25
62	10	52	—	—	50	4.5	8	4.5	—	—	M6	5.05×10^{-4}	0.56	1.3
72	11	61	—	—	51	5.5	9.5	5.5	—	—	M6	5.05×10^{-4}	0.67	1.41
84.5	10	65.5	18.1	27.1	49	4.5	—	—	44	6	M6	5.05×10^{-4}	0.67	1.42
75	12	63	—	—	53	5.5	9.5	5.5	—	—	M6	8.09×10^{-4}	0.75	1.81
119	12	107	94	—	53	5.5	9.5	5.5	—	—	M6	8.09×10^{-4}	1.09	1.81
135	12	123	110	—	53	5.5	9.5	5.5	—	—	M6	8.09×10^{-4}	1.21	1.81

For model number coding, see B-718.

Description of Each Option⇒A-815 **Dimensions⇒B-777**



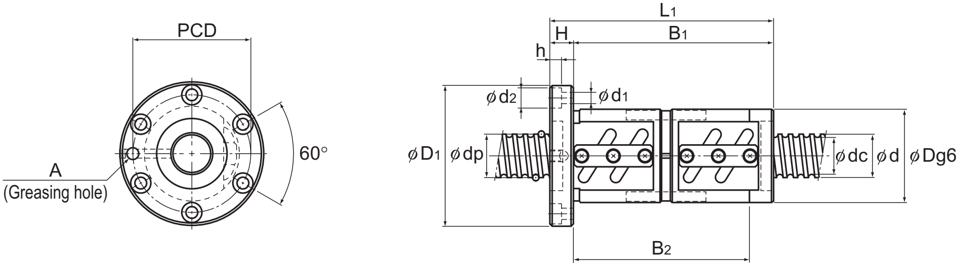
DIK (1404 to 2510)



BIF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K
						Ca kN	C0a kN	N/μm
20	4	BIF 2004-5	20.5	17.8	1×2.5	4.8	10.9	360
		DIK 2004-6	20.5	17.8	3×1	5.2	11.6	380
		DIK 2004-8	20.5	17.8	4×1	6.6	15.5	510
		BNFN 2004-2.5	20.5	17.8	1×2.5	4.8	10.9	360
		BNFN 2004-5	20.5	17.8	2×2.5	8.6	21.8	700
	5	BIF 2005-5	20.75	17.2	1×2.5	8.3	17.4	390
		DIK 2005-6	20.75	17.2	3×1	8.5	17.3	310
		BNFN 2005-2.5	20.75	17.2	1×2.5	8.3	17.4	390
		BNFN 2005-3	20.75	17.2	2×1.5	9.7	21	470
		BNFN 2005-3.5	20.75	17.2	1×3.5	11.1	24.5	550
		BNFN 2005-5	20.75	17.2	2×2.5	15.1	35	760

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



BNFN

Unit: mm

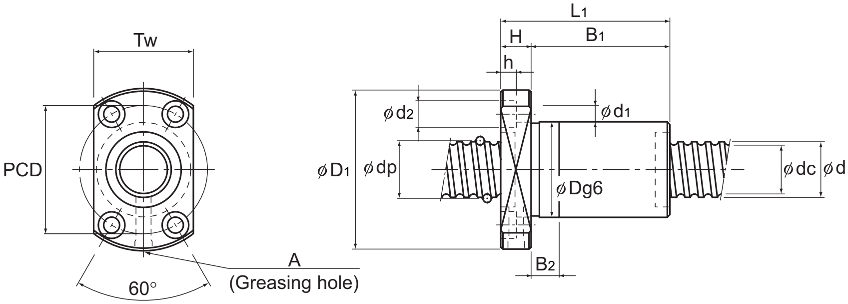
Nut dimensions										Screw shaft inertia moment/mm	Nut mass	Shaft mass
Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1\times d_2\times h$	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
40	63	53	11	42	—	51	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.49	2.18
32	56	62	11	51	15	44	5.5×9.5×5.5	35	M6	1.23×10^{-3}	0.34	2.18
32	56	70	11	59	15	44	5.5×9.5×5.5	35	M6	1.23×10^{-3}	0.37	2.18
40	63	69	11	58	—	51	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.58	2.18
40	63	93	11	82	—	51	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.74	2.18
44	67	56	11	45	—	55	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.57	2.06
34	58	61	11	50	10	46	5.5×9.5×5.5	36	M6	1.23×10^{-3}	0.38	2.06
44	67	76	11	65	53	55	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.77	2.06
44	67	97	11	86	74	55	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.93	2.06
44	67	85	11	74	62	55	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.86	2.06
44	67	106	11	95	83	55	5.5×9.5×5.5	—	M6	1.23×10^{-3}	0.98	2.06

For model number coding, see B-718.

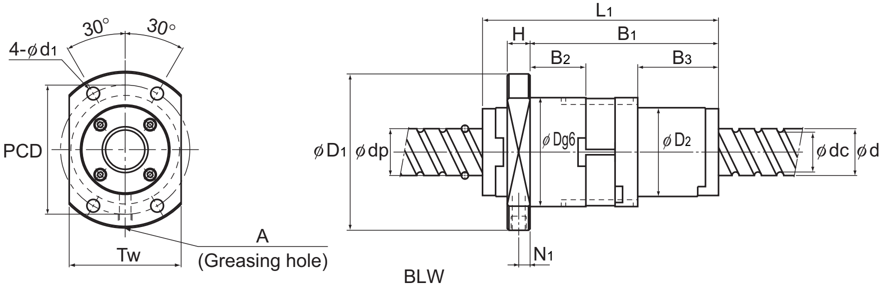
Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

Screw shaft outer diameter	20
Lead	6 to 20



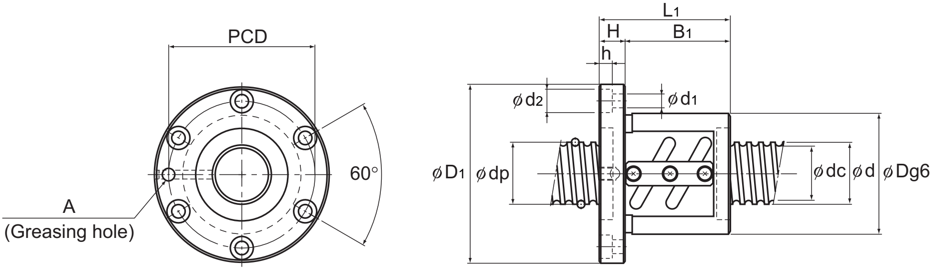
DIK (1404 to 2510)



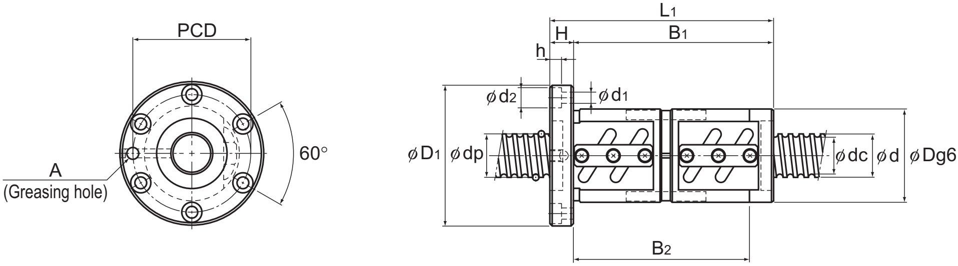
BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity	Outer diameter	Flange diameter	
d	Ph		dp	dc	Rows x turns	Ca kN	C0a kN	K N/µm	D	D1	D2
20	6	BIF 2006-3	20.75	17.2	1×1.5	5.4	10.5	250	48	71	—
		BIF 2006-5	20.75	17.2	1×2.5	8.3	17.5	390	48	71	—
		DIK 2006-6	21	16.4	3×1	11.4	21.5	410	35	58	—
		BNFN 2006-2.5	20.75	17.2	1×2.5	8.3	17.5	390	48	71	—
		BNFN 2006-3	20.75	17.2	2×1.5	9.7	21	470	48	71	—
		BNFN 2006-3.5	20.75	17.2	1×3.5	11.1	24.5	550	48	71	—
		BNFN 2006-5	20.75	17.2	2×2.5	15.1	35	760	48	71	—
	8	DIK 2008-4	21	16.4	2×1	8.1	14.4	280	35	58	—
		BNFN 2008-2.5	21	16.4	1×2.5	15.1	35	760	46	74	—
	10	BNFN 2010A-1.5	21	16.4	1×1.5	7.2	13.2	250	46	74	—
	12	BNFN 2012-1.5	21	16.4	1×1.5	7.1	12.5	250	48	71	—
	20	BLW 2020-3.6	20.75	17.5	2×1.8	11.1	24.7	570	48	69	39

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.
Model BLW cannot be attached with seal.



BIF



BNFN

Unit: mm

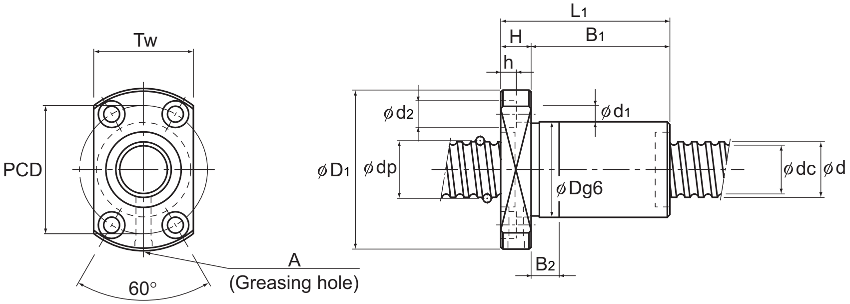
Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	B_3	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
56	11	45	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.74	2.13
62	11	51	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.8	2.13
76	11	65	15	—	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.48	1.93
86	11	75	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.05	2.13
110	11	99	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.3	2.13
98	11	87	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.17	2.13
122	11	111	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.42	2.13
69	11	58	15	—	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.45	2.06
100	15	85	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.08	2.06
98	15	83	67	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.06	2.14
100	18	82	—	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	1.3	2.19
105	10	84	25	36	57	5.5	—	—	50	5	M6	1.23×10^{-3}	0.54	2.25

For model number coding, see B-718.

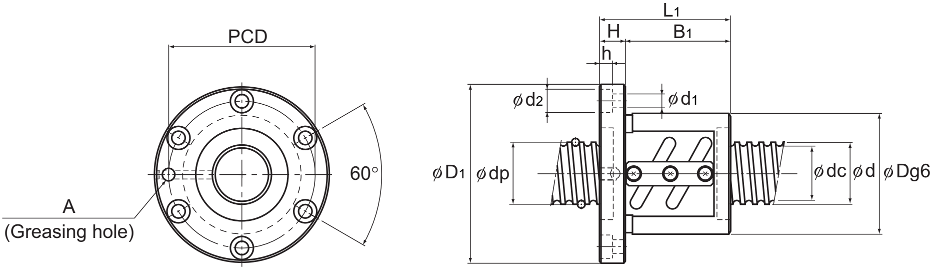
Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

Screw shaft outer diameter	25
Lead	4 to 6



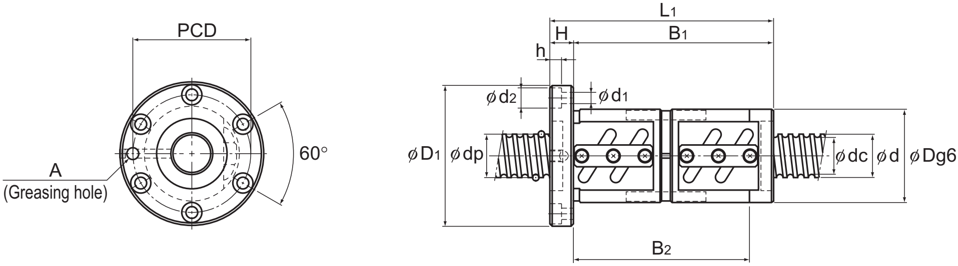
DIK (1404 to 2510)



BIF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K N/μm
						Ca kN	C_0a kN	
25	4	DIK 2504-6	25.5	22.8	3×1	5.7	15	470
		DIK 2504-8	25.5	22.8	4×1	7.4	19.9	620
		○ BNFN 2504-2.5	25.5	22.8	1×2.5	5.2	13.7	420
		○ BNFN 2504-5	25.5	22.8	2×2.5	9.5	27.3	820
	5	DIK 2505-6	25.75	22.2	3×1	9.7	22.6	490
		○ BIF 2505-3	25.75	22.2	1×1.5	6	13.1	280
		○ BIF 2505-5	25.75	22.2	1×2.5	9.2	22	470
		○ BNFN 2505-2.5	25.75	22.2	1×2.5	9.2	22	470
		○ BNFN 2505-3	25.75	22.2	2×1.5	10.8	26.4	560
		○ BNFN 2505-3.5	25.75	22.2	1×3.5	12.3	30.7	650
		○ BNFN 2505-5	25.75	22.2	2×2.5	16.7	44	910
	6	DIK 2506-4	26	21.4	2×1	9.1	18	330
		DIK 2506-6	26	21.4	3×1	12.8	27	490

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



BNFN

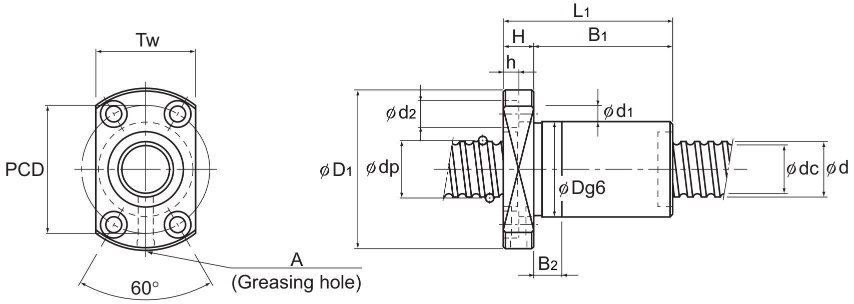
Unit: mm

	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1 \times d_2 \times h$	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
	38	63	63	11	52	15	51	5.5×9.5×5.5	39	M6	3.01×10^{-3}	0.43	3.5
	38	63	71	11	60	15	51	5.5×9.5×5.5	39	M6	3.01×10^{-3}	0.47	3.5
	46	69	68	11	57	—	57	5.5×9.5×5.5	—	M6	3.01×10^{-3}	0.69	3.5
	46	69	92	11	81	—	57	5.5×9.5×5.5	—	M6	3.01×10^{-3}	0.88	3.5
	40	63	61	11	50	10	51	5.5×9.5×5.5	41	M6	3.01×10^{-3}	0.47	3.35
	50	73	52	11	41	—	61	5.5×9.5×5.5	—	M6	3.01×10^{-3}	0.7	3.35
	50	73	55	11	44	—	61	5.5×9.5×5.5	—	M6	3.01×10^{-3}	0.75	3.35
	50	73	75	11	64	52	61	5.5×9.5×5.5	—	M6	3.01×10^{-3}	0.92	3.35
	50	73	102	11	91	79	61	5.5×9.5×5.5	—	M6	3.01×10^{-3}	1.19	3.35
	50	73	85	11	74	62	61	5.5×9.5×5.5	—	M6	3.01×10^{-3}	1.02	3.35
	50	73	105	11	94	82	61	5.5×9.5×5.5	—	M6	3.01×10^{-3}	1.22	3.35
	40	63	60	11	49	10	51	5.5×9.5×5.5	41	M6	3.01×10^{-3}	0.46	3.19
	40	63	72	11	61	15	51	5.5×9.5×5.5	41	M6	3.01×10^{-3}	0.54	3.19

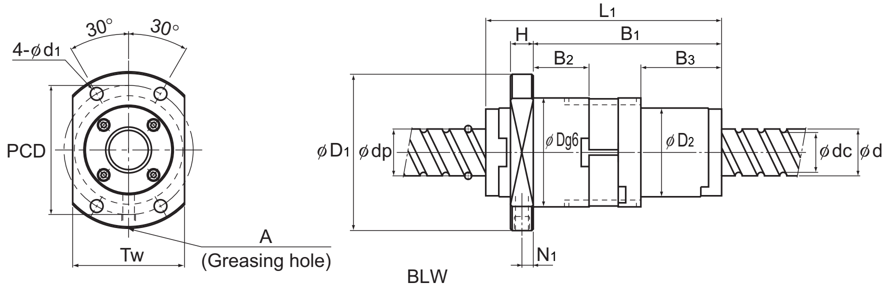
For model number coding, see B-718.

Preload Type of Precision Ball Screw

Screw shaft outer diameter	25
Lead	6 to 25



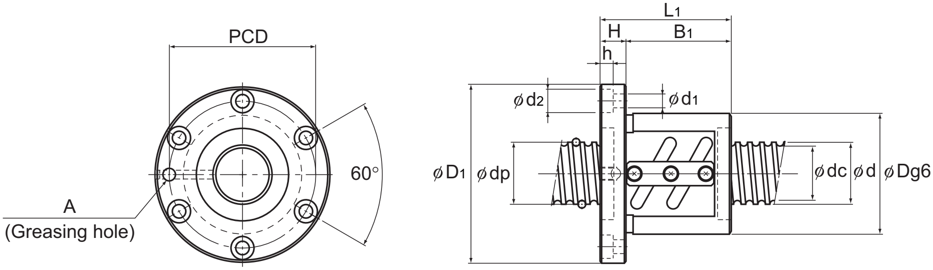
DIK (1404 to 2510)



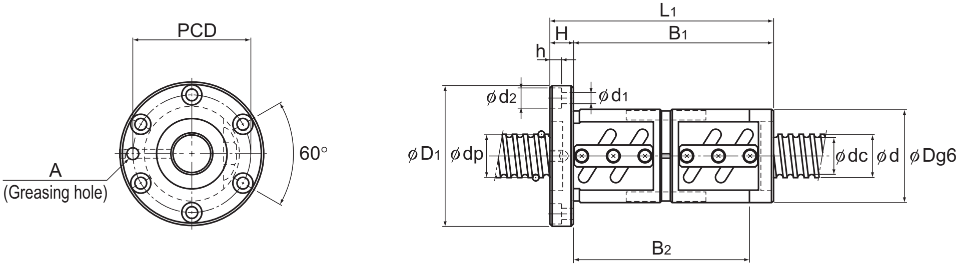
BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity			
						Ca	C_{0a}	K	Outer diameter	Flange diameter	
d	Ph		dp	dc	Rows x turns	kN	kN	N/μm	D	D_1	D_2
25	6	○ BNFN 2506-2.5	26	21.4	1×2.5	12.5	27.3	490	53	76	—
		○ BNFN 2506-3	26	21.4	2×1.5	14.6	32.8	580	53	76	—
		○ BNFN 2506-3.5	26	21.4	1×3.5	15.1	35.9	670	53	76	—
		○ BNFN 2506-5	26	21.4	2×2.5	22.5	54.8	940	53	76	—
	8	DIK 2508-4	26	21.4	2×1	9.2	18.8	340	40	63	—
		DIK 2508-6	26	21.4	3×1	13.1	28.1	500	40	63	—
		○ BIF 2508-5	26.25	20.5	1×2.5	15.8	32.8	500	58	85	—
		○ BNFN 2508-2.5	26.25	20.5	1×2.5	15.8	32.8	500	58	85	—
		○ BNFN 2508-3	26.25	20.5	2×1.5	18.5	39.4	600	58	85	—
		○ BNFN 2508-3.5	26.25	20.5	1×3.5	21.2	46	690	58	85	—
		○ BNFN 2508-5	26.25	20.5	2×2.5	28.7	65.8	970	58	85	—
	10	DIK 2510-4	26	21.6	2×1	9	18	330	40	63	—
		○ BIF 2510A-5	26.3	21.4	1×2.5	15.8	33	500	58	85	—
		○ BNFN 2510A-2.5	26.3	21.4	1×2.5	15.8	33	500	58	85	—
	12	○ BNFN 2512-2.5	26	21.9	1×2.5	12.3	27.6	490	53	76	—
	16	○ BNFN 2516-1.5	26	21.4	1×1.5	7.9	16.7	300	53	76	—
	25	BLW 2525-3.6	26	22	2×1.8	16.6	38.7	700	57	82	47

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778. Model BLW cannot be attached with seal.



BIF



BNFN

Unit: mm

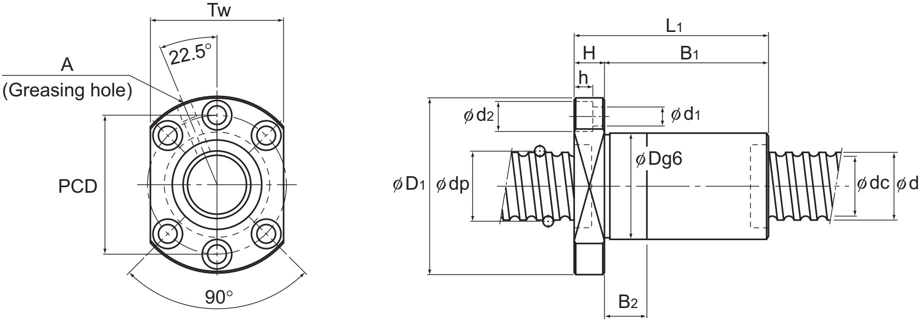
Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	B_3	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
86	11	75	—	—	64	5.5	9.5	5.5	—	—	M6	3.01×10^{-3}	1.19	3.19
110	11	99	—	—	64	5.5	9.5	5.5	—	—	M6	3.01×10^{-3}	1.47	3.19
98	11	87	—	—	64	5.5	9.5	5.5	—	—	M6	3.01×10^{-3}	1.33	3.19
122	11	111	—	—	64	5.5	9.5	5.5	—	—	M6	3.01×10^{-3}	1.61	3.19
71	12	59	15	—	51	5.5	9.5	5.5	41	—	M6	3.01×10^{-3}	0.54	3.35
94	12	82	25	—	51	5.5	9.5	5.5	41	—	M6	3.01×10^{-3}	0.68	3.35
82	15	67	—	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	1.52	3.13
106	15	91	—	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	1.89	3.13
135	15	120	—	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	2.32	3.13
122	15	107	—	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	2.12	3.13
154	15	139	—	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	2.6	3.13
85	15	70	20	—	51	5.5	9.5	5.5	41	—	M6	3.01×10^{-3}	0.65	3.45
100	18	82	—	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	1.86	3.27
120	18	102	83	—	71	6.6	11	6.5	—	—	M6	3.01×10^{-3}	2.16	3.27
108	11	97	—	—	64	5.5	9.5	5.5	—	—	M6	3.01×10^{-3}	1.44	3.52
108	11	97	—	—	64	5.5	9.5	5.5	—	—	M6	3.01×10^{-3}	1.44	3.6
124.5	12	101.5	33	44	68	6.6	—	—	60	5	M6	3.01×10^{-3}	0.94	3.52

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

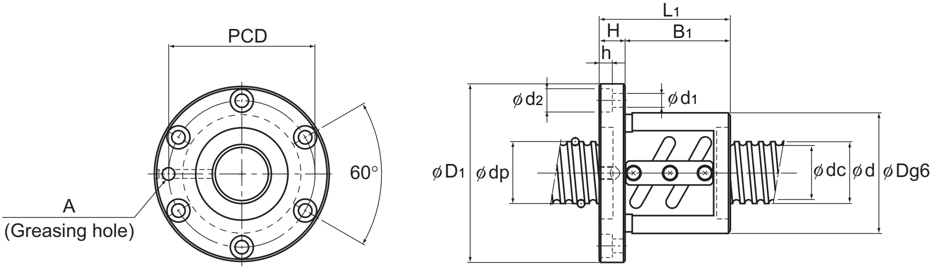
Screw shaft outer diameter	28
Lead	5 to 10



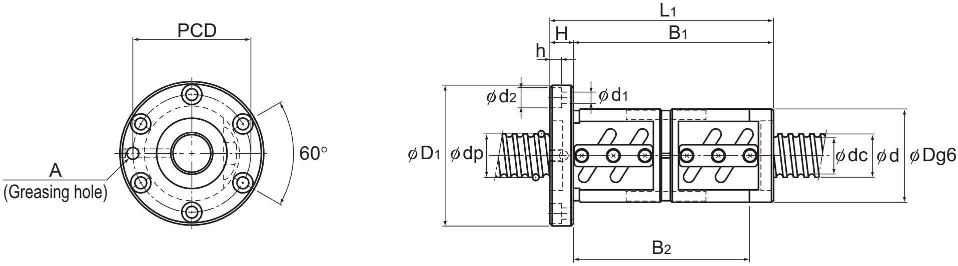
DIK (2805 to 6312)

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	 C0a kN	Rigidity K N/μm
28	5	BIF 2805-5	28.75	25.2	1×2.5	9.7	24.6	520
		BIF 2805-10	28.75	25.2	2×2.5	17.4	49.4	1000
		DIK 2805-6	28.75	25.2	3×1	10.5	26.4	560
		DIK 2805-8	28.75	25.2	4×1	13.4	35.2	730
		BNFN 2805-2.5	28.75	25.2	1×2.5	9.7	24.6	520
		BNFN 2805-3	28.75	25.2	2×1.5	11.3	29.5	620
		BNFN 2805-3.5	28.75	25.2	1×3.5	12.9	34.4	720
		BNFN 2805-5	28.75	25.2	2×2.5	17.5	49.4	1000
		BNFN 2805-7.5	28.75	25.2	3×2.5	24.8	73.8	1470
	6	BIF 2806-5	28.75	25.2	1×2.5	9.6	24.6	520
		BIF 2806-10	28.75	25.2	2×2.5	17.5	49.4	1000
		DIK 2806-6	29	24.4	3×1	14	32	530
		BNFN 2806-2.5	28.75	25.2	1×2.5	9.6	24.6	520
		BNFN 2806-3.5	28.75	25.2	1×3.5	12.9	34.5	710
		BNFN 2806-5	28.75	25.2	2×2.5	17.5	49.4	1000
		BNFN 2806-7.5	28.75	25.2	3×2.5	24.8	73.8	1470
	8	BNFN 2808-2.5	29.25	23.6	1×2.5	16.8	36.8	550
		BNFN 2808-3	29.25	23.6	2×1.5	19.6	44.2	660
		BNFN 2808-5	29.25	23.6	2×2.5	30.4	73.7	1060
	10	BIF 2810-3	29.75	22.4	1×1.5	15.7	29.4	350
		DIK 2810-4	29.25	23.6	2×1	12.3	25	380
		BNFN 2810-2.5	29.75	22.4	1×2.5	24	48.2	560

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



BIF



BNFN

Unit: mm

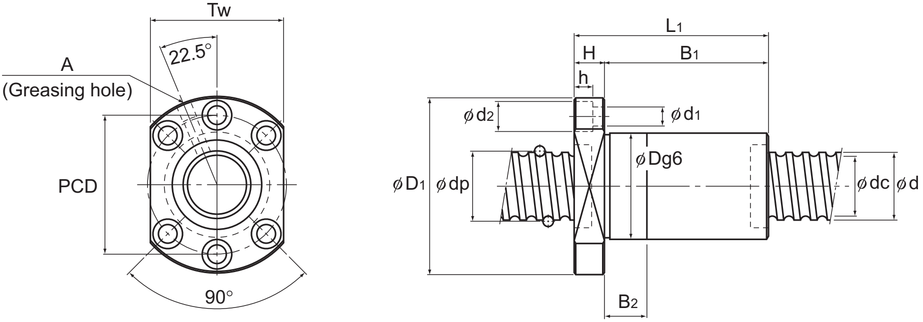
	Nut dimensions									Greasing hole	Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1 \times d_2 \times h$	Tw	A	kg•cm²/mm	kg	kg/m
	55	85	59	12	47	—	69	6.6×11×6.5	—	M6	4.74×10^{-3}	0.98	4.27
	55	85	89	12	77	—	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.34	4.27
	43	71	69	12	57	15	57	6.6×11×6.5	55	M6	4.74×10^{-3}	0.61	4.27
	43	71	79	12	67	20	57	6.6×11×6.5	55	M6	4.74×10^{-3}	0.68	4.27
	55	85	74	12	62	49	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.16	4.27
	55	85	94	12	82	69	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.4	4.27
	55	85	84	12	72	59	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.28	4.27
	55	85	104	12	92	79	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.52	4.27
	55	85	134	12	122	109	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.88	4.27
	55	85	68	12	56	—	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.09	4.36
	55	85	104	12	92	—	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.52	4.36
	43	71	73	12	61	15	57	6.6×11×6.5	55	M6	4.74×10^{-3}	0.64	4.36
	55	85	86	12	74	61	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.3	4.36
	55	85	98	12	86	73	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.45	4.36
	55	85	122	12	110	97	69	6.6×11×6.5	—	M6	4.74×10^{-3}	1.73	4.36
	55	85	158	12	146	133	69	6.6×11×6.5	—	M6	4.74×10^{-3}	2.16	4.36
	60	104	116	18	98	—	82	11×17.5×11	—	M6	4.74×10^{-3}	2.47	4.02
	60	104	144	18	126	—	82	11×17.5×11	—	M6	4.74×10^{-3}	2.9	4.02
	60	104	164	18	146	—	82	11×17.5×11	—	M6	4.74×10^{-3}	3.2	4.02
	65	106	88	18	70	—	85	11×17.5×11	—	M6	4.74×10^{-3}	2.33	3.66
	45	71	84	15	69	20	57	6.6×11×6.5	55	M6	4.74×10^{-3}	0.82	4.18
	65	106	146	18	128	—	85	11×17.5×11	—	M6	4.74×10^{-3}	3.41	3.66

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

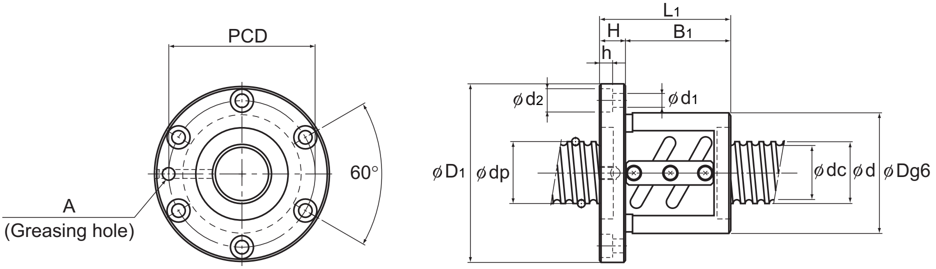
Screw shaft outer diameter	32
Lead	4 to 6



DIK (2805 to 6312)

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity
						Ca kN	C_{0a} kN	K N/μm
32	4	BIF 3204-10	32.5	30.1	2×2.5	10.5	35.4	1010
		DIK 3204-6	32.5	30.1	3×1	6.4	19.6	580
		DIK 3204-8	32.5	30.1	4×1	8.2	26.1	760
		DIK 3204-10	32.5	30.1	5×1	10	32.7	940
	5	DIK 3205-6	32.75	29.2	3×1	11.1	30.2	620
		DIK 3205-8	32.75	29.2	4×1	14.2	40.3	810
		○ BIF 3205-5	32.75	29.2	1×2.5	10.2	28.1	570
		○ BIF 3205-10	32.75	29.2	2×2.5	18.5	56.4	1110
		○ BNFN 3205-2.5	32.75	29.2	1×2.5	10.2	28.1	570
		○ BNFN 3205-3	32.75	29.2	2×1.5	12	33.8	690
		○ BNFN 3205-4.5	32.75	29.2	3×1.5	17	50.7	1000
		○ BNFN 3205-5	32.75	29.2	2×2.5	18.5	56.4	1110
		○ BNFN 3205-7.5	32.75	29.2	3×2.5	26.3	84.5	1640
	6	DIK 3206-6	33	28.4	3×1	14.9	37.1	630
		DIK 3206-8	33	28.4	4×1	19.1	49.5	820
		○ BIF 3206-5	33	28.4	1×2.5	13.9	35.2	600
		○ BIF 3206-7	33	28.4	1×3.5	18.5	49.2	810
		○ BIF 3206-10	33	28.4	2×2.5	25.2	70.4	1150
		○ BNFN 3206-2.5	33	28.4	1×2.5	13.9	35.2	600
		○ BNFN 3206-3	33	28.4	2×1.5	16.3	42.2	710
		○ BNFN 3206-5	33	28.4	2×2.5	25.2	70.4	1150

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



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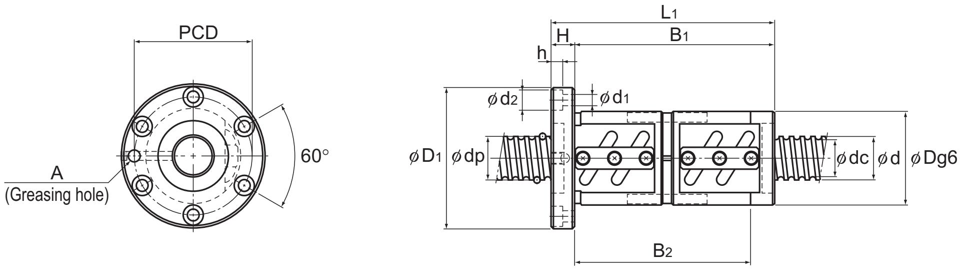


BNFN

Unit: mm

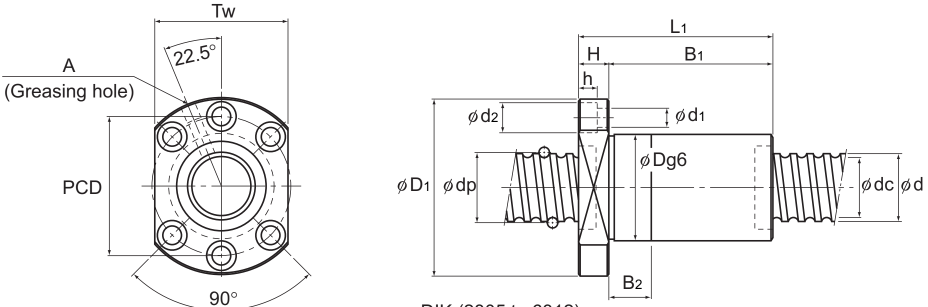
	Nut dimensions									Greasing hole	Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1\times d_2\times h$	Tw	A	kg•cm^2/mm	kg	kg/m
	54	81	76	11	65	—	67	6.6×11×6.5	—	M6	8.08×10^{-3}	0.97	5.86
	45	76	64	11	53	15	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.57	5.86
	45	76	72	11	61	15	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.62	5.86
	45	76	80	11	69	20	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.66	5.86
	46	76	62	12	50	10	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.60	5.67
	46	76	73	12	61	15	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.67	5.67
	58	85	56	12	44	—	71	6.6×11×6.5	—	M6	8.08×10^{-3}	0.94	5.67
	58	85	86	12	74	—	71	6.6×11×6.5	—	M6	8.08×10^{-3}	1.31	5.67
	58	85	76	12	64	51	71	6.6×11×6.5	—	M6	8.08×10^{-3}	1.19	5.67
	58	85	103	12	91	78	71	6.6×11×6.5	—	M6	8.08×10^{-3}	1.52	5.67
	58	85	123	12	111	98	71	6.6×11×6.5	—	M6	8.08×10^{-3}	1.77	5.67
	58	85	106	12	94	81	71	6.6×11×6.5	—	M6	8.08×10^{-3}	1.56	5.67
	58	85	136	12	124	111	71	6.6×11×6.5	—	M6	8.08×10^{-3}	1.93	5.67
	48	76	73	12	61	15	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.74	6.31
	48	76	87	12	75	20	63	6.6×11×6.5	59	M6	8.08×10^{-3}	0.85	6.31
	62	89	63	12	51	—	75	6.6×11×6.5	—	M6	8.08×10^{-3}	1.21	6.31
	62	89	75	12	63	—	75	6.6×11×6.5	—	M6	8.08×10^{-3}	1.39	6.31
	62	89	99	12	87	—	75	6.6×11×6.5	—	M6	8.08×10^{-3}	1.75	6.31
	62	89	87	12	75	62	75	6.6×11×6.5	—	M6	8.08×10^{-3}	1.57	6.31
	62	89	111	12	99	86	75	6.6×11×6.5	—	M6	8.08×10^{-3}	1.93	6.31
	62	89	123	12	111	98	75	6.6×11×6.5	—	M6	8.08×10^{-3}	2.11	6.31

For model number coding, see B-718.

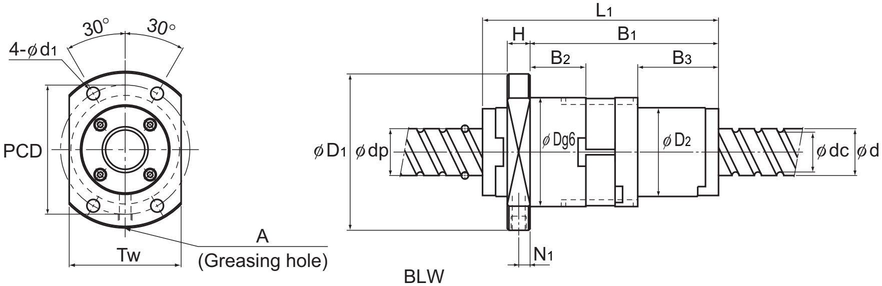
Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

Screw shaft outer diameter	32
Lead	8 to 32



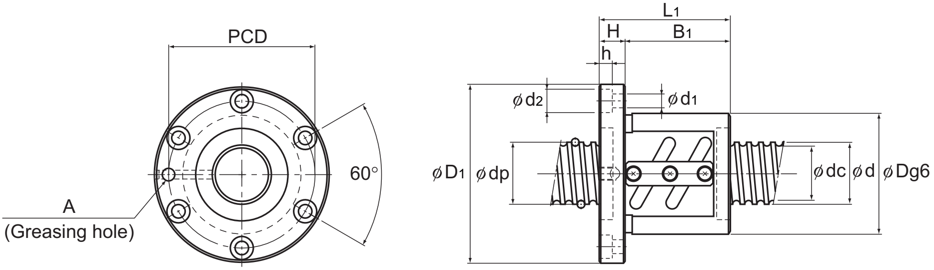
DIK (2805 to 6312)



BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity			
						Ca	C_0a	K	Outer diameter	Flange diameter	
d	Ph		dp	dc	Rows x turns	kN	kN	N/µm	D	D_1	D_2
32	8	○ BIF 3208A-5	33.25	27.5	1×2.5	17.8	42.2	610	66	100	—
		○ BIF 3208A-7	33.25	27.5	1×3.5	23.8	59.1	840	66	100	—
		○ BNFN 3208A-2.5	33.25	27.5	1×2.5	17.8	42.2	610	66	100	—
		○ BNFN 3208A-3	33.25	27.5	2×1.5	20.9	50.7	730	66	100	—
		○ BNFN 3208A-4.5	33.25	27.5	3×1.5	29.5	76	1070	66	100	—
		○ BNFN 3208A-5	33.25	27.5	2×2.5	32.3	84.4	1180	66	100	—
	10	DIK 3210-6	33.75	26.4	3×1	25.7	52.2	600	54	87	—
		○ BIF 3210A-5	33.75	26.4	1×2.5	26.1	56.2	640	74	108	—
		○ BNFN 3210A-2.5	33.75	26.4	1×2.5	26.1	56.2	640	74	108	—
		○ BNFN 3210A-3	33.75	26.4	2×1.5	30.5	67.4	750	74	108	—
		○ BNFN 3210A-3.5	33.75	26.4	1×3.5	34.8	78.6	870	74	108	—
		○ BNFN 3210A-5	33.75	26.4	2×2.5	47.2	112.7	1230	74	108	—
	12	DIK 3212-4	33.75	26.4	2×1	18.8	37	430	54	87	—
		○ BNFN 3212-3.5	34	26.1	1×3.5	40.4	88.5	890	76	121	—
	32	BLW 3232-3.6	33.25	28.3	2×1.8	23.7	59.5	880	68	99	58

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.
Model BLW cannot be attached with seal.



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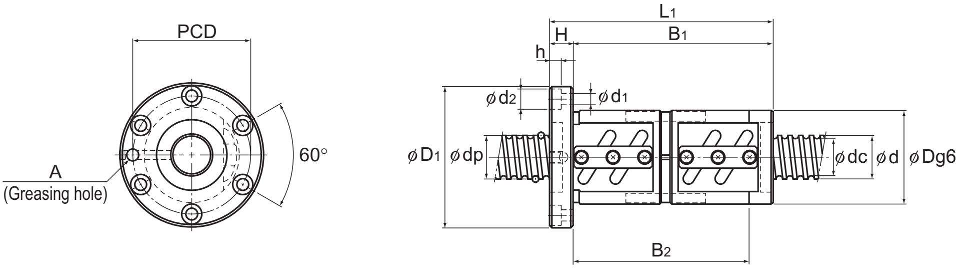


BNFN

Unit: mm

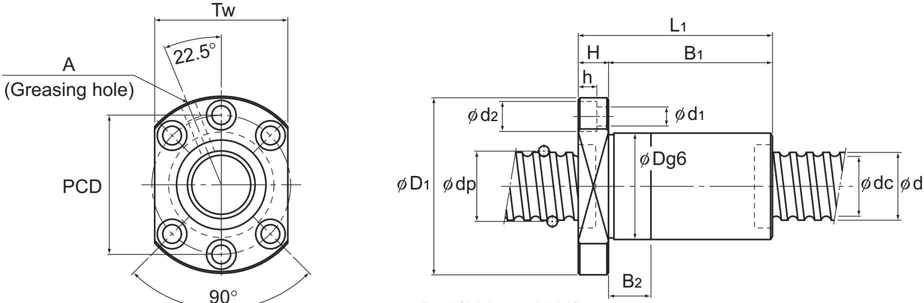
	Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L1	H	B1	B2	B3	PCD	d1	d2	h	Tw	N1	Greasing hole A	kg•cm²/mm	kg	kg/m
	82	15	67	—	—	82	9	14	8.5	—	—	M6	8.08×10^{-3}	1.93	5.39
	98	15	83	—	—	82	9	14	8.5	—	—	M6	8.08×10^{-3}	2.21	5.39
	106	15	91	—	—	82	9	14	8.5	—	—	M6	8.08×10^{-3}	2.36	5.39
	135	15	120	—	—	82	9	14	8.5	—	—	M6	8.08×10^{-3}	2.88	5.39
	167	15	152	—	—	82	9	14	8.5	—	—	M6	8.08×10^{-3}	3.45	5.39
	154	15	139	—	—	82	9	14	8.5	—	—	M6	8.08×10^{-3}	3.21	5.39
	110	15	95	25	—	69	9	14	8.5	66	—	M6	8.08×10^{-3}	1.57	4.98
	100	15	85	—	—	90	9	14	8.5	—	—	M6	8.08×10^{-3}	2.92	4.98
	130	15	115	99	—	90	9	14	8.5	—	—	M6	8.08×10^{-3}	3.64	4.98
	167	15	152	136	—	90	9	14	8.5	—	—	M6	8.08×10^{-3}	4.53	4.98
	150	15	135	119	—	90	9	14	8.5	—	—	M6	8.08×10^{-3}	4.12	4.98
	190	15	175	159	—	90	9	14	8.5	—	—	M6	8.08×10^{-3}	5.08	4.98
	98	15	83	25	—	69	9	14	8.5	66	—	M6	8.08×10^{-3}	1.43	5.2
	170	18	152	—	—	98	11	17.5	11	—	—	M6	8.08×10^{-3}	5.26	4.9
	155	15	127	42.4	55.4	81	9	—	—	70	6	M6	8.08×10^{-3}	3.19	5.83

For model number coding, see B-718.

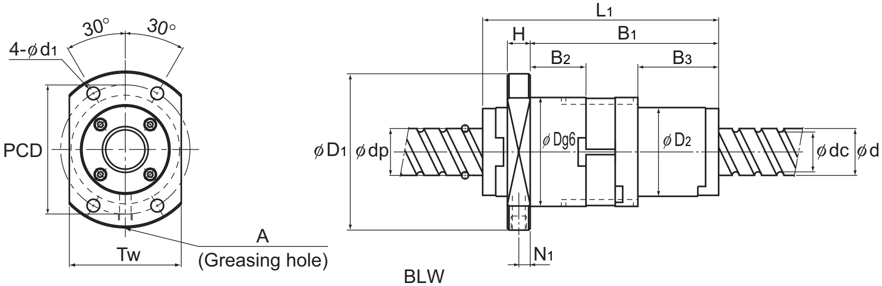
Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

Screw shaft outer diameter	36
Lead	6 to 36



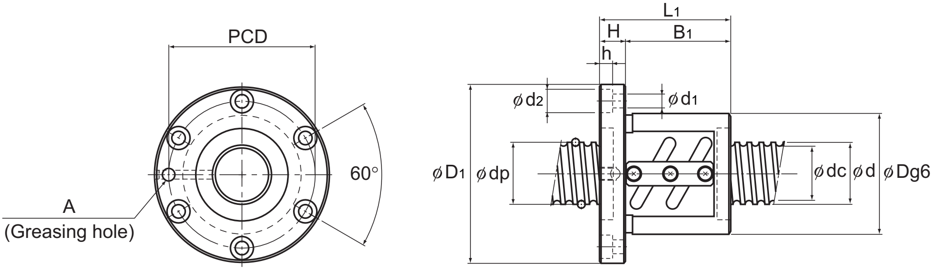
DIK (2805 to 6312)



BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity			
d	Ph		dp	dc	Rows x turns	Ca kN	C_{0a} kN	K N/μm	Outer diameter D	Flange diameter D_1	D_2
36	6	○ BNFN 3606-2.5	36.75	33.2	1×2.5	10.7	31.8	630	65	100	—
		○ BNFN 3606-3	36.75	33.2	2×1.5	12.5	38	740	65	100	—
		○ BNFN 3606-5	36.75	33.2	2×2.5	19.4	63.4	1220	65	100	—
		○ BNFN 3606-7.5	36.75	33.2	3×2.5	27.5	95.2	1790	65	100	—
	8	○ BNFN 3608-2.5	37.25	31.6	1×2.5	18.8	47.5	670	70	114	—
		○ BNFN 3608-5	37.25	31.6	2×2.5	34.1	95.1	1290	70	114	—
		○ BNFN 3608-7.5	37.25	31.6	3×2.5	48.3	142.1	1910	70	114	—
	10	DIK 3610-6	37.75	30.5	3×1	28.8	63.8	710	58	98	—
		DIK 3610-8	37.75	30.5	4×1	36.8	85	940	58	98	—
		DIK 3610-10	37.75	30.5	5×1	44.6	106.3	1160	58	98	—
		○ BIF 3610-5	37.75	30.5	1×2.5	27.6	63.3	700	75	120	—
		○ BIF 3610-10	37.75	30.5	2×2.5	50.1	126.4	1350	75	120	—
		○ BNFN 3610-2.5	37.75	30.5	1×2.5	27.6	63.3	700	75	120	—
		○ BNFN 3610-5	37.75	30.5	2×2.5	50.1	126.4	1350	75	120	—
		○ BNFN 3610-7.5	37.75	30.5	3×2.5	71.1	190.1	1990	75	120	—
	12	○ BNFN 3612-2.5	38	30.1	1×2.5	32.1	71.4	720	78	123	—
		○ BNFN 3612-5	38	30.1	2×2.5	58.4	142.1	1370	78	123	—
	16	○ BNFN 3616-2.5	38	30.1	1×2.5	32.1	71.4	720	78	123	—
		○ BNFN 3616-5	38	30.1	2×2.5	58.3	143.1	1380	78	123	—
	20	○ BNFN 3620-1.5	37.75	30.5	1×1.5	17.6	38.3	430	70	103	—
	36	BLW 3636-3.6	37.4	31.7	2×1.8	30.8	78	980	79	116	66

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778. Model BLW cannot be attached with seal.



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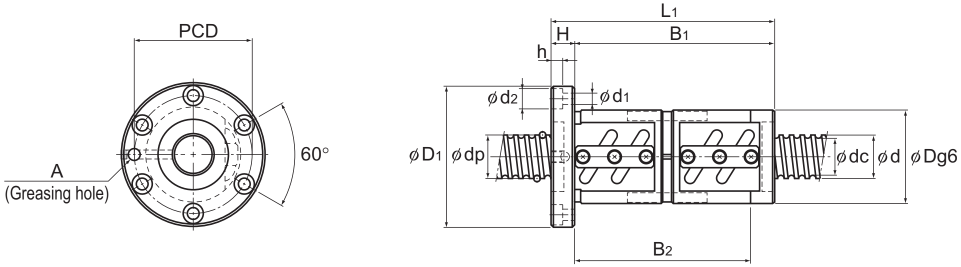


BNFN

Unit: mm

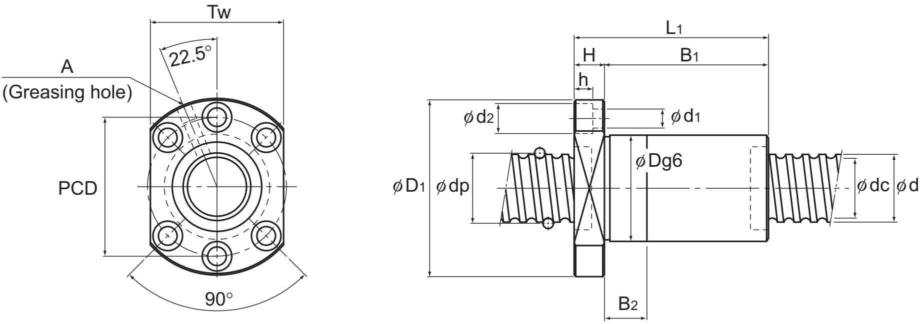
	Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L_1	H	B_1	B_2	B_3	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
	89	15	74	58	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	1.85	7.39
	110	15	95	79	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	2.18	7.39
	125	15	110	94	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	2.41	7.39
	161	15	146	130	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	2.96	7.39
	116	18	98	—	—	92	11	17.5	11	—	—	M6	1.29×10^{-2}	3.03	6.96
	164	18	146	—	—	92	11	17.5	11	—	—	M6	1.29×10^{-2}	3.95	6.96
	212	18	194	—	—	92	11	17.5	11	—	—	M6	1.29×10^{-2}	4.87	6.96
	122	18	104	30	—	77	11	17.5	11	75	—	M6	1.29×10^{-2}	2.03	6.51
	143	18	125	35	—	77	11	17.5	11	75	—	M6	1.29×10^{-2}	2.3	6.51
	164	18	146	45	—	77	11	17.5	11	75	—	M6	1.29×10^{-2}	2.57	6.51
	111	18	93	—	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	3.45	6.51
	171	18	153	—	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	4.84	6.51
	141	18	123	104	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	4.15	6.51
	201	18	183	164	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	5.54	6.51
	261	18	243	224	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	6.93	6.51
	147	18	129	—	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	4.69	6.41
	219	18	201	—	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	6.54	6.41
	172	18	154	—	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	5.33	6.8
	268	18	250	—	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	7.8	6.8
	135	15	120	—	—	85	9	14	8.5	—	—	M6	1.29×10^{-2}	3.06	7.24
	181	17	147.9	49.4	65.4	95	11	—	—	82	7	M6	1.29×10^{-2}	5.99	7.34

For model number coding, see B-718.

Description of Each Option⇒A-815 **Dimensions⇒B-777**

Preload Type of Precision Ball Screw

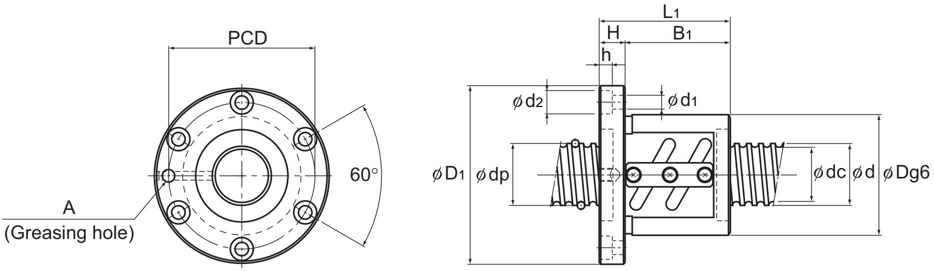
Screw shaft outer diameter	40
Lead	5 to 10



DIK (2805 to 6312)

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity
						Ca kN	C0a kN	K N/μm
40	5	BNFN 4005-3	40.75	37.2	2×1.5	13	42.3	810
		BNFN 4005-4.5	40.75	37.2	3×1.5	18.5	63.5	1200
		BNFN 4005-5	40.75	37.2	2×2.5	20.3	70.6	1320
		BNFN 4005-6	40.75	37.2	4×1.5	23.7	84.7	1580
	6	BNFN 4006-2.5	41	36.4	1×2.5	15.3	44.1	710
		BNFN 4006-5	41	36.4	2×2.5	27.7	88.1	1360
		BNFN 4006-7.5	41	36.4	3×2.5	39.2	132.3	2010
	8	BNFN 4008-2.5	41.25	35.5	1×2.5	19.6	52.8	730
		BNFN 4008-3	41.25	35.5	2×1.5	22.9	63.4	860
		BNFN 4008-5	41.25	35.5	2×2.5	35.7	105.8	1410
	10	BIF 4010-5	41.75	34.4	1×2.5	29	70.4	750
		BIF 4010-10	41.75	34.4	2×2.5	52.7	141.1	1470
		DIK 4010-6	41.75	34.7	3×1	29.8	69.3	750
		DIK 4010-8	41.75	34.7	4×1	38.1	92.4	1000
		BNFN 4010-2.5	41.75	34.4	1×2.5	29	70.4	750
		BNFN 4010-3	41.75	34.4	2×1.5	33.8	84.5	900
		BNFN 4010-3.5	41.75	34.4	1×3.5	38.8	99	1050
		BNFN 4010-5	41.75	34.4	2×2.5	52.7	141.1	1470

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
These models can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



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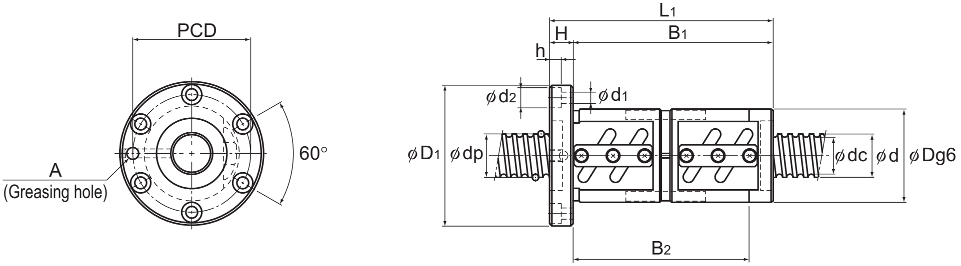


BNFN

Unit: mm

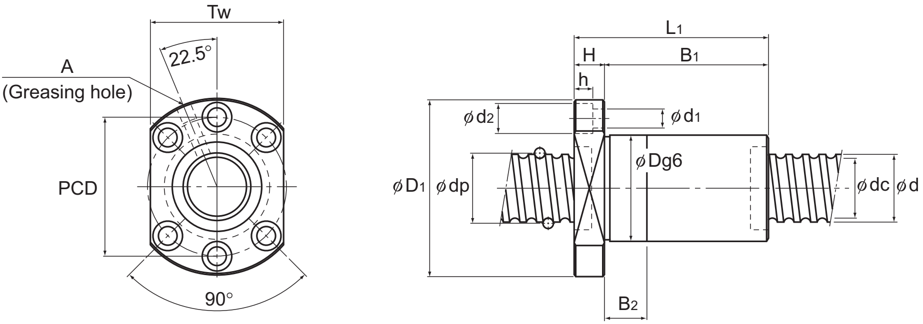
	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter	Flange diameter	Overall length							Greasing hole			
	D	D_1	L_1	H	B_1	B_2	PCD	$d_1\times d_2\times h$	Tw	A	kg•cm²/mm	kg	kg/m
	67	101	106	15	91	—	83	9×14×8.5	—	M6	1.97×10^{-2}	2.07	9.06
	67	101	126	15	111	—	83	9×14×8.5	—	M6	1.97×10^{-2}	2.37	9.06
	67	101	109	15	94	—	83	9×14×8.5	—	M6	1.97×10^{-2}	2.11	9.06
	67	101	156	15	141	—	83	9×14×8.5	—	M6	1.97×10^{-2}	2.82	9.06
	70	104	90	15	75	—	86	9×14×8.5	—	M6	1.97×10^{-2}	2.05	8.82
	70	104	126	15	111	—	86	9×14×8.5	—	M6	1.97×10^{-2}	2.67	8.82
	70	104	162	15	147	—	86	9×14×8.5	—	M6	1.97×10^{-2}	3.29	8.82
	74	108	106	15	91	—	90	9×14×8.5	—	M6	1.97×10^{-2}	2.69	8.72
	74	108	135	15	120	—	90	9×14×8.5	—	M6	1.97×10^{-2}	3.28	8.72
	74	108	154	15	139	—	90	9×14×8.5	—	M6	1.97×10^{-2}	3.67	8.72
	82	124	103	18	85	—	102	11×17.5×11	—	M6	1.97×10^{-2}	3.69	8.22
	82	124	163	18	145	—	102	11×17.5×11	—	M6	1.97×10^{-2}	5.33	8.22
	62	104	113	18	95	25	82	11×17.5×11	79	PT 1/8	1.97×10^{-2}	2.09	8.22
	62	104	137	18	119	35	82	11×17.5×11	79	PT 1/8	1.97×10^{-2}	2.42	8.22
	82	124	133	18	115	96	102	11×17.5×11	—	M6	1.97×10^{-2}	4.51	8.22
	82	124	170	18	152	133	102	11×17.5×11	—	M6	1.97×10^{-2}	5.52	8.22
	82	124	153	18	135	116	102	11×17.5×11	—	M6	1.97×10^{-2}	5.06	8.22
	82	124	193	18	175	156	102	11×17.5×11	—	M6	1.97×10^{-2}	6.16	8.22

For model number coding, see B-718.

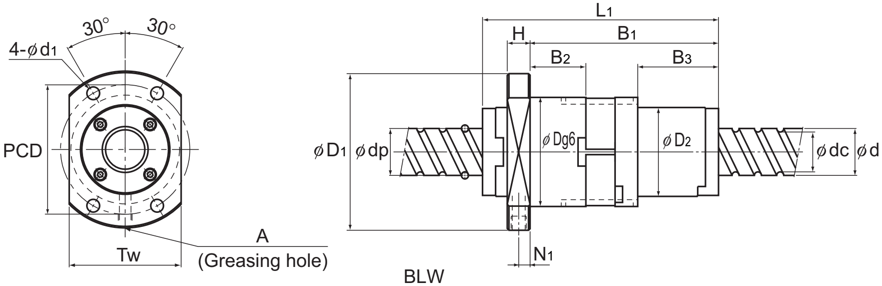
Description of Each Option⇒A-815 **Dimensions⇒B-777**

Preload Type of Precision Ball Screw

Screw shaft outer diameter	40
Lead	12 to 40



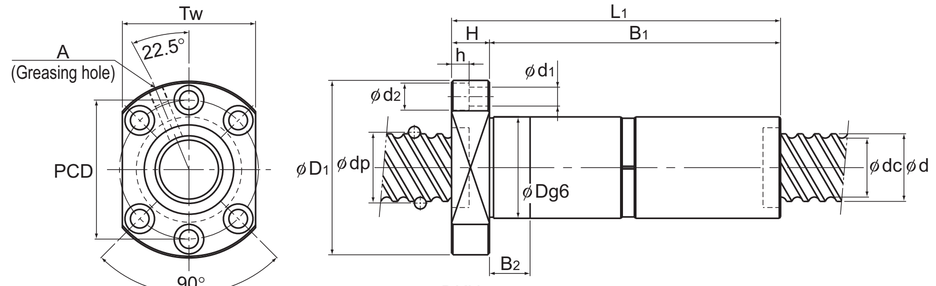
DIK (2805 to 6312)



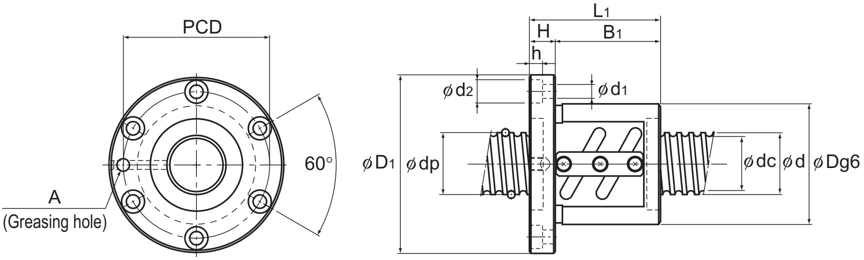
BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity			
						Ca	C_0a	K	Outer diameter	Flange diameter	
d	Ph		dp	dc	Rows x turns	kN	kN	N/µm	D	D_1	D_2
40	12	BIF 4012-5	42	34.1	1×2.5	33.9	79.2	770	84	126	—
		BIF 4012-10	42	34.1	2×2.5	61.6	158.8	1490	84	126	—
		DIK 4012-6	41.75	34.4	3×1	30.6	72.3	790	62	104	—
		DIK 4012-8	41.75	34.4	4×1	39.2	96.4	1030	62	104	—
		BNFN 4012-2.5	42	34.1	1×2.5	33.9	79.2	770	84	126	—
		BNFN 4012-3.5	42	34.1	1×3.5	45.4	110.7	1070	84	126	—
		BNFN 4012-5	42	34.1	2×2.5	61.6	158.8	1490	84	126	—
	16	DIK 4016-4	41.75	34.4	2×1	21.5	68.4	540	62	104	—
		BNFN 4016-5	42	34.1	2×2.5	61.4	158.8	1500	84	126	—
	20	DKN 4020-3	41.75	34.7	3×1	29.4	69.3	750	62	104	—
	40	BLW 4040-3.6	41.75	35.2	2×1.8	38.7	99.2	1090	84	121	73

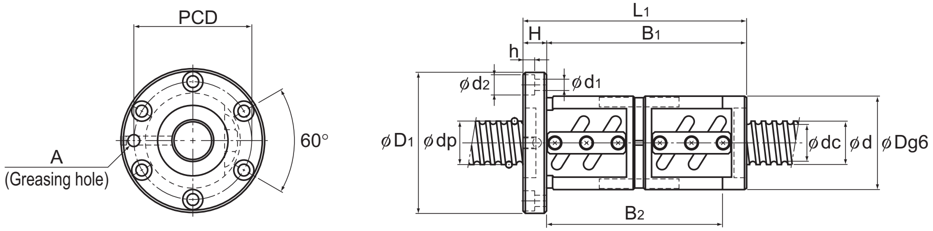
Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
These models can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.
Model BLW cannot be attached with seal.



DKN



BIF



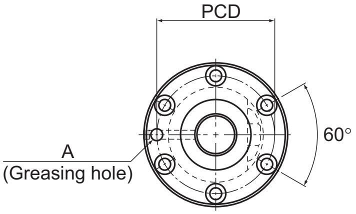
BNFN

Unit: mm

	Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L_1	H	B_1	B_2	B_3	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
	119	18	101	—	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	4.36	8.12
	191	18	173	—	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	6.47	8.12
	138	18	120	35	—	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	2.44	8.5
	163	18	145	45	—	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	2.78	8.5
	155	18	137	118	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	5.42	8.12
	179	18	161	142	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	6.12	8.12
	227	18	209	190	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	7.52	8.12
	120	18	102	30	—	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	2.19	8.83
	280	22	258	—	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	9.27	8.55
	223	18	205	25	—	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	3.61	9.03
	191	17	158	54.5	70.5	100	11	—	—	87	7	M6	1.97×10^{-2}	6.16	9.01

For model number coding, see B-718.

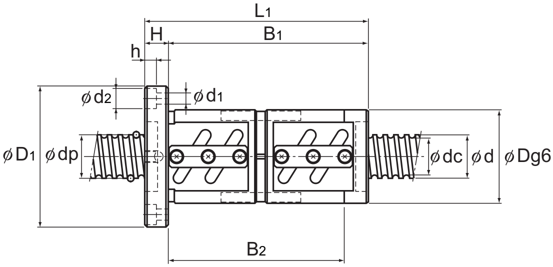
Preload Type of Precision Ball Screw



BNFN

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K
						Ca kN	C_0a kN	N/µm
45	6	BNFN 4506A-2.5	46	41.4	1×2.5	16	49.6	770
		BNFN 4506A-5	46	41.4	2×2.5	29	99	1500
		BNFN 4506A-7.5	46	41.4	3×2.5	41.2	150	2210
	8	BNFN 4508-2.5	46.25	40.6	1×2.5	20.7	59.5	790
		BNFN 4508-5	46.25	40.6	2×2.5	37.4	118.6	1540
		BNFN 4508-7.5	46.25	40.6	3×2.5	53.1	178.4	2270
	10	BNFN 4510-2.5	46.75	39.5	1×2.5	30.7	79.3	830
		BNFN 4510-3	46.75	39.5	2×1.5	35.9	95.2	990
		BNFN 4510-5	46.75	39.5	2×2.5	55.6	158.8	1610
		BNFN 4510-7.5	46.75	39.5	3×2.5	78.8	238.1	2370
	12	BNFN 4512-5	47	39.2	2×2.5	65.2	178.4	1640
	20	BNFN 4520-1.5	47.7	37.9	1×1.5	44.2	99	690

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



BNFN

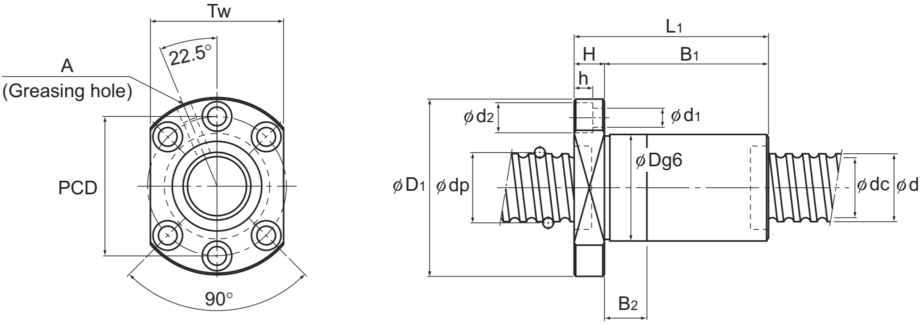
Unit: mm

	Nut dimensions									Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1\times d_2\times h$	Greasing hole A	kg·cm²/mm	kg	kg/m
	80	114	89	15	74	—	96	9×14×8.5	PT 1/8	3.16×10^{-2}	2.59	11.31
	80	114	125	15	110	—	96	9×14×8.5	PT 1/8	3.16×10^{-2}	3.42	11.31
	80	114	161	15	146	—	96	9×14×8.5	PT 1/8	3.16×10^{-2}	4.25	11.31
	85	127	116	18	98	—	105	11×17.5×11	PT 1/8	3.16×10^{-2}	4.09	11.21
	85	127	164	18	146	—	105	11×17.5×11	PT 1/8	3.16×10^{-2}	5.41	11.21
	85	127	212	18	194	—	105	11×17.5×11	PT 1/8	3.16×10^{-2}	6.74	11.21
	88	132	141	18	123	104	110	11×17.5×11	PT 1/8	3.16×10^{-2}	5.26	10.65
	88	132	164	18	146	127	110	11×17.5×11	PT 1/8	3.16×10^{-2}	5.96	10.65
	88	132	201	18	183	164	110	11×17.5×11	PT 1/8	3.16×10^{-2}	7.09	10.65
	88	132	261	18	243	224	110	11×17.5×11	PT 1/8	3.16×10^{-2}	8.92	10.65
	90	130	227	18	209	—	110	11×17.5×11	PT 1/8	3.16×10^{-2}	8.24	10.54
	98	142	175	20	155	—	120	11×17.5×11	PT 1/8	3.16×10^{-2}	8.31	10.37

For model number coding, see B-718.

Preload Type of Precision Ball Screw

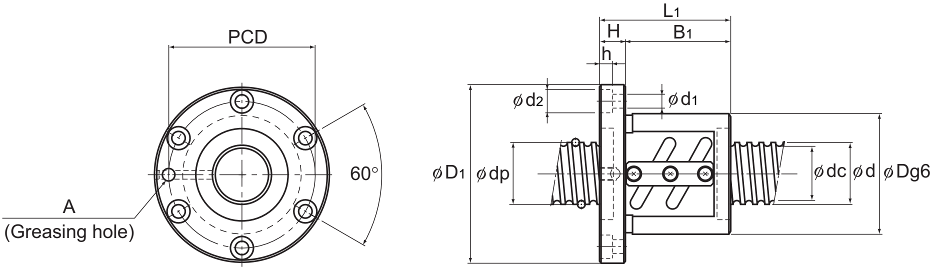
Screw shaft outer diameter	50
Lead	5 to 10



DIK (2805 to 6312)

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity
						Ca kN	C0a kN	K N/μm
50	5	○ BNFN 5005-3	50.75	47.2	2×1.5	14.2	53	970
		○ BNFN 5005-4.5	50.75	47.2	3×1.5	20.2	79.5	1420
	8	○ BNFN 5008-2.5	51.25	45.5	1×2.5	21.6	66.2	860
		○ BNFN 5008-5	51.25	45.5	2×2.5	39.1	132.3	1680
		○ BNFN 5008-7.5	51.25	45.5	3×2.5	55.4	198.9	2470
	10	DIK 5010-6	51.75	44.4	3×1	33.9	90.7	940
		DIK 5010-8	51.75	44.4	4×1	43.4	120.5	1230
		DIK 5010-10	51.75	44.4	5×1	52.5	150.9	1530
		○ BIF 5010-5	51.75	44.4	1×2.5	32	88.2	900
		○ BIF 5010-10	51.75	44.4	2×2.5	58.2	176.4	1750
		○ BNFN 5010-2.5	51.75	44.4	1×2.5	32	88.2	900
		○ BNFN 5010-3	51.75	44.4	2×1.5	37.5	105.8	1080
		○ BNFN 5010-3.5	51.75	44.4	1×3.5	42.8	123.5	1240
		○ BNFN 5010-5	51.75	44.4	2×2.5	58.2	176.4	1750
		○ BNFN 5010-7.5	51.75	44.4	3×2.5	82.5	264.6	2580

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



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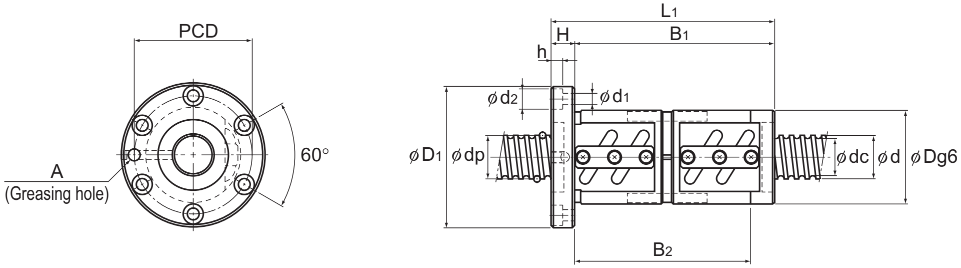


BNFN

Unit: mm

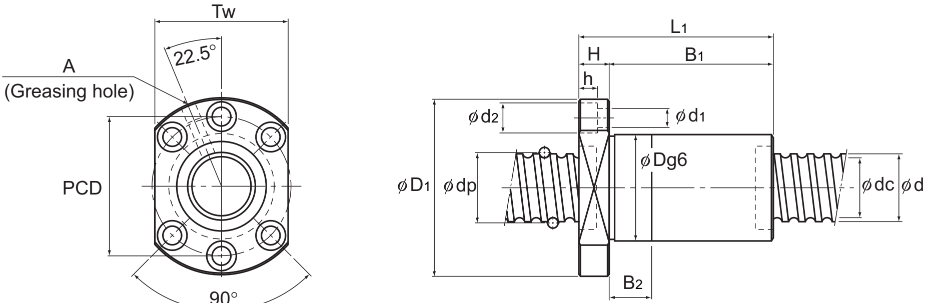
	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1 \times d_2 \times h$	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
	80	114	108	15	93	—	96	9×14×8.5	—	PT 1/8	4.82×10^{-2}	2.71	14.42
	80	114	128	15	113	—	96	9×14×8.5	—	PT 1/8	4.82×10^{-2}	3.12	14.42
	87	129	109	18	91	—	107	11×17.5×11	—	PT 1/8	4.82×10^{-2}	3.8	14.0
	87	129	157	18	139	—	107	11×17.5×11	—	PT 1/8	4.82×10^{-2}	5.08	14.0
	87	129	205	18	187	—	107	11×17.5×11	—	PT 1/8	4.82×10^{-2}	6.35	14.0
	72	123	114	18	96	30	101	11×17.5×11	92	PT 1/8	4.82×10^{-2}	2.65	13.38
	72	123	137	18	119	35	101	11×17.5×11	92	PT 1/8	4.82×10^{-2}	3.03	13.38
	72	123	160	18	142	45	101	11×17.5×11	92	PT 1/8	4.82×10^{-2}	3.41	13.38
	93	135	103	18	85	—	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	4.31	13.38
	93	135	163	18	145	—	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	6.26	13.38
	93	135	133	18	115	96	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	5.28	13.38
	93	135	170	18	152	133	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	6.49	13.38
	93	135	153	18	135	116	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	5.94	13.38
	93	135	193	18	175	156	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	7.24	13.38
	93	135	253	18	235	216	113	11×17.5×11	—	PT 1/8	4.82×10^{-2}	9.19	13.38

For model number coding, see B-718.

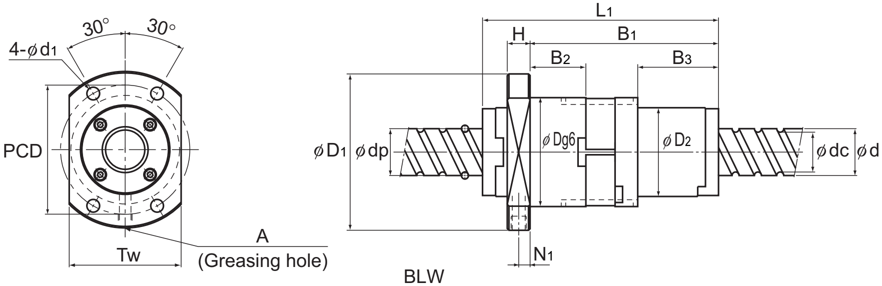
Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

Screw shaft outer diameter	50
Lead	12 to 50



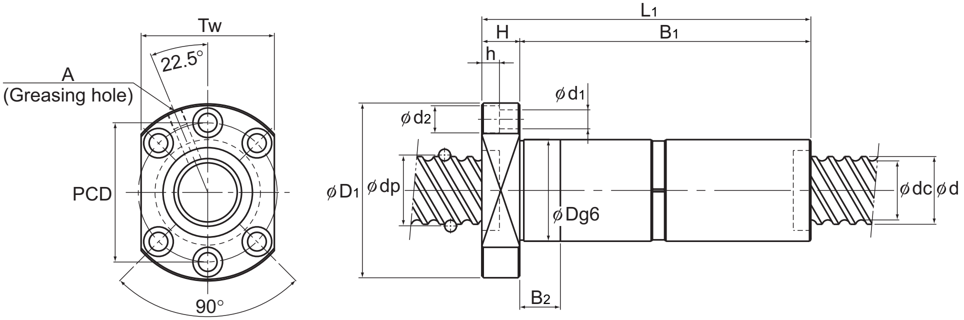
DIK (2805 to 6312)



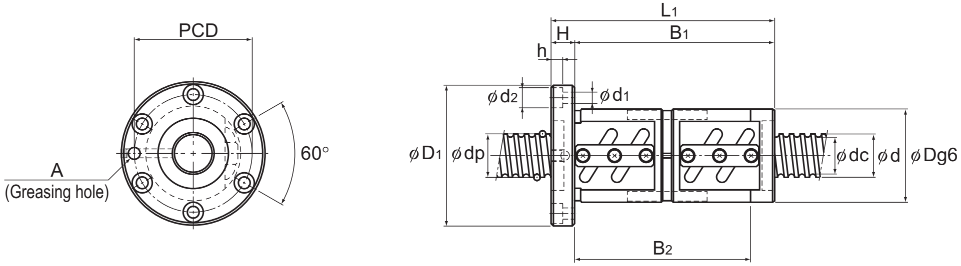
BLW

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity			
d	Ph		dp	dc	Rows x turns	C_a kN	C_{0a} kN	K N/μm	Outer diameter D	Flange diameter D1	D2
50	12	DIK 5012-6	52.25	43.3	3×1	45.8	113	970	75	129	—
		DIK 5012-8	52.25	43.3	4×1	58.6	150.6	1270	75	129	—
		○ BNFN 5012-2.5	52.25	43.3	1×2.5	43.4	109.8	930	100	146	—
		○ BNFN 5012-3.5	52.25	43.3	1×3.5	58	153.9	1280	100	146	—
		○ BNFN 5012-5	52.25	43.3	2×2.5	78.8	220.5	1810	100	146	—
	16	DIK 5016-4	52.25	43.3	2×1	32.3	75.5	660	75	129	—
		DIK 5016-6	52.25	43.3	3×1	45.7	113.3	970	75	129	—
		○ BNFN 5016-2.5	52.7	42.9	1×2.5	72.6	183.3	1230	105	152	—
		○ BNFN 5016-5	52.7	42.9	2×2.5	132.3	366.5	2360	105	152	—
	20	DKN 5020-3	52.25	43.6	3×1	44.2	108.8	930	75	129	—
		○ BNFN 5020-2.5	52.7	42.9	1×2.5	72.5	183.3	1230	105	152	—
	50	BLW 5050-3.6	52.2	44.1	2×1.8	57.8	155	1340	106	149	90

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.
Model BLW cannot be attached with seal.



DKN



BNFN

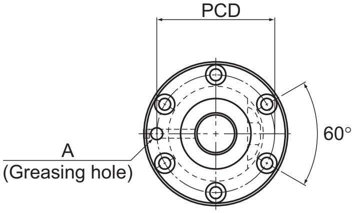
Unit: mm

	Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L1	H	B1	B2	B3	PCD	d1	d2	h	Tw	N1	Greasing hole A	kg•cm²/mm	kg	kg/m
	145	22	123	35	—	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	3.83	12.74
	170	22	148	45	—	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	4.31	12.74
	159	22	137	114	—	122	14	20	13	—	—	PT 1/8	4.82×10^{-2}	7.75	12.74
	183	22	161	138	—	122	14	20	13	—	—	PT 1/8	4.82×10^{-2}	8.71	12.74
	231	22	209	186	—	122	14	20	13	—	—	PT 1/8	4.82×10^{-2}	10.63	12.74
	129	22	107	30	—	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	3.52	13.41
	175	22	153	45	—	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	4.41	13.41
	196	25	171	—	—	128	14	20	13	—	—	PT 1/8	4.82×10^{-2}	10.64	12.5
	292	25	267	—	—	128	14	20	13	—	—	PT 1/8	4.82×10^{-2}	15.03	12.5
	243	28	215	30	—	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	6.0	13.8
	241	28	213	—	—	128	14	20	13	—	—	PT 1/8	4.82×10^{-2}	12.9	13.1
	245	20	203.8	70.7	91.7	126	14	—	—	108	8	M6	4.82×10^{-2}	9.06	14.08

For model number coding, see B-718.

Preload Type of Precision Ball Screw

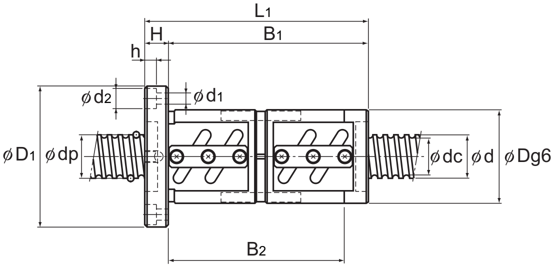
Screw shaft outer diameter	55
Lead	10 to 20



BNFN

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity
						Ca	C_0a	K
d	Ph		dp	dc	Rows x turns	kN	kN	N/µm
55	10	BNFN 5510-2.5	56.75	49.5	1×2.5	33.4	97	970
		BNFN 5510-5	56.75	49.5	2×2.5	60.7	194	1890
		BNFN 5510-7.5	56.75	49.5	3×2.5	85.9	291.1	2770
	12	BNFN 5512-2.5	57	49.2	1×2.5	39.3	108.8	990
		BNFN 5512-3	57	49.2	2×1.5	46	131.3	1180
		BNFN 5512-3.5	57	49.2	1×3.5	52.4	152.9	1360
		BNFN 5512-5	57	49.2	2×2.5	71.3	218.5	1920
		BNFN 5512-7.5	57	49.2	3×2.5	100.9	327.3	2830
	16	BNFN 5516-2.5	57.7	47.9	1×2.5	76.1	201.9	1310
		BNFN 5516-5	57.7	47.9	2×2.5	138.2	402.8	2550
	20	BNFN 5520-2.5	57.7	47.9	1×2.5	76	201.9	1320
		BNFN 5520-5	57.7	47.9	2×2.5	138.2	403.8	2550

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



BNFN

Unit: mm

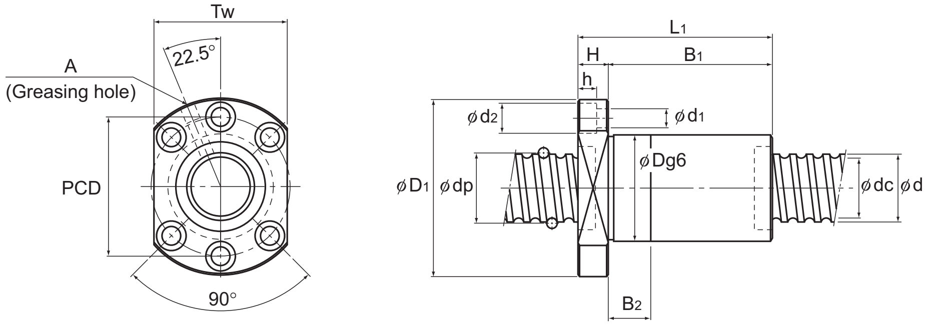
	Nut dimensions								Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	PCD	$d_1 \times d_2 \times h$	Greasing hole A	kg•cm^2/mm	kg	kg/m
	102	144	141	18	123	122	11×17.5×11	PT 1/8	7.05×10^{-2}	6.54	16.43
	102	144	201	18	183	122	11×17.5×11	PT 1/8	7.05×10^{-2}	8.88	16.43
	102	144	261	18	243	122	11×17.5×11	PT 1/8	7.05×10^{-2}	11.23	16.43
	105	147	165	18	147	125	11×17.5×11	PT 1/8	7.05×10^{-2}	8.07	16.29
	105	147	191	18	173	125	11×17.5×11	PT 1/8	7.05×10^{-2}	9.17	16.29
	105	147	189	18	171	125	11×17.5×11	PT 1/8	7.05×10^{-2}	9.09	16.29
	105	147	237	18	219	125	11×17.5×11	PT 1/8	7.05×10^{-2}	11.13	16.29
	105	147	309	18	291	125	11×17.5×11	PT 1/8	7.05×10^{-2}	14.19	16.29
	110	158	196	25	171	133	14×20×13	PT 1/8	7.05×10^{-2}	11.28	15.46
	110	158	292	25	267	133	14×20×13	PT 1/8	7.05×10^{-2}	15.94	15.46
	112	158	227	28	199	134	14×20×13	PT 1/8	7.05×10^{-2}	13.49	16.1
	112	158	347	28	319	134	14×20×13	PT 1/8	7.05×10^{-2}	19.61	16.1

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

Preload Type of Precision Ball Screw

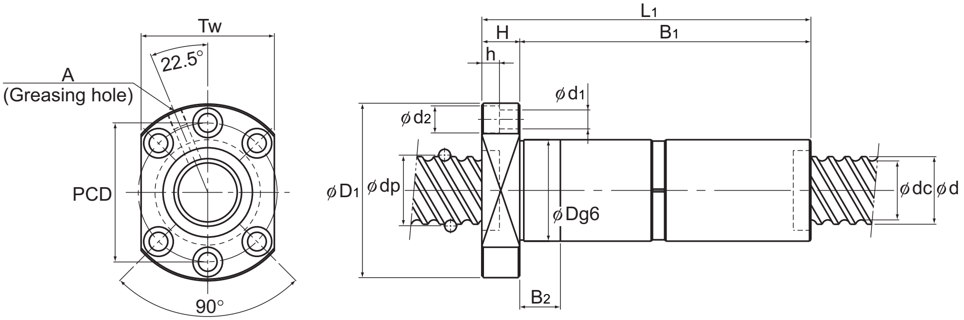
Screw shaft outer diameter	**63**
Lead	**10 to 20**



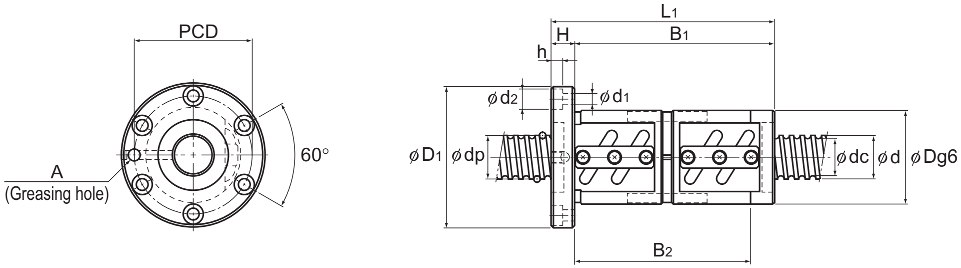
DIK (2805 to 6312)

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C0a kN	Rigidity K N/μm
63	10	DIK 6310-8	64.75	57.7	4×1	49.5	160.7	1550
		BNFN 6310-2.5	64.75	57.7	1×2.5	35.4	111.7	1090
		BNFN 6310-5	64.75	57.7	2×2.5	64.2	222.5	2100
		BNFN 6310-7.5	64.75	57.7	3×2.5	90.9	334.2	3090
	12	DIK 6312-6	65.25	56.3	3×1	51.9	147.4	1200
		DIK 6312-8	65.25	56.3	4×1	66.4	196.6	1570
		BNFN 6312A-2.5	65.25	56.3	1×2.5	48.1	139.2	1120
		BNFN 6312A-5	65.25	56.3	2×2.5	87.4	278.3	2160
	16	BNFN 6316-2.5	65.7	55.9	1×2.5	81.1	231.3	1470
		BNFN 6316-5	65.7	55.9	2×2.5	147	462.6	2840
	20	BNFN 6320-2.5	65.7	55.9	1×2.5	81	231.3	1470
		BNFN 6320-5	65.7	55.9	2×2.5	147	463.5	2640
		DKN 6320-3	65.7	55.9	3×1	83.5	229.3	1470

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



DKN



BNFN

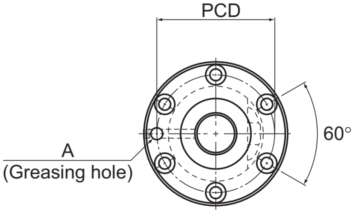
Unit: mm

	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1 \times d_2 \times h$	Tw	Greasing hole A	kg・cm²/mm	kg	kg/m
	85	146	141	22	119	35	122	14×20×13	110	PT 1/8	1.21×10^{-1}	4.16	21.93
	108	154	137	22	115	—	130	14×20×13	—	PT 1/8	1.21×10^{-1}	6.98	21.93
	108	154	197	22	175	—	130	14×20×13	—	PT 1/8	1.21×10^{-1}	9.4	21.93
	108	154	257	22	235	—	130	14×20×13	—	PT 1/8	1.21×10^{-1}	11.81	21.93
	90	146	146	22	124	35	122	14×20×13	110	PT 1/8	1.21×10^{-1}	4.93	21.14
	90	146	171	22	149	45	122	14×20×13	110	PT 1/8	1.21×10^{-1}	5.56	21.14
	115	161	159	22	137	—	137	14×20×13	—	PT 1/8	1.21×10^{-1}	9.32	21.14
	115	161	231	22	209	—	137	14×20×13	—	PT 1/8	1.21×10^{-1}	12.84	21.14
	122	184	208	24	184	—	152	18×26×17.5	—	PT 1/8	1.21×10^{-1}	14.61	20.85
	122	184	304	24	280	—	152	18×26×17.5	—	PT 1/8	1.21×10^{-1}	20.19	20.85
	122	180	227	28	199	—	150	18×26×17.5	—	PT 1/8	1.21×10^{-1}	15.91	20.85
	122	180	347	28	319	—	150	18×26×17.5	—	PT 1/8	1.21×10^{-1}	22.88	20.85
	95	159	243	28	215	30	129	18×26×17.5	121	PT 1/8	1.21×10^{-1}	9.5	20.85

For model number coding, see B-718.

Preload Type of Precision Ball Screw

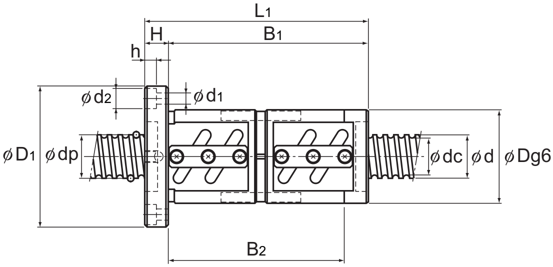
Screw shaft outer diameter	70 to 100
Lead	10 to 20



BNFN

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	 C_0a kN	Rigidity K N/µm
70	10	BNFN 7010-2.5	71.75	64.5	1×2.5	36.8	123.5	1180
		BNFN 7010-5	71.75	64.5	2×2.5	66.9	247	2280
		BNFN 7010-7.5	71.75	64.5	3×2.5	94.9	371.4	3350
	12	BNFN 7012-2.5	72	64.2	1×2.5	43.5	139.2	1200
		BNFN 7012-5	72	64.2	2×2.5	78.9	278.3	2320
		BNFN 7012-7.5	72	64.2	3×2.5	111.7	417.5	3420
	20	BNFN 7020-5	72.7	62.9	2×2.5	153.9	514.5	3090
80	10	BNFN 8010-2.5	81.75	75.2	1×2.5	38.9	141.1	1300
		BNFN 8010-5	81.75	75.2	2×2.5	70.6	283.2	2530
		BNFN 8010-7.5	81.75	75.2	3×2.5	100	424.3	3720
	12	BNFN 8012-5	82.3	74.1	2×2.5	96.5	353.8	2620
	20	BNFN 8020A-2.5	82.7	72.9	1×2.5	90.1	294	1770
		BNFN 8020A-5	82.7	72.9	2×2.5	163.7	589	3430
100	20	BNFN 10020A-2.5	102.7	92.9	1×2.5	99	368.5	2110
		BNFN 10020A-5	102.7	92.9	2×2.5	179.3	737	4080
		BNFN 10020A-7.5	102.7	92.9	3×2.5	253.8	1105.4	6010

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



BNFN

Unit: mm

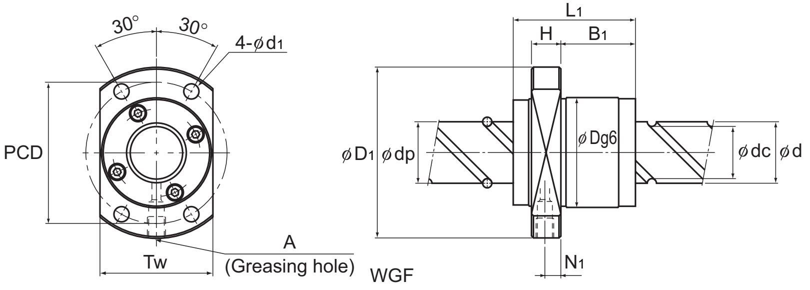
	Nut dimensions								Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Outer diameter D	Flange diameter D_1	Overall length L_1	H	B_1	PCD	$d_1\times d_2\times h$	Greasing hole A	kg•cm²/mm	kg	kg/m
	125	167	141	18	123	145	11×17.5×11	PT 1/8	1.85×10^{-1}	9.19	27.4
	125	167	201	18	183	145	11×17.5×11	PT 1/8	1.85×10^{-1}	12.57	27.4
	125	167	261	18	243	145	11×17.5×11	PT 1/8	1.85×10^{-1}	15.96	27.4
	128	170	165	18	147	148	11×17.5×11	PT 1/8	1.85×10^{-1}	11.26	27.24
	128	170	237	18	219	148	11×17.5×11	PT 1/8	1.85×10^{-1}	15.63	27.24
	128	170	309	18	291	148	11×17.5×11	PT 1/8	1.85×10^{-1}	20.0	27.24
	130	186	325	28	297	158	18×26×17.5	PT 1/8	1.85×10^{-1}	23.4	27.0
	130	176	137	22	115	152	14×20×13	PT 1/8	3.16×10^{-1}	9.15	36.26
	130	176	197	22	175	152	14×20×13	PT 1/8	3.16×10^{-1}	12.41	36.26
	130	176	257	22	235	152	14×20×13	PT 1/8	3.16×10^{-1}	15.67	36.26
	135	181	231	22	209	157	14×20×13	PT 1/8	3.16×10^{-1}	16.02	35.26
	143	204	227	28	199	172	18×26×17.5	PT 1/8	3.16×10^{-1}	20.08	35.81
	143	204	347	28	319	172	18×26×17.5	PT 1/8	3.16×10^{-1}	28.97	35.81
	170	243	231	32	199	205	22×32×21.5	PT 1/8	7.71×10^{-1}	28.15	57.13
	170	243	351	32	319	205	22×32×21.5	PT 1/8	7.71×10^{-1}	39.99	57.13
	170	243	471	32	439	205	22×32×21.5	PT 1/8	7.71×10^{-1}	51.84	57.13

For model number coding, see B-718.

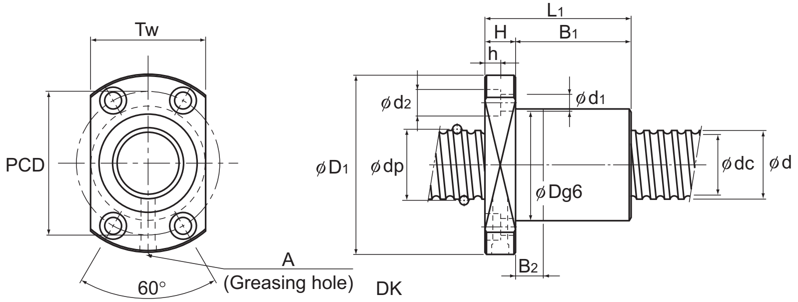
Description of Each Option⇒A-815 Dimensions⇒B-777

No Preload Type of Precision Ball Screw

Screw shaft outer diameter	4 to 15
Lead	1 to 40



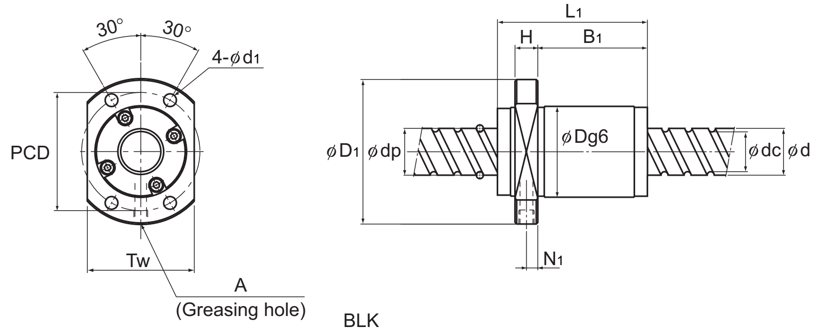
WGF



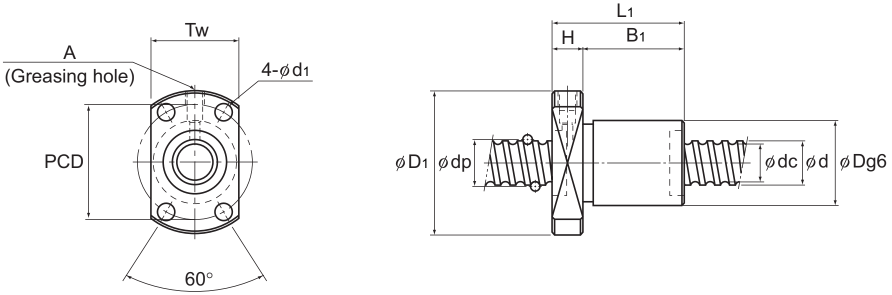
DK

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity		
d	Ph		dp	dc	Rows x turns	Ca kN	C_0a kN	K N/μm	Outer diameter D	Flange diameter D_1
4	1	MDK 0401-3	4.15	3.4	3×1	0.29	0.42	35	9	19
6	1	MDK 0601-3	6.2	5.3	3×1	0.54	0.94	60	11	23
8	1	MDK 0801-3	8.2	7.3	3×1	0.64	1.4	80	13	26
	2	MDK 0802-3	8.3	7	3×1	1.4	2.3	80	15	28
	12	WGF 0812-3	8.4	6.6	2×1.65	2.2	3.9	110	18	31
10	2	MDK 1002-3	10.3	9	3×1	1.5	2.9	100	17	34
	15	WGF 1015-3	10.5	8.3	2×1.65	3.3	6.2	140	23	40
12	2	MDK 1202-3	12.3	11	3×1	1.7	3.6	120	19	36
13	20	WGF 1320-3	13.5	10.8	2×1.65	4.7	9.6	180	28	45
14	2	MDK 1402-3	14.3	13	3×1	1.8	4.3	190	21	40
	4	MDK 1404-3	14.65	11.9	3×1	4.2	7.6	190	26	45
		DK 1404-4	14.5	11.8	4×1	5.4	10.2	180	26	45
		DK 1404-6	14.5	11.8	6×1	7.7	15.4	270	26	45
	5	MDK 1405-3	14.75	11.2	3×1	7	11.6	140	26	45
15	10	BLK 1510-5.6	15.75	12.5	2×2.8	14.3	27.8	340	34	57
	20	WGF 1520-1.5	15.75	12.5	1×1.5	4.4	7.9	100	32	53
		WGF 1520-3	15.75	12.5	2×1.5	8.1	15.8	190	32	53
	30	WGF 1530-1	15.75	12.5	2×0.6	3.5	5.4	90	32	53
		WGF 1530-3	15.75	12.5	2×1.6	8.1	14.6	220	32	53
	40	WGF 1540-1.5	15.75	12.5	2×0.75	3.9	7.4	110	32	53

Note) Models MDK0401, 0601 and 0801 is not provided with a labyrinth seal.
Models MDK0401, 0601, 0801, model WGF and Large Lead Precision Ball Screw model BLK cannot be attached with seal.



BLK



MDK

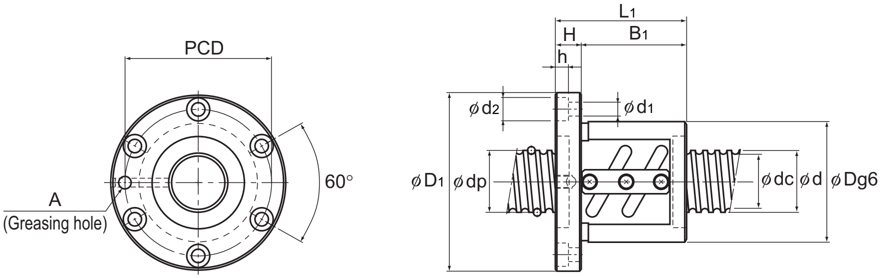
Unit: mm

Nut dimensions											Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L1	H	B1	B2	PCD	d1	d2	h	Tw	N1	Greasing hole A	kg•cm²/mm	kg	kg/m
13	3	10	—	14	2.9	—	—	13	—	—	1.97×10^{-6}	0.01	0.07
14.5	3.5	11	—	17	3.4	—	—	15	—	—	9.99×10^{-6}	0.017	0.14
15	4	11	—	20	3.4	—	—	17	—	—	3.16×10^{-5}	0.024	0.29
22	5	17	—	22	3.4	—	—	19	—	—	3.16×10^{-5}	0.034	0.27
27	4	17	—	25	3.4	—	—	20	—	—	3.16×10^{-5}	0.054	0.35
22	5	17	—	26	4.5	—	—	21	—	—	7.71×10^{-5}	0.045	0.47
33	5	22	—	32	4.5	—	—	25	—	—	7.71×10^{-5}	0.11	0.55
22	5	17	—	28	4.5	—	—	23	—	—	1.6×10^{-4}	0.05	0.71
43	5	29	—	37	4.5	—	—	30	—	—	2.2×10^{-4}	0.18	0.96
23	6	17	—	31	5.5	—	—	26	—	—	2.96×10^{-4}	0.15	1.0
33	6	27	—	36	5.5	—	—	28	—	—	2.96×10^{-4}	0.13	0.8
48	10	38	10	35	4.5	8	4.5	29	—	M6	2.96×10^{-4}	0.2	1
60	10	50	10	35	4.5	8	4.5	29	—	M6	2.96×10^{-4}	0.23	1
42	10	32	—	36	5.5	—	—	28	—	M6	2.96×10^{-4}	0.18	0.91
44	10	24	—	45	5.5	—	—	40	5	M6	3.9×10^{-4}	0.34	0.31
45	10	28	—	43	5.5	—	—	33	5	M6	3.9×10^{-4}	0.29	1.22
45	10	28	—	43	5.5	—	—	33	5	M6	3.9×10^{-4}	0.29	1.22
33	10	17	—	43	5.5	—	—	33	5	M6	3.9×10^{-4}	0.23	1.26
63	10	47	—	43	5.5	—	—	33	5	M6	3.9×10^{-4}	0.38	1.26
42	10	26.3	—	43	5.5	—	—	33	5	M6	3.9×10^{-4}	0.28	1.28

For model number coding, see B-718.

No Preload Type of Precision Ball Screw

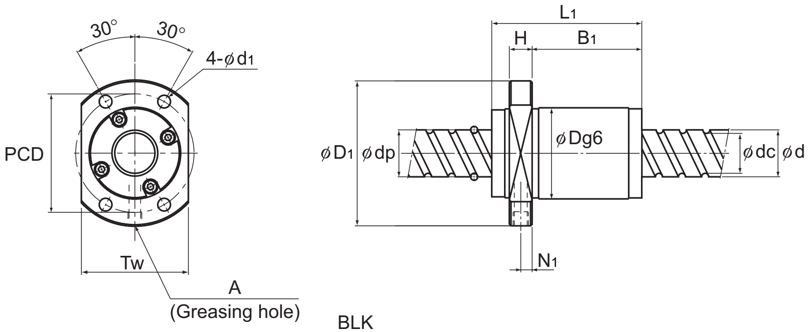
Screw shaft outer diameter	16 to 18
Lead	4 to 16



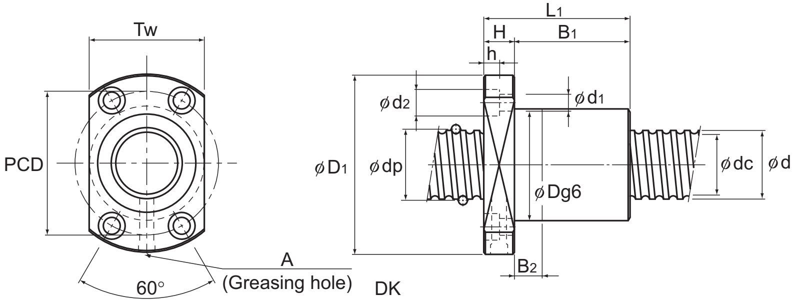
BNF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K N/μm		
						Ca kN	C_0a kN		Outer diameter D	Flange diameter D_1
16	4	BNF 1604-3	16.5	13.8	2×1.5	5.1	10.5	180	36	59
	5	BNF 1605-2.5	16.75	13.2	1×2.5	7.4	13.9	170	40	60
		BNF 1605-3	16.75	13.2	2×1.5	8.7	16.8	200	40	60
		BNF 1605-5	16.75	13.2	2×2.5	13.5	27.8	320	40	60
		DK 1605-3	16.75	13.1	3×1	7.4	13	160	30	49
		DK 1605-4	16.75	13.1	4×1	9.5	17.4	210	30	49
	6	BNF 1606-2.5	16.8	13.2	1×2.5	7.5	14	170	40	60
		BNF 1606-5	16.8	13.2	2×2.5	13.5	28	320	40	60
	10	BNF 1610-1.5	16.8	13.5	1×1.5	4.8	8.5	100	40	63
	16	BLK 1616-2.8	16.65	13.7	1×2.8	5.2	9.9	180	32	53
		BLK 1616-3.6	16.65	13.7	2×1.8	7.1	14.3	220	32	53
18	10	BNF 1810-2.5	18.8	15.5	1×2.5	7.8	15.9	190	42	65
		BNF 1810-3	18.8	15.5	2×1.5	9.2	19.1	220	42	65

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.
Large Lead Precision Ball Screw model BLK cannot be attached with seal.



BLK



DK

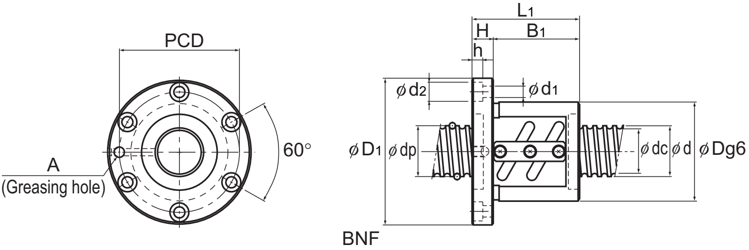
Unit: mm

Nut dimensions											Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L₁	H	B₁	B₂	PCD	d₁	d₂	h	Tw	N₁	Greasing hole A	kg•cm²/mm	kg	kg/m
45	11	34	—	47	5.5	9.5	5.5	—	—	M6	5.05×10⁻⁴	0.32	1.35
41	10	31	—	50	4.5	8	4.5	—	—	M6	5.05×10⁻⁴	0.37	1.24
51	10	41	—	50	4.5	8	4.5	—	—	M6	5.05×10⁻⁴	0.47	1.24
56	10	46	—	50	4.5	8	4.5	—	—	M6	5.05×10⁻⁴	0.49	1.24
45	10	35	10	39	4.5	8	4.5	31	—	M6	5.05×10⁻⁴	0.24	1.25
50	10	40	10	39	4.5	8	4.5	31	—	M6	5.05×10⁻⁴	0.26	1.25
44	10	34	—	50	4.5	8	4.5	—	—	M6	5.05×10⁻⁴	0.41	1.3
62	10	52	—	50	4.5	8	4.5	—	—	M6	5.05×10⁻⁴	0.49	1.3
42	11	31	—	51	5.5	9.5	5.5	—	—	M6	5.05×10⁻⁴	0.32	1.41
54	10	37.5	—	42	4.5	—	—	38	5	M6	5.05×10⁻⁴	0.32	1.41
38	10	21.5	—	42	4.5	—	—	38	5	M6	5.05×10⁻⁴	0.21	1.41
69	12	57	—	53	5.5	9.5	5.5	—	—	M6	8.09×10⁻⁴	0.67	1.81
75	12	63	—	53	5.5	9.5	5.5	—	—	M6	8.09×10⁻⁴	0.63	1.81

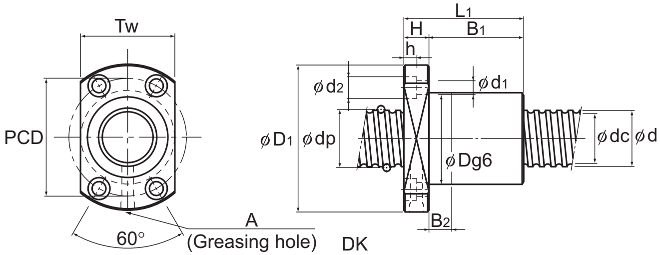
For model number coding, see B-718.

No Preload Type of Precision Ball Screw

Screw shaft outer diameter	20
Lead	4 to 60



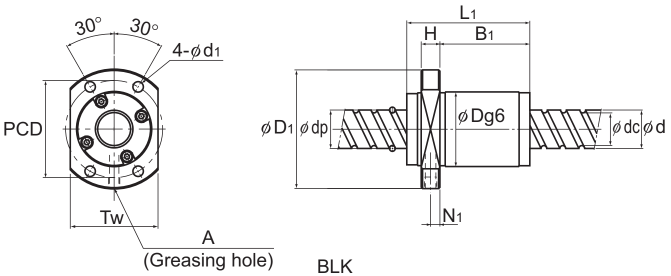
BNF



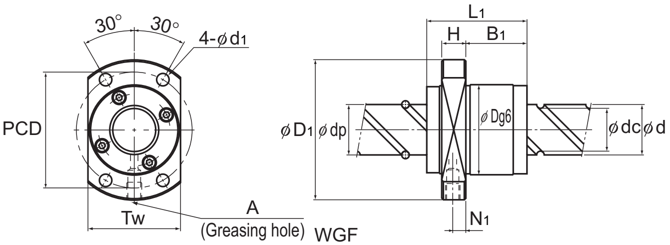
DK

Screw shaft outer diameter	Lead	Model No.		Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity	Outer diameter	Flange diameter
d	Ph			dp	dc	Rows x turns	Ca kN	C_0a kN	K N/µm	D	D_1
20	4	BNF	2004-2.5	20.5	17.8	1×2.5	4.8	10.9	180	40	63
		BNF	2004-5	20.5	17.8	2×2.5	8.6	21.8	350	40	63
		DK	2004-3	20.5	17.8	3×1	5.2	11.6	190	32	56
		DK	2004-4	20.5	17.8	4×1	6.6	15.5	250	32	56
	5	BNF	2005-2.5	20.75	17.2	1×2.5	8.3	17.4	200	44	67
		BNF	2005-3	20.75	17.2	2×1.5	9.7	21	240	44	67
		BNF	2005-3.5	20.75	17.2	1×3.5	11.1	24.5	270	44	67
		BNF	2005-5	20.75	17.2	2×2.5	15.1	35	380	44	67
		DK	2005-3	20.75	17.1	3×1	8.5	17.3	200	34	58
		DK	2005-4	20.75	17.1	4×1	11	23.1	260	34	58
	6	BNF	2006-2.5	20.75	17.2	1×2.5	8.3	17.5	200	48	71
		BNF	2006-3	20.75	17.2	2×1.5	9.7	21	240	48	71
		BNF	2006-3.5	20.75	17.2	1×3.5	11.1	24.5	270	48	71
		BNF	2006-5	20.75	17.2	2×2.5	15.1	35	380	48	71
		DK	2006-3	21	16.4	3×1	11.4	21.5	410	35	58
		DK	2006-4	21	16.4	4×1	14.6	28.6	540	35	58
	8	BNF	2008-2.5	21	16.4	1×2.5	11.1	21.9	210	46	74
		DK	2008-4	21	16.4	4×1	14.6	28.8	270	35	58
	10	BNF	2010A-1.5	21	16.4	1×1.5	7.2	13.2	130	46	74
	12	BNF	2012-1.5	21	16.4	1×1.5	7.1	13.2	130	48	71
	20	BLK	2020-2.8	20.75	17.5	1×2.8	8.1	17.2	230	39	62
		BLK	2020-3.6	20.75	17.5	2×1.8	11.1	24.7	290	39	62
	40	WGF	2040-1	20.75	17.5	2×0.65	4.3	8	110	37	57
		WGF	2040-3	20.75	17.5	2×1.65	9.5	20.2	280	37	57
	60	WGF	2060-1.5	20.75	17.5	2×0.75	4.5	11	140	37	57

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Model WGF and Large Lead Precision Ball Screw model BLK cannot be attached with seal.



BLK



WGF

Unit: mm

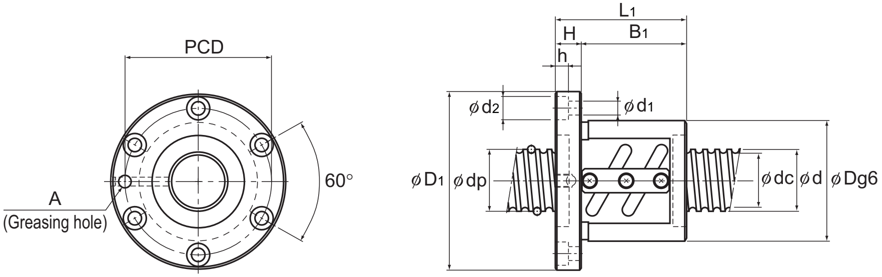
	Nut dimensions											Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
	37	11	26	—	51	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.3	2.18
	49	11	38	—	51	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.49	2.18
	42	11	31	10	44	5.5	9.5	5.5	35	—	M6	1.23×10^{-3}	0.26	2.18
	46	11	35	10	44	5.5	9.5	5.5	35	—	M6	1.23×10^{-3}	0.27	2.18
	41	11	30	—	55	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.46	2.05
	52	11	41	—	55	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.53	2.05
	45	11	34	—	55	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.53	2.05
	56	11	45	—	55	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.6	2.05
	46	11	35	10	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.31	2.06
	51	11	40	10	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.34	2.06
	44	11	33	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.51	2.12
	56	11	45	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.68	2.12
	50	11	39	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.62	2.12
	62	11	51	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.8	2.12
	52	11	41	10	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.36	1.93
	59	11	48	10	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.39	1.93
	60	15	45	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.69	2.06
	69	11	58	15	46	5.5	9.5	5.5	36	—	M6	1.23×10^{-3}	0.45	2.06
	58	15	43	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.77	2.14
	64	18	46	—	59	5.5	9.5	5.5	—	—	M6	1.23×10^{-3}	0.9	2.19
	65	10	47.5	—	50	5.5	—	—	46	5	M6	1.23×10^{-3}	0.49	2.25
	45	10	27.5	—	50	5.5	—	—	46	5	M6	1.23×10^{-3}	0.35	2.25
	41	10	25	—	47	5.5	—	—	38	5.5	M6	1.23×10^{-3}	0.24	2.34
	81	10	65	—	47	5.5	—	—	38	5.5	M6	1.23×10^{-3}	0.48	2.34
	60	10	40.1	—	47	5.5	—	—	38	5	M6	1.23×10^{-3}	0.4	2.37

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

No Preload Type of Precision Ball Screw

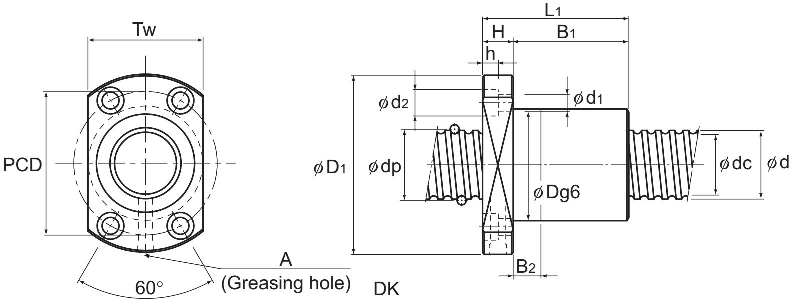
Screw shaft outer diameter	25
Lead	4 to 16



BNF

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity		
						Ca	C_0a	K	Outer diameter	Flange diameter
d	Ph		dp	dc	Rows x turns	kN	kN	N/µm	D	D_1
25	4	BNF 2504-2.5	25.5	22.8	1×2.5	5.2	13.7	210	46	69
		BNF 2504-5	25.5	22.8	2×2.5	9.5	27.3	410	46	69
		DK 2504-3	25.5	22.8	3×1	5.7	15	230	38	63
		DK 2504-4	25.5	22.8	4×1	7.4	19.9	310	38	63
	5	BNF 2505-2.5	25.75	22.2	1×2.5	9.2	22	240	50	73
		BNF 2505-3	25.75	22.2	2×1.5	10.8	26.4	280	50	73
		BNF 2505-3.5	25.75	22.2	1×3.5	12.3	30.7	320	50	73
		BNF 2505-5	25.75	22.2	2×2.5	16.7	44	460	50	73
		DK 2505-3	25.75	22.1	3×1	9.7	22.6	250	40	63
		DK 2505-4	25.75	22.1	4×1	12.4	30.3	320	40	63
	6	BNF 2506-2.5	26	21.4	1×2.5	12.5	27.3	250	53	76
		BNF 2506-3	26	21.4	2×1.5	14.6	32.8	290	53	76
		BNF 2506-3.5	26	21.4	1×3.5	15.1	35.9	330	53	76
		BNF 2506-5	26	21.4	2×2.5	22.5	54.8	470	53	76
		DK 2506-3	26	21.4	3×1	12.8	27	250	40	63
		DK 2506-4	26	21.4	4×1	16.8	37.4	330	40	63
	8	BNF 2508-2.5	26.25	20.5	1×2.5	15.8	32.8	250	58	85
		BNF 2508-3	26.25	20.5	2×1.5	18.5	39.4	290	58	85
		BNF 2508-3.5	26.25	20.5	1×3.5	21.2	46	340	58	85
		BNF 2508-5	26.25	20.5	2×2.5	28.7	65.8	480	58	85
		DK 2508-3	26	21.4	3×1	13.1	28.1	500	40	63
		DK 2508-4	26	21.4	4×1	16.8	37.5	330	40	63
	10	BNF 2510A-2.5	26.3	21.4	1×2.5	15.8	33	250	58	85
		DK 2510-3	26	21.6	3×1	12.7	27	250	40	63
		DK 2510-4	26	21.6	4×1	16.7	37.6	330	40	63
	12	BNF 2512-2.5	26	21.9	1×2.5	12.3	27.6	250	53	76
	16	BNF 2516-1.5	26	21.4	1×1.5	7.9	16.7	150	53	76

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
These models can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



Unit: mm

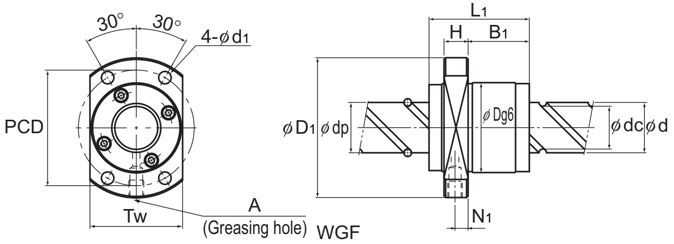
Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	T_w	Greasing hole A	kg•cm²/mm	kg	kg/m
36	11	25	—	57	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.21	3.5
48	11	37	—	57	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.55	3.5
43	11	32	10	51	5.5	9.5	5.5	39	M6	3.01×10^{-3}	0.33	3.5
47	11	36	10	51	5.5	9.5	5.5	39	M6	3.01×10^{-3}	0.35	3.5
40	11	29	—	61	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.52	3.34
52	11	41	—	61	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.66	3.34
45	11	34	—	61	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.6	3.34
55	11	44	—	61	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.68	3.34
46	11	35	10	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.38	3.35
51	11	40	10	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.41	3.35
44	11	33	—	64	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.61	3.19
56	11	45	—	64	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.85	3.19
50	11	39	—	64	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.79	3.19
62	11	51	—	64	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.91	3.19
52	11	41	10	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.41	3.19
60	11	49	10	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.46	3.19
58	15	43	—	71	6.6	11	6.5	—	M6	3.01×10^{-3}	1.07	3.12
71	15	56	—	71	6.6	11	6.5	—	M6	3.01×10^{-3}	1.27	3.12
66	15	51	—	71	6.6	11	6.5	—	M6	3.01×10^{-3}	1.29	3.12
82	15	67	—	71	6.6	11	6.5	—	M6	3.01×10^{-3}	1.44	3.12
62	12	50	10	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.48	3.35
71	12	59	15	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.54	3.35
70	18	52	—	71	6.6	11	6.5	—	M6	3.01×10^{-3}	1.43	3.27
80	15	65	15	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.62	3.45
85	15	70	20	51	5.5	9.5	5.5	41	M6	3.01×10^{-3}	0.65	3.45
60	11	49	—	64	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.86	3.51
60	11	49	—	64	5.5	9.5	5.5	—	M6	3.01×10^{-3}	0.96	3.6

For model number coding, see B-718.

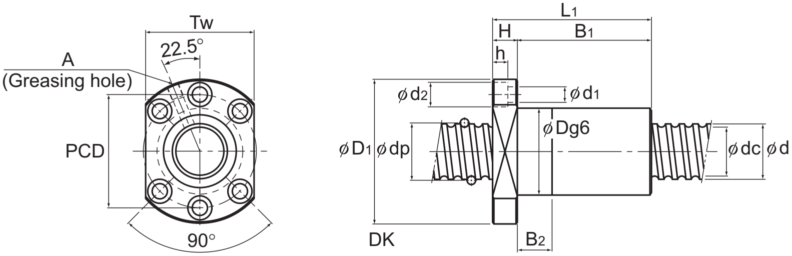
Description of Each Option⇒A-815 Dimensions⇒B-777

No Preload Type of Precision Ball Screw

Screw shaft outer diameter	25 to 30
Lead	5 to 90



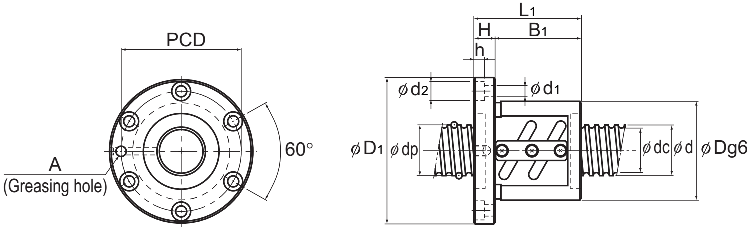
WGF



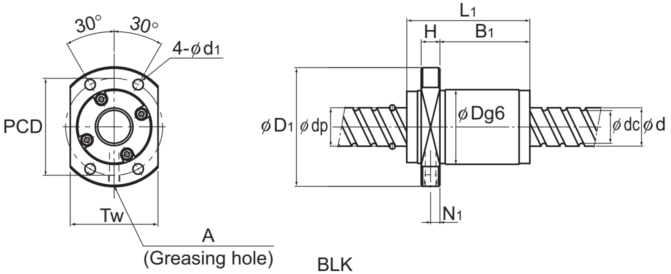
DK

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C0a kN	Rigidity K N/μm	Outer diameter D	Flange diameter D1
25	25	BLK 2525-2.8	26	22	1×2.8	12.2	26.9	270	47	74
		BLK 2525-3.6	26	22	2×1.8	16.6	38.7	350	47	74
	50	WGF 2550-1	26	21.9	2×0.65	6.4	12.5	140	45	69
		WGF 2550-3	26	21.9	2×1.65	14.3	31.7	340	45	69
28	5	BNF 2805-2.5	28.75	25.2	1×2.5	9.7	24.6	250	55	85
		BNF 2805-3	28.75	25.2	2×1.5	11.3	29.5	300	55	85
		BNF 2805-3.5	28.75	25.2	1×3.5	12.9	34.4	350	55	85
		BNF 2805-5	28.75	25.2	2×2.5	17.5	49.4	500	55	85
		BNF 2805-7.5	28.75	25.2	3×2.5	24.8	73.8	740	55	85
		DK 2805-3	28.75	25.2	3×1	10.5	26.4	270	43	71
		DK 2805-4	28.75	25.2	4×1	13.4	35.2	360	43	71
	6	BNF 2806-2.5	28.75	25.2	1×2.5	9.6	24.6	250	55	85
		BNF 2806-3.5	28.75	25.2	1×3.5	12.9	34.5	350	55	85
		BNF 2806-5	28.75	25.2	2×2.5	17.5	49.4	500	55	85
		BNF 2806-7.5	28.75	25.2	3×2.5	24.8	73.8	740	55	85
		DK 2806-3	29	24.4	3×1	14	32	280	43	71
		DK 2806-4	29	24.4	4×1	18	42.5	370	43	71
	8	BNF 2808-2.5	29.25	23.6	1×2.5	16.8	36.8	270	60	104
		BNF 2808-3	29.25	23.6	2×1.5	19.6	44.2	320	60	104
		BNF 2808-5	29.25	23.6	2×2.5	30.4	73.7	530	60	104
	10	BNF 2810-2.5	29.75	22.4	1×2.5	24	48.2	280	65	106
		DK 2810-4	29.25	23.6	4×1	22.4	50	370	45	71
30	60	WGF 3060-1	31.25	26.4	2×0.65	8.9	18	170	55	89
		WGF 3060-3	31.25	26.4	2×1.65	19.9	45.7	410	55	89
	90	WGF 3090-1.5	31.25	26.4	2×0.75	9.7	25.8	200	55	89

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Model WGF and Large Lead Precision Ball Screw model BLK cannot be attached with seal.



BNF



BLK

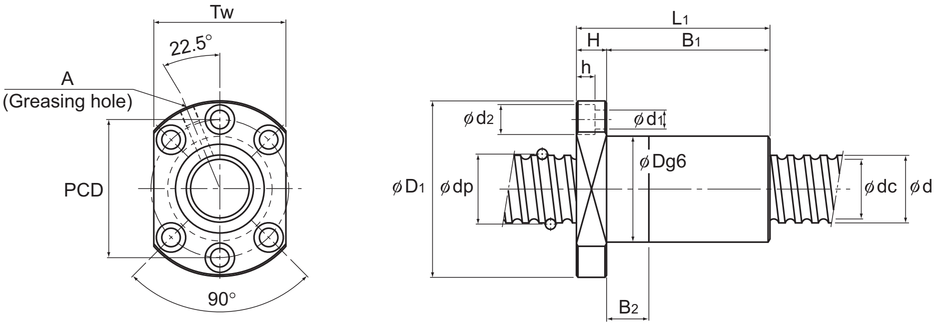
Unit: mm

Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L₁	H	B₁	B₂	PCD	d₁	d₂	h	Tw	N₁	Greasing hole A	kg•cm²/mm	kg	kg/m
	80	12	60	—	60	6.6	—	—	56	6	M6	3.01×10⁻³	0.89	3.52
	55	12	35	—	60	6.6	—	—	56	6	M6	3.01×10⁻³	0.64	3.52
	52	12	31.5	—	57	6.6	—	—	46	7	M6	3.01×10⁻³	0.43	3.66
	102	12	81.5	—	57	6.6	—	—	46	7	M6	3.01×10⁻³	0.85	3.66
	44	12	32	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	1.02	4.27
	54	12	42	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	0.92	4.27
	49	12	37	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	0.86	4.27
	59	12	47	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	1.06	4.27
	74	12	62	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	1.16	4.27
	49	12	37	10	57	6.6	11	6.5	55	—	M6	4.74×10⁻³	0.48	4.27
	54	12	42	10	57	6.6	11	6.5	55	—	M6	4.74×10⁻³	0.51	4.27
	50	12	38	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	0.87	4.36
	56	12	44	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	0.94	4.36
	68	12	56	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	1.09	4.36
	86	12	74	—	69	6.6	11	6.5	—	—	M6	4.74×10⁻³	1.3	4.36
	53	12	41	10	57	6.6	11	6.5	55	—	M6	4.74×10⁻³	0.5	4.36
	61	12	49	10	57	6.6	11	6.5	55	—	M6	4.74×10⁻³	0.56	4.36
	68	18	50	—	82	11	17.5	11	—	—	M6	4.74×10⁻³	1.75	4.02
	80	18	62	—	82	11	17.5	11	—	—	M6	4.74×10⁻³	1.93	4.02
	92	18	74	—	82	11	17.5	11	—	—	M6	4.74×10⁻³	2.11	4.02
	86	18	68	—	85	11	17.5	11	—	—	M6	4.74×10⁻³	2.3	3.66
	84	15	69	20	57	6.6	11	6.5	55	—	M6	4.74×10⁻³	0.82	4.18
	62	15	37	—	71	9	—	—	56	9	M6	6.24×10⁻³	1.11	5.28
	122	15	97	—	71	9	—	—	56	9	M6	6.24×10⁻³	1.9	5.28
	92	15	61.3	—	71	9	—	—	56	9	M6	6.24×10⁻³	1.51	5.34

For model number coding, see B-718.

No Preload Type of Precision Ball Screw

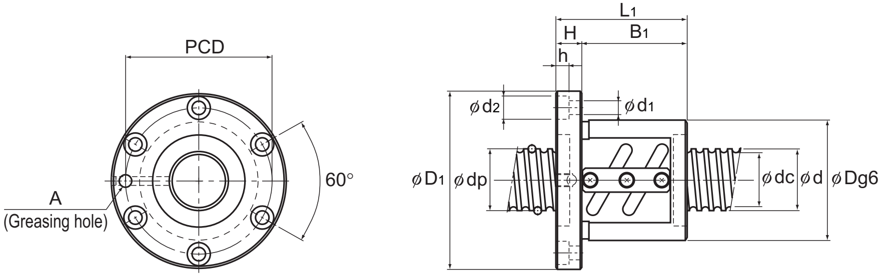
Screw shaft outer diameter	32
Lead	4 to 12



DK

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	C0a kN	Rigidity K N/µm	Outer diameter D	Flange diameter D1
32	4	BNF 3204-7.5	32.5	30	3×2.5	14.8	52.7	740	54	81
		DK 3204-3	32.5	30.1	3×1	6.4	19.6	290	45	76
		DK 3204-4	32.5	30.1	4×1	8.2	26.1	380	45	76
	5	○ BNF 3205-2.5	32.75	29.2	1×2.5	10.2	28.1	280	58	85
		○ BNF 3205-3	32.75	29.2	2×1.5	12	33.8	340	58	85
		○ BNF 3205-4.5	32.75	29.2	3×1.5	17	50.7	500	58	85
		○ BNF 3205-5	32.75	29.2	2×2.5	18.5	56.4	560	58	85
		○ BNF 3205-7.5	32.75	29.2	3×2.5	26.3	84.5	810	58	85
		DK 3205-3	32.75	29.2	3×1	11.1	30.2	300	46	76
		DK 3205-4	32.75	29.2	4×1	14.2	40.3	400	46	76
		DK 3205-6	32.75	29.2	6×1	20.1	60.4	600	46	76
	6	○ BNF 3206-2.5	33	28.4	1×2.5	13.9	35.2	290	62	89
		○ BNF 3206-3	33	28.4	2×1.5	16.3	42.2	350	62	89
		○ BNF 3206-5	33	28.4	2×2.5	25.2	70.4	580	62	89
		DK 3206-3	33	28.4	3×1	14.9	37.1	310	48	76
		DK 3206-4	33	28.4	4×1	19.1	49.5	410	48	76
	8	○ BNF 3208A-2.5	33.25	27.5	1×2.5	17.8	42.2	300	66	100
		○ BNF 3208A-3	33.25	27.5	2×1.5	20.9	50.7	360	66	100
		○ BNF 3208A-4.5	33.25	27.5	3×1.5	29.5	76	530	66	100
		○ BNF 3208A-5	33.25	27.5	2×2.5	32.3	84.4	590	66	100
	10	○ BNF 3210A-2.5	33.75	26.4	1×2.5	26.1	56.2	310	74	108
		○ BNF 3210A-3	33.75	26.4	2×1.5	30.5	67.4	380	74	108
		○ BNF 3210A-3.5	33.75	26.4	1×3.5	34.8	78.6	440	74	108
		○ BNF 3210A-5	33.75	26.4	2×2.5	47.2	112.7	620	74	108
		DK 3210-3	33.75	26.4	3×1	25.7	52.2	300	54	87
		DK 3210-4	33.75	26.4	4×1	33	69.7	390	54	87
	12	○ BNF 3212-3.5	34	26.1	1×3.5	40.4	88.5	440	76	121
		DK 3212-4	33.75	26.4	4×1	34.2	73.9	420	54	87

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



BNF

Unit: mm

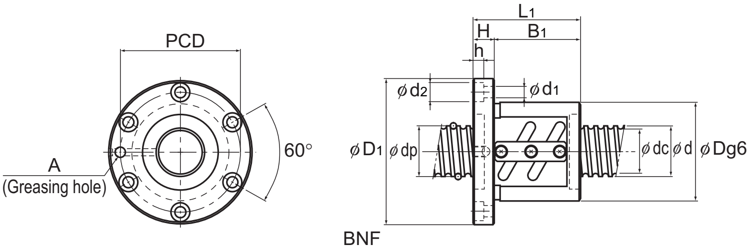
	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
	60	11	49	—	67	6.6	11	6.5	—	M6	8.08×10^{-3}	0.81	5.86
	44	11	33	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.44	5.86
	48	11	37	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.47	5.86
	41	12	29	—	71	6.6	11	6.5	—	M6	8.08×10^{-3}	0.76	5.67
	53	12	41	—	71	6.6	11	6.5	—	M6	8.08×10^{-3}	0.91	5.67
	63	12	51	—	71	6.6	11	6.5	—	M6	8.08×10^{-3}	1.03	5.67
	56	12	44	—	71	6.6	11	6.5	—	M6	8.08×10^{-3}	0.94	5.67
	71	12	59	—	71	6.6	11	6.5	—	M6	8.08×10^{-3}	1.13	5.67
	47	12	35	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.5	5.67
	52	12	40	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.53	5.67
	62	12	50	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.6	5.67
	45	12	33	—	75	6.6	11	6.5	—	M6	8.08×10^{-3}	0.94	5.47
	57	12	45	—	75	6.6	11	6.5	—	M6	8.08×10^{-3}	1.12	5.47
	63	12	51	—	75	6.6	11	6.5	—	M6	8.08×10^{-3}	1.21	5.47
	53	12	41	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.58	6.31
	61	12	49	10	63	6.6	11	6.5	59	M6	8.08×10^{-3}	0.65	6.31
	58	15	43	—	82	9	14	8.5	—	M6	8.08×10^{-3}	1.5	5.39
	71	15	56	—	82	9	14	8.5	—	M6	8.08×10^{-3}	1.73	5.39
	87	15	72	—	82	9	14	8.5	—	M6	8.08×10^{-3}	2.02	5.39
	82	15	67	—	82	9	14	8.5	—	M6	8.08×10^{-3}	1.93	5.39
	70	15	55	—	90	9	14	8.5	—	M6	8.08×10^{-3}	2.2	4.98
	87	15	72	—	90	9	14	8.5	—	M6	8.08×10^{-3}	2.6	4.98
	80	15	65	—	90	9	14	8.5	—	M6	8.08×10^{-3}	2.44	4.98
	100	15	85	—	90	9	14	8.5	—	M6	8.08×10^{-3}	2.92	4.98
	80	15	65	15	69	9	14	8.5	66	M6	8.08×10^{-3}	1.22	4.98
	90	15	75	20	69	9	14	8.5	66	M6	8.08×10^{-3}	1.34	4.98
	98	18	80	—	98	11	17.5	11	—	M6	8.08×10^{-3}	3.4	4.9
	98	15	83	25	69	9	14	8.5	66	M6	8.08×10^{-3}	1.43	5.2

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

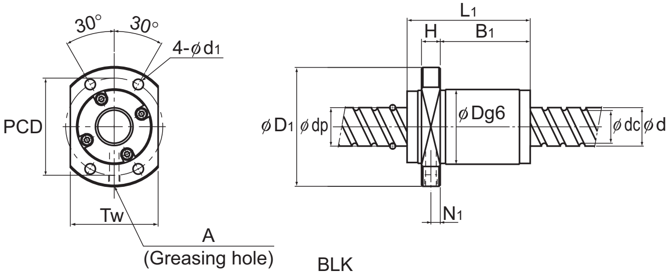
No Preload Type of Precision Ball Screw

Screw shaft outer diameter	32 to 36
Lead	6 to 36

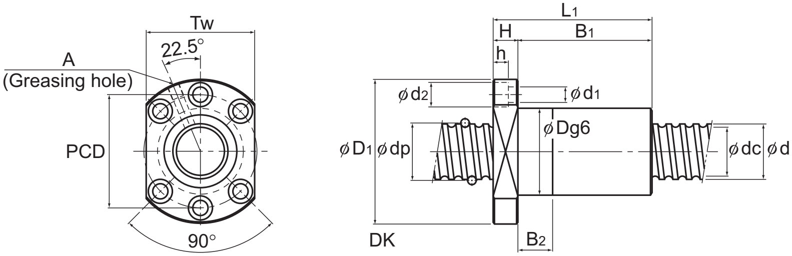


Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C_0a kN	Rigidity K N/µm	Outer diameter D	Flange diameter D_1
32	32	BLK 3232-2.8	33.25	28.3	1×2.8	17.3	41.4	340	58	92
		BLK 3232-3.6	33.25	28.3	2×1.8	23.7	59.5	440	58	92
36	6	○ BNF 3606-2.5	36.75	33.2	1×2.5	10.7	31.8	310	65	100
		○ BNF 3606-3	36.75	33.2	2×1.5	12.5	38	370	65	100
		○ BNF 3606-5	36.75	33.2	2×2.5	19.4	63.4	610	65	100
		○ BNF 3606-7.5	36.75	33.2	3×2.5	27.5	95.2	890	65	100
	8	○ BNF 3608-2.5	37.25	31.6	1×2.5	18.8	47.5	330	70	114
		○ BNF 3608-5	37.25	31.6	2×2.5	34.1	95.1	650	70	114
		○ BNF 3608-7.5	37.25	31.6	3×2.5	48.3	142.1	950	70	114
	10	○ BNF 3610-2.5	37.75	30.5	1×2.5	27.6	63.3	350	75	120
		○ BNF 3610-5	37.75	30.5	2×2.5	50.1	126.4	680	75	120
		○ BNF 3610-7.5	37.75	30.5	3×2.5	71.1	190.1	990	75	120
		DK 3610-3	37.75	30.5	3×1	28.8	63.8	350	58	98
		DK 3610-4	37.75	30.5	4×1	36.8	85	470	58	98
	12	○ BNF 3612-2.5	38	30.1	1×2.5	32.1	71.4	350	78	123
		○ BNF 3612-5	38	30.1	2×2.5	58.4	142.1	690	78	123
	16	○ BNF 3616-2.5	38	30.1	1×2.5	32.1	71.4	350	78	123
	20	○ BNF 3620-1.5	37.75	30.5	1×1.5	17.6	38.3	220	70	103
		BLK 3620-5.6	37.75	31.2	2×2.8	54.9	134.3	760	70	110
	24	BLK 3624-5.6	38	30.7	2×2.8	63.8	151.9	770	75	115
	36	BLK 3636-2.8	37.4	31.7	1×2.8	22.4	54.1	390	66	106
		BLK 3636-3.6	37.4	31.7	2×1.8	30.8	78	490	66	106

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.
Large Lead Precision Ball Screw model BLK cannot be attached with seal.



BLK



DK

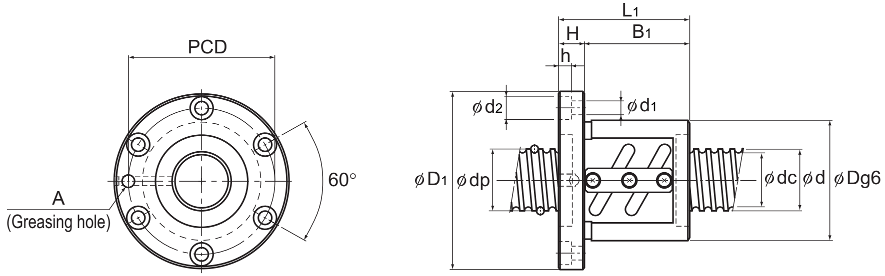
Unit: mm

Nut dimensions											Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg・cm²/mm	kg	kg/m
102	15	77	—	74	9	—	—	68	7.5	M6	8.08×10^{-3}	1.78	5.83
70	15	45	—	74	9	—	—	68	7.5	M6	8.08×10^{-3}	1.32	5.83
53	15	38	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	1.29	7.39
62	15	47	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	1.43	7.39
71	15	56	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	1.57	7.39
89	15	74	—	82	9	14	8.5	—	—	M6	1.29×10^{-2}	1.85	7.39
68	18	50	—	92	11	17.5	11	—	—	M6	1.29×10^{-2}	2.11	6.96
92	18	74	—	92	11	17.5	11	—	—	M6	1.29×10^{-2}	2.57	6.96
116	18	98	—	92	11	17.5	11	—	—	M6	1.29×10^{-2}	3.03	6.96
81	18	63	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	2.75	6.51
111	18	93	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	3.45	6.51
141	18	123	—	98	11	17.5	11	—	—	M6	1.29×10^{-2}	4.15	6.51
82	18	64	15	77	11	17.5	11	75	—	M6	1.29×10^{-2}	1.52	6.51
93	18	75	20	77	11	17.5	11	75	—	M6	1.29×10^{-2}	1.66	6.51
87	18	69	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	3.14	6.41
123	18	105	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	4.07	6.41
92	18	74	—	100	11	17.5	11	—	—	M6	1.29×10^{-2}	3.27	6.8
75	15	60	—	85	9	14	8.5	—	—	M6	1.29×10^{-2}	1.91	7.24
78	17	45	—	90	11	—	—	80	8.5	M6	1.29×10^{-2}	2.23	6.49
94	18	59	—	94	11	—	—	86	9	M6	1.29×10^{-2}	3.05	6.39
113	17	86	—	85	11	—	—	76	8.5	M6	1.29×10^{-2}	2.61	7.34
77	17	50	—	85	11	—	—	76	8.5	M6	1.29×10^{-2}	1.93	7.34

For model number coding, see B-718.

No Preload Type of Precision Ball Screw

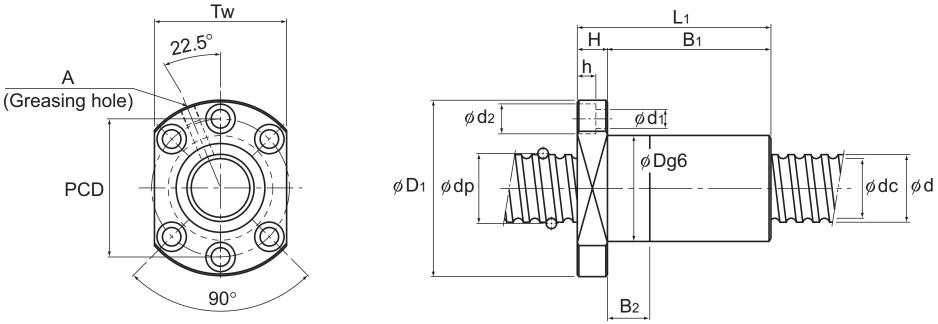
Screw shaft outer diameter	40
Lead	5 to 10



BNF

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity		
d	Ph		dp	dc	Rows x turns	Ca kN	C_{0a} kN	K N/µm	Outer diameter D	Flange diameter D_1
40	5	BNF 4005-3	40.75	37.2	2×1.5	13	42.3	400	67	101
		BNF 4005-4.5	40.75	37.2	3×1.5	18.5	63.5	600	67	101
		BNF 4005-6	40.75	37.2	4×1.5	23.7	84.7	780	67	101
	6	BNF 4006-2.5	41	36.4	1×2.5	15.3	44.1	350	70	104
		BNF 4006-5	41	36.4	2×2.5	27.7	88.1	690	70	104
		BNF 4006-7.5	41	36.4	3×2.5	39.2	132.3	1010	70	104
	8	BNF 4008-2.5	41.25	35.5	1×2.5	19.6	52.8	360	74	108
		BNF 4008-3	41.25	35.5	2×1.5	22.9	63.4	430	74	108
		BNF 4008-5	41.25	35.5	2×2.5	35.7	105.8	710	74	108
	10	BNF 4010-2.5	41.75	34.4	1×2.5	29	70.4	380	82	124
		BNF 4010-3	41.75	34.4	2×1.5	33.8	84.5	450	82	124
		BNF 4010-3.5	41.75	34.4	1×3.5	38.8	99	520	82	124
		BNF 4010-5	41.75	34.4	2×2.5	52.7	141.1	740	82	124
		DK 4010-3	41.75	34.4	3×1	29.8	69.3	380	62	104
		DK 4010-4	41.75	34.4	4×1	38.1	92.4	500	62	104

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
These models can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



DK

Unit: mm

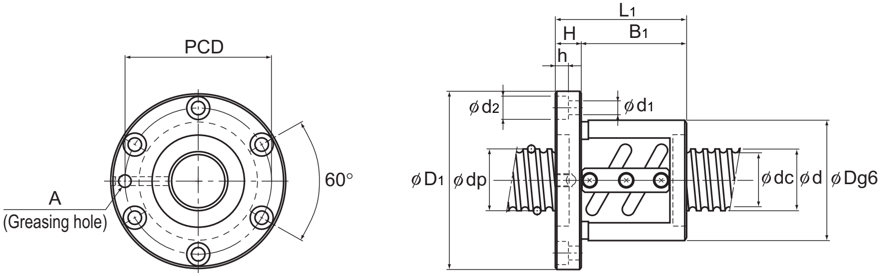
	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
	56	15	41	—	83	9	14	8.5	—	M6	1.97×10^{-2}	1.31	9.06
	66	15	51	—	83	9	14	8.5	—	M6	1.97×10^{-2}	1.46	9.06
	81	15	66	—	83	9	14	8.5	—	M6	1.97×10^{-2}	1.69	9.06
	48	15	33	—	86	9	14	8.5	—	M6	1.97×10^{-2}	1.32	8.82
	66	15	51	—	86	9	14	8.5	—	M6	1.97×10^{-2}	1.63	8.82
	84	15	69	—	86	9	14	8.5	—	M6	1.97×10^{-2}	1.94	8.82
	58	15	43	—	90	9	14	8.5	—	M6	1.97×10^{-2}	1.7	8.72
	71	15	56	—	90	9	14	8.5	—	M6	1.97×10^{-2}	1.97	8.72
	82	15	67	—	90	9	14	8.5	—	M6	1.97×10^{-2}	2.19	8.72
	73	18	55	—	102	11	17.5	11	—	M6	1.97×10^{-2}	2.86	8.22
	90	18	72	—	102	11	17.5	11	—	M6	1.97×10^{-2}	3.33	8.22
	83	18	65	—	102	11	17.5	11	—	M6	1.97×10^{-2}	3.14	8.22
	103	18	85	—	102	11	17.5	11	—	M6	1.97×10^{-2}	3.69	8.22
	83	18	65	15	82	11	17.5	11	79	PT 1/8	1.97×10^{-2}	3.14	8.22
	93	18	75	20	82	11	17.5	11	79	PT 1/8	1.97×10^{-2}	3.41	8.22

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

No Preload Type of Precision Ball Screw

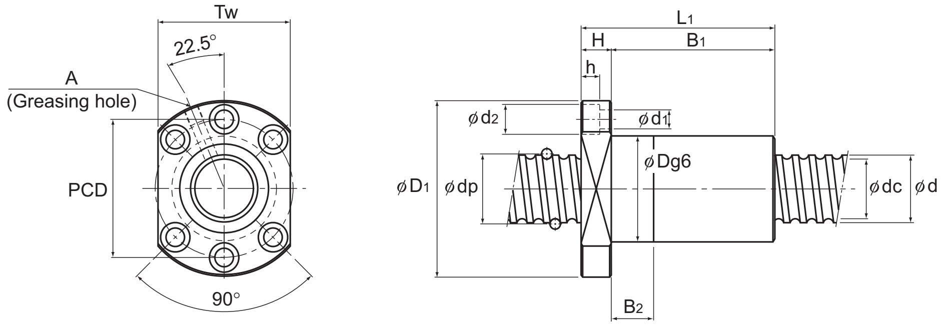
Screw shaft outer diameter	40
Lead	12 to 40



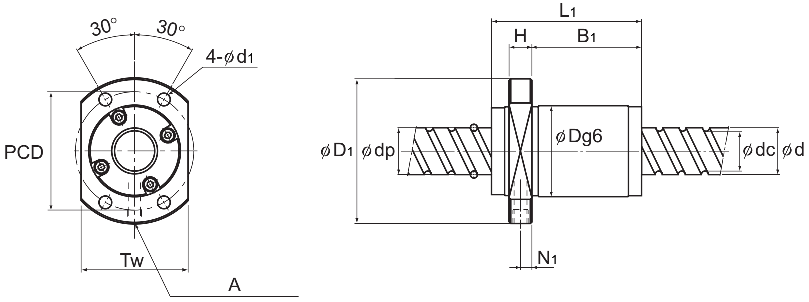
BNF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K		
						Ca kN	C_0a kN	N/µm	Outer diameter D	Flange diameter D_1
40	12	○ BNF 4012-2.5	42	34.1	1×2.5	33.9	79.2	390	84	126
		○ BNF 4012-3.5	42	34.1	1×3.5	45.4	110.7	530	84	126
		○ BNF 4012-5	42	34.1	2×2.5	61.6	158.3	750	84	126
		○ DK 4012-3	41.75	34.4	3×1	30.6	72.3	390	62	104
		○ DK 4012-4	41.75	34.4	4×1	39.2	96.4	520	62	104
	16	○ BNF 4016-5	42	34.1	2×2.5	61.4	158.8	740	84	126
		○ DK 4016-4	41.75	34.4	4×1	39.1	96.8	520	62	104
	20	○ DK 4020-3	41.75	34.7	3×1	29.4	69.3	750	62	104
	40	BLK 4040-2.8	41.75	35.2	1×2.8	28.2	68.9	430	73	114
		BLK 4040-3.6	41.75	35.2	2×1.8	38.7	99.2	550	73	114

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.
Large Lead Precision Ball Screw model BLK cannot be attached with seal.



DK



BLK

Unit: mm

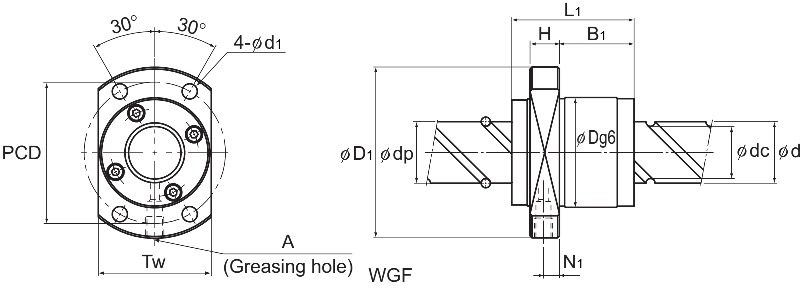
Nut dimensions											Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
83	18	65	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	3.31	8.12
95	18	77	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	3.66	8.12
119	18	101	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	4.36	8.12
90	18	72	20	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	1.77	8.5
103	18	85	25	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	1.95	8.5
152	22	130	—	104	11	17.5	11	—	—	M6	1.97×10^{-2}	5.52	8.55
120	18	102	30	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	2.19	8.83
123	18	105	30	82	11	17.5	11	79	—	PT 1/8	1.97×10^{-2}	2.23	9.03
125	17	96.5	—	93	11	—	—	84	8.5	M6	1.97×10^{-2}	3.4	9.01
85	17	56.5	—	93	11	—	—	84	8.5	M6	1.97×10^{-2}	2.48	9.01

For model number coding, see B-718.

Description of Each Option⇒A-815 **Dimensions⇒B-777**

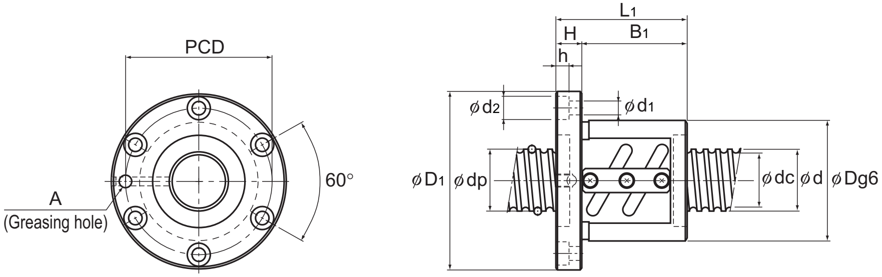
No Preload Type of Precision Ball Screw

Screw shaft outer diameter	40 to 45
Lead	6 to 80



Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity	Outer diameter	Flange diameter
d	Ph		dp	dc	Rows x turns	Ca kN	C_0a kN	K N/µm	D	D_1
40	80	WGF 4080-1	41.75	35.2	2×0.65	15	32.1	220	73	114
		WGF 4080-3	41.75	35.2	2×1.65	33.4	81.4	530	73	114
45	6	BNF 4506A-2.5	46	41.4	1×2.5	16	49.6	390	80	114
		BNF 4506A-5	46	41.4	2×2.5	29	99	750	80	114
		BNF 4506A-7.5	46	41.4	3×2.5	41.2	150	1100	80	114
	8	BNF 4508-2.5	46.25	40.6	1×2.5	20.7	59.5	400	85	127
		BNF 4508-5	46.25	40.6	2×2.5	37.4	118.6	770	85	127
		BNF 4508-7.5	46.25	40.6	3×2.5	53.1	178.4	1140	85	127
	10	BNF 4510-2.5	46.75	39.5	1×2.5	30.7	79.3	420	88	132
		BNF 4510-3	46.75	39.5	2×1.5	35.9	95.2	500	88	132
		BNF 4510-5	46.75	39.5	2×2.5	55.6	158.8	800	88	132
		BNF 4510-7.5	46.75	39.5	3×2.5	78.8	238.1	1190	88	132
	12	BNF 4512-5	47	39.2	2×2.5	65.2	178.4	820	90	130
	20	BNF 4520-1.5	47.7	37.9	1×1.5	44.2	99	350	98	142

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.
Model WGF cannot be attached with seal.



BNF

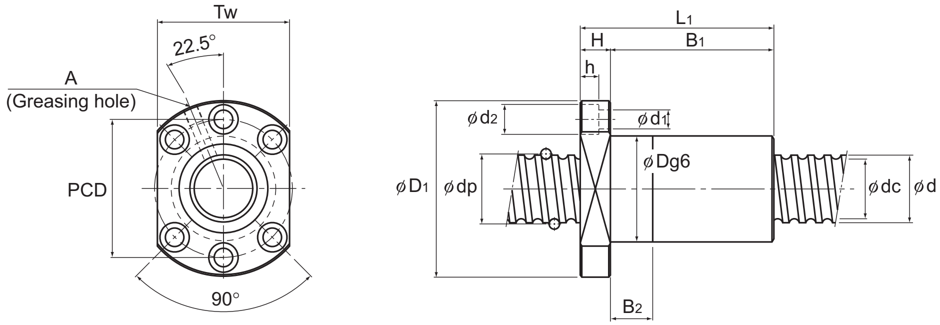
Unit: mm

Nut dimensions										Screw shaft inertia moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	$\text{kg}\cdot\text{cm}^2/\text{mm}$	kg	kg/m
79	17	50.5	93	11	—	—	74	8.5	M6	1.97×10^{-2}	2.34	9.38
159	17	130.5	93	11	—	—	74	8.5	M6	1.97×10^{-2}	4.18	9.38
53	15	38	96	9	14	8.5	—	—	PT 1/8	3.16×10^{-2}	1.76	11.31
71	15	56	96	9	14	8.5	—	—	PT 1/8	3.16×10^{-2}	2.18	11.31
89	15	74	96	9	14	8.5	—	—	PT 1/8	3.16×10^{-2}	2.59	11.31
68	18	50	105	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	2.76	11.21
92	18	74	105	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	3.42	11.21
116	18	98	105	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	4.09	11.21
81	18	63	110	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	3.43	10.65
94	18	76	110	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	3.83	10.65
111	18	93	110	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	4.35	10.65
141	18	123	110	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	5.26	10.65
119	18	101	110	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	4.74	10.54
95	20	75	120	11	17.5	11	—	—	PT 1/8	3.16×10^{-2}	5.04	10.37

For model number coding, see B-718.

No Preload Type of Precision Ball Screw

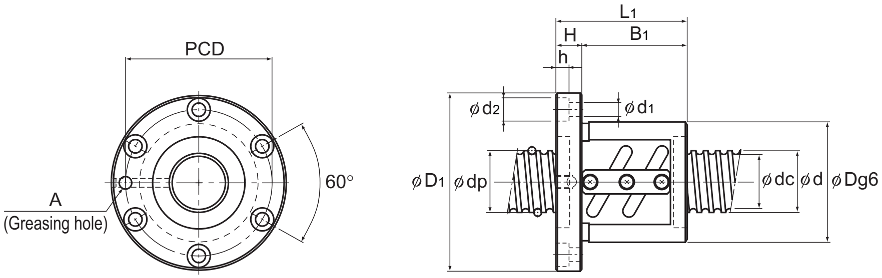
Screw shaft outer diameter	50
Lead	5 to 10



DK

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	 C0a kN	Rigidity K N/μm	Outer diameter D	Flange diameter D1
50	5	○ BNF 5005-4.5	50.75	47.2	3×1.5	20.2	79.5	710	80	114
	8	○ BNF 5008-2.5	51.25	45.5	1×2.5	21.6	66.2	430	87	129
		○ BNF 5008-5	51.25	45.5	2×2.5	39.1	132.3	840	87	129
		○ BNF 5008-7.5	51.25	45.5	3×2.5	55.4	198.9	1230	87	129
	10	○ BNF 5010-2.5	51.75	44.4	1×2.5	32	88.2	450	93	135
		○ BNF 5010-3	51.75	44.4	2×1.5	37.5	105.8	540	93	135
		○ BNF 5010-3.5	51.75	44.4	1×3.5	42.8	123.5	620	93	135
		○ BNF 5010-5	51.75	44.4	2×2.5	58.2	176.4	880	93	135
		○ BNF 5010-7.5	51.75	44.4	3×2.5	82.5	264.6	1290	93	135
		DK 5010-3	51.75	44.4	3×1	33.9	90.7	470	72	123
		DK 5010-4	51.75	44.4	4×1	43.4	120.5	610	72	123
		DK 5010-6	51.75	44.4	6×1	62.7	186.8	930	72	123

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.



BNF

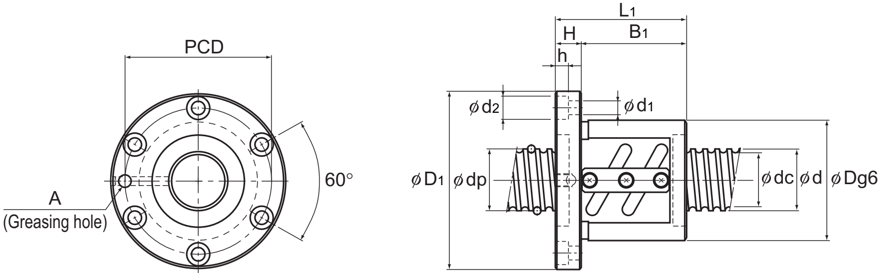
Unit: mm

Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
68	15	53	—	96	9	14	8.5	—	PT 1/8	4.82×10^{-2}	1.91	14.4
61	18	43	—	107	11	17.5	11	—	PT 1/8	4.82×10^{-2}	2.52	14.0
85	18	67	—	107	11	17.5	11	—	PT 1/8	4.82×10^{-2}	3.16	14.0
109	18	91	—	107	11	17.5	11	—	PT 1/8	4.82×10^{-2}	3.8	14.0
73	18	55	—	113	11	17.5	11	—	PT 1/8	4.82×10^{-2}	3.33	13.38
90	18	72	—	113	11	17.5	11	—	PT 1/8	4.82×10^{-2}	3.88	13.38
83	18	65	—	113	11	17.5	11	—	PT 1/8	4.82×10^{-2}	3.66	13.38
103	18	85	—	113	11	17.5	11	—	PT 1/8	4.82×10^{-2}	4.31	13.38
133	18	115	—	113	11	17.5	11	—	PT 1/8	4.82×10^{-2}	5.28	13.38
83	18	65	15	101	11	17.5	11	92	PT 1/8	4.82×10^{-2}	2.14	13.38
93	18	75	20	101	11	17.5	11	92	PT 1/8	4.82×10^{-2}	2.3	13.38
114	18	96	30	101	11	17.5	11	92	PT 1/8	4.82×10^{-2}	2.65	13.38

For model number coding, see B-718.

No Preload Type of Precision Ball Screw

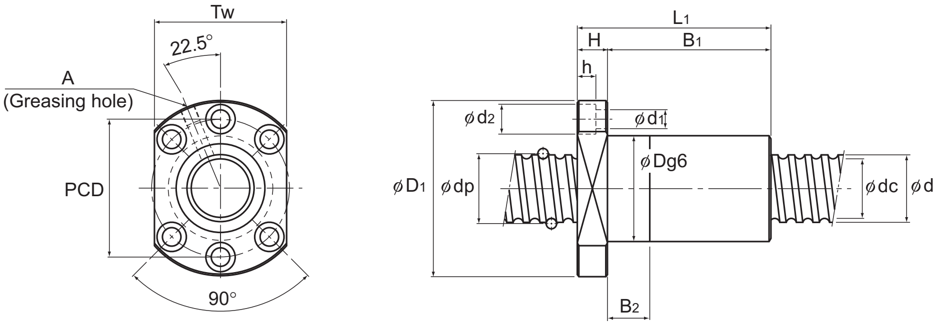
Screw shaft outer diameter	50
Lead	12 to 50



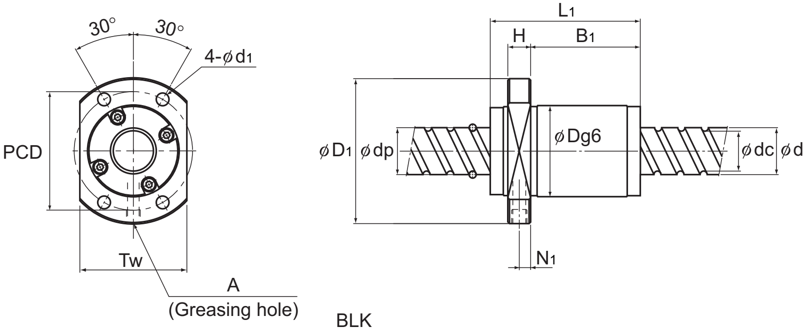
BNF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	 C0a kN	Rigidity K N/μm	Outer diameter D	Flange diameter D1
50	12	DK 5012-3	52.25	43.3	3×1	45.8	113	490	75	129
		DK 5012-4	52.25	43.3	4×1	58.6	150.6	640	75	129
		○ BNF 5012-2.5	52.25	43.3	1×2.5	43.4	109.8	470	100	146
		○ BNF 5012-3.5	52.25	43.3	1×3.5	58	153.9	640	100	146
		○ BNF 5012-5	52.25	43.3	2×2.5	78.8	220.5	910	100	146
	16	DK 5016-3	52.25	43.3	3×1	45.7	113.3	490	75	129
		DK 5016-4	52.25	43.3	4×1	58.5	151	640	75	129
		○ BNF 5016-2.5	52.7	42.9	1×2.5	72.6	183.3	620	105	152
		○ BNF 5016-5	52.7	42.9	2×2.5	132.3	366.5	1180	105	152
	20	DK 5020-3	52.25	43.6	3×1	44.2	108.8	470	75	129
		○ BNF 5020-2.5	52.7	42.9	1×2.5	72.5	183.3	620	105	152
	50	BLK 5050-2.8	52.2	44.1	1×2.8	42.2	107.8	530	90	135
		BLK 5050-3.6	52.2	44.1	2×1.8	57.8	155	670	90	135

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Those models marked with ○ can be attached with QZ Lubricator or the wiper ring.
For dimensions of the ball screw nut with either accessory being attached, see B-778.
Large Lead Precision Ball Screw model BLK cannot be attached with seal.



DK



BLK

Unit: mm

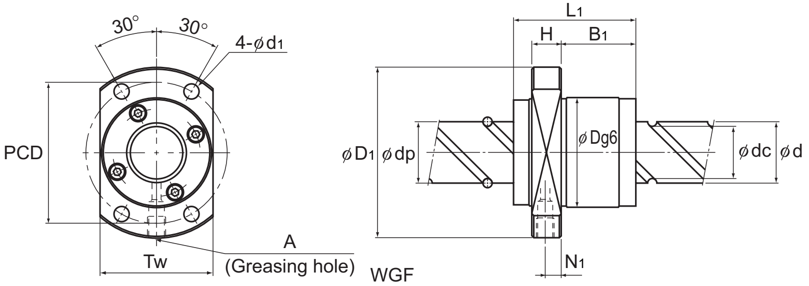
	Nut dimensions											Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L_1	H	B_1	B_2	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
	97	22	75	20	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	2.91	12.74
	110	22	88	25	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	3.16	12.74
	87	22	65	—	122	14	20	13	—	—	PT 1/8	4.82×10^{-2}	4.57	12.74
	99	22	77	—	122	14	20	13	—	—	PT 1/8	4.82×10^{-2}	5.05	12.74
	123	22	101	—	122	14	20	13	—	—	PT 1/8	4.82×10^{-2}	6.02	12.74
	111	22	89	25	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	3.18	13.41
	129	22	107	30	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	3.52	13.41
	116	25	91	—	128	14	20	13	—	—	PT 1/8	4.82×10^{-2}	6.98	12.5
	164	25	139	—	128	14	20	13	—	—	PT 1/8	4.82×10^{-2}	9.18	12.5
	136	28	108	30	105	14	20	13	98	—	PT 1/8	4.82×10^{-2}	3.94	13.8
	141	28	113	—	128	14	20	13	—	—	PT 1/8	4.82×10^{-2}	8.32	13.08
	156	20	122	—	112	14	—	—	104	10	M6	4.82×10^{-2}	6.18	14.08
	106	20	72	—	112	14	—	—	104	10	M6	4.82×10^{-2}	4.45	14.08

For model number coding, see B-718.

Description of Each Option⇒A-815 Dimensions⇒B-777

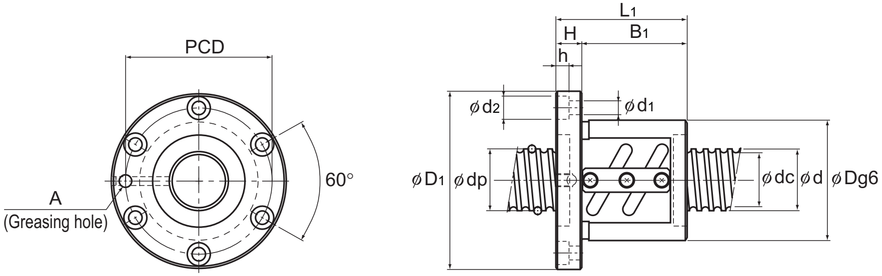
No Preload Type of Precision Ball Screw

Screw shaft outer diameter	50 to 55
Lead	10 to 100



Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity		
						Ca kN	C_0a kN	K N/µm	Outer diameter D	Flange diameter D_1
50	100	WGF 50100-1	52.2	44.1	2×0.65	22.4	50.1	270	90	135
		WGF 50100-3	52.2	44.1	2×1.65	49.9	127.2	650	90	135
55	10	BNF 5510-2.5	56.75	49.5	1×2.5	33.4	97	490	102	144
		BNF 5510-5	56.75	49.5	2×2.5	60.7	194	950	102	144
		BNF 5510-7.5	56.75	49.5	3×2.5	85.9	291.1	1390	102	144
	12	BNF 5512-2.5	57	49.2	1×2.5	39.3	108.8	500	105	147
		BNF 5512-3	57	49.2	2×1.5	46	131.3	590	105	147
		BNF 5512-3.5	57	49.2	1×3.5	52.4	152.9	680	105	147
		BNF 5512-5	57	49.2	2×2.5	71.3	218.5	960	105	147
		BNF 5512-7.5	57	49.2	3×2.5	100.9	327.3	1420	105	147
	16	BNF 5516-2.5	57.7	47.9	1×2.5	76.1	201.9	650	110	158
		BNF 5516-5	57.7	47.9	2×2.5	138.2	402.8	1280	110	158
	20	BNF 5520-2.5	57.7	47.9	1×2.5	76	201.9	660	112	158
		BNF 5520-5	57.7	47.9	2×2.5	138.2	403.8	1280	112	158

Note) The model numbers in dimmed type indicate semi-standard types. If desiring them, contact THK.
Model WGF cannot be attached with seal.



BNF

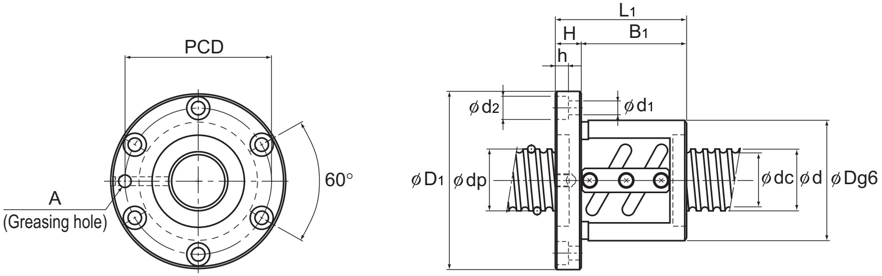
Unit: mm

Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
Overall length L_1	H	B_1	PCD	d_1	d_2	h	Tw	N_1	Greasing hole A	kg•cm²/mm	kg	kg/m
98	20	64	112	14	—	—	92	10	M6	4.82×10^{-2}	4.18	14.66
198	20	164	112	14	—	—	92	10	M6	4.82×10^{-2}	7.63	14.66
81	18	63	122	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	4.19	16.43
111	18	93	122	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	5.36	16.43
141	18	123	122	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	6.54	16.43
93	18	75	125	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	5.01	16.29
107	18	89	125	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	5.6	16.29
105	18	87	125	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	5.52	16.29
129	18	111	125	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	6.54	16.29
165	18	147	125	11	17.5	11	—	—	PT 1/8	7.05×10^{-2}	8.07	16.29
116	25	91	133	14	20	13	—	—	PT 1/8	7.05×10^{-2}	7.4	15.46
164	25	139	133	14	20	13	—	—	PT 1/8	7.05×10^{-2}	9.73	15.46
127	28	99	134	14	20	13	—	—	PT 1/8	7.05×10^{-2}	8.4	16.1
187	28	159	134	14	20	13	—	—	PT 1/8	7.05×10^{-2}	11.45	16.1

For model number coding, see B-718.

No Preload Type of Precision Ball Screw

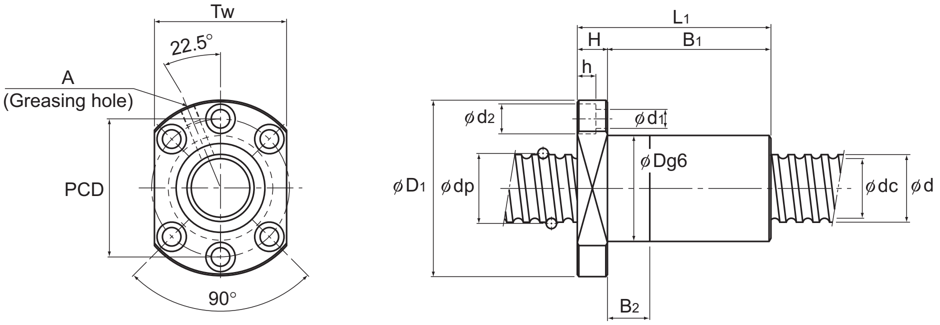
Screw shaft outer diameter	63
Lead	10 to 20



BNF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca	C_0a	Rigidity K	Outer diameter D	Flange diameter D_1
						kN	kN	N/μm		
63	10	BNF 6310-2.5	64.75	57.7	1×2.5	35.4	111.7	550	108	154
		BNF 6310-5	64.75	57.7	2×2.5	64.2	222.5	1050	108	154
		BNF 6310-7.5	64.75	57.7	3×2.5	90.9	334.2	1550	108	154
		DK 6310-4	64.75	57.7	4×1	49.5	160.7	780	85	146
		DK 6310-6	64.75	57.7	6×1	70.3	242.1	1140	85	146
	12	BNF 6312A-2.5	65.25	56.3	1×2.5	48.1	139.2	560	115	161
		BNF 6312A-5	65.25	56.3	2×2.5	87.4	278.3	1090	115	161
		DK 6312-3	65.25	56.3	3×1	51.9	147.4	600	90	146
		DK 6312-4	65.25	56.3	4×1	66.4	196.6	785	90	146
	16	BNF 6316-5	65.7	55.9	2×2.5	147	462.6	1420	122	184
	20	BNF 6320-2.5	65.7	55.9	1×2.5	81	231.3	740	122	180
		BNF 6320-5	65.7	55.9	2×2.5	147	463.5	1420	122	180
		DK 6320-3	65.7	55.9	3×1	83.5	229.3	1470	95	159

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



DK

Unit: mm

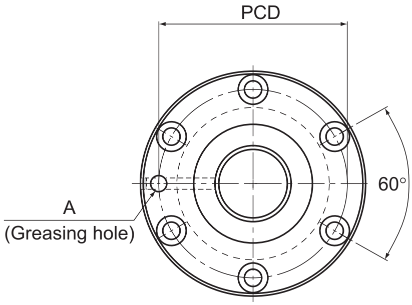
	Nut dimensions										Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L₁	H	B₁	B₂	PCD	d₁	d₂	h	Tw	Greasing hole A	kg•cm²/mm	kg	kg/m
	77	22	55	—	130	14	20	13	—	PT 1/8	1.21×10^{-1}	4.57	21.93
	107	22	85	—	130	14	20	13	—	PT 1/8	1.21×10^{-1}	5.77	21.93
	137	22	115	—	130	14	20	13	—	PT 1/8	1.21×10^{-1}	6.98	21.93
	97	22	75	20	122	14	20	13	110	PT 1/8	1.21×10^{-1}	3.28	21.93
	118	22	96	30	122	14	20	13	110	PT 1/8	1.21×10^{-1}	3.7	21.93
	87	22	65	—	137	14	20	13	—	PT 1/8	1.21×10^{-1}	5.8	21.14
	123	22	101	—	137	14	20	13	—	PT 1/8	1.21×10^{-1}	7.56	21.14
	98	22	76	20	122	14	20	13	110	PT 1/8	1.21×10^{-1}	3.71	21.14
	111	22	89	25	122	14	20	13	110	PT 1/8	1.21×10^{-1}	4.04	21.14
	160	24	136	—	152	18	26	17.5	—	PT 1/8	1.21×10^{-1}	11.82	20.85
	127	28	99	—	150	18	26	17.5	—	PT 1/8	1.21×10^{-1}	10.1	21.57
	187	28	159	—	150	18	26	17.5	—	PT 1/8	1.21×10^{-1}	13.58	21.57
	136	28	108	30	129	18	26	17.5	121	PT 1/8	1.21×10^{-1}	6.17	21.57

For model number coding, see B-718.

Description of Each Option⇒A-815 **Dimensions⇒B-777**

No Preload Type of Precision Ball Screw

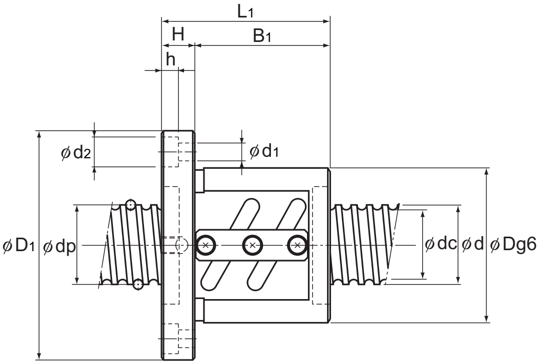
Screw shaft outer diameter	70 to 100
Lead	10 to 20



BNF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K		
						Ca kN	C_0a kN	N/μm	Outer diameter D	Flange diameter D_1
70	10	BNF 7010-2.5	71.75	64.5	1×2.5	36.8	123.5	590	125	167
		BNF 7010-5	71.75	64.5	2×2.5	66.9	247	1140	125	167
		BNF 7010-7.5	71.75	64.5	3×2.5	94.9	371.4	1680	125	167
	12	BNF 7012-2.5	72	64.2	1×2.5	43.5	139.2	600	128	170
		BNF 7012-5	72	64.2	2×2.5	78.9	278.3	1160	128	170
		BNF 7012-7.5	72	64.2	3×2.5	111.7	417.5	1710	128	170
	20	BNF 7020-5	72.7	62.9	2×2.5	153.9	514.5	1550	130	186
80	10	BNF 8010-2.5	81.75	75.2	1×2.5	38.9	141.1	650	130	176
		BNF 8010-5	81.75	75.2	2×2.5	70.6	283.2	1270	130	176
		BNF 8010-7.5	81.75	75.2	3×2.5	100	424.3	1860	130	176
	20	BNF 8020A-2.5	82.7	72.9	1×2.5	90.1	294	890	143	204
		BNF 8020A-5	82.7	72.9	2×2.5	163.7	589	1720	143	204
		BNF 8020A-7.5	82.7	72.9	3×2.5	231.6	883.2	2520	143	204
100	20	BNF 10020A-2.5	102.7	92.9	1×2.5	99	368.5	2110	170	243
		BNF 10020A-5	102.7	92.9	2×2.5	179.3	737	4080	170	243
		BNF 10020A-7.5	102.7	92.9	3×2.5	253.8	1105.4	6010	170	243

Note) The model numbers in dimmed type indicate semi-standard types.
If desiring them, contact THK.



BNF

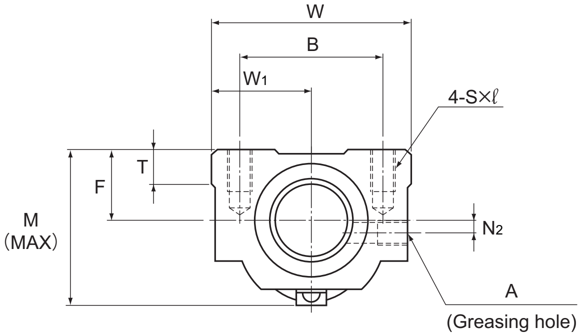
Unit: mm

	Nut dimensions								Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L₁	H	B₁	PCD	d₁	d₂	h	Greasing hole A	kg•cm²/mm	kg	kg/m
	81	18	63	145	11	17.5	11	PT 1/8	1.85×10^{-1}	5.8	27.4
	111	18	93	145	11	17.5	11	PT 1/8	1.85×10^{-1}	7.49	27.4
	141	18	123	145	11	17.5	11	PT 1/8	1.85×10^{-1}	9.19	27.4
	93	18	75	148	11	17.5	11	PT 1/8	1.85×10^{-1}	6.89	27.24
	129	18	111	148	11	17.5	11	PT 1/8	1.85×10^{-1}	9.08	27.24
	165	18	147	148	11	17.5	11	PT 1/8	1.85×10^{-1}	11.26	27.24
	185	28	157	158	18	26	17.5	PT 1/8	1.85×10^{-1}	14.5	27.0
	77	22	55	152	14	20	13	PT 1/8	3.16×10^{-1}	5.9	36.26
	107	22	85	152	14	20	13	PT 1/8	3.16×10^{-1}	7.53	36.26
	137	22	115	152	14	20	13	PT 1/8	3.16×10^{-1}	9.15	36.26
	127	28	99	172	18	26	17.5	PT 1/8	3.16×10^{-1}	12.68	35.81
	187	28	159	172	18	26	17.5	PT 1/8	3.16×10^{-1}	17.12	35.81
	247	28	219	172	18	26	17.5	PT 1/8	3.16×10^{-1}	21.56	35.81
	131	32	99	205	22	32	21.5	PT 1/8	7.71×10^{-1}	18.28	57.13
	191	32	159	205	22	32	21.5	PT 1/8	7.71×10^{-1}	24.2	57.13
	251	32	219	205	22	32	21.5	PT 1/8	7.71×10^{-1}	30.12	57.13

For model number coding, see B-718.

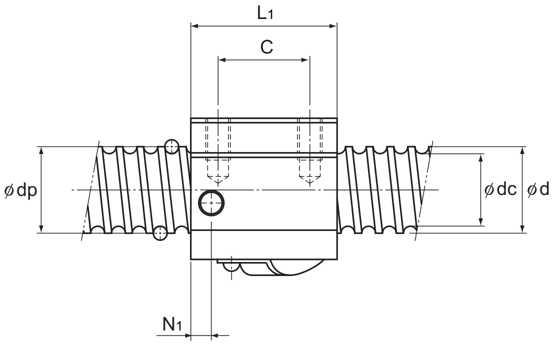
No Preload Type of Precision Ball Screw (Square Nut)

Screw shaft outer diameter	14 to 45
Lead	4 to 12



BNT

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity K
						Ca kN	C0a kN	N/µm
14	4	BNT 1404-3.6	14.4	11.5	1×3.65	6.8	12.6	190
	5	BNT 1405-2.6	14.5	11.2	1×2.65	7.2	12.6	150
16	5	BNT 1605-2.6	16.75	13.5	1×2.65	7.8	14.7	170
18	8	BNT 1808-3.6	19.3	14.4	1×3.65	18.2	34.4	270
20	5	BNT 2005-2.6	20.5	17.2	1×2.65	8.7	18.3	200
	10	BNT 2010-2.6	21.25	16.4	1×2.65	14.7	27.8	220
25	5	BNT 2505-2.6	25.5	22.2	1×2.65	9.6	23	240
	10	BNT 2510-5.3	26.8	20.2	2×2.65	43.4	92.8	520
28	6	BNT 2806-2.6	28.5	25.2	1×2.65	10.1	25.8	270
		BNT 2806-5.3	28.5	25.2	2×2.65	18.3	51.6	510
32	10	BNT 3210-2.6	33.75	27.2	1×2.65	27.3	59.5	330
		BNT 3210-5.3	33.75	27.2	2×2.65	49.6	118.9	640
36	10	BNT 3610-2.6	37	30.5	1×2.65	28.7	65.6	360
		BNT 3610-5.3	37	30.5	2×2.65	52.1	131.2	700
45	12	BNT 4512-5.3	46.5	39.2	2×2.65	68.1	186.7	860



BNT

Unit: mm

Nut dimensions												Screw shaft inertial moment/mm	Nut mass	Shaft mass
Width	Center height	Overall length	Mounting hole								Greasing hole			
W	F	L_1	B	C	S×ℓ	W_1	T	M	N_1	N_2	A	kg·cm²/mm	kg	kg/m
34	13	35	26	22	M4×7	17	6	30	6	2	M6	2.96×10^{-4}	0.15	0.93
34	13	35	26	22	M4×7	17	6	31	6	2	M6	2.96×10^{-4}	0.15	0.92
42	16	36	32	22	M5×8	21	21.5	32.5	6	2	M6	5.05×10^{-4}	0.3	1.24
48	17	56	35	35	M6×10	24	10	44	8	3	M6	8.09×10^{-4}	0.47	1.46
48	17	35	35	22	M6×10	24	9	39	5	3	M6	1.23×10^{-3}	0.28	2.06
48	18	58	35	35	M6×10	24	9	46	10	2	M6	1.23×10^{-3}	0.5	1.99
60	20	35	40	22	M8×12	30	9.5	45	7	5	M6	3.01×10^{-3}	0.41	3.35
60	23	94	40	60	M8×12	30	10	55	10	—	M6	3.01×10^{-3}	1.18	2.79
60	22	42	40	18	M8×12	30	10	50	8	—	M6	4.74×10^{-3}	0.81	4.42
60	22	67	40	40	M8×12	30	10	50	8	—	M6	4.74×10^{-3}	0.78	4.42
70	26	64	50	45	M8×12	35	12	62	10	—	M6	8.08×10^{-3}	1.3	4.98
70	26	94	50	60	M8×12	35	12	62	10	—	M6	8.08×10^{-3}	2.0	4.98
86	29	64	60	45	M10×16	43	17	67	11	—	M6	1.29×10^{-2}	1.8	6.54
86	29	96	60	60	M10×16	43	17	67	11	—	M6	1.29×10^{-2}	2.4	6.54
100	36	115	75	75	M12×20	50	20.5	80	13	—	M6	3.16×10^{-2}	4.1	10.56

For model number coding, see B-718.

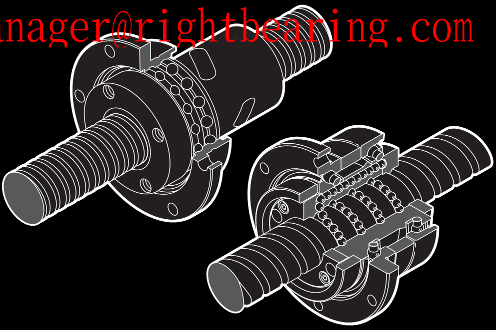
Description of Each Option⇒A-815 Dimensions⇒B-777

Model number coding

Model number coding

BNFN 20 05 L -5 RR G0 + 620L C5 A

- BNFN: Model number
- 20: Screw shaft outer diameter (in mm)
- 05: Lead (in mm)
- L: Threading direction
  (No symbol: right-hand thread L: left-hand thread
  RL: right-hand and left-hand threads are formed on one screw shaft)
- -5: No. of circuits (Rows × turns)
- RR: Seal symbol
  (Labyrinth seal attached to both ends)
- G0: Symbol for clearance in the axial direction
- 620L: Overall screw shaft length (in mm)
- C5: Accuracy symbol
- A: Standard Ball Screw assembly
  (A,B: Unfinished Shaft Ends
  Y: Finished Shaft Ends)



Precision Rotary Ball Screw
Model DIR and BLR

Ball Screw

B Product Specifications

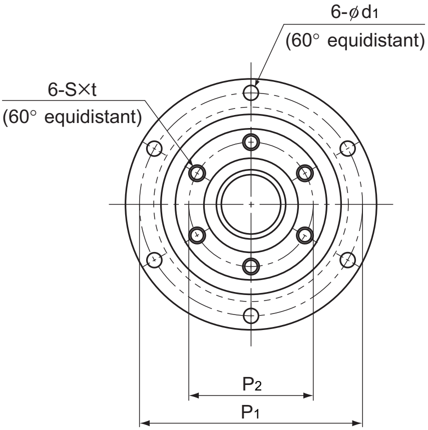
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model DIR Standard-Lead Rotary-Nut Ball Screw



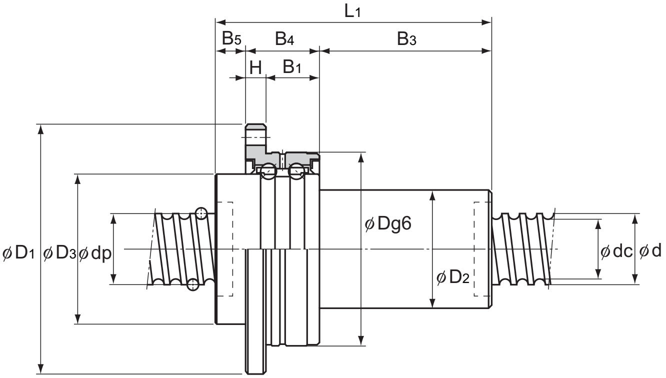
Model No.	Screw shaft outer diameter	Thread minor diameter	Lead	Ball center-to-center diameter	Basic load rating		Rigidity				
	d	dc	Ph	dp	C_a kN	C_{0a} kN	K N/μm	Outer diameter D	Flange diameter D_1	Overall length L_1	D_3 h7
DIR 1605-6	16	13.2	5	16.75	7.4	13	310	48	64	79	36
DIR 2005-6	20	17.2	5	20.75	8.5	17.3	310	56	72	80	43.5
DIR 2505-6	25	22.2	5	25.75	9.7	22.6	490	66	86	88	52
DIR 2510-4		21.6	10	26	9	18	330	66	86	106	52
DIR 3205-6	32	29.2	5	32.75	11.1	30.2	620	78	103	86	63
DIR 3206-6		28.4	6	33	14.9	37.1	630	78	103	97	63
DIR 3210-6		26.4	10	33.75	25.7	52.2	600	78	103	131	63
DIR 3610-6	36	30.5	10	37.75	28.8	63.8	710	92	122	151	72
DIR 4010-6	40	34.7	10	41.75	29.8	69.3	750	100	130	142	79.5
DIR 4012-6		34.4	12	41.75	30.6	72.3	790	100	130	167	79.5

Model number coding

DIR2005-6 RR G0 +520L C1

DIR2005-6: Model number
RR: Seal symbol (*1)
G0: Symbol for clearance in the axial direction (*2)
+520L: Overall screw shaft length (in mm)
C1: Accuracy symbol (*3)

(*1) See A-816. (*2) See A-685. (*3) See A-678.



Unit: mm

Ball screw dimensions												Support bearing basic load rating		Nut inertial moment	Nut mass	Shaft mass
												Ca	C_0a			
	D_2	B_5	B_4	B_3	P_1	P_2	H	B_1	S	t	d_1	kN	kN	kg•cm²	kg	kg/m
	30	8	21	50	56	30	6	15	M4	6	4.5	8.7	10.5	0.61	0.49	1.24
	34	9	21	50	64	36	6	15	M5	8	4.5	9.7	13.4	1.18	0.68	2.05
	40	13	25	50	75	43	7	18	M6	10	5.5	12.7	18.2	2.65	1.07	3.34
	40	11	25	70	75	43	7	18	M6	10	5.5	12.7	18.2	2.84	1.16	3.52
	46	11	25	50	89	53	8	17	M6	10	6.6	13.6	22.3	5.1	1.39	5.67
	48	11	25	61	89	53	8	17	M6	10	6.6	13.6	22.3	5.68	1.54	5.47
	54	11	25	95	89	53	8	17	M6	10	6.6	13.6	22.3	8.13	2.16	4.98
	58	14	33	104	105	61	10	23	M8	12	9	20.4	32.3	14.7	3.25	6.51
	62	14	33	95	113	67	10	23	M8	12	9	21.5	36.8	20.6	3.55	8.22
	62	14	33	120	113	67	10	23	M8	12	9	21.5	36.8	22.5	3.9	8.5

Note) The rigidity values in the table represent spring constants each obtained from the load and the elastic deformation when providing a preload 10% of the basic dynamic load rating (Ca) and applying an axial load three times greater than the preload.

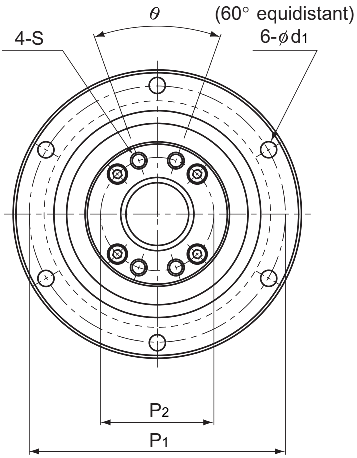
These values do not include the rigidity of the components related to mounting the ball screw nut. Therefore, it is normally appropriate to regard roughly 80% of the value in the table as the actual value.

If the applied preload (Fa_0) is not 0.1 Ca, the rigidity value (K_N) is obtained from the following equation.

$$K_N = K\left(\frac{Fa_0}{0.1Ca}\right)^{\frac{1}{3}}$$

K: Rigidity value in the dimensional table.

Model BLR Large Lead Rotary-Nut Precision Ball Screw



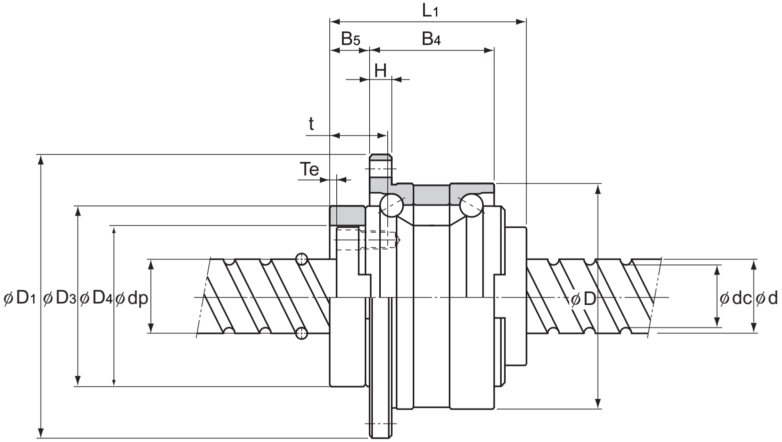
Model No.	Screw shaft outer diameter d	Thread minor diameter dc	Lead Ph	Ball center-to-center diameter dp	Basic load rating Ca kN	 C0a kN	Outer diameter D	Flange diameter D1	Overall length L1	D3
BLR 1616-3.6	16	13.7	16	16.65	7.1	14.3	$52^{\ 0}_{-0.007}$	68	43.5	$40^{\ 0}_{-0.025}$
BLR 2020-3.6	20	17.5	20	20.75	11.1	24.7	$62^{\ 0}_{-0.007}$	78	54	$50^{\ 0}_{-0.025}$
BLR 2525-3.6	25	22	25	26	16.6	38.7	$72^{\ 0}_{-0.007}$	92	65	$58^{\ 0}_{-0.03}$
BLR 3232-3.6	32	28.3	32	33.25	23.7	59.5	$80^{\ 0}_{-0.007}$	105	80	$66^{\ 0}_{-0.03}$
BLR 3636-3.6	36	31.7	36	37.4	30.8	78	$100^{\ 0}_{-0.008}$	130	93	$80^{\ 0}_{-0.03}$
BLR 4040-3.6	40	35.2	40	41.75	38.7	99.2	$110^{\ 0}_{-0.008}$	140	98	$90^{\ 0}_{-0.035}$
BLR 5050-3.6	50	44.1	50	52.2	57.8	155	$120^{\ 0}_{-0.008}$	156	126	$100^{\ 0}_{-0.035}$

Model number coding

BLR2020-3.6 K UU G1 +1000L C5

- BLR2020-3.6: Model number
- K: Flange orientation symbol (*1)
- UU: Symbol for support bearing seal (*2)
- G1: Symbol for clearance in the axial direction (*3)
- +1000L: Overall screw shaft length (in mm)
- C5: Accuracy symbol (*4)

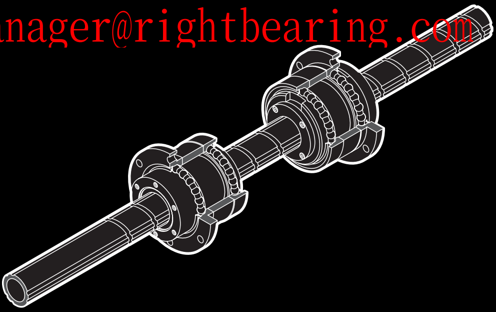
(*1) See A-778 (*2) UU: Seal attached on both ends No symbol: Without seal (*3) See A-685 (*4) See A-678



Unit: mm

	Ball screw dimensions											Support bearing basic load rating		Nut inertial moment	Nut mass	Shaft mass
	D_4	H	B_4	B_5	Te	P_1	P_2	S	t	d_1	θ°	Ca	C_0a			
												kN	kN	kg•cm²	kg	kg/m
	$32^{+0.025}_{0}$	5	27.5	9	2	60	25	M4	12	4.5	40	19.4	19.2	0.48	0.38	1.41
	$39^{+0.025}_{0}$	6	34	11	2	70	31	M5	16	4.5	40	26.8	29.3	1.44	0.68	2.25
	$47^{+0.025}_{0}$	8	43	12.5	3	81	38	M6	19	5.5	40	28.2	33.3	3.23	1.1	3.52
	$58^{+0.03}_{0}$	9	55	14	3	91	48	M6	19	6.6	40	30	39	6.74	1.74	5.83
	$66^{+0.03}_{0}$	11	62	17	3	113	54	M8	22	9	40	56.4	65.2	16.8	3.2	7.34
	$73^{+0.03}$	11	68	16.5	3	123	61	M8	22	9	50	59.3	74.1	27.9	3.95	9.01
	$90^{+0.035}_{0}$	12	80	25	4	136	75	M10	28	11	50	62.2	83	58.2	6.22	14.08

Description of Each Option⇒A-815 Dimensions⇒B-777



Precision Ball Screw/Spline

Models BNS-A, BNS, NS-A and NS

Ball Screw

B Product Specifications

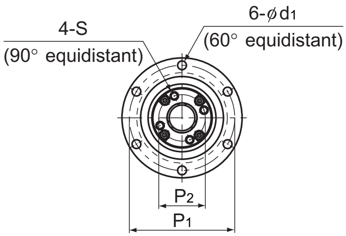
Dimensional Drawing, Dimensional Table

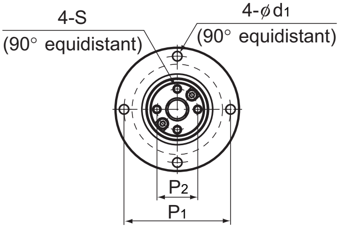
A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model BNS-A Compact Type: Straight-curved Motion





Models BNS 0812A and 1015A

Ball screw unit

Model No.	Screw shaft outer diameter	Screw shaft inner diameter	Lead	Ball screw dimensions								
				Basic load rating		Ball center-to-center diameter	Thread minor diameter	Outer diameter				
				Ca	C_{0a}			D	Flange diameter	Overall length	D_3	D_4
	d	db	Ph	kN	kN	dp	dc	g6	D_1	L_1	h7	H7
BNS 0812A	8	—	12	1.1	1.8	8.4	6.6	32	44	28.5	22	19
BNS 1015A	10	—	15	1.7	2.7	10.5	8.3	36	48	34.5	26	23
BNS 1616A	16	11	16	3.9	7.2	16.65	13.7	48	64	40	36	32
BNS 2020A	20	14	20	6.1	12.3	20.75	17.5	56	72	48	43.5	39
BNS 2525A	25	18	25	9.1	19.3	26	22	66	86	58	52	47
BNS 3232A	32	23	32	13	29.8	33.25	28.3	78	103	72	63	58
BNS 4040A	40	29	40	21.4	49.7	41.75	35.2	100	130	88	79.5	73

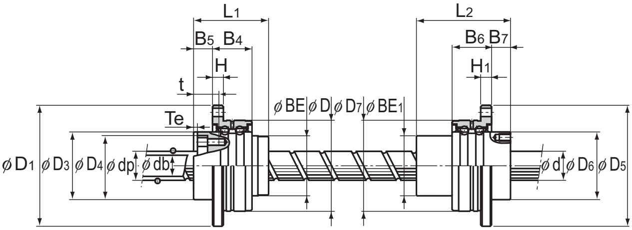
Ball spline

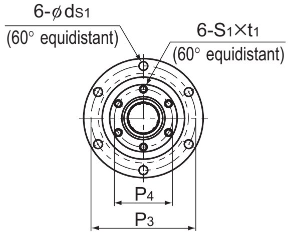
Model No.	Ball spline dimensions									
	Basic load rating		Static permissible moment	Basic torque rating		Outer diameter				
	C	C_0	M_A	C_T	C_{0T}	D_7	Flange diameter	Overall length	D_6	
	kN	kN	N-m	N-m	N-m	g6	D_5	L_2	h7	BE_1
BNS 0812A	1.5	2.6	5.9	2	2.9	32	44	25	24	16
BNS 1015A	2.7	4.9	15.7	3.9	7.8	36	48	33	28	21
BNS 1616A	7.1	12.6	67.6	31.4	34.3	48	64	50	36	31
BNS 2020A	10.2	17.8	118	56.8	55.8	56	72	63	43.5	35
BNS 2525A	15.2	25.8	210	105	103	66	86	71	52	42
BNS 3232A	20.5	34	290	180	157	78	103	80	63	52
BNS 4040A	37.8	60.5	687	418	377	100	130	100	79.5	64

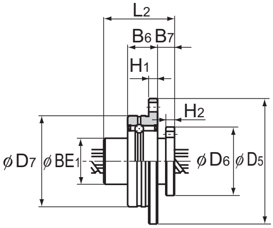
Model number coding

BNS2020A +500L

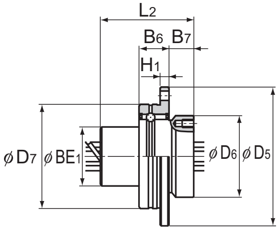
Model number — Overall shaft length (in mm)



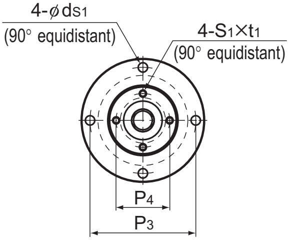




Model BNS 0812A



Model BNS 1015A



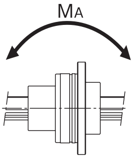
Models BNS 0812A and 1015A

Unit: mm

	BE	H	B_4	B_5	Te	P_1	P_2	S	t	d_1	Support bearing basic load rating Ca kN	Support bearing basic load rating C_0a kN	Nut inertial moment kg•cm²	Screw shaft inertial moment/mm J kg•cm²/mm	Nut mass kg	Shaft mass kg/m
	19	3	10.5	7	1.5	38	14.5	M2.6	10	3.4	0.8	0.5	0.03	3.16×10^{-5}	0.08	0.35
	23	3	10.5	8	1.5	42	18	M3	11.5	3.4	0.9	0.7	0.08	7.71×10^{-5}	0.15	0.52
	32	6	21	10	2	56	25	M4	13.5	4.5	8.7	10.5	0.35	3.92×10^{-4}	0.31	0.8
	39	6	21	11	2.5	64	31	M5	16.5	4.5	9.7	13.4	0.85	9.37×10^{-4}	0.54	1.21
	47	7	25	13	3	75	38	M6	20	5.5	12.7	18.2	2.12	2.2×10^{-3}	0.88	1.79
	58	8	25	14	3	89	48	M6	21	6.6	13.6	22.3	5.42	5.92×10^{-3}	1.39	2.96
	73	10	33	16.5	3	113	61	M8	24.5	9	21.5	36.8	17.2	1.43×10^{-2}	3.16	4.51

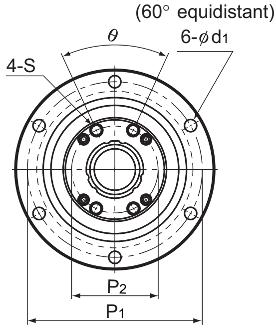
Unit: mm

	H_1	B_6	B_7	H_2	P_3	P_4	$S_1\times t_1$	d_{s1}	Support bearing basic load rating C kN	Support bearing basic load rating C_0 kN	Nut inertial moment kg•cm²	Nut mass kg
	3	10.5	6	3	38	19	M2.6×3	3.4	0.6	0.2	0.03	0.08
	3	10.5	9	—	42	23	M3×4	3.4	0.8	0.3	0.08	0.13
	6	21	10	—	56	30	M4×6	4.5	6.7	6.4	0.44	0.35
	6	21	12	—	64	36	M5×8	4.5	7.4	7.8	0.99	0.51
	7	25	13	—	75	44	M5×8	5.5	9.7	10.6	2.2	0.79
	8	25	17	—	89	54	M6×10	6.6	10.5	12.5	5.17	1.25
	10	33	20	—	113	68	M6×10	9	16.5	20.7	16.1	2.51



Description of Each Option⇒A-815 Dimensions⇒B-777

Model BNS Heavy-load Type: Straight-curved Motion



Ball screw unit

Model No.	Screw shaft outer diameter d	Screw shaft inner diameter db	Lead Ph	Ball screw dimensions Basic load rating Ca kN	 C0a kN	 Ball center-to-center diameter dp	 Thread minor diameter dc	 Outer diameter D	 Flange diameter D1	 Overall length L1	 D3 h7
BNS 1616	16	11	16	3.9	7.2	16.65	13.7	52 $^{0}_{-0.007}$	68	43.5	40
BNS 2020	20	14	20	6.1	12.3	20.75	17.5	62 $^{0}_{-0.007}$	78	54	50
BNS 2525	25	18	25	9.1	19.3	26	22	72 $^{0}_{-0.007}$	92	65	58
BNS 3232	32	23	32	13	29.8	33.25	28.3	80 $^{0}_{-0.007}$	105	80	66
BNS 4040	40	29	40	21.4	49.7	41.75	35.2	110 $^{0}_{-0.008}$	140	98	90
BNS 5050	50	36	50	31.8	77.6	52.2	44.1	120 $^{0}_{-0.008}$	156	126	100

Ball spline

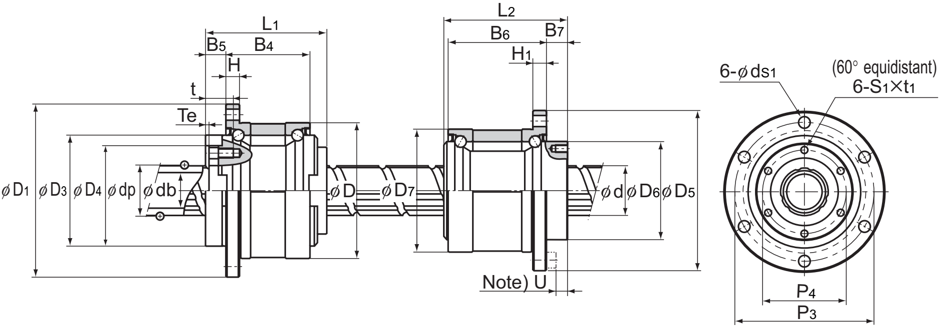
Model No.	Ball spline dimensions Basic load rating C kN	 C0 kN	 Static permissible moment MA N-m	 Basic torque rating CT N-m	 C0T N-m	 Outer diameter D7	 Flange diameter D5	 Overall length L2
BNS 1616	7.1	12.6	67.6	31.4	34.3	52 $^{0}_{-0.007}$	68	50
BNS 2020	10.2	17.8	118	56.8	55.8	56 $^{0}_{-0.007}$	72	63
BNS 2525	15.2	25.8	210	105	103	62 $^{0}_{-0.007}$	78	71
BNS 3232	20.5	34	290	180	157	80 $^{0}_{-0.007}$	105	80
BNS 4040	37.8	60.5	687	418	377	100 $^{0}_{-0.008}$	130	100
BNS 5050	60.9	94.5	1340	842	768	120 $^{0}_{-0.008}$	156	125

Note) Dimension U indicates the length from the head of the hexagonal-socket-head type bolt to the ball screw nut end.

Model number coding

BNS2525 +600L

Model number Overall shaft length (in mm)

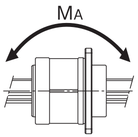


Unit: mm

D$_4$ H7	H	B$_4$	B$_5$	Te	P$_1$	P$_2$	S	t	d$_1$	θ°	Support bearing basic load rating Ca kN	C$_0$a kN	Nut inertial moment kg·cm²	Screw shaft inertial moment/mm J kg·cm²/mm	Nut mass kg	Shaft mass kg/m
32	5	27.5	9	2	60	25	M4	12	4.5	40	19.4	19.2	0.48	3.92×10^{-4}	0.38	0.8
39	6	34	11	2	70	31	M5	16	4.5	40	26.8	29.3	1.44	9.37×10^{-4}	0.68	1.21
47	8	43	12.5	3	81	38	M6	19	5.5	40	28.2	33.3	3.23	2.2×10^{-3}	1.1	1.79
58	9	55	14	3	91	48	M6	19	6.6	40	30	39	6.74	5.92×10^{-3}	1.74	2.96
73	11	68	16.5	3	123	61	M8	22	9	50	59.3	74.1	27.9	1.43×10^{-2}	3.95	4.51
90	12	80	25	4	136	75	M10	28	11	50	62.2	83	58.2	3.52×10^{-2}	6.22	7.16

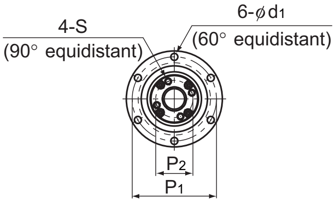
Unit: mm

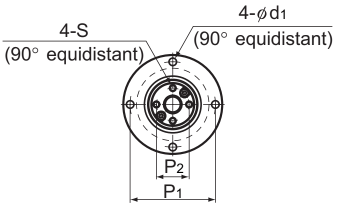
D$_6$ h7	H$_1$	B$_6$	B$_7$	P$_3$	P$_4$	S$_1$×t$_1$	d$_{s1}$	U	Support bearing basic load rating C kN	C$_0$ kN	Nut inertial moment kg·cm²	Nut mass kg
39.5	5	37	10	60	32	M5×8	4.5	5	12.7	11.8	0.52	0.51
43.5	6	48	12	64	36	M5×8	4.5	7	16.2	15.5	0.87	0.7
53	6	55	13	70	45	M6×8	4.5	8	17.6	18	1.72	0.93
65.5	9	60	17	91	55	M6×10	6.6	10	20.1	24	5.61	1.8
79.5	11	74	23	113	68	M6×10	9	13	37.2	42.5	14.7	3.9
99.5	12	97	25	136	85	M10×15	11	13	41.6	54.1	62.5	6.7



Description of Each Option⇒A-815 Dimensions⇒B-777

Model NS-A Compact Type: Straight Motion





Models NS 0812A and 1015A

Ball screw unit

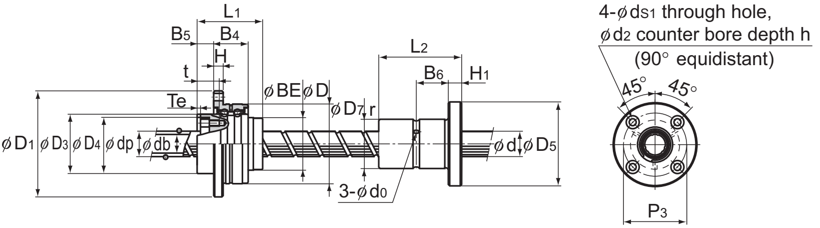
Model No.	Screw shaft outer diameter	Screw shaft inner diameter	Lead	Ball screw dimensions								
				Basic load rating		Ball center-to-center diameter	Thread minor diameter	Outer diameter	Flange diameter	Overall length		
	d	db	Ph	C_a kN	C_{0a} kN	dp	dc	D g6	D_1	L_1	D_3 h7	D_4 H7
NS 0812A	8	—	12	1.1	1.8	8.4	6.6	32	44	28.5	22	19
NS 1015A	10	—	15	1.7	2.7	10.5	8.3	36	48	34.5	26	23
NS 1616A	16	11	16	3.9	7.2	16.65	13.7	48	64	40	36	32
NS 2020A	20	14	20	6.1	12.3	20.75	17.5	56	72	48	43.5	39
NS 2525A	25	18	25	9.1	19.3	26	22	66	86	58	52	47
NS 3232A	32	23	32	13	29.8	33.25	28.3	78	103	72	63	58
NS 4040A	40	29	40	21.4	49.7	41.75	35.2	100	130	88	79.5	73

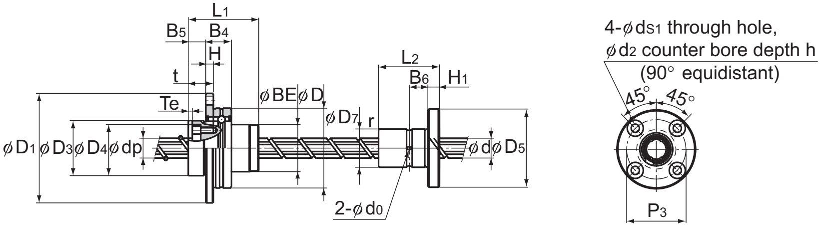
Ball spline

Model No.	Ball spline dimensions						
	Basic load rating		Static permissible moment	Basic torque rating		Outer diameter	Flange diameter
	C kN	C_0 kN	M_A N-m	C_T N-m	C_{0T} N-m	D_7	$D_5\ ^{0}_{-0.2}$
NS 0812A	1.5	2.6	5.9	2	2.9	$16\ ^{0}_{-0.011}$	32
NS 1015A	2.8	4.9	15.7	3.9	7.8	$21\ ^{0}_{-0.013}$	42
NS 1616A	7.1	12.6	67.6	31.4	34.3	$31\ ^{0}_{-0.013}$	51
NS 2020A	10.2	17.8	118	56.8	55.8	$35\ ^{0}_{-0.016}$	58
NS 2525A	15.2	25.8	210	105	103	$42\ ^{0}_{-0.016}$	65
NS 3232A	20.5	34	290	180	157	$49\ ^{0}_{-0.016}$	77
NS 4040A	37.8	60.5	687	418	377	$64\ ^{0}_{-0.019}$	100

Model number coding

$$\underbrace{\textbf{NS2020A}}_{\text{Model number}}\ \underbrace{\textbf{+500L}}_{\text{Overall shaft length (in mm)}}$$





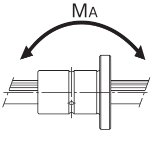
Models NS 0812A and 1015A

Unit: mm

	BE	H	B4	B5	Te	P1	P2	S	t	d1	Support bearing basic load rating Ca kN	Support bearing basic load rating C0a kN	Nut inertial moment kg•cm²	Screw shaft inertial moment/mm J kg•cm²/mm	Nut mass kg	Shaft mass kg/m
	19	3	10.5	7	1.5	38	14.5	M2.6	10	3.4	0.8	0.5	0.03	3.16×10^{-5}	0.08	0.35
	23	3	10.5	8	1.5	42	18	M3	11.5	3.4	0.9	0.7	0.08	7.71×10^{-5}	0.15	0.52
	32	6	21	10	2	56	25	M4	13.5	4.5	8.7	10.5	0.35	3.92×10^{-4}	0.31	0.8
	39	6	21	11	2.5	64	31	M5	16.5	4.5	9.7	13.4	0.85	9.37×10^{-4}	0.54	1.21
	47	7	25	13	3	75	38	M6	20	5.5	12.7	18.2	2.12	2.2×10^{-3}	0.88	1.79
	58	8	25	14	3	89	48	M6	21	6.6	13.6	22.3	5.42	5.92×10^{-3}	1.39	2.96
	73	10	33	16.5	3	113	61	M8	24.5	9	21.5	36.8	17.2	1.43×10^{-2}	3.16	4.51

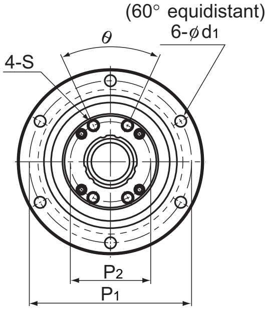
Unit: mm

	Overall length L2	H1	B6	r	Greasing hole d0	P3	Mounting hole ds1	Mounting hole d2	Mounting hole h	Nut mass kg
	25	5	7.5	0.5	1.5	24	3.4	6.5	3.3	0.04
	33	6	10.5	0.5	1.5	32	4.5	8	4.4	0.09
	50 $^{0}_{-0.2}$	7	18	0.5	2	40	4.5	8	4.4	0.23
	63 $^{0}_{-0.2}$	9	22.5	0.5	2	45	5.5	9.5	5.4	0.33
	71 $^{0}_{-0.3}$	9	26.5	0.5	3	52	5.5	9.5	5.4	0.45
	80 $^{0}_{-0.3}$	10	30	0.5	3	62	6.6	11	6.5	0.58
	100 $^{0}_{-0.3}$	14	36	0.5	4	82	9	14	8.6	1.46



Description of Each Option⇒A-815 Dimensions⇒B-777

Model NS Heavy-load Type: Linear Motion



Ball screw unit

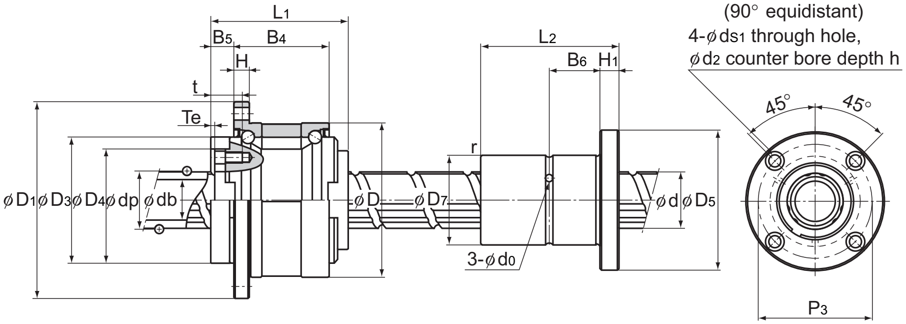
Model No.	Screw shaft outer diameter d	Screw shaft inner diameter db	Lead Ph	Ball screw dimensions							
				Basic load rating		Ball center-to-center diameter dp	Thread minor diameter dc	Outer diameter D	Flange diameter D_1	Overall length L_1	D_3 h7
				Ca kN	C_0a kN						
NS 1616	16	11	16	3.9	7.2	16.65	13.7	$52\ ^{0}_{-0.007}$	68	43.5	40
NS 2020	20	14	20	6.1	12.3	20.75	17.5	$62\ ^{0}_{-0.007}$	78	54	50
NS 2525	25	18	25	9.1	19.3	26	22	$72\ ^{0}_{-0.007}$	92	65	58
NS 3232	32	23	32	13	29.8	33.25	28.3	$80\ ^{0}_{-0.007}$	105	80	66
NS 4040	40	29	40	21.4	49.7	41.75	35.2	$110\ ^{0}_{-0.008}$	140	98	90
NS 5050	50	36	50	31.8	77.6	52.2	44.1	$120\ ^{0}_{-0.008}$	156	126	100

Ball spline

Model No.	Ball spline dimensions					
	Basic load rating		Static permissible moment M_A N-m	Basic torque rating		Outer diameter D_7
	C kN	C_0 kN		C_T N-m	C_{0T} N-m	
NS 1616	7.1	12.6	67.6	31.4	34.3	$31\ ^{0}_{-0.013}$
NS 2020	10.2	17.8	118	56.9	55.9	$35\ ^{0}_{-0.016}$
NS 2525	15.2	25.8	210	105	103	$42\ ^{0}_{-0.016}$
NS 3232	20.5	34	290	180	157	$49\ ^{0}_{-0.016}$
NS 4040	37.8	60.5	687	419	377	$64\ ^{0}_{-0.019}$
NS 5050	60.9	94.5	1340	842	769	$80\ ^{0}_{-0.019}$

Model number coding

$$\underbrace{\textbf{NS2525}}_{\text{Model number}}\ \underbrace{\textbf{+600L}}_{\text{Overall shaft length (in mm)}}$$

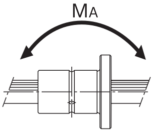


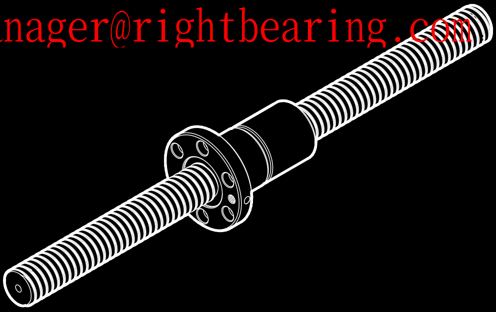
Unit: mm

D4 H7	H	B4	B5	Te	P1	P2	S	t	d1	θ°	Support bearing basic load rating Ca kN	C0a kN	Nut inertial moment kg•cm^2	Screw shaft inertial moment/mm J kg•cm^2/mm	Nut mass kg	Shaft mass kg/m
32	5	27.5	9	2	60	25	M4	12	4.5	40	19.4	19.2	0.48	3.92×10^{-4}	0.38	0.8
39	6	34	11	2	70	31	M5	16	4.5	40	26.8	29.3	1.44	9.37×10^{-4}	0.68	1.21
47	8	43	12.5	3	81	38	M6	19	5.5	40	28.2	33.3	3.23	2.2×10^{-3}	1.1	1.79
58	9	55	14	3	91	48	M6	19	6.6	40	30	39	6.74	5.92×10^{-3}	1.74	2.96
73	11	68	16.5	3	123	61	M8	22	9	50	59.3	74.1	27.9	1.43×10^{-2}	3.95	4.51
90	12	80	25	4	136	75	M10	28	11	50	62.2	83	58.2	3.52×10^{-2}	6.22	7.16

Unit: mm

Flange diameter D5	Overall length L2	H1	B6	r	Greasing hole d0	P3	Mounting hole ds1	d2	h	Nut mass kg
51	$50^{\ 0}_{-0.2}$	7	18	0.5	2	40	4.5	8	4.4	0.23
58	$63^{\ 0}_{-0.2}$	9	22.5	0.5	2	45	5.5	9.5	5.4	0.33
65	$71^{\ 0}_{-0.3}$	9	26.5	0.5	3	52	5.5	9.5	5.4	0.45
77	$80^{\ 0}_{-0.3}$	10	30	0.5	3	62	6.6	11	6.5	0.58
100	$100^{\ 0}_{-0.3}$	14	36	0.5	4	82	9	14	8.6	1.46
124	$125^{\ 0}_{-0.3}$	16	46.5	1	4	102	11	17.5	11	2.76





Rolled Ball Screw
Models JPF, BTK, MTF, BLK/WTF, CNF and BNT

Ball Screw

B Product Specifications

Dimensional Drawing, Dimensional Table

Options

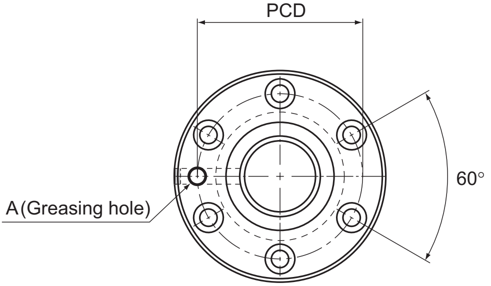
A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Preload Type of Rolled Ball Screw

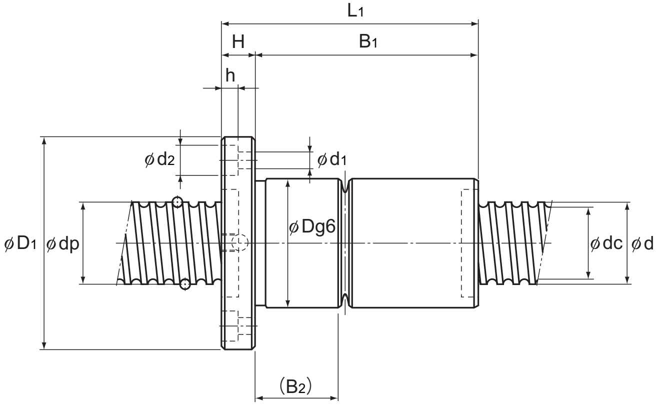
Screw shaft outer diameter	14 to 40
Lead	4 to 10



JPF

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating Ca kN	Basic load rating C_0a kN	Outer diameter D
14	4	JPF 1404-4	14.4	11.5	2×1	2.8	5.1	26
	5	JPF 1405-4	14.5	11.2	2×1	3.9	8.6	26
16	5	JPF 1605-4	16.75	13.5	2×1	3.7	8.2	30
20	5	JPF 2005-6	20.5	17.2	3×1	6	16	34
25	5	JPF 2505-6	25.5	22.2	3×1	6.9	20.8	40
	10	JPF 2510-4	26.8	20.2	2×1	11.4	24.5	47
28	5	JPF 2805-6	28.75	25.2	3×1	7.3	23.9	43
	6	JPF 2806-6	28.5	25.2	3×1	7.3	23.9	43
32	10	JPF 3210-6	33.75	27.2	3×1	19.3	49.9	54
36	10	JPF 3610-6	37	30.5	3×1	20.6	56.2	58
40	10	JPF 4010-6	41.75	35.2	3×1	22.2	65.3	62

Note) The ball screw nut and the screw shaft of model JPF are not sold alone.



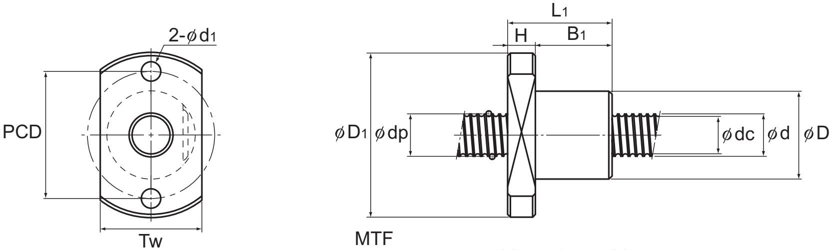
JPF

Unit: mm

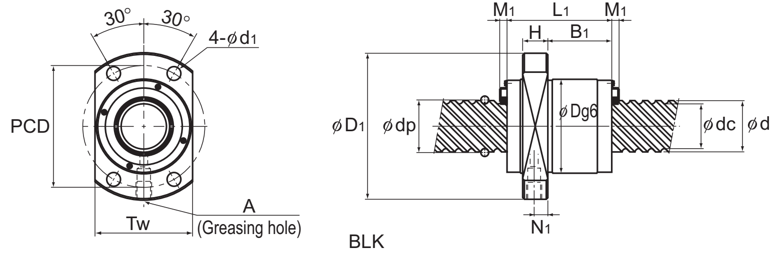
Nut dimensions								Screw shaft inertial moment/mm	Nut mass	Shaft mass
Flange diameter D_1	Overall length L_1	H	B_1	B_2	PCD	$d_1\times d_2\times h$	Greasing hole A	kg•cm²/mm	kg	kg/m
46	52	10	42	16.5	36	4.5×8×4.5	M6	2.96×10^{-4}	0.22	1.0
46	60	10	50	20	36	4.5×8×4.5	M6	2.96×10^{-4}	0.24	0.99
49	60	10	50	19.5	39	4.5×8×4.5	M6	5.05×10^{-4}	0.3	1.34
57	80	11	69	26.5	45	5.5×9.5×5.5	M6	1.23×10^{-3}	0.46	2.15
66	80	11	69	26	51	5.5×9.5×5.5	M6	3.01×10^{-3}	0.6	3.45
72	112	12	100	42	58	6.6×11×6.5	M6	3.01×10^{-3}	1.2	3.26
69	80	12	68	25	55	6.6×11×6.5	M6	4.74×10^{-3}	0.66	4.27
69	90	12	78	35	55	6.6×11×6.5	M6	4.74×10^{-3}	0.72	4.44
88	135	15	120	53.5	70	9×14×8.5	M6	8.08×10^{-3}	1.84	5.49
98	138	18	120	53.5	77	11×17.5×11	M6	1.29×10^{-2}	2.22	6.91
104	138	18	120	53.5	82	11×17.5×11	PT 1/8	1.97×10^{-2}	2.42	8.81

No Preload Type of Rolled Ball Screw

Screw shaft outer diameter	6 to 16
Lead	1 to 30



MTF



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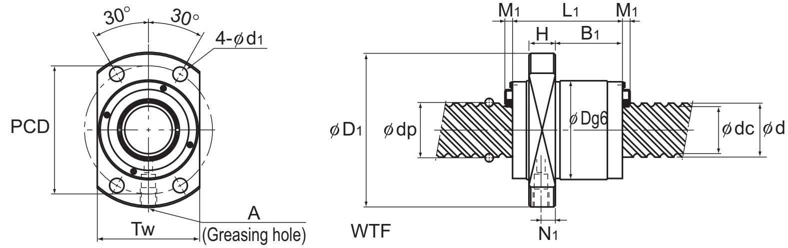
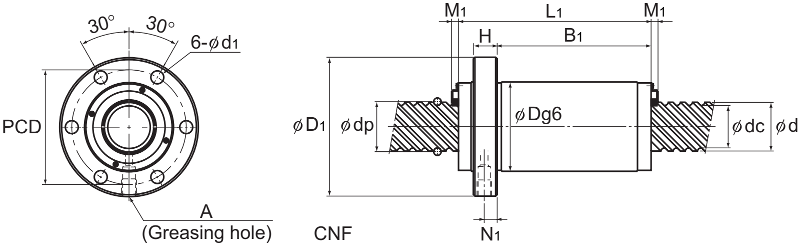
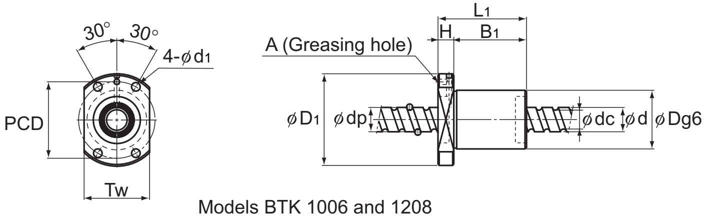


WTF

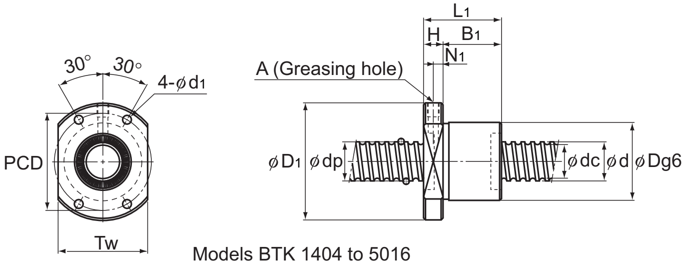
Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity		
						Ca kN	C_0a kN	K N/μm	Outer diameter D	Flange diameter D_1
6	1	MTF 0601-3.7	6.15	5.3	1×3.7	0.7	1.2	70	13	30
8	2	MTF 0802-3.7	8.3	6.6	1×3.7	2.1	3.8	90	20	40
10	2	MTF 1002-3.7	10.3	8.6	1×3.7	2.3	4.8	110	23	43
	6	BTK 1006-2.6	10.5	7.8	1×2.65	2.8	4.9	88	26	42
12	2	MTF 1202-3.7	12.3	10.6	1×3.7	2.5	5.8	130	25	47
	8	BTK 1208-2.6	12.65	9.7	1×2.65	3.8	6.8	108	29	45
14	4	BTK 1404-3.6	14.4	11.5	1×3.65	5.5	11.5	150	31	50
	5	BTK 1405-2.6	14.5	11.2	1×2.65	5	11.4	116	32	50
15	10	BLK 1510-5.6	15.75	12.5	2×2.8	9.8	25.2	260	34	57
	20	WTF 1520-3	15.75	12.5	2×1.5	5.5	14.2	140	32	53
		WTF 1520-6	15.75	12.5	4×1.5	10.1	28.5	280	32	53
	30	WTF 1530-2	15.75	12.5	4×0.6	4.3	9.3	120	32	53
		WTF 1530-3	15.75	12.5	2×1.6	5.6	12.4	160	32	53
		CNF 1530-6	15.75	12.5	4×1.6	10.1	24.7	310	32	53
16	5	BTK 1605-2.6	16.75	13.5	1×2.65	5.4	13.3	130	34	54
	16	BLK 1616-3.6	16.65	13.7	2×1.8	5.8	12.9	170	32	53
		BLK 1616-7.2	16.65	13.7	4×1.8	10.5	25.9	340	32	53

Note) Model MTF cannot be attached with seal.





Models BTK 1006 and 1208



Models BTK 1404 to 5016

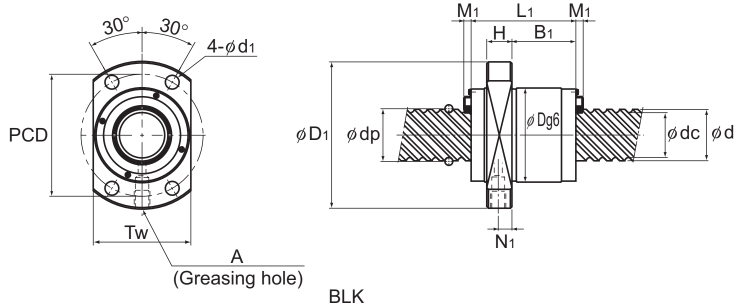
Unit: mm

	Nut dimensions									Axial clearance	Standard shaft length	Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length L₁	H	B₁	PCD	d₁	Tw	Greasing hole N₁	Greasing hole A	Seal M₁			kg•cm²/mm	kg	kg/m
	21	5	16	21.5	3.4	17	—	—	—	0.05	150, 250	9.99×10^{-6}	0.03	0.19
	28	6	22	30	4.5	24	—	—	—	0.05		3.16×10^{-5}	0.08	0.31
	28	6	22	33	4.5	27	—	—	—	0.05	200, 300	7.71×10^{-5}	0.1	0.52
	36	8	28	34	4.5	29	—	3	—	0.05		7.71×10^{-5}	0.19	0.48
	30	8	22	36	5.5	29	—	—	—	0.05		1.6×10^{-4}	0.13	0.77
	44	8	36	37	4.5	32	—	3	—	0.05		1.6×10^{-4}	0.20	0.72
	40	10	30	40	4.5	37	5	M6	—	0.1	500, 1000	2.96×10^{-4}	0.23	1.0
	40	10	30	40	4.5	38	5	M6	—	0.1		2.96×10^{-4}	0.24	0.99
	44	10	24	45	5.5	40	5	M6	3.5	0.1		3.9×10^{-4}	0.26	1.16
	45	10	28	43	5.5	33	5	M6	3.5	0.1		3.9×10^{-4}	0.20	1.17
	45	10	28	43	5.5	33	5	M6	3.5	0.1		3.9×10^{-4}	0.20	1.17
	33	10	17	43	5.5	33	5	M6	3.5	0.1		3.9×10^{-4}	0.22	1.19
	63	10	47	43	5.5	33	5	M6	3.5	0.1		3.9×10^{-4}	0.4	1.19
	63	10	47	43	5.5	—	5	M6	3.5	0.1		3.9×10^{-4}	0.42	1.19
	40	10	30	44	4.5	40	5	M6	—	0.1		5.05×10^{-4}	0.27	1.34
	38	10	21.5	42	4.5	38	5	M6	3.5	0.1		5.05×10^{-4}	0.21	1.35
	38	10	21.5	42	4.5	38	5	M6	3.5	0.1		5.05×10^{-4}	0.25	1.35

Description of Each Option⇒A-815 Dimensions⇒B-777

No Preload Type of Rolled Ball Screw

Screw shaft outer diameter	18 to 30
Lead	5 to 60



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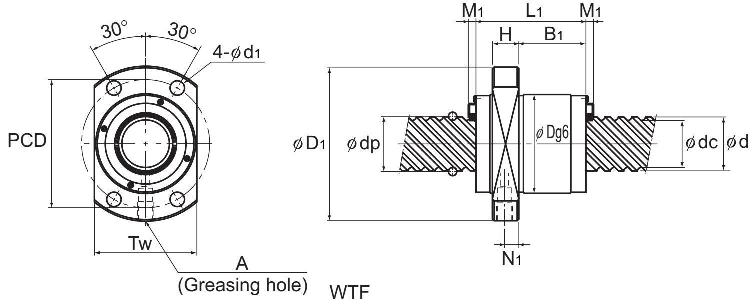
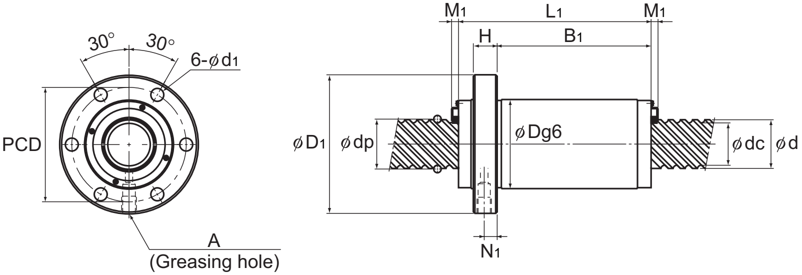
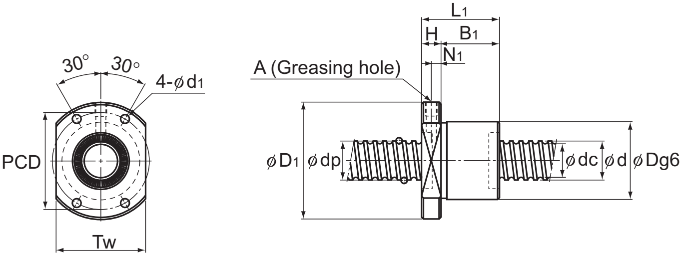


WTF

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity		
d	Ph		dp	dc	Rows x turns	Ca kN	C₀a kN	K N/μm	Outer diameter D	Flange diameter D₁
18	8	BTK 1808-3.6	19.3	14.4	1×3.65	13.1	31	210	50	80
20	5	BTK 2005-2.6	20.5	17.2	1×2.65	6	16.5	150	40	60
	10	BTK 2010-2.6	21.25	16.4	1×2.65	10.6	25.1	160	52	82
	20	BLK 2020-3.6	20.75	17.5	2×1.8	7.7	22.3	210	39	62
		BLK 2020-7.2	20.75	17.5	4×1.8	13.9	44.6	410	39	62
	40	WTF 2040-2	20.75	17.5	4×0.65	5.4	13.6	160	37	57
		WTF 2040-3	20.75	17.5	2×1.65	6.6	17.2	200	37	57
		CNF 2040-6	20.75	17.5	4×1.65	12	34.4	400	37	57
25	5	BTK 2505-2.6	25.5	22.2	1×2.65	6.7	20.8	180	43	67
	10	BTK 2510-5.3	26.8	20.2	2×2.65	31.2	83.7	400	60	96
	25	BLK 2525-3.6	26	22	2×1.8	12.1	35	270	47	74
		BLK 2525-7.2	26	22	4×1.8	21.9	69.9	520	47	74
	50	WTF 2550-2	26	21.9	4×0.65	8.5	21.2	200	45	69
		WTF 2550-3	26	21.9	2×1.65	10.4	26.9	260	45	69
		CNF 2550-6	26	21.9	4×1.65	18.9	53.9	460	45	69
28	6	BTK 2806-2.6	28.5	25.2	1×2.65	7	23.4	200	50	80
		BTK 2806-5.3	28.5	25.2	2×2.65	12.8	46.8	390	50	80
30	60	WTF 3060-2	31.25	26.4	4×0.65	11.8	30.6	240	55	89
		WTF 3060-3	31.25	26.4	2×1.65	14.5	38.9	310	55	89
		CNF 3060-6	31.25	26.4	4×1.65	26.2	77.7	600	55	89



CNF



Models BTK 1404 to 5016

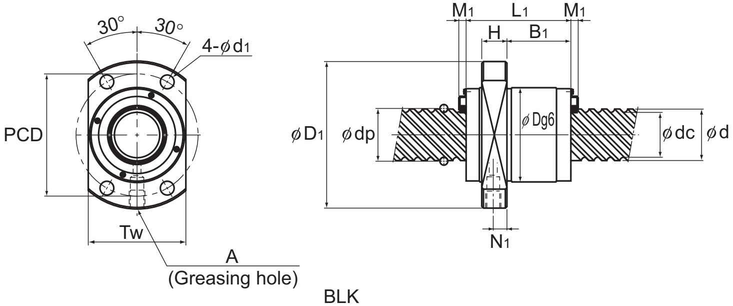
Unit: mm

	Nut dimensions									Axial clearance	Standard shaft length	Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length	H	B1	PCD	d1	Tw	Greasing hole		Seal					
	L1						N1	A	M1			kg•cm²/mm	kg	kg/m
	61	12	49	65	6.6	60	5	M6	—	0.1	500, 1000	8.09×10^{-4}	0.98	1.71
	40	10	30	50	4.5	46	5	M6	—	0.1	500, 1000, 1500	1.23×10^{-3}	0.35	2.15
	61	12	49	67	6.6	64	5	M6	—	0.1		1.23×10^{-3}	1.08	2.16
	45	10	27.5	50	5.5	46	5	M6	3.5	0.1		1.23×10^{-3}	0.35	2.18
	45	10	27.5	50	5.5	46	5	M6	3.5	0.1		1.23×10^{-3}	0.35	2.18
	41.5	10	25.5	47	5.5	38	5.5	M6	3.5	0.1		1.23×10^{-3}	0.25	2.12
	81.5	10	65.5	47	5.5	38	5.5	M6	3.5	0.1		1.23×10^{-3}	0.5	2.12
	81	10	65	47	5.5	—	5.5	M6	3.5	0.1		1.23×10^{-3}	0.5	2.12
	40	10	30	55	5.5	50	5	M6	—	0.1		3.01×10^{-3}	0.37	3.45
	98	15	83	78	9	72	5	M6	—	0.1		3.01×10^{-3}	2.06	3.26
	55	12	35	60	6.6	56	6	M6	3.5	0.1	1000, 1500, 2000	3.01×10^{-3}	0.64	3.41
	55	12	35	60	6.6	56	6	M6	3.5	0.1		3.01×10^{-3}	0.64	3.41
	52	12	31.5	57	6.6	46	7	M6	3.5	0.1		3.01×10^{-3}	0.45	3.34
	102	12	81.5	57	6.6	46	7	M6	3.5	0.1		3.01×10^{-3}	0.85	3.34
	102	12	81.5	57	6.6	—	7	M6	3.5	0.1		3.01×10^{-3}	0.85	3.34
	47	12	35	65	6.6	60	6	M6	—	0.1	500, 1000, 2000, 2500	4.74×10^{-3}	0.66	4.44
	65	12	53	65	6.6	60	6	M6	—	0.1		4.74×10^{-3}	0.84	4.44
	62.5	15	37.5	71	9	56	9	M6	3.8	0.14	1000, 2000, 3000, 4000	6.24×10^{-3}	0.8	4.84
	122.5	15	97.5	71	9	56	9	M6	3.8	0.14		6.24×10^{-3}	1.7	4.84
	122	15	97	71	9	—	9	M6	3.8	0.14		6.24×10^{-3}	1.7	4.84

Description of Each Option⇒A-815 Dimensions⇒B-777

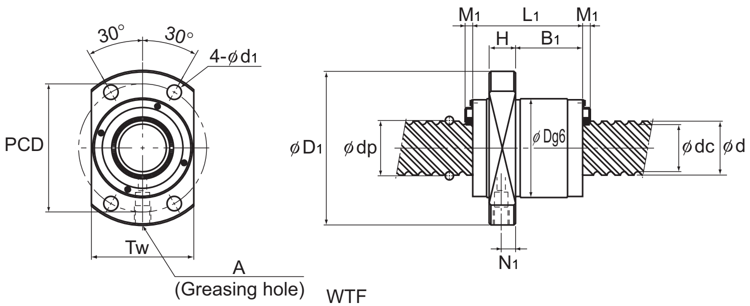
No Preload Type of Rolled Ball Screw

Screw shaft outer diameter	32 to 50
Lead	10 to 100

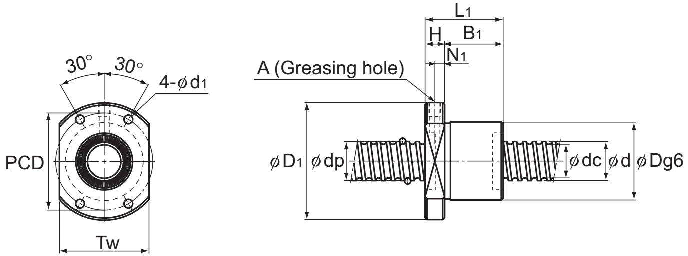


BLK

Screw shaft outer diameter	Lead	Model No.	Ball center-to-center diameter	Thread minor diameter	No. of loaded circuits	Basic load rating		Rigidity		
						Ca	C0a	K	Outer diameter	Flange diameter
d	Ph		dp	dc	Rows x turns	kN	kN	N/µm	D	D1
32	10	BTK 3210-2.6	33.75	27.2	1×2.65	19.8	53.8	250	67	103
		BTK 3210-5.3	33.75	27.2	2×2.65	36	107.5	490	67	103
	32	BLK 3232-3.6	33.25	28.3	2×1.8	17.3	53.9	330	58	92
		BLK 3232-7.2	33.25	28.3	4×1.8	31.3	107.8	650	58	92
36	10	BTK 3610-2.6	37	30.5	1×2.65	20.8	59.8	270	70	110
		BTK 3610-5.3	37	30.5	2×2.65	37.8	118.7	530	70	110
	20	BLK 3620-5.6	37.75	31.2	2×2.8	39.8	121.7	570	70	110
	24	BLK 3624-5.6	38	30.7	2×2.8	46.2	137.4	590	75	115
	36	BLK 3636-3.6	37.4	31.7	2×1.8	22.4	70.5	370	66	106
		BLK 3636-7.2	37.4	31.7	4×1.8	40.6	141.1	730	66	106
40	10	BTK 4010-5.3	41.75	35.2	2×2.65	40.3	134.9	590	76	116
	40	BLK 4040-3.6	41.75	35.2	2×1.8	28.1	89.8	420	73	114
		BLK 4040-7.2	41.75	35.2	4×1.8	51.1	179.6	810	73	114
	80	WTF 4080-2	41.75	35.2	4×0.65	19.8	54.5	320	73	114
		WTF 4080-3	41.75	35.2	2×1.65	24.3	69.2	400	73	114
45	12	BTK 4512-5.3	46.5	39.2	2×2.65	49.5	169	650	82	128
50	16	BTK 5016-5.3	52.7	42.9	2×2.65	93.8	315.2	930	102	162
	50	BLK 5050-3.6	52.2	44.1	2×1.8	42.1	140.4	510	90	135
		BLK 5050-7.2	52.2	44.1	4×1.8	76.3	280.7	1000	90	135
	100	WTF 50100-2	52.2	44.1	4×0.65	29.6	85.2	390	90	135
		WTF 50100-3	52.2	44.1	2×1.65	36.3	108.1	500	90	135



WTF



Models BTK 1404 to 5016

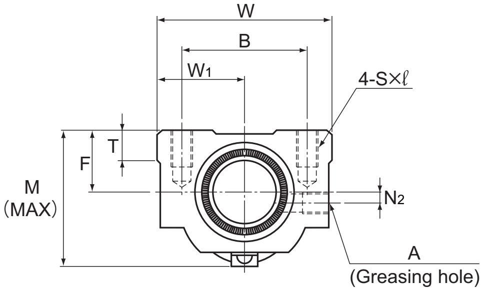
Unit: mm

	Nut dimensions									Axial clearance	Standard shaft length	Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Overall length						Greasing hole		Seal					
	L₁	H	B₁	PCD	d₁	Tw	N₁	A	M₁			kg•cm²/mm	kg	kg/m
	68	15	53	85	9	78	5	M6	—	0.14	500, 1000, 2000, 2500	8.08×10^{-3}	1.77	5.49
	98	15	83	85	9	78	5	M6	—	0.14		8.08×10^{-3}	2.35	5.49
	70	15	45	74	9	68	7.5	M6	3.8	0.14	1000, 1500, 2000, 2500	8.08×10^{-3}	1.14	5.69
	70	15	45	74	9	68	7.5	M6	3.8	0.14		8.08×10^{-3}	1.14	5.69
	70	17	53	90	11	82	7	M6	—	0.17	500, 1000, 2000, 2500, 3000	1.29×10^{-2}	1.94	6.91
	100	17	83	90	11	82	7	M6	—	0.17		1.29×10^{-2}	2.55	6.91
	78	17	45	90	11	80	8.5	M6	5	0.17	1000, 1500, 2000, 3000	1.29×10^{-2}	1.74	7.09
	94	18	59	94	11	86	9	M6	5	0.17		1.29×10^{-2}	2.42	7.02
	77	17	50	85	11	76	8.5	M6	5	0.17		1.29×10^{-2}	1.74	7.12
	77	17	50	85	11	76	8.5	M6	5	0.17		1.29×10^{-2}	1.74	7.12
	100	17	83	96	11	88	7	M6	—	0.17	1000, 1500, 2000, 3000, 3500	1.97×10^{-2}	2.91	8.81
	85	17	56.5	93	11	84	8.5	M6	5.4	0.17	1000, 1500, 2000, 3000	1.97×10^{-2}	2.16	8.76
	85	17	56.5	93	11	84	8.5	M6	5.4	0.17		1.97×10^{-2}	2.16	8.76
	79	17	50.5	93	11	74	8.5	M6	5.4	0.17		1.97×10^{-2}	2.1	8.66
	159	17	130.5	93	11	74	8.5	M6	5.4	0.17		1.97×10^{-2}	3.67	8.66
	118	20	98	104	14	94	8	M6	—	0.17	1000, 1500, 2000, 3000, 3500	3.16×10^{-2}	3.9	11.08
	145	25	120	132	18	104	12.5	PT 1/8	—	0.2		4.82×10^{-2}	7.8	13.66
	106	20	72	112	14	104	10	M6	5.4	0.2	1000, 1500, 2000, 3000	4.82×10^{-2}	3.89	13.79
	106	20	72	112	14	104	10	M6	5.4	0.2		4.82×10^{-2}	3.86	13.79
	98	20	64	112	14	92	10	M6	5.4	0.2		4.82×10^{-2}	3.5	13.86
	198	20	164	112	14	92	10	M6	5.4	0.2		4.82×10^{-2}	6.4	13.86

Description of Each Option⇒A-815 Dimensions⇒B-777

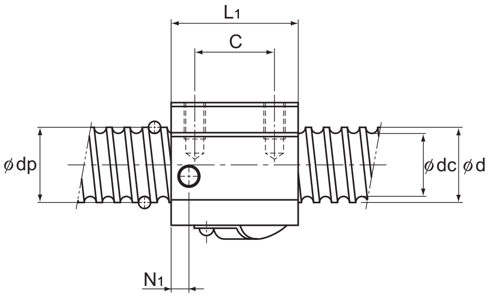
No Preload Type of Rolled Ball Screw (Square Nut)

Screw shaft outer diameter	14 to 45
Lead	4 to 12



BNT

Screw shaft outer diameter d	Lead Ph	Model No.	Ball center-to-center diameter dp	Thread minor diameter dc	No. of loaded circuits Rows x turns	Basic load rating		Rigidity			
						Ca kN	C_{0a} kN	K N/μm	Width W	Center height F	Overall length L_1
14	4	BNT 1404-3.6	14.4	11.5	1×3.65	5.5	11.5	150	34	13	35
	5	BNT 1405-2.6	14.5	11.2	1×2.65	5	11.4	110	34	13	35
16	5	BNT 1605-2.6	16.75	13.5	1×2.65	5.4	13.3	130	42	16	36
18	8	BNT 1808-3.6	19.3	14.4	1×3.65	13.1	31	210	48	17	56
20	5	BNT 2005-2.6	20.5	17.2	1×2.65	6	16.5	150	48	17	35
	10	BNT 2010-2.6	21.25	16.4	1×2.65	10.6	25.1	160	48	18	58
25	5	BNT 2505-2.6	25.5	22.2	1×2.65	6.7	20.8	180	60	20	35
	10	BNT 2510-5.3	26.8	20.2	2×2.65	31.2	83.7	400	60	23	94
28	6	BNT 2806-2.6	28.5	25.2	1×2.65	7	23.4	200	60	22	42
		BNT 2806-5.3	28.5	25.2	2×2.65	12.8	46.8	390	60	22	67
32	10	BNT 3210-2.6	33.75	27.2	1×2.65	19.8	53.8	250	70	26	64
		BNT 3210-5.3	33.75	27.2	2×2.65	36	107.5	490	70	26	94
36	10	BNT 3610-2.6	37	30.5	1×2.65	20.8	59.3	270	86	29	64
		BNT 3610-5.3	37	30.5	2×2.65	37.8	118.7	530	86	29	96
45	12	BNT 4512-5.3	46.5	39.2	2×2.65	49.5	169	650	100	36	115



BNT

Unit: mm

	Nut dimensions									Axial clearance	Screw shaft inertial moment/mm	Nut mass	Shaft mass
	Mounting hole			W_1	T	M	N_1	N_2	A				
	B	C	S×ℓ								kg•cm²/mm	kg	kg/m
	26	22	M4×7	17	6	30	6	2	M6	0.1	2.96×10^{-4}	0.15	1.0
	26	22	M4×7	17	6	31	6	2	M6	0.1	2.96×10^{-4}	0.15	0.99
	32	22	M5×8	21	21.5	32.5	6	2	M6	0.1	5.05×10^{-4}	0.3	1.34
	35	35	M6×10	24	10	44	8	3	M6	0.1	8.09×10^{-4}	0.47	1.71
	35	22	M6×10	24	9	39	5	3	M6	0.1	1.23×10^{-3}	0.28	2.15
	35	35	M6×10	24	9	46	10	2	M6	0.1	1.23×10^{-3}	0.5	2.16
	40	22	M8×12	30	9.5	45	7	5	M6	0.1	3.01×10^{-3}	0.41	3.45
	40	60	M8×12	30	10	55	10	—	M6	0.1	3.01×10^{-3}	1.18	3.26
	40	18	M8×12	30	10	50	8	—	M6	0.1	4.74×10^{-3}	0.81	4.44
	40	40	M8×12	30	10	50	8	—	M6	0.1	4.74×10^{-3}	0.78	4.44
	50	45	M8×12	35	12	62	10	—	M6	0.14	8.08×10^{-3}	1.3	5.49
	50	60	M8×12	35	12	62	10	—	M6	0.14	8.08×10^{-3}	2.0	5.49
	60	45	M10×16	43	17	67	11	—	M6	0.17	1.29×10^{-2}	1.8	6.91
	60	60	M10×16	43	17	67	11	—	M6	0.17	1.29×10^{-2}	2.4	6.91
	75	75	M12×20	50	20.5	80	13	—	M6	0.2	3.16×10^{-2}	4.1	11.08

Description of Each Option⇒A-815 Dimensions⇒B-777

Model number coding

Model number coding

Ball Screw Nut

BTK1405-2.6 ZZ

BTK1405-2.6: Model number

ZZ: Seal symbol
no symbol: without seal
ZZ: brush seal attached to both ends of the ball screw nut (see page 1466)

Screw Shaft

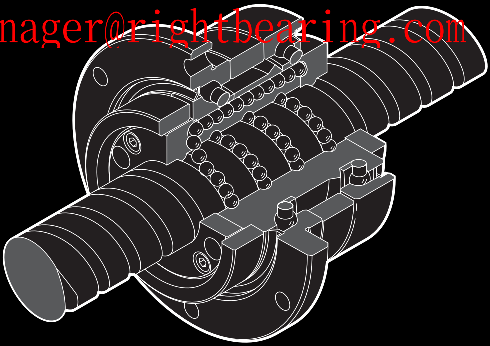
TS 14 05 +500L C7

C7: Accuracy symbol (see page 1140) (no symbol for class C10)
+500L: Overall screw shaft length (in mm)
05: Lead (in mm)
14: Screw shaft outer diameter (in mm)
TS: Symbol for rolled ball screw shaft

Combination of the Ball Screw Nut and the Screw Shaft

BTK1405-2.6 ZZ +500L C7 T

BTK1405-2.6: Model number
T: Symbol for rolled shaft
C7: Accuracy symbol (see page 1140) (no symbol for class C10)
+500L: Overall screw shaft length (in mm)
ZZ: Seal symbol
no symbol: without seal
ZZ: brush seal attached to both ends of the ball screw nut (see page 1466)



Rolled Rotary Ball Screw
Model BLR

Ball Screw

B Product Specifications

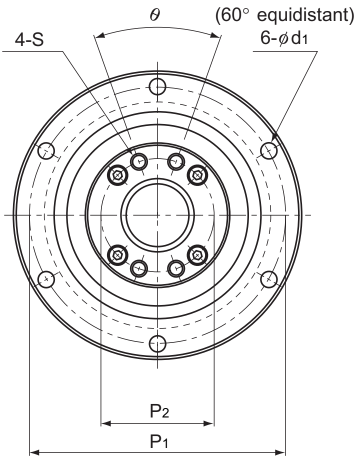
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

Technical Descriptions

* Please see the separate "A Technical Descriptions of the Products".

Model BLR Large Lead Rotary Nut Rolled Ball Screw



Model No.	Screw shaft outer diameter	Thread minor diameter	Lead	Ball center-to-center diameter	Basic load rating					
					Ca	C_0a	Outer diameter	Flange diameter	Overall length	
	d	dc	Ph	dp	kN	kN	D	D_1	L_1	D_3
BLR 1616-3.6	16	13.7	16	16.65	5.8	12.9	$52^{0}_{-0.007}$	68	43.5	$40^{0}_{-0.025}$
BLR 2020-3.6	20	17.5	20	20.75	7.7	22.3	$62^{0}_{-0.007}$	78	54	$50^{0}_{-0.025}$
BLR 2525-3.6	25	22	25	26	12.1	35	$72^{0}_{-0.007}$	92	65	$58^{0}_{-0.03}$
BLR 3232-3.6	32	28.3	32	33.25	17.3	53.9	$80^{0}_{-0.007}$	105	80	$66^{0}_{-0.03}$
BLR 3636-3.6	36	31.7	36	37.4	22.4	70.5	$100^{0}_{-0.008}$	130	93	$80^{0}_{-0.03}$
BLR 4040-3.6	40	35.2	40	41.75	28.1	89.8	$110^{0}_{-0.008}$	140	98	$90^{0}_{-0.035}$
BLR 5050-3.6	50	44.1	50	52.2	42.1	140.4	$120^{0}_{-0.008}$	156	126	$100^{0}_{-0.035}$

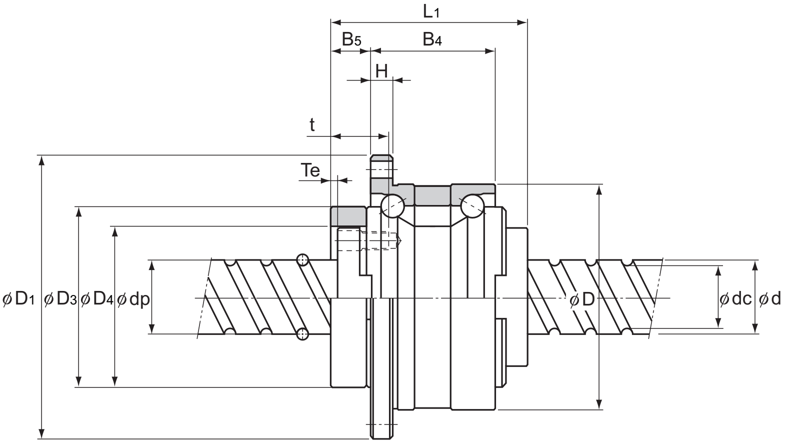
Model number coding

BLR2020-3.6 K UU +1000L C7 T

Model number
Flange orientation symbol (*1)
Symbol for support bearing seal (*2)
Overall screw shaft length (in mm)
Accuracy symbol (*3)
Symbol for rolled Ball Screw

(*1) See A-799. (*2) UU: seal attached on both ends; No symbol: without seal (*3) See A-678.

Note) For clearance in the axial direction, see A-685.



Unit: mm

	Ball screw dimensions										Support bearing basic load rating		Nut inertial moment	Nut mass	Shaft mass
	D_4	H	B_4	B_5	Te	P_1	P_2	S	t	d_1	θ°	Ca kN	C_{0a} kN	kg•cm²	kg	kg/m
	32 $^{+0.025}_{0}$	5	27.5	9	2	60	25	M4	12	4.5	40	19.4	19.2	0.48	0.38	1.35
	39 $^{+0.025}_{0}$	6	34	11	2	70	31	M5	16	4.5	40	26.8	29.3	1.44	0.68	2.17
	47 $^{+0.025}_{0}$	8	43	12.5	3	81	38	M6	19	5.5	40	28.2	33.3	3.23	1.1	3.41
	58 $^{+0.03}_{0}$	9	55	14	3	91	48	M6	19	6.6	40	30	39	6.74	1.74	5.69
	66 $^{+0.03}_{0}$	11	62	17	3	113	54	M8	22	9	40	56.4	65.2	16.8	3.2	7.12
	73 $^{+0.03}$	11	68	16.5	3	123	61	M8	22	9	50	59.3	74.1	27.9	3.95	8.76
	90 $^{+0.035}_{0}$	12	80	25	4	136	75	M10	28	11	50	62.2	83	58.2	6.22	13.79

Description of Each Option⇒A-815 Dimensions⇒B-777

Maximum Length of the Ball Screw Shaft

The maximum length of the precision Ball Screw by accuracy grade is shown in Table1, and that of the rolled Ball Screw in Table2.
If the shaft dimensions exceed the manufacturing limit in Table1 or Table2, contact THK.

Table1 Maximum Length of the Precision Ball Screw by Accuracy Grade Unit: mm

Screw shaft outer diameter	Overall screw shaft length					
	C0	C1	C2	C3	C5	C7
4	90	110	120	120	120	120
6	150	170	210	210	210	210
8	230	270	340	340	340	340
10	350	400	500	500	500	500
12	440	500	630	680	680	680
13	440	500	630	680	680	680
14	530	620	770	870	890	890
15	570	670	830	950	980	1100
16	620	730	900	1050	1100	1400
18	720	840	1050	1220	1350	1600
20	820	950	1200	1400	1600	1800
25	1100	1400	1600	1800	2000	2400
28	1300	1600	1900	2100	2350	2700
30	1450	1700	2050	2300	2570	2950
32	1600	1800	2200	2500	2800	3200
36	2000	2100	2550	2950	3250	3650
40		2400	2900	3400	3700	4300
45		2750	3350	3950	4350	5050
50		3100	3800	4500	5000	5800
55		3450	4150	5300	6050	6500
63		4000	5200	5800	6700	7700
70			6300	6450	7650	9000
80				7900	9000	10000
100				10000	10000	

Table2 Maximum Length of the Rolled Ball Screw by Accuracy Grade

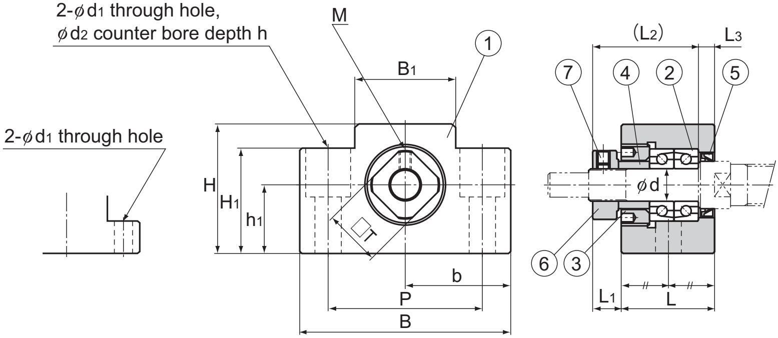
Unit: mm

Screw shaft outer diameter	Overall screw shaft length		
	C7	C8	C10
6 to 8	320	320	—
10 to 12	500	1000	—
14 to 15	1500	1500	1500
16 to 18	1500	1800	1800
20	2000	2200	2200
25	2000	3000	3000
28	3000	3000	3000
30	3000	3000	4000
32 to 36	3000	4000	4000
40	3000	5000	5000
45	3000	5500	5500
50	3000	6000	6000

Ball Screw

Ball Screw Peripherals

Model EK Square Type Support Unit on the Fixed Side



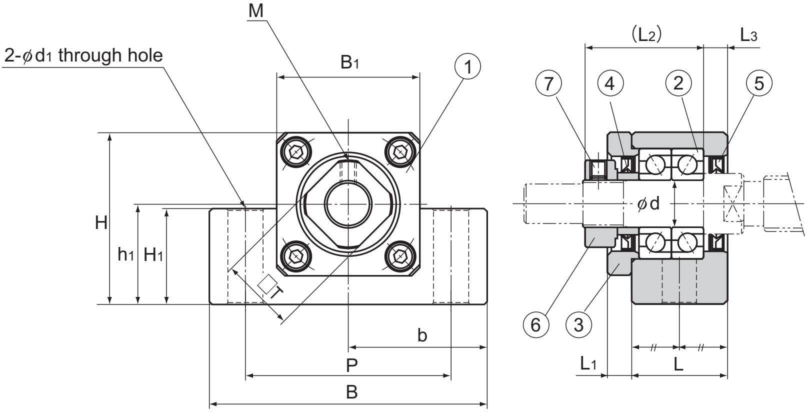
Models EK 4 and 5

Models EK 6 and 8

Model No.	Shaft diameter d	L	L_1	L_2	L_3	B	H	b ±0.02
EK 4	4	15	5.5	17.5	3	34	19	17
EK 5	5	16.5	5.5	18.5	3.5	36	21	18
EK 6	6	20	5.5	22	3.5	42	25	21
EK 8	8	23	7	26	4	52	32	26
EK 10	10	24	6	29.5	6	70	43	35
EK 12	12	24	6	29.5	6	70	43	35
EK 15	15	25	6	36	5	80	49	40
EK 20	20	42	10	50	10	95	58	47.5

Models EK 4 to 8

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1 set
3	Set nut	1
4	Collar	2
5	Seal	1
6	Lock Nut	1
7	Hexagonal socket-head setscrew (with a set piece)	1



Models EK 10 to 20

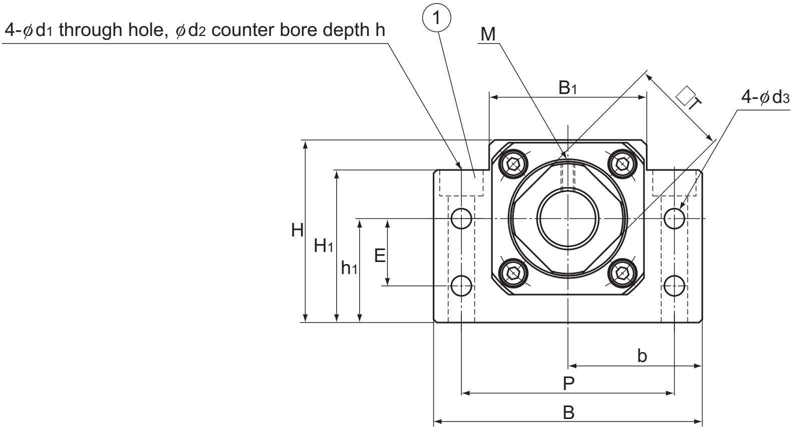
Unit: mm

	h_1 ±0.02	B_1	H_1	P	d_1	d_2	h	M	T	Bearing used	Mass kg
	10	18	7	26	4.5	—	—	M2.6	10	AC4-12P5	0.06
	11	20	8	28	4.5	—	—	M2.6	11	AC5-14P5	0.08
	13	18	20	30	5.5	9.5	11	M3	12	AC6-16P5	0.14
	17	25	26	38	6.6	11	12	M3	14	79M8DFGMP5	0.24
	25	36	24	52	9	—	—	M3	16	7000HTDFGMP5	0.46
	25	36	24	52	9	—	—	M3	19	7001HTDFGMP5	0.44
	30	41	25	60	11	—	—	M3	22	7002HTDFGMP5	0.55
	30	56	25	75	11	—	—	M4	30	7204HTDFGMP5	1.35

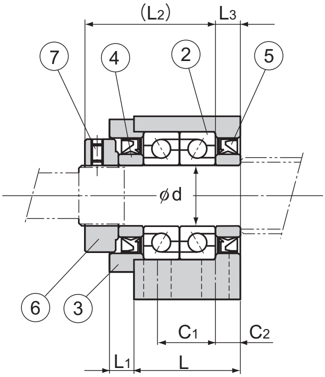
Models EK 10 to 20

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1 set
3	Holding lid	1
4	Collar	2
5	Seal	2
6	Lock Nut	1
7	Hexagonal socket-head setscrew (with a set piece)	1

Model BK Square Type Support Unit on the Fixed Side



Model No.	Shaft diameter d	L	L_1	L_2	L_3	B	H	b ±0.02	h_1 ±0.02	B_1	H_1
BK 10	10	25	5	29	5	60	39	30	22	34	32.5
BK 12	12	25	5	29	5	60	43	30	25	35	32.5
BK 15	15	27	6	32	6	70	48	35	28	40	38
BK 17	17	35	9	44	7	86	64	43	39	50	55
BK 20	20	35	8	43	8	88	60	44	34	52	50
BK 25	25	42	12	54	9	106	80	53	48	64	70
BK 30	30	45	14	61	9	128	89	64	51	76	78
BK 35	35	50	14	67	12	140	96	70	52	88	79
BK 40	40	61	18	76	15	160	110	80	60	100	90

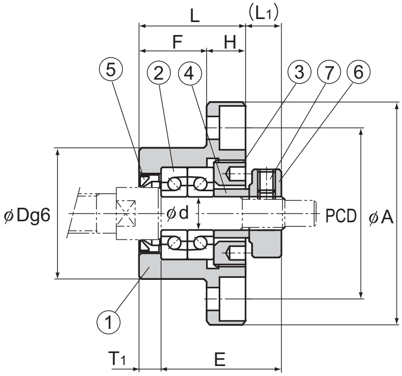


Unit: mm

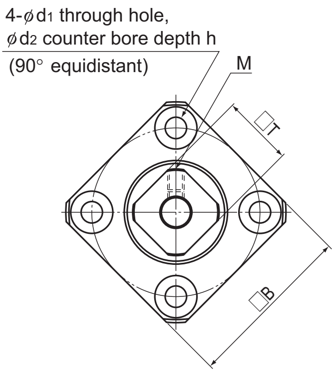
												Mass
	E	P	C_1	C_2	d_3	d_1	d_2	h	M	T	Bearing used	kg
	15	46	13	6	5.5	6.6	10.8	5	M3	16	7000HTDFGMP5	0.39
	18	46	13	6	5.5	6.6	10.8	1.5	M3	19	7001HTDFGMP5	0.41
	18	54	15	6	5.5	6.6	11	6.5	M3	22	7002HTDFGMP5	0.57
	28	68	19	8	6.6	9	14	8.5	M4	24	7203HTDFGMP5	1.27
	22	70	19	8	6.6	9	14	8.5	M4	30	7004HTDFGMP5	1.19
	33	85	22	10	9	11	17.5	11	M5	35	7205HTDFGMP5	2.3
	33	102	23	11	11	14	20	13	M6	40	7206HTDFGMP5	3.32
	35	114	26	12	11	14	20	13	M8	50	7207HTDFGMP5	4.33
	37	130	33	14	14	18	26	17.5	M8	50	7208HTDFGMP5	6.5

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1 set
3	Holding lid	1
4	Collar	2
5	Seal	2
6	Lock Nut	1
7	Hexagonal socket-head setscrew (with a set piece)	1

Model FK Round Type Support Unit on the Fixed Side

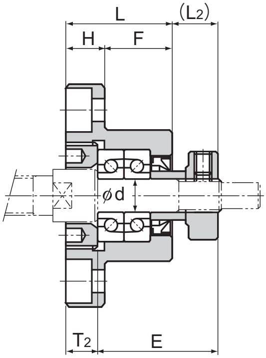


Mounting method A



Models FK 4 to 8

Model No.	Shaft diameter d	L	H	F	E	D	A	PCD	B
FK 4	4	15	6	9	17.5	$18^{-0.006}_{-0.017}$	32	24	25
FK 5	5	16.5	6	10.5	18.5	$20^{-0.007}_{-0.02}$	34	26	26
FK 6	6	20	7	13	22	$22^{-0.007}_{-0.02}$	36	28	28
FK 8	8	23	9	14	26	$28^{-0.007}_{-0.02}$	43	35	35



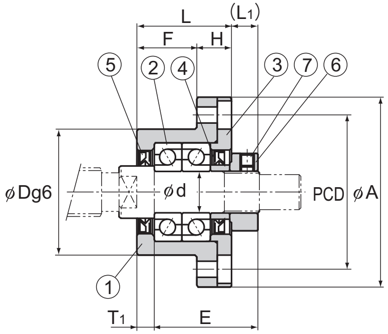
Mounting method B

Unit: mm

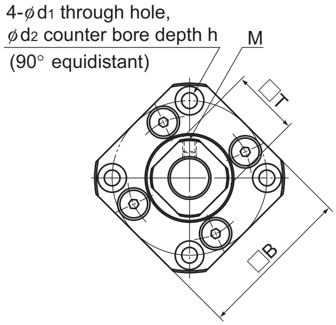
	Installation procedure A		Installation procedure B								Mass
	L_1	T_1	L_2	T_2	d_1	d_2	h	M	T	Bearing used	kg
	5.5	3	6.5	4	3.4	6.5	4	M2.6	10	AC4-12P5	0.05
	5.5	3.5	7	5	3.4	6.5	4	M2.6	11	AC5-14P5	0.06
	5.5	3.5	8.5	6.5	3.4	6.5	4	M3	12	AC6-16P5	0.08
	7	4	10	7	3.4	6.5	4	M3	14	79M8DFGMP5	0.15

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1 set
3	Set nut	1
4	Collar	2
5	Seal	1
6	Lock Nut	1
7	Hexagonal socket-head setscrew (with a set piece)	1

Model FK Round Type Support Unit on the Fixed Side

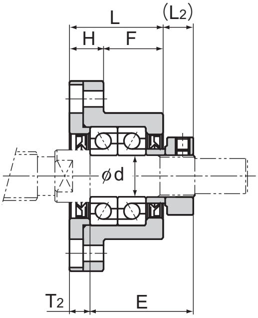


Mounting method A



Models FK 10 to 30

Model No.	Shaft diameter d	L	H	F	E	D	A	PCD	B
FK 10	10	27	10	17	29.5	$34^{-0.009}_{-0.025}$	52	42	42
FK 12	12	27	10	17	29.5	$36^{-0.009}_{-0.025}$	54	44	44
FK 15	15	32	15	17	36	$40^{-0.009}_{-0.025}$	63	50	52
FK 20	20	52	22	30	50	$57^{-0.01}_{-0.029}$	85	70	68
FK 25	25	57	27	30	60	$63^{-0.01}_{-0.029}$	98	80	79
FK 30	30	62	30	32	61	$75^{-0.01}_{-0.029}$	117	95	93



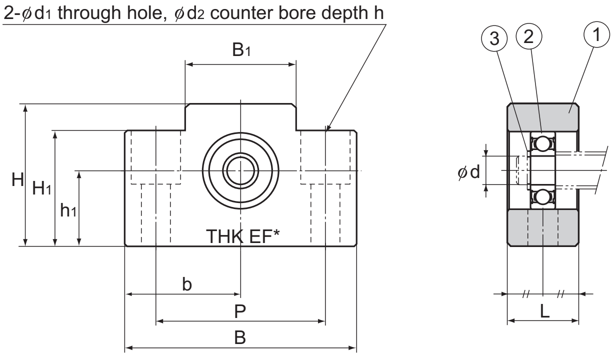
Mounting method B

Unit: mm

	Installation procedure A		Installation procedure B		d_1	d_2	h	M	T	Bearing used	Mass
	L_1	T_1	L_2	T_2							kg
	7.5	5	8.5	6	4.5	8	4	M3	16	7000HTDFGMP5	0.21
	7.5	5	8.5	6	4.5	8	4	M3	19	7001HTDFGMP5	0.22
	10	6	12	8	5.5	9.5	6	M3	22	7002HTDFGMP5	0.39
	8	10	12	14	6.6	11	10	M4	30	7204HTDFGMP5	1.09
	13	10	20	17	9	15	13	M5	35	7205HTDFGMP5	1.49
	11	12	17	18	11	17.5	15	M6	40	7206HTDFGMP5	2.32

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1 set
3	Holding lid	1
4	Collar	2
5	Seal	2
6	Lock Nut	1
7	Hexagonal socket-head setscrew (with a set piece)	1

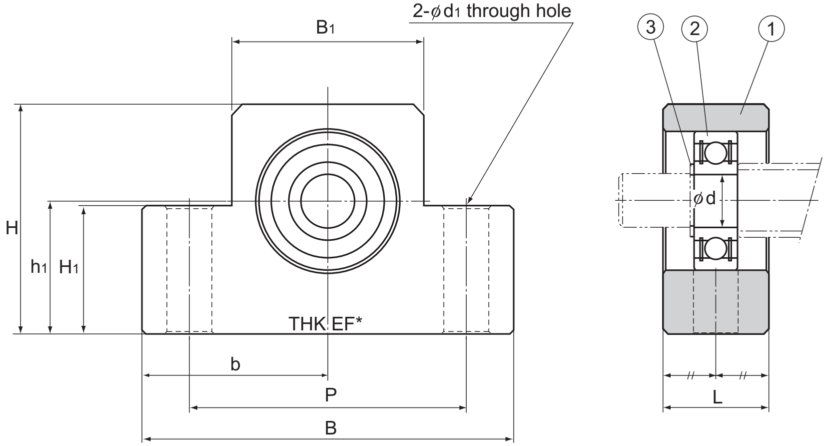
Model EF Square Type Support Unit on the Supported Side



Models EF 6 and 8

Model No.	Shaft diameter d	L	B	H	b ±0.02	h_1 ±0.02	B_1
EF 6	6	12	42	25	21	13	18
EF 8	6	14	52	32	26	17	25
EF 10	8	20	70	43	35	25	36
EF 12	10	20	70	43	35	25	36
EF 15	15	20	80	49	40	30	41
EF 20	20	26	95	58	47.5	30	56

Note) The area marked with “*” is imprinted with a numeric character(s) as part of the model number.



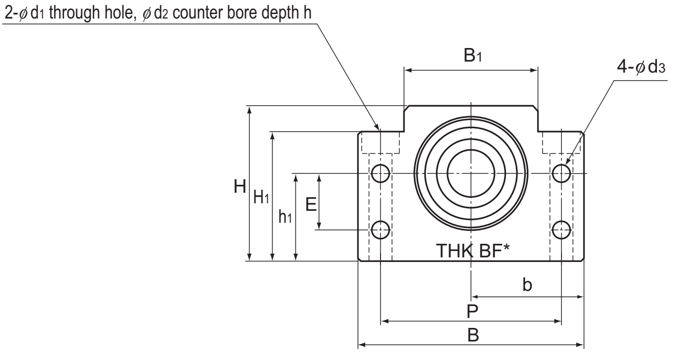
Models EF 10 to 20

Unit: mm

	H_1	P	d_1	d_2	h	Bearing used	Snap ring used	Mass kg
	20	30	5.5	9.5	11	606ZZ	C6	0.07
	26	38	6.6	11	12	606ZZ	C6	0.13
	24	52	9	—	—	608ZZ	C8	0.33
	24	52	9	—	—	6000ZZ	C10	0.32
	25	60	9	—	—	6002ZZ	C15	0.38
	25	75	11	—	—	6204ZZ	C20	0.63

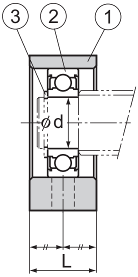
Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1
3	Snap ring	1

Model BF Square Type Support Unit on the Supported Side



Model No.	Shaft diameter d	L	B	H	b ±0.02	h_1 ±0.02	B_1	H_1
BF 10	8	20	60	39	30	22	34	32.5
BF 12	10	20	60	43	30	25	35	32.5
BF 15	15	20	70	48	35	28	40	38
BF 17	17	23	86	64	43	39	50	55
BF 20	20	26	88	60	44	34	52	50
BF 25	25	30	106	80	53	48	64	70
BF 30	30	32	128	89	64	51	76	78
BF 35	35	32	140	96	70	52	88	79
BF 40	40	37	160	110	80	60	100	90

Note) The area marked with “*” is imprinted with a numeric character(s) as part of the model number.

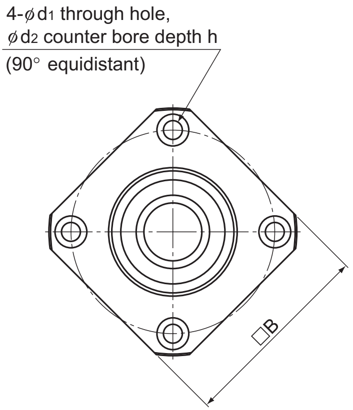


Unit: mm

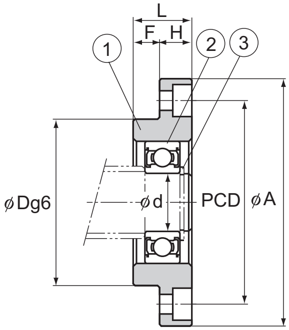
	E	P	d_3	d_1	d_2	h	Bearing used	Snap ring used	Mass kg
	15	46	5.5	6.6	10.8	5	608ZZ	C8	0.29
	18	46	5.5	6.6	10.8	1.5	6000ZZ	C10	0.3
	18	54	5.5	6.6	11	6.5	6002ZZ	C15	0.38
	28	68	6.6	9	14	8.5	6203ZZ	C17	0.74
	22	70	6.6	9	14	8.5	6004ZZ	C20	0.76
	33	85	9	11	17.5	11	6205ZZ	C25	1.42
	33	102	11	14	20	13	6206ZZ	C30	1.97
	35	114	11	14	20	13	6207ZZ	C35	2.22
	37	130	14	18	26	17.5	6208ZZ	C40	3.27

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1
3	Snap ring	1

Model FF Round Type Support Unit on the Supported Side



Model No.	Shaft diameter d	L	H	F	D	A
FF 6	6	10	6	4	22 $^{-0.007}_{-0.02}$	36
FF 10	8	12	7	5	28 $^{-0.007}_{-0.02}$	43
FF 12	10	15	7	8	34 $^{-0.009}_{-0.025}$	52
FF 15	15	17	9	8	40 $^{-0.009}_{-0.025}$	63
FF 20	20	20	11	9	57 $^{-0.01}_{-0.029}$	85
FF 25	25	24	14	10	63 $^{-0.01}_{-0.029}$	98
FF 30	30	27	18	9	75 $^{-0.01}_{-0.029}$	117

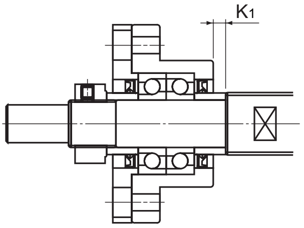


Unit: mm

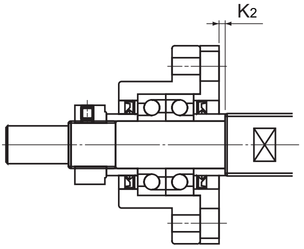
	PCD	B	d₁	d₂	h	Bearing used	Snap ring used	Mass kg
	28	28	3.4	6.5	4	606ZZ	C6	0.04
	35	35	3.4	6.5	4	608ZZ	C8	0.07
	42	42	4.5	8	4	6000ZZ	C10	0.11
	50	52	5.5	9.5	5.5	6002ZZ	C15	0.2
	70	68	6.6	11	6.5	6204ZZ	C20	0.27
	80	79	9	14	8.5	6205ZZ	C25	0.67
	95	93	11	17.5	11	6206ZZ	C30	1.07

Part No.	Part name	No. of units
1	Housing	1
2	Bearing	1
3	Snap ring	1

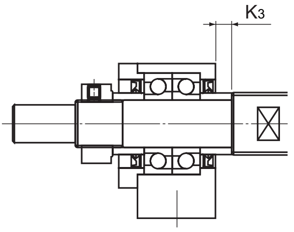
Recommended Shapes of Shaft Ends - Shape H (H1, H2 and H3) (For Support Unit Models FK and EK)



Model FK



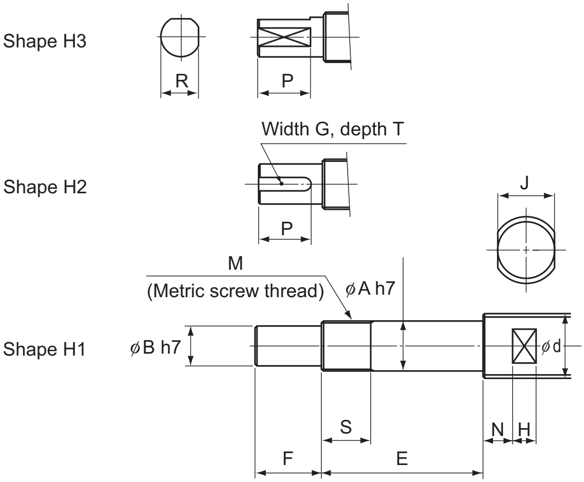
Model FK



Model EK

Support Unit model No.		Ball screw shaft outer diameter	Shaft outer diameter of the bearung				Metric screw thread	
Model FK	Model EK	d	A	B	E	F	M	S
FK4	EK4	6	4	3	23	5	M4×0.5	7
FK5	EK5	8	5	4	25	6	M5×0.5	7
FK6	EK6	8	6	4	30	8	M6×0.75	8
FK8	EK8	12	8	6	35	9	M8×1	10
FK10	EK10	14	10	8	36	15	M10×1	11
FK10	EK10	15	10	8	36	15	M10×1	11
FK12	EK12	16	12	10	36	15	M12×1	11
FK12	EK12	18	12	10	36	15	M12×1	11
FK15	EK15	20	15	12	49	20	M15×1	13
FK15	EK15	25	15	12	49	20	M15×1	13
FK20	EK20	28	20	17	64	25	M20×1	17
FK20	EK20	30	20	17	64	25	M20×1	17
FK20	EK20	32	20	17	64	25	M20×1	17
FK25	—	36	25	20	76	30	M25×1.5	20
FK30	—	40	30	25	72	38	M30×1.5	25

Note) Support Units are designed to have dimensions so that combinations of models FK and FF, models EK and EF or models BK and BF are used on the same shaft.
If desiring the shaft end to be machined at THK, add the shape symbol in the end of the Ball Screw model number.
(Example) TS2505+500L-H2K
(Shape H2 on the fixed side; shape K on the supported side)
For the perpendicularity of the end face of the bearing, refer to JIS B 1192-1997.

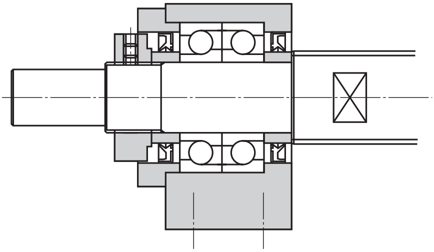


Unit: mm

	Width across flat			Shape H2 Keyway			Shape H3 Cut flat on two side		Support Unit position		
									Model FK		Model EK
	J	N	H	G N9	T +0.1 0	P	R	P	K_1	K_2	K_3
	4	4	4	—	—	—	2.7	4	1.5	0.5	1.5
	5	4	4	—	—	—	3.7	5	2	0.5	2
	5	4	4	—	—	—	3.7	6	3.5	0.5	3.5
	8	5	5	—	—	—	5.6	7	3.5	0.5	3.5
	10	5	7	2	1.2	11	7.5	11	0.5	−0.5	−0.5
	10	5	7	2	1.2	11	7.5	11	0.5	−0.5	−0.5
	13	6	8	3	1.8	12	9.5	12	0.5	−0.5	−0.5
	13	6	8	3	1.8	12	9.5	12	0.5	−0.5	−0.5
	16	6	9	4	2.5	16	11.3	16	4	2	5
	18	7	10	4	2.5	16	11.3	16	4	2	5
	21	8	11	5	3	21	16	21	1	−3	1
	24	8	12	5	3	21	16	21	1	−3	1
	27	9	13	5	3	21	16	21	1	−3	1
	27	10	13	6	3.5	25	19	25	5	−2	—
	32	10	15	8	4	32	23.5	32	−3	−9	—

Note) The ball nut flange faces the fixed side unless otherwise specified.
If desiring the flange to face the supported side, add symbol G in the end of the Ball Screw model number when placing an order.
(Example) BNFN2505-5RRGO+420LC5-H2KG

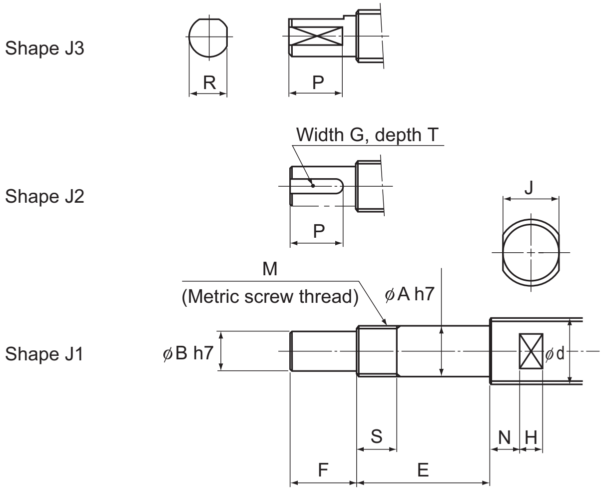
Recommended Shapes of Shaft Ends - Shape J (J1, J2 and J3) (For Support Unit Model BK)



Model BK

Support Unit model No.	Ball screw shaft outer diameter	Shaft outer diameter of the bearung				Metric screw thread
Model BK	d	A	B	E	F	M
BK10	14	10	8	39	15	M10×1
BK10	15	10	8	39	15	M10×1
BK12	16	12	10	39	15	M12×1
BK12	18	12	10	39	15	M12×1
BK15	20	15	12	40	20	M15×1
BK17	25	17	15	53	23	M17×1
BK20	28	20	17	53	25	M20×1
BK20	30	20	17	53	25	M20×1
BK20	32	20	17	53	25	M20×1
BK25	36	25	20	65	30	M25×1.5
BK30	40	30	25	72	38	M30×1.5
BK35	45	35	30	83	45	M35×1.5
BK40	50	40	35	98	50	M40×1.5
BK40	55	40	35	98	50	M40×1.5

Note) Support Units are designed to have dimensions so that combinations of models FK and FF, models EK and EF or models BK and BF are used on the same shaft.
If desiring the shaft end to be machined at THK, add the shape symbol in the end of the Ball Screw model number.
(Example) TS2505+500L-J2K
(Shape J2 on the fixed side; shape K on the supported side)
For the perpendicularity of the end face of the bearing, refer to JIS B 1192-1997.

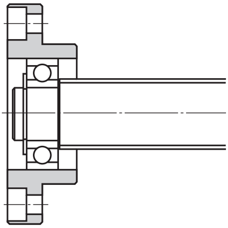


Unit: mm

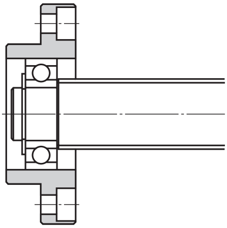
		Width across flat			Shape J2 Keyway			Shape J3 Cut flat on two side	
	S	J	N	H	G N9	T +0.1 0	P	R	P
	16	10	5	7	2	1.2	11	7.5	11
	16	10	5	7	2	1.2	11	7.5	11
	14	13	6	8	3	1.8	12	9.5	12
	14	13	6	8	3	1.8	12	9.5	12
	12	16	6	9	4	2.5	16	11.3	16
	17	18	7	10	5	3	21	14.3	21
	15	21	8	11	5	3	21	16	21
	15	24	8	12	5	3	21	16	21
	15	27	9	13	5	3	21	16	21
	18	27	10	13	6	3.5	25	19	25
	25	32	10	15	8	4	32	23.5	32
	28	36	12	15	8	4	40	28.5	40
	35	41	14	19	10	5	45	33	45
	35	46	14	20	10	5	45	33	45

Note) The ball nut flange faces the fixed side unless otherwise specified.
If desiring the flange to face the supported side, add symbol G in the end of the Ball Screw model number when placing an order.
(Example) BNFN2505-5RRGO+420LC5-J2KG

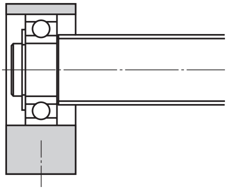
Recommended Shapes of Shaft Ends - Shape K (For Support Unit Models FF, EF and BF)



Model FF



Model FF

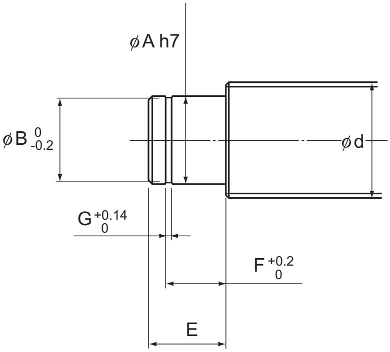


Model EF

Model BF

Support Unit model No.			Ball screw shaft outer diameter	Shaft outer diameter of the bearung
Model FF	Model EF	Model BF	d	A
FF10	EF10	BF10	14	8
FF10	EF10	BF10	15	8
FF12	EF12	BF12	16	10
FF12	EF12	BF12	18	10
FF15	EF15	BF15	20	15
FF15	EF15	BF15	25	15
—	—	BF17 *	25	17
FF20	EF20	BF20 **	28	20
FF20	EF20	BF20 **	30	20
FF20	EF20	BF20 **	32	20
FF25	—	BF25	36	25
FF30	—	BF30	40	30
—	—	BF35	45	35
—	—	BF40	50	40
—	—	BF40	55	40

Note) Support Units are designed to have dimensions so that combinations of models FK and FF, models EK and EF or models BK and BF are used on the same shaft.
If desiring the shaft end to be machined at THK, add the shape symbol in the end of the Ball Screw model number.
(Example) TS2505+500L-H2K
(Shape H2 on the fixed side; shape K on the supported side)
For the perpendicularity of the end face of the bearing, refer to JIS B 1192-1997.



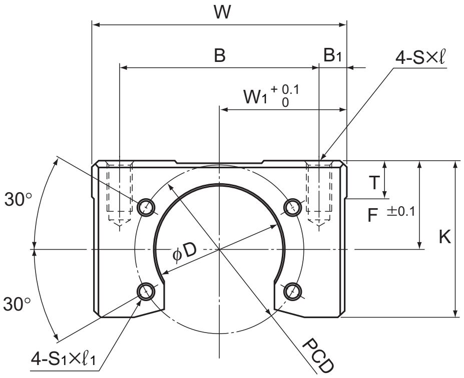
Unit: mm

	E	Snap ring groove		
		B	F	G
	10	7.6	7.9	0.9
	10	7.6	7.9	0.9
	11	9.6	9.15	1.15
	11	9.6	9.15	1.15
	13	14.3	10.15	1.15
	13	14.3	10.15	1.15
	16	16.2	13.15	1.15
	19 (16)	19	15.35 (13.35)	1.35
	19 (16)	19	15.35 (13.35)	1.35
	19 (16)	19	15.35 (13.35)	1.35
	20	23.9	16.35	1.35
	21	28.6	17.75	1.75
	22	33	18.75	1.75
	23	38	19.95	1.95
	23	38	19.95	1.95

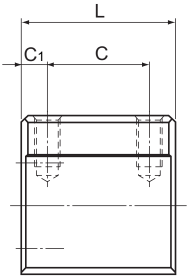
Note) * When model BK17 (shaft end shape: J) is used on the fixed side for a Ball Screw with a shaft outer diameter of 25 mm, the shaft end shape on the supported side is that for model BF17.

** The dimensions in the parentheses in the table above are that of model BF20. They differ from those of models FF20 and EF20. When placing an order, be sure to specify the model number of the Support Unit to be used.

Nut Bracket



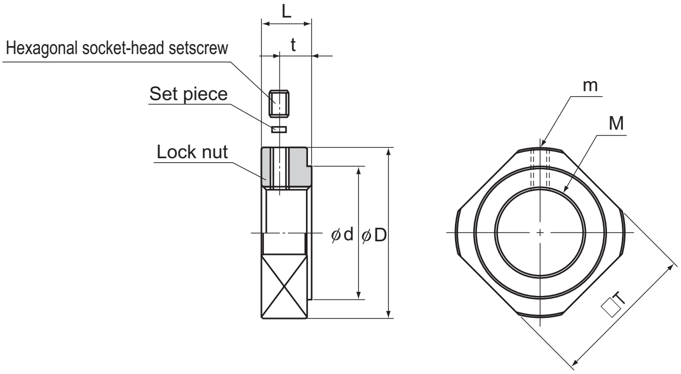
Model No.	Width W	W_1	B	B_1	Overall length L	C	C_1	F	K
MC 1004	48	24	40	4	32	16	10	20	32.5
MC 1205	60	30	47	6.5	36	24	6	21	37
MC 1408	60	30	50	5	36	20	10	21.5	37
MC 2010	86	43	70	8	50	30	10	31	54
MC 2020	86	43	70	8	40	24	8	28	51



Unit: mm

	T	D	PCD	S×ℓ	S_1×ℓ_1	For factory automation equipment Supported Ball Screw models	Mass kg
	9	26.4	36	M5×10	M4×7	BNK1004,BNK1010	0.24
	9	30.4	40	M6×12	M4×7	BNK1205	0.38
	9	34.4	45	M6×12	M5×7	BNK1408,BNK1510,BNK1520,BNK1616	0.34
	16	46.4	59	M10×20	M6×10	BNK2010	1.04
	16	39.4	59	M10×20	M6×10	BNK2020	0.83

Lock Nut



Unit: mm

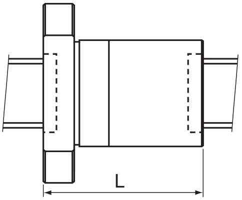
Model No.	M	m	D	d	L	t	T	Mass kg
RN 4	M4×0.5	M2.6	11.5	8	5	2.7	10	0.003
RN 5	M5×0.5	M2.6	13.5	9	5	2.7	11	0.004
RN 6	M6×0.75	M3	14.5	10	5	2.7	12	0.005
RN 8	M8×1	M3	17	13	6.5	4	14	0.008
RN 10	M10×1	M3	20	15	8	5.5	16	0.013
RN 12	M12×1	M3	22	17	8	5.5	19	0.014
RN 15	M15×1	M3	25	21	8	4.5	22	0.017
RN 17	M17×1	M4	30	25	13	9	24	0.042
RN 20	M20×1	M4	35	26	11	7	30	0.048
RN 25	M25×1.5	M5	43	33	15	10	35	0.096
RN 30	M30×1.5	M6	48	39	20	14	40	0.145
RN 35	M35×1.5	M8	60	46	21	14	50	0.261
RN 40	M40×1.5	M8	63	51	25	18	50	0.304

Ball Screw

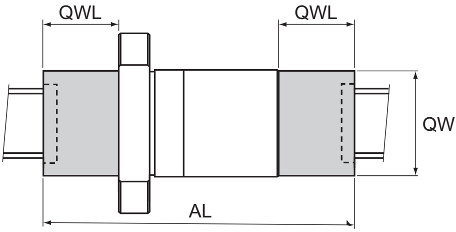
Options

Dimensions of Each Model with an Option Attached

Dimensions of the Ball Screw Nut Attached with Wiper Ring W and QZ Lubricator



With WW (without QZ)



With QZ and WW

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
SBN Retainer	3210-7	○	○	120	31	73	182
	3212-5	○	○	117	33	73	183
	3610-7	○	○	123	33	64	189
	3612-7	○	○	140	35	64	210
	3616-5	○	○	140	32	64	204
	4012-5	○	○	119	38	66	195
	4016-5	○	○	144	42	66	228
	4512-5	○	△	119	—	—	—
	4516-5	○	△	140	—	—	—
	5012-5	○	○	119	38.5	79	196
	5016-5	○	○	143	38.5	79	220
	5020-5	○	○	169	40.5	79	250
SBK Retainer	3620-7.6	○	○	110	28	69	166
	4020-7.6	○	○	110	30.5	79	171
	4030-7.6	○	○	148	30.4	79	208.8
	5020-7.6	○	○	110	35	89	180
	5030-7.6	○	○	149	35	89	219
	5036-7.6	○	○	172	35	89	242
	5520-7.6	○	○	110	32	95	174
	5530-7.6	○	○	149	32	95	213
	5536-7.6	○	○	172	32	95	236
HBN Retainer	3210-5	×	△	—	—	—	—
	3610-5	×	△	—	—	—	—
	3612-5	×	△	—	—	—	—
	4010-7.5	×	△	—	—	—	—
	4012-7.5	×	△	—	—	—	—
	5010-7.5	×	△	—	—	—	—
	5012-7.5	×	△	—	—	—	—
	5016-7.5	×	△	—	—	—	—
	6316-7.5	×	△	—	—	—	—
	6316-10.5	×	△	—	—	—	—
	6320-7.5	×	△	—	—	—	—

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNF	1604-3	○	○	45	29	31	103
	1605-2.5	○	○	41	29	31	99
	1605-3	○	○	51	29	31	109
	1605-5	○	○	56	29	31	114
	1606-2.5	○	○	44	29	31	102
	1606-5	○	○	62	29	31	120
	1610-1.5	○	○	42	29	31	100
	1810-2.5	○	△	69	—	—	—
	1810-3	○	△	75	—	—	—
	2004-2.5	○	○	37	27.5	39	92
	2004-5	○	○	49	27.5	39	104
	2005-2.5	○	○	41	27.5	43	96
	2005-3	○	○	52	27.5	43	107
	2005-3.5	○	○	45	27.5	43	100
	2005-5	○	○	56	27.5	43	111
	2006-2.5	○	△	44	—	—	—
	2006-3	○	△	56	—	—	—
	2006-3.5	○	△	50	—	—	—
	2006-5	○	△	62	—	—	—
	2008-2.5	△	△	—	—	—	—
	2010A-1.5	○	△	58	—	—	—
	2012-1.5	△	△	—	—	—	—
	2504-2.5	○	○	36	32.5	45	101
	2504-5	○	○	48	32.5	45	113
	2505-2.5	○	○	40	32.5	45	105
	2505-3	○	○	52	32.5	45	117
	2505-3.5	○	○	45	32.5	45	110
	2505-5	○	○	55	32.5	45	120
	2506-2.5	○	○	44	33	45	110
	2506-3	○	○	56	33	45	122
	2506-3.5	○	○	50	33	45	116
	2506-5	○	○	62	33	45	128

○: available △: available per request X: not available

The dimension “L” indicates the value with WW attached. Depending on the model number, the dimension including WW may exceed the overall nut length.

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNF	2508-2.5	○	○	58	34	45	126
	2508-3	○	○	71	34	45	139
	2508-3.5	○	○	66	34	45	134
	2508-5	○	○	82	34	45	150
	2510A-2.5	○	○	70	37	45	144
	2512-2.5	○	○	60	33	45	126
	2516-1.5	○	○	60	35	45	130
	2805-2.5	○	△	44	—	—	—
	2805-3	○	△	54	—	—	—
	2805-3.5	○	△	49	—	—	—
	2805-5	○	△	59	—	—	—
	2805-7.5	○	△	74	—	—	—
	2806-2.5	○	△	50	—	—	—
	2806-3.5	○	△	56	—	—	—
	2806-5	○	△	68	—	—	—
	2806-7.5	○	△	86	—	—	—
	2808-2.5	○	△	68	—	—	—
	2808-3	○	△	80	—	—	—
	2808-5	○	△	92	—	—	—
	2810-2.5	○	△	86	—	—	—
	3204-7.5	△	△	—	—	—	—
	3205-2.5	○	○	41	32	57	105
	3205-3	○	○	53	32	57	117
	3205-4.5	○	○	63	32	57	127
	3205-5	○	○	56	32	57	120
	3205-7.5	○	○	71	32	57	135
	3206-2.5	○	○	45	32	57	109
	3206-3	○	○	57	32	57	121
	3206-5	○	○	63	32	57	127
	3208A-2.5	○	○	58	34	57	126
	3208A-3	○	○	71	34	57	139
	3208A-4.5	○	○	87	34	57	155
	3208A-5	○	○	82	34	57	150
	3210A-2.5	○	○	70	31	73	132
	3210A-3	○	○	87	31	73	149
	3210A-3.5	○	○	80	31	73	142
	3210A-5	○	○	100	31	73	162
	3212-3.5	○	○	98	33	73	164
	3606-2.5	○	○	53	30	64	113
	3606-3	○	○	62	30	64	122
	3606-5	○	○	71	30	64	131
	3606-7.5	○	○	89	30	64	149
	3608-2.5	○	○	68	31	64	130
	3608-5	○	○	92	31	64	154
	3608-7.5	○	○	116	31	64	178
	3610-2.5	○	○	81	33	64	147
	3610-5	○	○	111	33	64	177
	3610-7.5	○	○	141	33	64	207
	3612-2.5	○	○	87	35	64	157
	3612-5	○	○	123	35	64	193
	3616-2.5	○	○	92	32	64	156

○: available △: available per request X: not available

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNF	3620-1.5	○	○	75	32	64	139
	4005-3	○	○	56	33	66	122
	4005-4.5	○	○	66	33	66	132
	4005-6	○	○	81	33	66	147
	4006-2.5	○	○	48	35	66	118
	4006-5	○	○	66	35	66	136
	4006-7.5	○	○	84	35	66	154
	4008-2.5	○	○	58	35	66	128
	4008-3	○	○	71	35	66	141
	4008-5	○	○	82	35	66	152
	4010-2.5	○	○	73	37	66	147
	4010-3	○	○	90	37	66	164
	4010-3.5	○	○	83	37	66	157
	4010-5	○	○	103	37	66	177
	4012-2.5	○	○	83	38	66	159
	4012-3.5	○	○	95	38	66	171
	4012-5	○	○	119	38	66	195
	4016-5	○	○	152	42	66	236
	4506A-2.5	○	△	53	—	—	—
	4506A-5	○	△	71	—	—	—
	4506A-7.5	○	△	89	—	—	—
	4508-2.5	○	△	68	—	—	—
	4508-5	○	△	92	—	—	—
	4508-7.5	○	△	116	—	—	—
	4510-2.5	○	△	81	—	—	—
	4510-3	○	△	94	—	—	—
	4510-5	○	△	111	—	—	—
	4510-7.5	○	△	141	—	—	—
	4512-5	○	△	119	—	—	—
	4520-1.5	○	△	95	—	—	—
	5005-4.5	○	○	68	35.5	79	139
	5008-2.5	○	○	61	36.5	79	134
	5008-5	○	○	85	36.5	79	158
	5008-7.5	○	○	109	36.5	79	182
	5010-2.5	○	○	73	37.5	79	148
	5010-3	○	○	90	37.5	79	165
	5010-3.5	○	○	83	37.5	79	158
	5010-5	○	○	103	37.5	79	178
	5010-7.5	○	○	133	37.5	79	208
	5012-2.5	○	○	87	38.5	79	164
	5012-3.5	○	○	99	38.5	79	176
	5012-5	○	○	123	38.5	79	200
	5016-2.5	○	○	116	38.5	79	193
	5016-5	○	○	164	38.5	79	241
	5020-2.5	○	○	141	40.5	79	222
	5510-2.5	○	△	81	—	—	—
	5510-5	○	△	111	—	—	—
	5510-7.5	○	△	141	—	—	—
	5512-2.5	○	△	93	—	—	—
	5512-3	○	△	107	—	—	—
	5512-3.5	○	△	105	—	—	—

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNF	5512-5	○	△	129	—	—	—
	5512-7.5	○	△	165	—	—	—
	5516-2.5	○	△	116	—	—	—
	5516-5	○	△	164	—	—	—
	5520-2.5	○	△	127	—	—	—
	5520-5	○	△	187	—	—	—
	6310-2.5	○	△	77	—	—	—
	6310-5	○	△	107	—	—	—
	6310-7.5	○	△	137	—	—	—
	6312A-2.5	△	△	—	—	—	—
	6312A-5	△	△	—	—	—	—
	6316-5	△	△	—	—	—	—
	6320-2.5	○	△	127	—	—	—
	6320-5	○	△	187	—	—	—
	7010-2.5	△	△	—	—	—	—
	7010-5	△	△	—	—	—	—
	7010-7.5	△	△	—	—	—	—
	7012-2.5	△	△	—	—	—	—
	7012-5	△	△	—	—	—	—
	7012-7.5	△	△	—	—	—	—
	7020-5	△	△	—	—	—	—
	8010-2.5	△	△	—	—	—	—
	8010-5	△	△	—	—	—	—
	8010-7.5	△	△	—	—	—	—
	8020A-2.5	△	△	—	—	—	—
	8020A-5	△	△	—	—	—	—
	8020A-7.5	△	△	—	—	—	—
	10020A-2.5	○	△	131	—	—	—
	10020A-5	○	△	191	—	—	—
	10020A-7.5	○	△	251	—	—	—
BNFN	1604-3	○	○	85	29	31	143
	1605-2.5	○	○	76	29	31	134
	1605-3	○	○	96	29	31	154
	1605-5	○	○	106	29	31	164
	1610-1.5	○	○	72	29	31	130
	1810-2.5	○	△	119	—	—	—
	1810-3	○	△	135	—	—	—
	2004-2.5	○	△	69	—	—	—
	2004-5	○	△	93	—	—	—
	2005-2.5	○	△	76	—	—	—
	2005-3	○	△	97	—	—	—
	2005-3.5	○	△	85	—	—	—
	2005-5	○	△	106	—	—	—
	2006-2.5	○	△	86	—	—	—
	2006-3	○	△	110	—	—	—
	2006-3.5	○	△	98	—	—	—
	2006-5	○	△	122	—	—	—
	2008-2.5	△	△	—	—	—	—
	2010A-1.5	○	△	98	—	—	—
	2012-1.5	△	△	—	—	—	—
	2504-2.5	○	○	68	32.5	45	133

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNFN	2504-5	○	○	92	32.5	45	157
	2505-2.5	○	○	75	32.5	45	140
	2505-3	○	○	102	32.5	45	167
	2505-3.5	○	○	85	32.5	45	150
	2505-5	○	○	105	32.5	45	170
	2506-2.5	○	○	86	33	45	152
	2506-3	○	○	110	33	45	176
	2506-3.5	○	○	98	33	45	164
	2506-5	○	○	122	33	45	188
	2508-2.5	○	○	106	34	45	174
	2508-3	○	○	135	34	45	203
	2508-3.5	○	○	122	34	45	190
	2508-5	○	○	154	34	45	222
	2510A-2.5	○	○	120	37	45	194
	2512-2.5	○	○	108	33	45	174
	2516-1.5	○	○	108	35	45	178
	2805-2.5	○	△	74	—	—	—
	2805-3	○	△	94	—	—	—
	2805-3.5	○	△	84	—	—	—
	2805-5	○	△	104	—	—	—
	2805-7.5	○	△	134	—	—	—
	2806-2.5	○	△	86	—	—	—
	2806-3.5	○	△	98	—	—	—
	2806-5	○	△	122	—	—	—
	2806-7.5	○	△	158	—	—	—
	2808-2.5	○	△	116	—	—	—
	2808-3	○	△	144	—	—	—
	2808-5	○	△	164	—	—	—
	2810-2.5	○	△	146	—	—	—
	3205-2.5	○	○	76	32	57	140
	3205-3	○	○	103	32	57	167
	3205-4.5	○	○	123	32	57	187
	3205-5	○	○	106	32	57	170
	3205-7.5	○	○	136	32	57	200
	3206-2.5	○	○	87	32	57	151
	3206-3	○	○	111	32	57	175
	3206-5	○	○	123	32	57	187
	3208A-2.5	○	○	106	34	57	174
	3208A-3	○	○	135	34	57	203
	3208A-4.5	○	○	167	34	57	235
	3208A-5	○	○	154	34	57	222
	3210A-2.5	○	○	130	31	73	192
	3210A-3	○	○	167	31	73	229
	3210A-3.5	○	○	150	31	73	212
	3210A-5	○	○	190	31	73	252
	3212-3.5	○	○	170	33	73	236
	3606-2.5	○	○	89	30	64	149
	3606-3	○	○	110	30	64	170
	3606-5	○	○	125	30	64	185
	3606-7.5	○	○	161	30	64	221
	3608-2.5	○	○	116	31	64	178

○: available △: available per request X: not available

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNFN	3608-5	○	○	164	31	64	226
	3608-7.5	○	○	212	31	64	274
	3610-2.5	○	○	141	33	64	207
	3610-5	○	○	201	33	64	267
	3610-7.5	○	○	261	33	64	327
	3612-2.5	○	○	147	35	64	217
	3612-5	○	○	219	35	64	289
	3616-2.5	○	○	172	32	64	236
	3616-5	○	○	268	32	64	332
	3620-1.5	○	○	135	32	64	199
	4005-3	○	○	106	33	66	172
	4005-4.5	○	○	126	33	66	192
	4005-5	○	○	109	33	66	175
	4005-6	○	○	156	33	66	222
	4006-2.5	○	○	90	35	66	160
	4006-5	○	○	126	35	66	196
	4006-7.5	○	○	162	35	66	232
	4008-2.5	○	○	106	35	66	176
	4008-3	○	○	135	35	66	205
	4008-5	○	○	154	35	66	224
	4010-2.5	○	○	133	37	66	207
	4010-3	○	○	170	37	66	244
	4010-3.5	○	○	153	37	66	227
	4010-5	○	○	193	37	66	267
	4012-2.5	○	○	155	38	66	231
	4012-3.5	○	○	179	38	66	255
	4012-5	○	○	227	38	66	303
	4016-5	○	○	280	42	66	364
	4506A-2.5	○	△	89	—	—	—
	4506A-5	○	△	125	—	—	—
	4506A-7.5	○	△	161	—	—	—
	4508-2.5	○	△	116	—	—	—
	4508-5	○	△	164	—	—	—
	4508-7.5	○	△	212	—	—	—
	4510-2.5	○	△	141	—	—	—
	4510-3	○	△	164	—	—	—
	4510-5	○	△	201	—	—	—
	4510-7.5	○	△	261	—	—	—
	4512-5	○	△	227	—	—	—
	4520-1.5	○	△	175	—	—	—
	5005-3	○	○	108	35.5	79	179
	5005-4.5	○	○	128	35.5	79	199
	5008-2.5	○	○	109	36.5	79	182
	5008-5	○	○	157	36.5	79	230
	5008-7.5	○	○	205	36.5	79	278
	5010-2.5	○	○	133	37.5	79	208
	5010-3	○	○	170	37.5	79	245
	5010-3.5	○	○	153	37.5	79	228
	5010-5	○	○	193	37.5	79	268
	5010-7.5	○	○	253	37.5	79	328
	5012-2.5	○	○	159	38.5	79	236
BNFN	5012-3.5	○	○	183	38.5	79	260
	5012-5	○	○	231	38.5	79	308
	5016-2.5	○	○	196	38.5	79	273
	5016-5	○	○	292	38.5	79	369
	5020-2.5	○	○	241	40.5	79	322
	5510-2.5	○	△	141	—	—	—
	5510-5	○	△	201	—	—	—
	5510-7.5	○	△	261	—	—	—
	5512-2.5	○	△	165	—	—	—
	5512-3	○	△	191	—	—	—
	5512-3.5	○	△	189	—	—	—
	5512-5	○	△	237	—	—	—
	5512-7.5	○	△	309	—	—	—
	5516-2.5	○	△	196	—	—	—
	5516-5	○	△	292	—	—	—
	5520-2.5	○	△	227	—	—	—
	5520-5	○	△	347	—	—	—
	6310-2.5	○	△	137	—	—	—
	6310-5	○	△	197	—	—	—
	6310-7.5	○	△	257	—	—	—
	6312A-2.5	△	△	—	—	—	—
	6312A-5	△	△	—	—	—	—
	6316-2.5	△	△	—	—	—	—
	6316-5	△	△	—	—	—	—
	6320-2.5	○	△	227	—	—	—
	6320-5	○	△	347	—	—	—
	7010-2.5	△	△	—	—	—	—
	7010-5	△	△	—	—	—	—
	7010-7.5	△	△	—	—	—	—
	7012-2.5	△	△	—	—	—	—
	7012-5	△	△	—	—	—	—
	7012-7.5	△	△	—	—	—	—
	7020-5	△	△	—	—	—	—
	8010-2.5	△	△	—	—	—	—
	8010-5	△	△	—	—	—	—
	8010-7.5	△	△	—	—	—	—
	8012-5	△	△	—	—	—	—
	8020A-2.5	△	△	—	—	—	—
	8020A-5	△	△	—	—	—	—
	10020A-2.5	○	△	231	—	—	—
	10020A-5	○	△	351	—	—	—
	10020A-7.5	○	△	471	—	—	—
BIF	1605-5	○	○	56	29	31	114
	1606-5	○	○	62	29	31	120
	1810-3	○	△	75	—	—	—
	2004-5	○	△	53	—	—	—
	2005-5	○	△	56	—	—	—
	2006-3	○	△	56	—	—	—
	2006-5	○	△	62	—	—	—
	2505-3	○	○	52	32.5	45	117
	2505-5	○	○	55	32.5	45	120

○: available △: available per request X: not available

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BIF	2508-5	○	○	82	34	45	150
	2510A-5	○	○	100	37	45	174
	2805-5	○	△	59	—	—	—
	2805-10	○	△	89	—	—	—
	2806-5	○	△	68	—	—	—
	2806-10	○	△	104	—	—	—
	2810-3	○	△	88	—	—	—
	3204-10	△	△	—	—	—	—
	3205-5	○	○	56	32	57	120
	3205-10	○	○	86	32	57	150
	3206-5	○	○	63	32	57	127
	3206-7	○	○	75	32	57	139
	3206-10	○	○	99	32	57	163
	3208A-5	○	○	82	34	57	150
	3208A-7	○	○	98	34	57	166
	3210A-5	○	○	100	31	73	162
	3610-5	○	○	111	33	64	177
	3610-10	○	○	171	33	64	237
	4010-5	○	○	103	37	66	177
	4010-10	○	○	163	37	66	237
	4012-5	○	○	119	38	66	195
	4012-10	○	○	191	38	66	267
	5010-5	○	○	103	37.5	79	178
	5010-10	○	○	163	37.5	79	238
DIK	1404-4	△	△	—	—	—	—
	1404-6	△	△	—	—	—	—
	1605-6	○	△	60	—	—	—
	2004-6	○	△	62	—	—	—
	2004-8	○	△	70	—	—	—
	2005-6	○	△	61	—	—	—
	2006-6	△	△	—	—	—	—
	2008-4	△	△	—	—	—	—
	2504-6	○	△	63	—	—	—
	2504-8	○	△	71	—	—	—
	2505-6	○	△	61	—	—	—
	2506-4	○	△	60	—	—	—
	2506-6	○	△	72	—	—	—
	2508-4	○	△	71	—	—	—
	2508-6	○	△	94	—	—	—
	2510-4	○	△	85	—	—	—
	2805-6	○	△	69	—	—	—
	2805-8	○	△	79	—	—	—
	2806-6	○	△	73	—	—	—
	2810-4	○	△	84	—	—	—
	3204-6	○	△	64	—	—	—
	3204-8	○	△	72	—	—	—
	3204-10	○	△	80	—	—	—
	3205-6	○	△	62	—	—	—
	3205-8	○	△	73	—	—	—
	3206-6	○	△	73	—	—	—
	3206-8	○	△	87	—	—	—

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
DIK	3210-6	○	△	110	—	—	—
	3212-4	○	△	98	—	—	—
	3610-6	○	△	122	—	—	—
	3610-8	○	△	143	—	—	—
	3610-10	○	△	164	—	—	—
	4010-6	○	○	113	44	61	201
	4010-8	○	○	137	44	61	225
	4012-6	○	○	138	44	61	226
	4012-8	○	○	163	44	61	251
	4016-4	○	○	120	44	61	208
	5010-6	○	△	114	—	—	—
	5010-8	○	△	137	—	—	—
	5010-10	○	△	160	—	—	—
	5012-6	○	△	145	—	—	—
	5012-8	○	△	170	—	—	—
	5016-4	○	△	129	—	—	—
	5016-6	○	△	175	—	—	—
	6310-8	△	△	—	—	—	—
	6312-6	△	△	—	—	—	—
	6312-8	△	△	—	—	—	—
DK	1404-4	△	△	—	—	—	—
	1404-6	△	△	—	—	—	—
	1605-3	○	△	45	—	—	—
	1605-4	○	△	50	—	—	—
	2004-3	○	△	42	—	—	—
	2004-4	○	△	46	—	—	—
	2005-3	○	△	46	—	—	—
	2005-4	○	△	51	—	—	—
	2006-3	△	△	—	—	—	—
	2006-4	△	△	—	—	—	—
	2008-4	△	△	—	—	—	—
	2504-3	○	△	43	—	—	—
	2504-4	○	△	47	—	—	—
	2505-3	○	△	46	—	—	—
	2505-4	○	△	51	—	—	—
	2506-3	○	△	52	—	—	—
	2506-4	○	△	60	—	—	—
	2508-3	○	△	62	—	—	—
	2508-4	○	△	71	—	—	—
	2510-3	○	△	80	—	—	—
	2510-4	○	△	85	—	—	—
	2805-3	○	△	49	—	—	—
	2805-4	○	△	54	—	—	—
	2806-3	○	△	53	—	—	—
	2806-4	○	△	61	—	—	—
	2810-4	○	△	84	—	—	—
	3204-3	○	△	44	—	—	—
	3204-4	○	△	48	—	—	—
	3205-3	○	△	47	—	—	—
	3205-4	○	△	52	—	—	—
	3205-6	○	△	62	—	—	—

○: available △: available per request X: not available

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
DK	3206-3	○	△	53	—	—	—
	3206-4	○	△	61	—	—	—
	3210-3	○	△	80	—	—	—
	3210-4	○	△	90	—	—	—
	3212-4	○	△	98	—	—	—
	3610-3	○	△	82	—	—	—
	3610-4	○	△	93	—	—	—
	4010-3	○	○	83	44	61	171
	4010-4	○	○	93	44	61	181
	4012-3	○	○	90	44	61	178
	4012-4	○	○	103	44	61	191
	4016-4	○	○	120	44	61	208
	4020-3	○	○	123	44	61	211
	5010-3	○	△	83	—	—	—
	5010-4	○	△	93	—	—	—
	5010-6	○	△	114	—	—	—
	5012-3	○	△	97	—	—	—
	5012-4	○	△	110	—	—	—
	5016-3	○	△	111	—	—	—
	5016-4	○	△	129	—	—	—
	5020-3	○	△	136	—	—	—
	6310-4	△	△	—	—	—	—
	6310-6	△	△	—	—	—	—
	6312-3	△	△	—	—	—	—
	6312-4	△	△	—	—	—	—
	6320-3	△	△	—	—	—	—
DKN	4020-3	○	○	233	47	61	327
	5020-3	○	△	243	—	—	—
	6320-3	△	△	—	—	—	—
BLW	1510-5.6	○	○	96	25.5	31	140
	1616-3.6	△	○	—	29	31	(142.5)
	2020-3.6	○	△	112	—	—	—
	2525-3.6	○	△	131.5	—	—	—
	3232-3.6	○	○	162.6	37.5	53	230
	3636-3.6	○	△	191	—	—	—
	4040-3.6	○	△	201.8	—	—	—
	5050-3.6	○	△	255.8	—	—	—
BLK (Precision)	1510-5.6	○	○	51	25.5	31	95
	1616-2.8	△	○	—	29	31	(112)
	1616-3.6	△	○	—	29	31	(96)
	2020-2.8	○	△	72	—	—	—
	2020-3.6	○	△	52	—	—	—
	2525-2.8	○	△	87	—	—	—
	2525-3.6	○	△	62	—	—	—
	3232-2.8	○	○	109.6	37.5	53	177
	3232-3.6	○	○	77.6	37.5	53	145
	3620-5.6	○	△	88	—	—	—
	3624-5.6	△	△	—	—	—	—
	3636-2.8	○	△	123	—	—	—
	3636-3.6	○	△	87	—	—	—
	4040-2.8	○	△	135.8	—	—	—

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BLK (Precision)	4040-3.6	○	△	95.8	—	—	—
	5050-2.8	○	△	166.8	—	—	—
	5050-3.6	○	△	116.8	—	—	—
WGF	0812-3	×	×	—	—	—	—
	1015-3	×	×	—	—	—	—
	1320-3	×	×	—	—	—	—
	1520-1.5	○	○	52	25.5	31	96
	1520-3	○	○	52	25.5	31	96
	1530-1	○	○	40	25.5	31	84
	1530-3	○	○	70	25.5	31	114
	1540-1.5	×	○	49	25.5	31	(93)
	2040-1	×	△	—	—	—	—
	2040-3	×	△	—	—	—	—
	2060-1.5	×	△	—	—	—	—
	2550-1	×	△	—	—	—	—
	2550-3	×	△	—	—	—	—
	3060-1	×	○	—	37.5	53	(137)
	3060-3	×	○	—	37.5	53	(197)
	3090-1.5	×	○	—	37.5	53	(167)
	4080-1	×	△	—	—	—	—
	4080-3	×	△	—	—	—	—
	50100-1	×	△	—	—	—	—
	50100-3	×	△	—	—	—	—
BNK	0401-3	×	×	—	—	—	—
	0501-3	×	×	—	—	—	—
	0601-3	×	×	—	—	—	—
	0801-3	×	×	—	—	—	—
	0802-3	×	×	—	—	—	—
	0810-3	×	×	—	—	—	—
	1002-3	×	×	—	—	—	—
	1004-2.5	×	×	—	—	—	—
	1010-1.5	×	×	—	—	—	—
	1205-2.5	×	×	—	—	—	—
	1402-3	△	△	—	—	—	—
	1404-3	△	△	—	—	—	—
	1408-2.5	△	△	—	—	—	—
	1510-5.6	○	○	51	25.5	31	95
	1520-3	△	○	—	25.5	31	(96)
	1616-3.6	△	○	—	25.5	31	(93)
	2010-2.5	○	△	54	—	—	—
	2020-3.6	○	△	59	—	—	—
	2520-3.6	△	△	—	—	—	—
BNT (both Precision and Rolled)	1404-3.6	△	△	—	—	—	—
	1405-2.6	△	△	35	—	—	—
	1605-2.6	△	△	36	29	31	94
	1808-3.6	△	△	—	—	—	—
	2005-2.6	△	△	35	—	—	—
	2010-2.6	△	△	58	—	—	—
	2505-2.6	△	△	35	—	—	—
	2510-5.3	△	△	94	—	—	—
	2806-2.6	△	△	42	—	—	—

○: available △: available per request X: not available ( ): dimension including QZ (without WW)

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
BNT (both Precision and Rolled)	2806-5.3	△	△	67	—	—	—
	3210-2.6	△	△	64	—	—	—
	3210-5.3	△	△	94	—	—	—
	3610-2.6	△	△	64	—	—	—
	3610-5.3	△	△	96	—	—	—
	4512-5.3	△	△	115	—	—	—
BLK (Rolled)	1510-5.6	○	○	51	25.5	31	95
	1616-3.6	△	○	—	29	31	(96)
	1616-7.2	△	○	—	29	31	(96)
	2020-3.6	○	△	52	—	—	—
	2020-7.2	○	△	52	—	—	—
	2525-3.6	○	△	62	—	—	—
	2525-7.2	○	△	62	—	—	—
	3232-3.6	○	○	77.6	37.5	53	145
	3232-7.2	○	○	77.6	37.5	53	145
	3620-5.6	○	△	88	—	—	—
	3624-5.6	○	△	104	—	—	—
	3636-3.6	△	△	—	—	—	—
	3636-7.2	△	△	—	—	—	—
	4040-3.6	△	△	—	—	—	—
	4040-7.2	△	△	—	—	—	—
	5050-3.6	△	△	—	—	—	—
	5050-7.2	△	△	—	—	—	—
WTF	1520-3	○	○	52	25.5	31	96
	1520-6	○	○	52	25.5	31	96
	1530-2	×	○	—	25.5	31	(84)
	1530-3	×	○	—	25.5	31	(114)
	2040-2	×	△	—	—	—	—
	2040-3	×	△	—	—	—	—
	2550-2	×	△	—	—	—	—
	2550-3	×	△	—	—	—	—
	3060-2	×	○	—	37.5	53	(137.5)
	3060-3	×	○	—	37.5	53	(197.5)
	4080-2	×	△	—	—	—	—
	4080-3	×	△	—	—	—	—
	50100-2	×	△	—	—	—	—
	50100-3	×	△	—	—	—	—
CNF	1530-6	×	○	—	25.5	31	(114)
	2040-6	×	△	—	—	—	—

Unit: mm

Model No.		WW availability	QZ availability	Dimensions including WW	Length of protrusion with QZ attached	Outer diameter of protrusion with QZ attached	Dimensions including QZ and WW
				L	QWL	QWD	AL
CNF	2550-6	×	△	—	—	—	—
	3060-6	×	○	—	37.5	53	(197)
MBF	0401-3.7	×	×	—	—	—	—
	0601-3.7	×	×	—	—	—	—
	0802-3.7	×	×	—	—	—	—
	1002-3.7	×	×	—	—	—	—
	1202-3.7	×	×	—	—	—	—
	1402-3.7	△	△	—	—	—	—
	1404-3.7	△	△	—	—	—	—
BTK	1006-2.6	×	△	—	—	—	—
	1208-2.6	×	△	—	—	—	—
	1404-3.6	△	△	—	—	—	—
	1405-2.6	○	△	40	—	—	—
	1605-2.6	○	△	40	—	—	—
	1808-3.6	△	△	—	—	—	—
	2005-2.6	○	△	40	—	—	—
	2010-2.6	○	△	61	—	—	—
	2505-2.6	○	△	40	—	—	—
	2510-5.3	○	○	98	32.5	45	163
	2806-2.6	○	△	47	—	—	—
	2806-5.3	○	△	65	—	—	—
	3210-2.6	○	○	68	32	57	132
	3210-5.3	○	○	98	32	57	162
	3610-2.6	○	○	70	31	64	132
	3610-5.3	○	○	100	31	64	162
	4010-5.3	○	○	100	34	66	168
	4512-5.3	△	△	—	—	—	—
	5016-5.3	○	○	145	35	79	215
JPF	1404-4	△	×	—	—	—	—
	1405-4	△	×	—	—	—	—
	1605-4	○	×	60	—	—	—
	2005-6	○	×	80	—	—	—
	2505-6	○	×	80	—	—	—
	2510-4	○	×	112	—	—	—
	2805-6	○	×	80	—	—	—
	2806-6	○	×	90	—	—	—
	3210-6	○	×	135	—	—	—
	3610-6	○	×	138	—	—	—
	4010-6	○	×	138	—	—	—

○: available △: available per request X: not available ( ): dimension including QZ (without WW)

Model number coding

BNFN2505-2.5 QZ WW G0 +1000L C5

BNFN2505-2.5: Model number

QZ: With QZ Lubricator

WW: With wiper ring W

G0: Symbol for clearance in the axial direction (*1)

+1000L: Overall screw shaft length (in mm)

C5: Accuracy symbol (*2)

(*1) See A-685. (*2) See A-678.

Note) QZ Lubricator and wiper ring W are not sold alone.

Lead Screw Nut

THK General Catalog

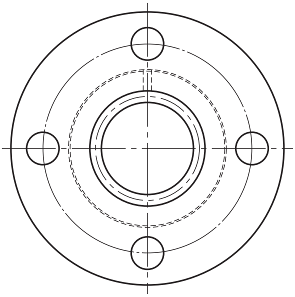
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model DCM



Lead Screw Nut Model No.	Outer dimensions			Lead screw nut dimensions						
	Outer diameter D	Tolerance h9	Length L	Flange diameter D_1	H	B	PCD	r	F	d
DCM 12	22	0 −0.052	30	44	6	5.4	31	1.5	7	1.5
DCM 14	22		30	44	6	5.4	31	1.5	7	1.5
DCM 16	28		35	51	7	6.6	38	1.5	8	1.5
DCM 18	32	0 −0.062	40	56	7	6.6	42	1.5	10.5	2
DCM 20	32		40	56	7	6.6	42	1.5	10.5	2
DCM 22	36		50	61	8	6.6	47	2	14	2.5
DCM 25	36		50	61	8	6.6	47	2	14	2.5
DCM 28	44		56	76	10	9	58	2	15	2.5
DCM 32	44		56	76	10	9	58	2	15	2.5
DCM 36	52	0 −0.074	60	84	10	9	66	2.5	17	3
DCM 40	58		70	98	12	11	76	2.5	19	3
DCM 45	64		75	104	12	11	80	2.5	21.5	4
DCM 50	68		80	109	12	11	85	2.5	24	4

Note) Cut shafts (K) and ground shafts (G) are build-to-order.
The dynamic permissible thrust (F) indicates the torque at which the contact surface pressure on the screw tooth surface is 9.8 N/mm^2.
The static permissible load (P) of the flange indicates the strength of the flange against the load as shown in the figure on the right.

Model number coding

Combination of lead screw nut and screw shaft

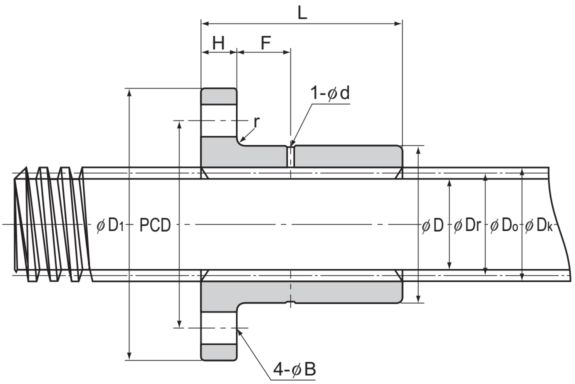
2 DC20 +1500L T

Overall screw shaft length (in mm)

Model No. of lead screw nut

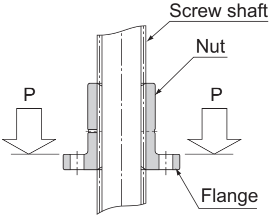
How the screw shaft is processed (T: rolled shaft)

Number of lead screw nuts used on the same shaft



Unit: mm

Screw shaft	Screw shaft details					Standard shaft length	Maximum shaft length	Dynamic permissible thrust	Static permissible load of the flange	Mass	
Model No.(note)	Outer diameter D_k	Effective diameter D_0	Thread minor diameter D_r	Lead R	Lead angle α			F(note) N	P(note) N	Screw nut g	Screw shaft kg/m
CS 12	12	11	9.5	2	3°19′	1000	1500	3920	20200	100	0.8
CS 14	14	12.5	10.5	3	4°22′	1000	1500	4900	16900	85	1
CS 16	16	14.5	12.5	3	3°46′	1000	1500	6670	31500	160	1.3
CS 18	18	16	13.5	4	4°33′	1000	2000	8730	42000	230	1.6
CS 20	20	18	15.5	4	4°03′	1500	2000	9800	37200	210	2
CS 22	22	19.5	16.5	5	4°40′	1500	2500	12400	48600	320	2.3
CS 25	25	22.5	19.5	5	4°03′	1500	3000	14200	39800	290	3.1
CS 28	28	25.5	22.5	5	3°34′	2000	3000	17900	69200	550	4
CS 32	32	29	25.5	6	3°46′	2000	4000	21100	54200	490	5.2
CS 36	36	33	29.5	6	3°19′	2000	4000	25800	84500	670	6.7
CS 40	40	37	33.5	6	2°57′	2000	4000	33800	106000	980	8.4
CS 45	45	41	36.5	8	3°33′	3000	5000	42100	125000	1310	10.4
CS 50	50	46	41.5	8	3°10′	3000	5000	50100	128000	1430	13



Model number coding

Screw shaft

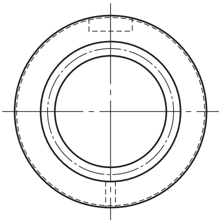
CS20 T +1500L

CS20: Model number of screw shaft

T: How the screw shaft is processed (T: rolled shaft)

+1500L: Overall screw shaft length (in mm)

Model DC



Lead Screw Nut	Outer dimensions			Lead screw nut dimensions					
	Outer diameter		L	Keyway dimensions					
Model No.	D	Tolerance h9	0 −0.3	b	Tolerance N9	t	ℓ	d	r
DC 12	22	0 −0.052	22	4	0 −0.030	2	16	1.5	1
DC 14	22		22	4		2	16	1.5	1
DC 16	28		26	5		2.5	18	1.5	1
DC 18	32	0 −0.062	31	7	0 −0.036	2.5	22	2	1
DC 20	32		31	7		2.5	22	2	1
DC 22	36		40	7		2.5	26	2.5	1
DC 25	36		40	7		2.5	26	2.5	1
DC 28	44		45	10		4	32	2.5	1.5
DC 32	44		45	10		4	32	2.5	1.5
DC 36	52	0 −0.074	49	12	0 −0.043	4.5	40	3	1.5
DC 40	58		57	15		5	42	3	1.5
DC 45	64		62	15		5	48	4	1.5
DC 50	68		67	15		5	52	4	1.5

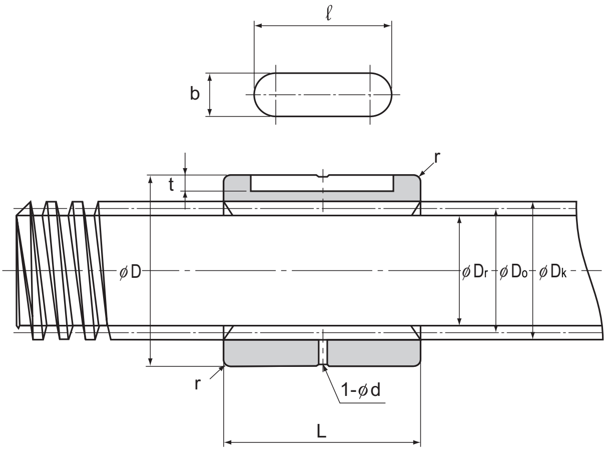
Note) Cut shafts (K) and ground shafts (G) are build-to-order.
The dynamic permissible thrust (F) indicates the torque at which the contact surface pressure on the screw tooth surface is 9.8 N/mm².

Model number coding

Combination of lead screw nut and screw shaft

2 DC20 +1500L T

- 2: Number of lead screw nuts used on the same shaft
- DC20: Model No. of lead screw nut
- +1500L: Overall screw shaft length (in mm)
- T: How the screw shaft is processed (T: rolled shaft)



Unit: mm

Screw shaft	Screw shaft details					Standard shaft length	Maximum shaft length	Dynamic permissible thrust	Mass	
Model No.(note)	Outer diameter D_k	Effective diameter D_0	Thread minor diameter D_r	Lead R	Lead angle α			F(note) N	Screw nut g	Screw shaft kg/m
CS 12	12	11	9.5	2	3°19′	1000	1500	2840	40	0.8
CS 14	14	12.5	10.5	3	4°22′	1000	1500	3630	45	1
CS 16	16	14.5	12.5	3	3°46′	1000	1500	4900	75	1.3
CS 18	18	16	13.5	4	4°33′	1000	2000	6860	120	1.6
CS 20	20	18	15.5	4	4°03′	1500	2000	7650	110	2
CS 22	22	19.5	16.5	5	4°40′	1500	2500	9900	180	2.3
CS 25	25	22.5	19.5	5	4°03′	1500	3000	11400	155	3.1
CS 28	28	25.5	22.5	5	3°34′	2000	3000	14400	280	4
CS 32	32	29	25.5	6	3°46′	2000	4000	17100	230	5.2
CS 36	36	33	29.5	6	3°19′	2000	4000	21200	380	6.7
CS 40	40	37	33.5	6	2°57′	2000	4000	27500	520	8.4
CS 45	45	41	36.5	8	3°33′	3000	5000	34900	730	10.4
CS 50	50	46	41.5	8	3°10′	3000	5000	42100	810	13

Model number coding

Screw shaft

CS20 T +1500L

How the screw shaft is processed (T: rolled shaft)

Overall screw shaft length (in mm)

Model number of screw shaft

Change Nut

THK General Catalog

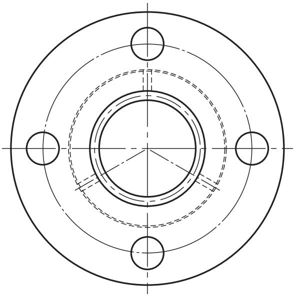
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Models DCMA and DCMB



Change Nut Model No.(note)	Outer dimensions			Change nut dimensions							Screw shaft Model No.(note)
	Outer diameter										
	D	Tolerance h9	Length L	Flange diameter D₁	H	B	PCD	r	F	d	
DCMB 8T(note)	15	0 −0.1	16	28	4	3.4	21	0.8	—	—	CT 8T
DCMB 12T(note)	20		25	36	5	4.5	27	1	—	—	CT 12T
DCMA 15T	22	0 −0.052	15	44	6	5.4	31	1.5	4.5	1.5	CT 15T
DCMB 15T			30								
DCMA 17T	28		15	51	7	6.6	38	1.5	4.5	1.5	CT 17T
DCMB 17T			35								
DCMA 20T	32	0 −0.062	20	56	7	6.6	42	1.5	6.5	2	CT 20T
DCMB 20T			40								
DCMA 25T	36		25	61	8	6.6	47	2	8.5	2	CT 25T
DCMB 25T			50								
DCMA 30T	44		28	76	10	9	58	2	9	2	CT 30T
DCMB 30T			56								
DCMA 35T	52	0 −0.074	30	84	10	9	66	2.5	10	3	CT 35T
DCMB 35T			60								
DCMA 40	58		35	98	12	11	76	2.5	11.5	3	☆CT 40
DCMB 40			70								
DCMA 45	64		37	104	12	11	80	2.5	12.5	3	☆CT 45
DCMB 45			75								
DCMA 50	68		40	109	12	11	85	2.5	14	3	☆CT 50
DCMB 50			80								

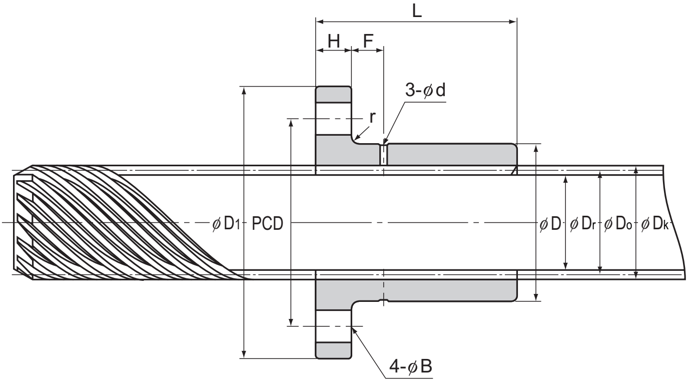
Note) Symbol T indicates that a rolled shaft is used in combination with the change nut.
The dynamic permissible torque (T) and the dynamic permissible thrust (F) indicate the values at which the contact surface pressure on the screw teeth is 9.8 N/mm². Miniature Change Nut models DCMB8T and DCMB12T use oil-impregnated plastics. (outer diameter tolerance: special).
The screw shafts marked with "☆" are build-to-order.
The static permissible load (P) of the flange indicates the strength of the flange against the load as shown in the figure on the right.

Model number coding

Combination of change nut and screw shaft

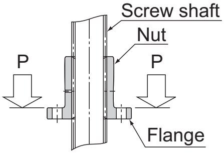
2 DCMA20 +1500L T

- 2: Number of nuts used on the same screw shaft
- DCMA20: Model No. of change nut
- +1500L: Overall screw shaft length (in mm)
- T: How the screw shaft is processed (T: rolled shaft)



Unit: mm

	Multi-thread screw shaft details						Standard shaft length	Maximum shaft length	Dynamic permissible torque	Dynamic permissible thrust	Static permissible load of the flange	Mass	
	Outer diameter D_k	Effective diameter D_0	Thread minor diameter D_r	Lead R	Lead angle α°	Threaded grooves Z			$T^{(note)}$ N-m	$F^{(note)}$ N	$P^{(note)}$ N	Change nut g	Screw shaft kg/m
	9	7.6	6.2	24	(45)	6	500	1000	3.24	863	1800	5	0.36
	13.3	11.5	9.7	36	(45)	7	500,1000	1500	12.7	1370	2800	10	0.82
	15.8	13.7	11.6	44.4	(45)	8	500,1000	1500	16.7	2300	13800	60	1.2
									32.4	4610		85	
	17.8	15.7	13.6	50	(45)	9	500,1000	1500	20.6	2600	28100	95	1.5
									48	6080		140	
	21.2	18.7	16.2	60	(45)	9	500,1000, 1500	3000	40.2	4170	34600	135	2.6
									79.4	8330		210	
	25.6	23.1	20.6	73.3	(45)	11	500,1000, 1500	3000	74.5	6370	38500	175	3.3
									148	12700		280	
	31.9	29.4	26.9	93.3	(45)	14	500,1000, 2000	4000	130	8090	55400	290	5.3
									269	16200		465	
	34.1	31.1	28.1	97.7	(45)	11	500,1000, 2000	4000	144	9260	84500	425	5.8
									287	18500		670	
	44	38.18	33.3	119.9	(45)	12	500,1000, 2000	—	381	20000	85200	715	9
									763	40000		1065	
	47	41.37	36.4	129.9	(45)	13	1000,2000, 3000	—	474	22900	115000	820	10.6
									960	46600		1270	
	52	47.73	42.9	149.9	(45)	15	1000,2000, 3000	—	681	28500	108000	925	14
									1360	57100		1375	



Model number coding

Multi-thread screw shaft

CT20 T +1500L

How the screw shaft is processed (T: rolled shaft)

Overall screw shaft length (in mm)

Model number of screw shaft

Cross-Roller Ring

THK General Catalog

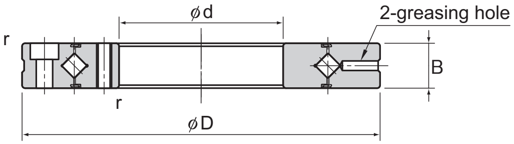
B Product Specifications

Dimensional Drawing, Dimensional Table

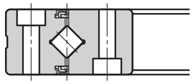
A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

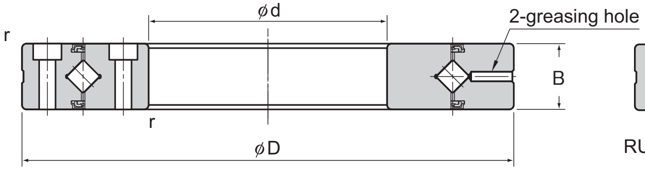
Model RU (Integrated Inner/Outer Ring Type)



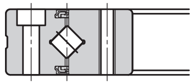
RU 42 to RU 85



RU 124G to RU 445G



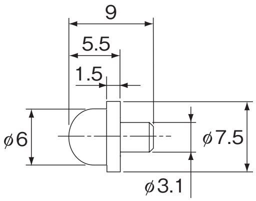
RU 124 to RU 445



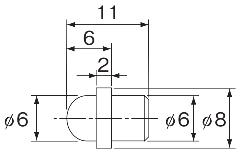
RU 124X to RU 445X

Shaft diameter	Model No.	Main dimensions						Shoulder height		Basic load rating (radial)		Mass
		Inner diameter d	Outer diameter D	Roller pitch circle diameter dp	Width B	Greasing hole d_1	r_{min}	ds	Dh	C kN	C_0 kN	kg
20	RU 42	20	70	41.5	12	3.1	0.6	37	47	7.35	8.35	0.29
35	RU 66	35	95	66	15	3.1	0.6	59	74	17.5	22.3	0.62
55	RU 85	55	120	85	15	3.1	0.6	79	93	20.3	29.5	1
80	RU 124 (G) RU 124X	80	165	124	22	3.1	1	114	134	33.1	50.9	2.6
90	RU 148 (G) RU 148X	90	210	147.5	25	3.1	1.5	133	162	49.1	76.8	4.9
115	RU 178 (G) RU 178X	115	240	178	28	3.1	1.5	161	195	80.3	135	6.8
160	RU 228 (G) RU 228X	160	295	227.5	35	6	2	208	246	104	173	11.4
210	RU 297 (G) RU 297X	210	380	297.3	40	6	2.5	272	320	156	281	21.3
350	RU 445 (G) RU 445X	350	540	445.4	45	6	2.5	417	473	222	473	35.4

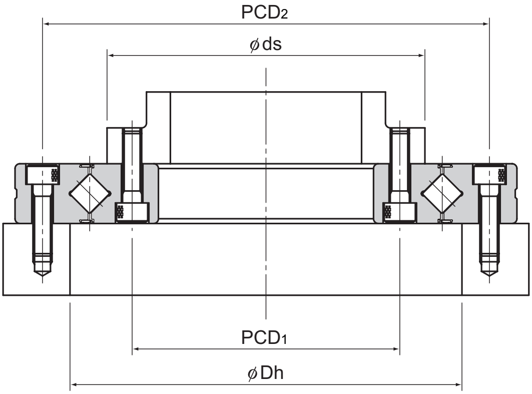
Note) Optional grease nipple available for model RU. (See figure below)
Please indicate with a “-N” at the end of the model number if required.

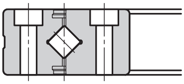


NP3.2×3.5

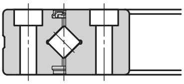


NP6×5

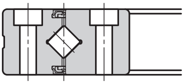




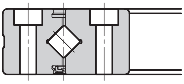
Model RU



Model RU···U



Model RU···UU



Model RU···UT

Unit: mm

	Mounting Hole Related			
	Inner ring		Outer ring	
	PCD_1	Mounting hole	PCD_2	Mounting hole
	28	6-M3 through	57	6-φ3.4 drilled through, φ6.5 counter bore depth 3.3
	45	8-M4 through	83	8-φ4.5 drilled through, φ8 counter bore depth 4.4
	65	8-M5 through	105	8-φ5.5 drilled through, φ9.5 counter bore depth 5.4
	97	10-φ5.5 drilled through, φ9.5 counter bore depth 5.4 10-M5 through	148	10-φ5.5 drilled through, φ9.5 counter bore depth 5.4
	112	12-φ9 drilled through, φ14 counter bore depth 8.6 12-M8 through	187	12-φ9 drilled through, φ14 counter bore depth 8.6
	139	12-φ9 drilled through, φ14 counter bore depth 8.6 12-M8 through	217	12-φ9 drilled through, φ14 counter bore depth 8.6
	184	12-φ11 drilled through, φ17.5 counter bore depth 10.8 12-M10 through	270	12-φ11 drilled through, φ17.5 counter bore depth 10.8
	240	16-φ14 drilled through, φ20 counter bore depth 13 16-M12 through	350	16-φ14 drilled through, φ20 counter bore depth 13
	385	24-φ14 drilled through, φ20 counter bore depth 13 24-M12 through	505	24-φ14 drilled through, φ20 counter bore depth 13

Model number coding

RU124 UU CC0 P2 B G X -N

Model No.

Accuracy symbol (*2)

Radial clearance symbol (*1)

Option symbol

No Symbol : No accessory
-N : Grease nipple attached
(For the nipple's shape,
see the figure on the left.)
RU42 to RU178: NP3.2×3.5
RU228 to RU445: NP6×5

Sub-part Accuracy symbol

No Symbol : Rotational Accuracy of the Inner Ring
R : Rotational Accuracy of the Outer Ring
B : Rotational Accuracy of the Inner/Outer Rings

Seal symbol

No Symbol : Without seal
UU : Seal attached on both ends
U : Seal attached on either end (counterbore side of the outer ring)
UT : Seal attached on either end (opposite to the counterbore side of the outer ring)

Inner Ring Hole symbol

[Available models: RU124 to RU445]

No Symbol : Inner ring counterbore hole
X : Inner ring tapped hole (through hole)

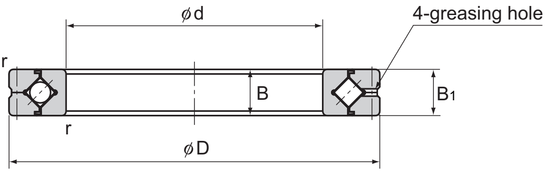
Mounting Hole Orientation symbol

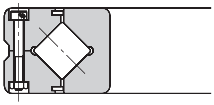
[Available models: RU124 to RU445 (excluding X type)]

No Symbol : The counterbore holes of the inner and outer rings face the same direction
G : The counterbore holes of the inner and outer rings face opposite direction

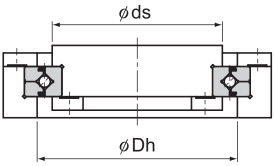
(*1) See A-870. (*2) See A-866.

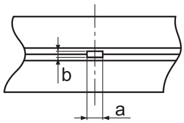
Model RB (Separable Outer Ring Type)



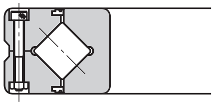


Model RB





Detail view of the greasing hole

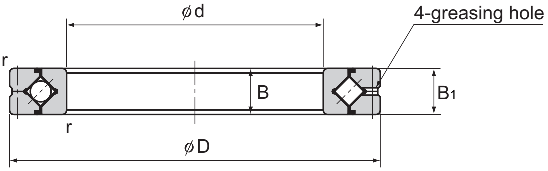


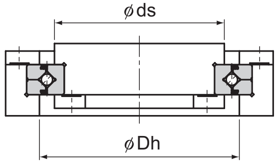
Model RB···UU

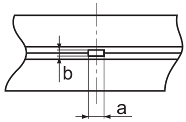
Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole					C	C_0	
		d	D	dp	B B_1	a	b	r_{min}	ds	Dh	kN	kN	kg
20	RB 2008	20	36	27	8	2	0.8	0.5	23.5	30.5	3.23	3.1	0.04
25	RB 2508	25	41	32	8	2	0.8	0.5	28.5	35.5	3.63	3.83	0.05
30	RB 3010	30	55	41.5	10	2.5	1	0.6	37	47	7.35	8.36	0.12
35	RB 3510	35	60	46.5	10	2.5	1	0.6	41	51.5	7.64	9.12	0.13
40	RB 4010	40	65	51.5	10	2.5	1	0.6	47.5	57.5	8.33	10.6	0.16
45	RB 4510	45	70	56.5	10	2.5	1	0.6	51	61.5	8.62	11.3	0.17
50	RB 5013	50	80	64	13	2.5	1.6	0.6	57.4	72	16.7	20.9	0.27
60	RB 6013	60	90	74	13	2.5	1.6	0.6	68	82	18	24.3	0.3
70	RB 7013	70	100	84	13	2.5	1.6	0.6	78	92	19.4	27.7	0.35
80	RB 8016	80	120	98	16	3	1.6	0.6	91	111	30.1	42.1	0.7
90	RB 9016	90	130	108	16	3	1.6	1	98	118	31.4	45.3	0.75
100	RB 10016	100	140	119.3	16	3.5	1.6	1	109	129	31.7	48.6	0.83
	RB 10020		150	123	20	3.5	1.6	1	113	133	33.1	50.9	1.45
110	RB 11012	110	135	121.8	12	2.5	1	0.6	117	127	12.5	24.1	0.4
	RB 11015		145	126.5	15	3.5	1.6	0.6	122	136	23.7	41.5	0.75
	RB 11020		160	133	20	3.5	1.6	1	120	143	34	54	1.56
120	RB 12016	120	150	134.2	16	3.5	1.6	0.6	127	141	24.2	43.2	0.72
	RB 12025		180	148.7	25	3.5	2	1.5	133	164	66.9	100	2.62
130	RB 13015	130	160	144.5	15	3.5	1.6	0.6	137	152	25	46.7	0.72
	RB 13025		190	158	25	3.5	2	1.5	143	174	69.5	107	2.82

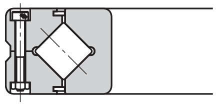
Note) The model number of a type with seals attached is RB···UU.
If a certain level of accuracy is required, this model is used for inner ring rotation.



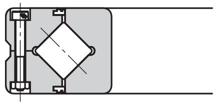




Detail view of the greasing hole



Model RB



Model RB···UU

Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole					C	C_0	
		d	D	dp	B B_1	a	b	r_{min}	ds	Dh	kN	kN	kg
140	RB 14016	140	175	154.8	16	2.5	1.6	1	147	162	25.9	50.1	1
	RB 14025		200	168	25	3.5	2	1.5	154	185	74.8	121	2.96
150	RB 15013	150	180	164	13	2.5	1.6	0.6	157	172	27	53.5	0.68
	RB 15025		210	178	25	3.5	2	1.5	164	194	76.8	128	3.16
	RB 15030		230	188	30	4.5	3	1.5	173	211	100	156	5.3
160	RB 16025	160	220	188.6	25	3.5	2	1.5	173	204	81.7	135	3.14
170	RB 17020	170	220	191	20	3.5	1.6	1.5	184	198	29	62.1	2.21
180	RB 18025	180	240	210	25	3.5	2	1.5	195	225	84	143	3.44
190	RB 19025	190	240	211.9	25	3.5	1.6	1	202	222	41.7	82.9	2.99
200	RB 20025	200	260	230	25	3.5	2	2	215	245	84.2	157	4
	RB 20030		280	240	30	4.5	3	2	221	258	114	200	6.7
	RB 20035		295	247.7	35	5	3	2	225	270	151	252	9.6
220	RB 22025	220	280	250.1	25	3.5	2	2	235	265	92.3	171	4.1
240	RB 24025	240	300	269	25	3.5	2	2.5	256	281	68.3	145	4.5
250	RB 25025	250	310	277.5	25	3.5	2	2.5	265	290	69.3	150	5
	RB 25030		330	287.5	30	4.5	3	2.5	269	306	126	244	8.1
	RB 25040		355	300.7	40	6	3.5	2.5	275	326	195	348	14.8
300	RB 30025	300	360	328	25	3.5	2	2.5	315	340	76.3	178	5.9
	RB 30035		395	345	35	5	3	2.5	322	368	183	367	13.4
	RB 30040		405	351.6	40	6	3.5	2.5	326	377	212	409	17.2
350	RB 35020	350	400	373.4	20	3.5	1.6	2.5	363	383	54.1	143	3.9

Note) The model number of a type with seals attached is RB···UU.
If a certain level of accuracy is required, this model is used for inner ring rotation.

Model number coding

RB3010 UU CC0 P5

Model number

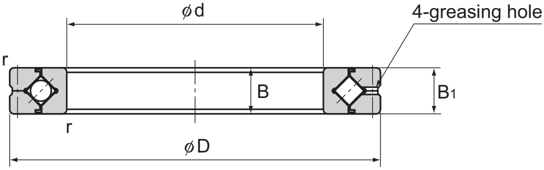
Accuracy symbol (*2)

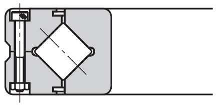
Radial clearance symbol (*1)

Seal attached on both ends (seal attached on either end: U)

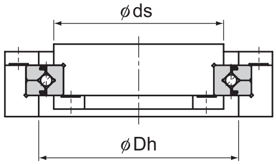
(*1) See A-870. (*2) See A-866.

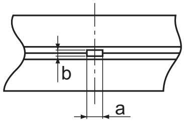
Model RB (Separable Outer Ring Type)



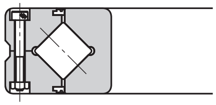


Model RB





Detail view of the greasing hole



Model RB⋯UU

Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole					C	C_0	
		d	D	dp	B B_1	a	b	r_{min}	ds	Dh	kN	kN	kg
400	RB 40035	400	480	440.3	35	5	3	2.5	422	459	156	370	14.5
	RB 40040		510	453.4	40	6	3.5	2.5	428	479	241	531	23.5
450	RB 45025	450	500	474	25	3.5	1.6	1	464	484	61.7	182	6.6
500	RB 50025	500	550	524.2	25	3.5	1.6	1	514	534	65.5	201	7.3
	RB 50040		600	548.8	40	6	3	2.5	526	572	239	607	26
	RB 50050		625	561.6	50	6	3.5	2.5	536	587	267	653	41.7
600	RB 60040	600	700	650	40	6	3	3	627	673	264	721	29
700	RB 70045	700	815	753.5	45	6	3	3	731	777	281	836	46
800	RB 80070	800	950	868.1	70	6	4	4	836	900	468	1330	105
900	RB 90070	900	1050	969	70	6	4	4	937	1001	494	1490	120
1000	RB 1000110	1000	1250	1114	110	6	6	5	1057	1171	1220	3220	360
1250	RB 1250110	1250	1500	1365.8	110	6	6	5	1308	1423	1350	3970	440

Note) The model number of a type with seals attached is RB⋯UU.
If a certain level of accuracy is required, this model is used for inner ring rotation.

Model number coding

RB40040 UU C0 PE5

Model number

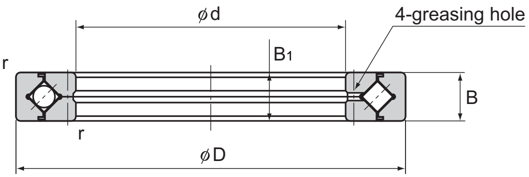
Accuracy symbol (*2)

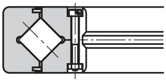
Radial clearance symbol (*1)

Seal attached on both ends (seal attached on either end: U)

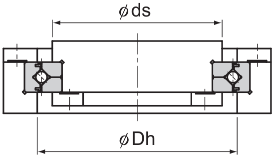
(*1) See A-870. (*2) See A-866.

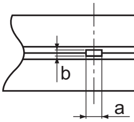
Model RE (Two-piece Inner Ring Type)



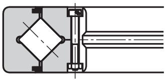


Model RE





Detail view of the greasing hole



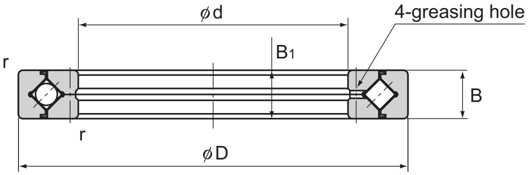
Model RE···UU

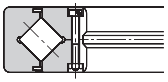
Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole					C	C_0	
		d	D	dp	B B_1	a	b	r_{min}	ds	Dh	kN	kN	kg
20	RE 2008	20	36	29	8	2	0.8	0.5	23.5	30.5	3.23	3.1	0.04
25	RE 2508	25	41	34	8	2	0.8	0.5	28.5	35.5	3.63	3.83	0.05
30	RE 3010	30	55	43.5	10	2.5	1	0.6	37	47	7.35	8.36	0.12
35	RE 3510	35	60	48.5	10	2.5	1	0.6	41	51.5	7.64	9.12	0.13
40	RE 4010	40	65	53.5	10	2.5	1	0.6	47.5	58	8.33	10.6	0.16
45	RE 4510	45	70	58.5	10	2.5	1	0.6	51	61.5	8.62	11.3	0.17
50	RE 5013	50	80	66	13	2.5	1.6	0.6	57.5	72	16.7	20.9	0.27
60	RE 6013	60	90	76	13	2.5	1.6	0.6	68	82	18	24.3	0.3
70	RE 7013	70	100	86	13	2.5	1.6	0.6	78	92	19.4	27.7	0.35
80	RE 8016	80	120	101.4	16	3	1.6	0.6	91	111	30.1	42.1	0.7
90	RE 9016	90	130	112	16	3	1.6	1	98	118	31.4	45.3	0.75
100	RE 10016	100	140	121.1	16	3	1.6	1	109	129	31.7	48.6	0.83
	RE 10020		150	127	20	3.5	1.6	1	113	133	33.1	50.9	1.45
110	RE 11012	110	135	123.3	12	2.5	1	0.6	117	127	12.5	24.1	0.4
	RE 11015		145	129	15	3	1.6	0.6	122	136	23.7	41.5	0.75
	RE 11020		160	137	20	3.5	1.6	1	120	140	34	54	1.56
120	RE 12016	120	150	136	16	3	1.6	0.6	127	141	24.2	43.2	0.72
	RE 12025		180	152	25	3.5	2	1.5	133	164	66.9	100	2.62
130	RE 13015	130	160	146	15	3	1.6	0.6	137	152	25	46.7	0.72
	RE 13025		190	162	25	3.5	2	1.5	143	174	69.5	107	2.82

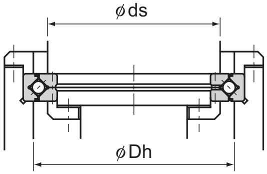
Note) The model number of a type with seals attached is RE···UU.
If a certain level of accuracy is required, this model is used for outer ring rotation.

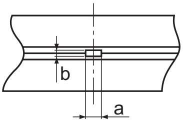
Model RE (Two-piece Inner Ring Type)



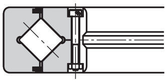


Model RE





Detail view of the greasing hole



Model RE···UU

Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole					C	C₀	
		d	D	dp	B B₁	a	b	r_{min}	ds	Dh	kN	kN	kg
140	RE 14016	140	175	160	16	3	1.6	1	147	162	25.9	50.1	1
	RE 14025		200	172	25	3.5	2	1.5	154	185	74.8	121	2.96
150	RE 15013	150	180	166	13	2.5	1.6	0.6	158	172	27	53.5	0.68
	RE 15025		210	182	25	3.5	2	1.5	164	194	76.8	128	3.16
	RE 15030		230	192	30	4.5	3	1.5	173	210	100	156	5.3
160	RE 16025	160	220	192	25	3.5	2	1.5	173	204	81.7	135	3.14
170	RE 17020	170	220	196.1	20	3.5	1.6	1.5	184	198	29	62.1	2.21
180	RE 18025	180	240	210	25	3.5	2	1.5	195	225	84	143	3.44
190	RE 19025	190	240	219	25	3.5	1.6	1	202	222	41.7	82.9	2.99
200	RE 20025	200	260	230	25	3.5	2	2	215	245	84.2	157	4
	RE 20030		280	240	30	4.5	3	2	221	258	114	200	6.7
	RE 20035		295	247.7	35	5	3	2	225	270	151	252	9.6
220	RE 22025	220	280	250.1	25	3.5	2	2	235	265	92.3	171	4.1
240	RE 24025	240	300	272.5	25	3.5	2	2.5	256	281	68.3	145	4.5
250	RE 25025	250	310	280.9	25	3.5	2	2.5	268	293	69.3	150	5
	RE 25030		330	287.5	30	4.5	3	2.5	269	306	126	244	8.1
	RE 25040		355	300.7	40	6	3.5	2.5	275	326	195	348	14.8
300	RE 30025	300	360	332	25	3.5	2	2.5	319	344	75.5	178	5.9
	RE 30035		395	345	35	5	3	2.5	322	368	183	367	13.4
	RE 30040		405	351.6	40	6	3.5	2.5	326	377	212	409	17.2
350	RE 35020	350	400	376.6	20	3.5	1.6	2.5	363	383	54.1	143	3.9

Note) The model number of a type with seals attached is RE···UU.
If a certain level of accuracy is required, this model is used for outer ring rotation.

Model number coding

RE8016 UU CC0 P4

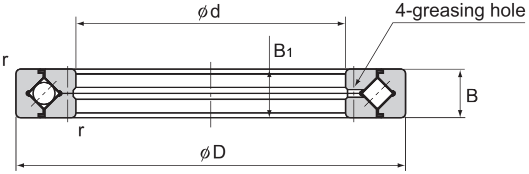
Model number

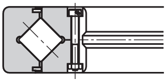
Accuracy symbol (*2)

Radial clearance symbol (*1)

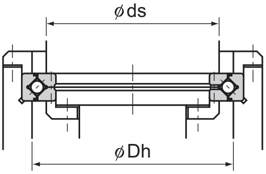
Seal attached on both ends (seal attached on either end: U)

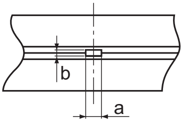
(*1) See A-870. (*2) See A-866.



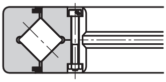


Model RE





Detail view of the greasing hole



Model RE⋯UU

Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter d	Outer diameter D	Roller pitch circle diameter dp	Width B B1	Greasing hole a	Greasing hole b	r_{min}	ds	Dh	C kN	C_0 kN	kg
400	RE 40035	400	480	440.3	35	5	3	2.5	422	459	156	370	14.5
	RE 40040		510	453.4	40	6	3.5	2.5	428	479	241	531	23.5
450	RE 45025	450	500	476.6	25	3.5	1.6	1	464	484	61.7	182	6.6
500	RE 50025	500	550	526.6	25	3.5	1.6	1	514	534	65.5	201	7.3
	RE 50040		600	548.8	40	6	3	2.5	526	572	239	607	26
	RE 50050		625	561.6	50	6	3.5	2.5	536	587	267	653	41.7
600	RE 60040	600	700	650	40	6	3	3	627	673	264	721	29

Note) The model number of a type with seals attached is RE⋯UU.
If a certain level of accuracy is required, this model is used for outer ring rotation.

Model number coding

RE50025 UU CC0 P6

Model number

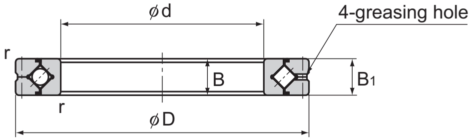
Accuracy symbol (*2)

Radial clearance symbol (*1)

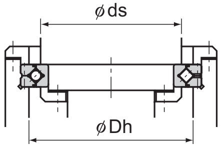
Seal attached on both ends (seal attached on either end: U)

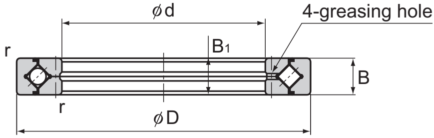
(*1) See A-870. (*2) See A-866.

USP-Grade Models RB and RE

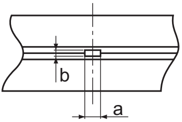


RB-USP（RB···UU-USP）





RE-USP（RE···UU-USP）



Detail view of the greasing hole

Unit: mm

Model No.	Main dimensions								Shoulder height		Basic load rating (radial)		Mass
	Inner diameter	Outer diameter	Roller pitch circle diameter dp		Width	Greasing hole					C	C_0	
	d	D	RB	RE	B B_1	a	b	r_{min}	ds	Dh	kN	kN	kg
RB 10020USP RE 10020USP	100	150	123	127	20	3.5	1.6	1	113	133	33.1	50.9	1.45
RB 12025USP RE 12025USP	120	180	148.7	152	25	3.5	2	1.5	133	164	66.9	100	2.62
RB 15025USP RE 15025USP	150	210	178	182	25				164	194	76.8	128	3.16
RB 20030USP RE 20030USP	200	280	240	240	30	4.5	3	2	221	258	114	200	6.7
RB 25030USP RE 25030USP	250	330	287.5	287.5	30			2.5	269	306	126	244	8.1
RB 30035USP RE 30035USP	300	395	345	345	35	5	3		322	368	183	367	13.4
RB 40040USP RE 40040USP	400	510	453.4	453.4	40	6	3.5		428	479	241	531	23.5
RB 50040USP RE 50040USP	500	600	548.8	548.8	40	6	3		526	572	239	607	26
RB 60040USP RE 60040USP	600	700	650	650	40			3	627	673	264	721	29

Note) The model number of a type with seals attached is RB···UU-USP or RE···UU-USP.
If a certain level of rotational accuracy is required for the inner ring, select model RB; if a certain level of rotational accuracy is required for the outer ring, select model RE.

Model number coding

RB50040 UU CC0 USP

Model number

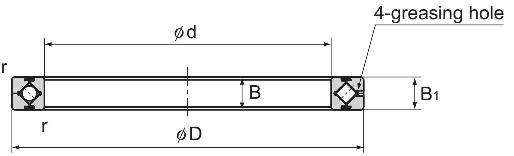
Accuracy symbol (Ultra precision grade)

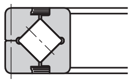
Radial clearance symbol (*1)

Seal attached on both ends (seal attached on either end: U)

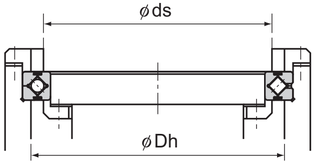
(*1) See A-870.

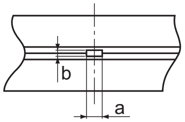
Model RA (Separable Outer Ring Type)



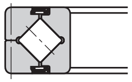


Model RA





Detail view of the greasing hole



Model RA···UU

Unit: mm

Shaft diameter	Model No.	Main dimensions							Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole					C	C_0	
		d	D	dp	B B_1	a	b	r_{min}	ds	Dh	kN	kN	kg
50	RA 5008	50	66	57	8	2	0.8	0.5	53.5	60.5	5.1	7.19	0.08
60	RA 6008	60	76	67	8	2	0.8	0.5	63.5	70.5	5.68	8.68	0.09
70	RA 7008	70	86	77	8	2	0.8	0.5	73.5	80.5	5.98	9.8	0.1
80	RA 8008	80	96	87	8	2	0.8	0.5	83.5	90.5	6.37	11.3	0.11
90	RA 9008	90	106	97	8	2	0.8	0.5	93.5	100.5	6.76	12.4	0.12
100	RA 10008	100	116	107	8	2	0.8	0.5	103.5	110.5	7.15	13.9	0.14
110	RA 11008	110	126	117	8	2	0.8	0.5	113.5	120.5	7.45	15	0.15
120	RA 12008	120	136	127	8	2	0.8	0.5	123.5	130.5	7.84	16.5	0.17
130	RA 13008	130	146	137	8	2	0.8	0.5	133.5	140.5	7.94	17.6	0.18
140	RA 14008	140	156	147	8	2	0.8	0.5	143.5	150.5	8.33	19.1	0.19
150	RA 15008	150	166	157	8	2	0.8	0.5	153.5	160.5	8.82	20.6	0.2
160	RA 16013	160	186	172	13	2.5	1.6	0.8	165	179	23.3	44.9	0.59
170	RA 17013	170	196	182	13	2.5	1.6	0.8	175	189	23.5	46.5	0.64
180	RA 18013	180	206	192	13	2.5	1.6	0.8	185	199	24.5	49.8	0.68
190	RA 19013	190	216	202	13	2.5	1.6	0.8	195	209	24.9	51.5	0.69
200	RA 20013	200	226	212	13	2.5	1.6	0.8	205	219	25.8	54.7	0.71

Note) The model number of a type with seals attached is RA···UU.
If a certain level of accuracy is required, this model is used for inner ring rotation.

Model number coding

RA7008 UU CC0

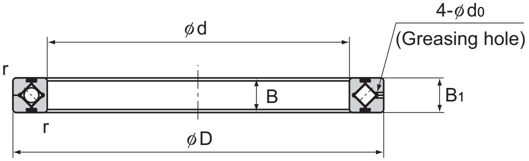
Model number

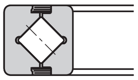
Radial clearance symbol (*1)

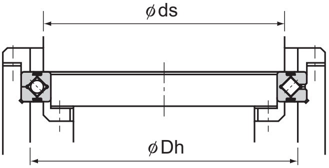
Seal attached on both ends (seal attached on either end: U)

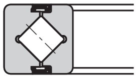
(*1) See A-870.

Model RA-C (Single-Split Type)




Model RA···C




Model RA···CUU

Unit: mm

Shaft diameter	Model No.	Main dimensions						Shoulder height		Basic load rating (radial)		Mass
		Inner diameter	Outer diameter	Roller pitch circle diameter	Width	Greasing hole				C	C_0	
		d	D	dp	B B_1	d_0	r_{min}	ds	Dh	kN	kN	kg
50	RA 5008C	50	66	57	8	1.5	0.5	53.5	60.5	5.1	7.19	0.08
60	RA 6008C	60	76	67	8	1.5	0.5	63.5	70.5	5.68	8.68	0.09
70	RA 7008C	70	86	77	8	1.5	0.5	73.5	80.5	5.98	9.8	0.1
80	RA 8008C	80	96	87	8	1.5	0.5	83.5	90.5	6.37	11.3	0.11
90	RA 9008C	90	106	97	8	1.5	0.5	93.5	100.5	6.76	12.4	0.12
100	RA 10008C	100	116	107	8	1.5	0.5	103.5	110.5	7.15	13.9	0.14
110	RA 11008C	110	126	117	8	1.5	0.5	113.5	120.5	7.45	15	0.15
120	RA 12008C	120	136	127	8	1.5	0.5	123.5	130.5	7.84	16.5	0.17
130	RA 13008C	130	146	137	8	1.5	0.5	133.5	140.5	7.94	17.6	0.18
140	RA 14008C	140	156	147	8	1.5	0.5	143.5	150.5	8.33	19.1	0.19
150	RA 15008C	150	166	157	8	1.5	0.5	153.5	160.5	8.82	20.6	0.2
160	RA 16013C	160	186	172	13	2	0.8	165	179	23.3	44.9	0.59
170	RA 17013C	170	196	182	13	2	0.8	175	189	23.5	46.5	0.64
180	RA 18013C	180	206	192	13	2	0.8	185	199	24.5	49.8	0.68
190	RA 19013C	190	216	202	13	2	0.8	195	209	24.9	51.5	0.69
200	RA 20013C	200	226	212	13	2	0.8	205	219	25.8	54.7	0.71

Note) The model number of a type with seals attached is RA···CUU.
If a certain level of accuracy is required, this model is used for inner ring rotation.

Model number coding

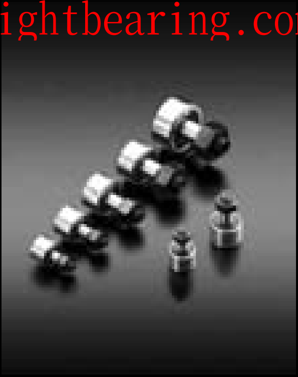
RA6008C UU C0

Model number

Radial clearance symbol (*1)

Seal attached on both ends (seal attached on either end: U)

(*1) See A-870.



Cam Follower

THK General Catalog

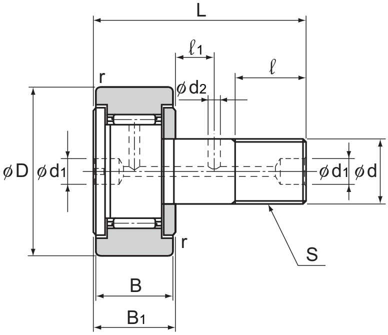
B Product Specifications

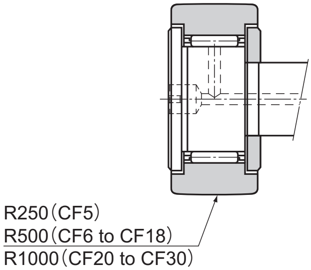
Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model CF(Popular Type (Cylindrical Outer Ring)), Model CF-M (Stainless Steel Type) Model CF-R(Popular Type (Spherical Outer Ring)), Model CF-MR (Stainless Steel Type)





Model CF-R

Stud diameter d	Model No.	Main dimensions										
		Outer diameter D	Threaded S	Outer ring width B	B_1	Overall length L	d_1	d_2	ℓ	ℓ_1	r	Shoulder height f (Min.)
5	CF 5	13	M5×0.8	9	10	23	3.1*	—	7.5	—	0.5	9.7
6	CF 6	16	M6×1	11	12	28	4*	—	9	—	0.5	11
8	CF 8	19	M8×1.25	11	12	32	4*	—	11	—	0.5	13
10	CF 10	22	M10×1.25	12	13	36	4*	—	13	—	1	15
10	CF 10-1	26	M10×1.25	12	13	36	4*	—	13	—	1	15
12	CF 12	30	M12×1.5	14	15	40	6	3	14	6	1.5	20
12	CF 12-1	32	M12×1.5	14	15	40	6	3	14	6	1.5	20
16	CF 16	35	M16×1.5	18	19.5	52	6	3	18	8	1.5	24
18	CF 18	40	M18×1.5	20	21.5	58	6	3	20	8	1.5	26
20	CF 20	52	M20×1.5	24	25.5	66	8	4	22	9	1.5	36
20	CF 20-1	47	M20×1.5	24	25.5	66	8	4	22	9	1.5	36
24	CF 24	62	M24×1.5	29	30.5	80	8	4	25	11	1.5	40
24	CF 24-1	72	M24×1.5	29	30.5	80	8	4	25	11	1.5	40
30	CF 30	80	M30×1.5	35	37	100	8	4	32	15	2	46
30	CF 30-1	85	M30×1.5	35	37	100	8	4	32	15	2	46
30	CF 30-2	90	M30×1.5	35	37	100	8	4	32	15	2	46

Note) The seal must be used at temperature of 80℃ or below.
Those models marked with "*" have a greasing hole only on the head.

Model number coding

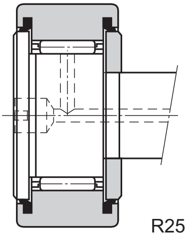
CF5 M UU R

Model number

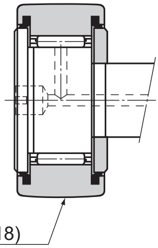
Spherical outer ring

Made of stainless steel

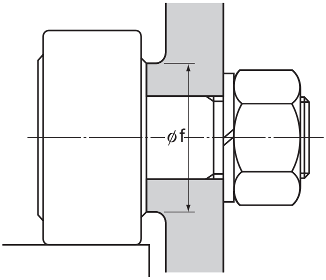
With seal



Model CF···UU



Model CF···UUR

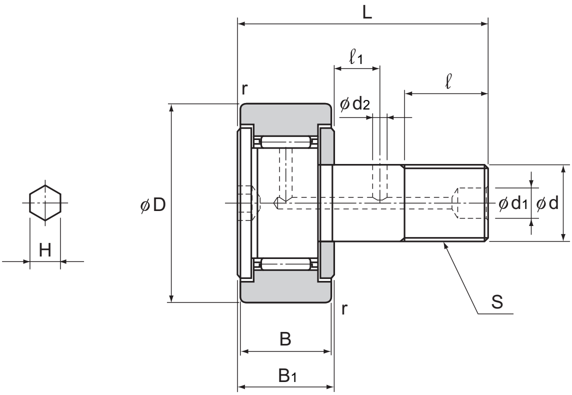


Unit: mm

	Basic load rating				Maximum permissible load	Track load capacity		Rotational speed limit *		Mass	
	With cage		Full-roller type			Cylindrical outer ring	Spherical outer ring	With cage	Full-roller type		
	C	C₀	C	C₀	F₀					Cage	Full rollers
	kN	kN	kN	kN	kN	kN	kN	min⁻¹	min⁻¹	g	g
	3.14	2.77	—	—	1.42	2.25	0.53	29000	—	10.5	11
	3.59	3.58	6.94	8.5	2.11	3.43	1.08	25000	11000	18.5	19
	4.17	4.65	8.13	11.2	4.73	4.02	1.37	20000	8700	28.5	29
	5.33	6.78	9.42	14.3	5.81	4.7	1.67	17000	7200	45	46
	5.33	6.78	9.42	14.3	5.81	5.49	2.06	17000	7200	60	61
	7.87	9.79	13.4	19.8	9.37	7.06	2.45	14000	5800	95	97
	7.87	9.79	13.4	19.8	9.37	7.45	2.74	14000	5800	105	107
	12	18.3	20.6	37.6	17.3	11.2	3.14	10000	4500	170	173
	14.7	25.2	25.2	51.3	26.1	14.4	3.72	8500	3800	250	255
	20.7	34.8	33.2	64.8	32.1	23.2	8.23	7000	3400	460	465
	20.7	34.8	33.2	64.8	32.1	21	7.15	7000	3400	385	390
	30.6	53.2	46.7	92.9	49.5	34.2	10.5	6500	2900	815	820
	30.6	53.2	46.7	92.9	49.5	39.8	12.9	6500	2900	1140	1140
	45.4	87.6	67.6	145	73.7	52.6	14.9	5000	2300	1870	1870
	45.4	87.6	67.6	145	73.7	56	16.1	5000	2300	2030	2030
	45.4	87.6	67.6	145	73.7	59.3	17.3	5000	2300	2220	2220

Note) The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 70% of this value is permitted.
THK also manufactures full-roller types. (stud diameter: 6 to 30 mm).

Model CF-A(Cam Follower with Hexagon Socket (Cylindrical Outer Ring)), Model CF-M-A (Stainless Steel Type) Model CF-R-A(Cam Follower with Hexagon Socket (Spherical Outer Ring)), Model CF-MR-A (Stainless Steel Type)



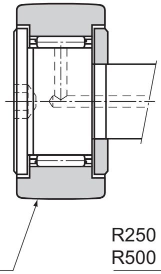
Stud diameter		Main dimensions											
		Outer diameter	Threaded	Outer ring width		Overall length							Shoulder height f
d	Model No.	D	S	B	B_1	L	d_1	d_2	ℓ	ℓ_1	H★	r	(Min.)
3	CF 3-A	10	M3×0.5	7	8	17	—*	—	5	—	2 (1.5)	0.3	6.8
4	CF 4-A	12	M4×0.7	8	9	20	—*	—	6	—	2.5 (2)	0.5	8.6
5	CF 5-A	13	M5×0.8	9	10	23	—*	—	7.5	—	3 (2.5)	0.5	9.7
6	CF 6-A	16	M6×1	11	12	28	—*	—	9	—	3	0.5	11
8	CF 8-A	19	M8×1.25	11	12	32	—*	—	11	—	4	0.5	13
10	CF 10-A	22	M10×1.25	12	13	36	—*	—	13	—	5	1	15
10	CF 10-1-A	26	M10×1.25	12	13	36	—*	—	13	—	5	1	15
12	CF 12-A	30	M12×1.5	14	15	40	6	3	14	6	6	1.5	20
12	CF 12-1-A	32	M12×1.5	14	15	40	6	3	14	6	6	1.5	20
16	CF 16-A	35	M16×1.5	18	19.5	52	6	3	18	8	6	1.5	24
18	CF 18-A	40	M18×1.5	20	21.5	58	6	3	20	8	6	1.5	26
20	CF 20-A	52	M20×1.5	24	25.5	66	8	4	22	9	8	1.5	36
20	CF 20-1-A	47	M20×1.5	24	25.5	66	8	4	22	9	8	1.5	36
24	CF 24-A	62	M24×1.5	29	30.5	80	8	4	25	11	8	1.5	40
24	CF 24-1-A	72	M24×1.5	29	30.5	80	8	4	25	11	8	1.5	40
30	CF 30-A	80	M30×1.5	35	37	100	8	4	32	15	8	2	46
30	CF 30-1-A	85	M30×1.5	35	37	100	8	4	32	15	8	2	46
30	CF 30-2-A	90	M30×1.5	35	37	100	8	4	32	15	8	2	46

Note) The seal must be used at temperature of 80℃ or below.
Those models marked with "＊" do not have a greasing hole and cannot be replenished with grease.

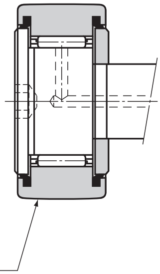
Model number coding

CF10 M UU R -A

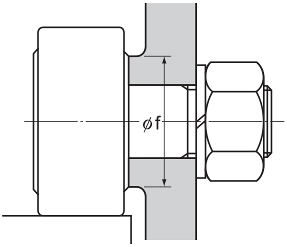
- CF10: Model number
- M: Made of stainless steel
- UU: With seal
- R: Spherical outer ring
- -A: Stud with a hexagon socket



Model CF-R-A



Model CF···UUR-A



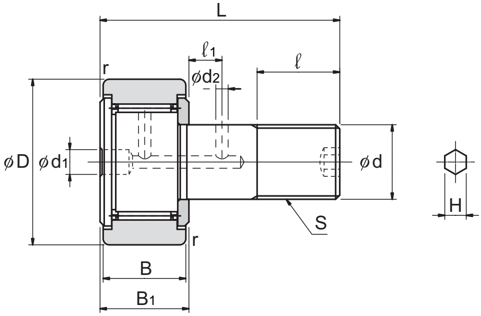
Unit: mm

Basic load rating				Maximum permissible load	Track load capacity		Rotational speed limit *		Mass	
With cage		Full-roller type			Cylindrical outer ring	Spherical outer ring	With cage	Full-roller type		
C	C_0	C	C_0	F_0					Cage	Full rollers
kN	kN	kN	kN	kN	kN	kN	min^{-1}	min^{-1}	g	g
1.47	1.18	—	—	0.36	1.37	0.37	47000	—	4.5	5
2.06	2.05	—	—	0.78	1.76	0.47	37000	—	7.5	8
3.14	2.77	—	—	1.42	2.25	0.53	29000	—	10.5	11
3.59	3.58	6.94	8.5	2.11	3.43	1.08	25000	11000	18.5	19
4.17	4.65	8.13	11.2	4.73	4.02	1.37	20000	8700	28.5	29
5.33	6.78	9.42	14.3	5.81	4.7	1.67	17000	7200	45	46
5.33	6.78	9.42	14.3	5.81	5.49	2.06	17000	7200	60	61
7.87	9.79	13.4	19.8	9.37	7.06	2.45	14000	5800	95	97
7.87	9.79	13.4	19.8	9.37	7.45	2.74	14000	5800	105	107
12	18.3	20.6	37.6	17.3	11.2	3.14	10000	4500	170	173
14.7	25.2	25.2	51.3	26.1	14.4	3.72	8500	3800	250	255
20.7	34.8	33.2	64.8	32.1	23.2	8.23	7000	3400	460	465
20.7	34.8	33.2	64.8	32.1	21	7.15	7000	3400	385	390
30.6	53.2	46.7	92.9	49.5	34.2	10.5	6500	2900	815	820
30.6	53.2	46.7	92.9	49.5	39.8	12.9	6500	2900	1140	1140
45.4	87.6	67.6	145	73.7	52.6	14.9	5000	2300	1870	1870
45.4	87.6	67.6	145	73.7	56	16.1	5000	2300	2030	2030
45.4	87.6	67.6	145	73.7	59.3	17.3	5000	2300	2220	2220

Note) "★" indicates that the dimensions in the parentheses in this row apply to stainless steel types.
The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 70% of this value is permitted.
THK also manufactures full-roller types. (stud diameter: 6 to 30 mm).

Model CF-B(Cam Follower with Hexagon Socket (Cylindrical Outer Ring)), Model CF-M-B (Made of Stainless Steel)

Model CF-R-B(Cam Follower with Hexagon Socket (Spherical Outer Ring)), Model CF-MR-B (Made of Stainless Steel)

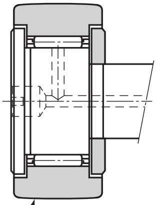


Stud diameter		Main dimensions											
		Outer diameter	Threaded	Outer ring width		Overall length							Shoulder height f
d	Model No.	D	S	B	B1	L	d1	d2	ℓ	ℓ1	H★	r	(Min.)
12	CF 12-B	30	M12×1.5	14	15	40	6	3	14	6	6	1.5	20
12	CF 12-1-B	32	M12×1.5	14	15	40	6	3	14	6	6	1.5	20
16	CF 16-B	35	M16×1.5	18	19.5	52	6	3	18	8	6	1.5	24
18	CF 18-B	40	M18×1.5	20	21.5	58	6	3	20	8	6	1.5	26
20	CF 20-B	52	M20×1.5	24	25.5	66	8	4	22	9	8	1.5	36
20	CF 20-1-B	47	M20×1.5	24	25.5	66	8	4	22	9	8	1.5	36
24	CF 24-B	62	M24×1.5	29	30.5	80	8	4	25	11	8	1.5	40
24	CF 24-1-B	72	M24×1.5	29	30.5	80	8	4	25	11	8	1.5	40
30	CF 30-B	80	M30×1.5	35	37	100	8	4	32	15	8	2	46
30	CF 30-1-B	85	M30×1.5	35	37	100	8	4	32	15	8	2	46
30	CF 30-2-B	90	M30×1.5	35	37	100	8	4	32	15	8	2	46

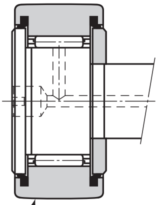
Model number coding

CF10 M UU R -B

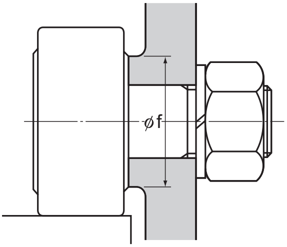
CF10: Model number
M: Made of stainless steel
UU: With seal
R: Spherical outer ring
-B: Stud with a hexagon socket



Model CF-R-B



Model CF···UUR-B



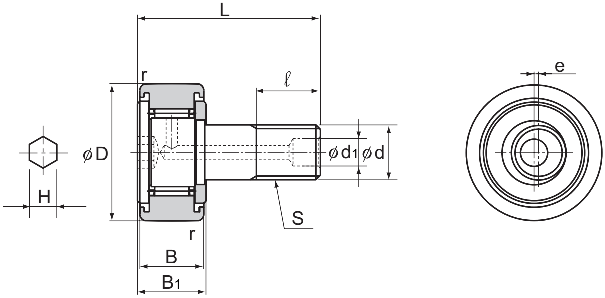
Unit: mm

	Basic load rating				Maximum permissible load	Track load capacity		Rotational speed limit *		Mass	
	With cage		Full-roller type			Cylindrical outer ring	Spherical outer ring	With cage	Full-roller type		
	C kN	C_0 kN	C kN	C_0 kN	F_0 kN	kN	kN	min^{-1}	min^{-1}	Cage g	Full rollers g
	7.87	9.79	13.4	19.8	9.37	7.06	2.45	14000	5800	95	97
	7.87	9.79	13.4	19.8	9.37	7.45	2.74	14000	5800	105	107
	12	18.3	20.6	37.6	17.3	11.2	3.14	10000	4500	170	173
	14.7	25.2	25.2	51.3	26.1	14.4	3.72	8500	3800	250	255
	20.7	34.8	33.2	64.8	32.1	23.2	8.23	7000	3400	460	465
	20.7	34.8	33.2	64.8	32.1	21	7.15	7000	3400	385	390
	30.6	53.2	46.7	92.9	49.5	34.2	10.5	6500	2900	815	820
	30.6	53.2	46.7	92.9	49.5	39.8	12.9	6500	2900	1140	1140
	45.4	87.6	67.6	145	73.7	52.6	14.9	5000	2300	1870	1870
	45.4	87.6	67.6	145	73.7	56	16.1	5000	2300	2030	2030
	45.4	87.6	67.6	145	73.7	59.3	17.3	5000	2300	2220	2220

Note) "★" indicates that the dimensions in the parentheses in this row apply to stainless steel types.
The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 70% of this value is permitted.
THK also manufactures full-roller types. (stud diameter: 6 to 30 mm).

Model CFH-A(Eccentric Cam Follower with Hexagon Socket (Cylindrical Outer Ring)), Model CFH-M-A (Made of Stainless Steel)

Model CFH-R-A(Eccentric Cam Follower with Hexagon Socket (Spherical Outer Ring)), Model CFH-MR-A (Made of Stainless Steel)



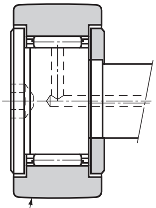
Stud diameter		Main dimensions										
		Outer diameter	Threaded	Outer ring width		Overall length			Runout			Shoulder height f
d	Model No.	D	S	B	B_1	L	d_1	ℓ	e	H	r	(Min.)
6	CFH 6-A	16	M6×1	11	12	28	—*	9	0.25	3	0.5	11
8	CFH 8-A	19	M8×1.25	11	12	32	—*	11	0.25	4	0.5	13
10	CFH 10-A	22	M10×1.25	12	13	36	—*	13	0.3	5	1	15
10	CFH 10-1-A	26	M10×1.25	12	13	36	—*	13	0.3	5	1	15
12	CFH 12-A	30	M12×1.5	14	15	40	6	14	0.4	6	1.5	20
12	CFH 12-1-A	32	M12×1.5	14	15	40	6	14	0.4	6	1.5	20
16	CFH 16-A	35	M16×1.5	18	19.5	52	6	18	0.5	6	1.5	24
18	CFH 18-A	40	M18×1.5	20	21.5	58	6	20	0.6	6	1.5	26
20	CFH 20-A	52	M20×1.5	24	25.5	66	8	22	0.7	8	1.5	36
20	CFH 20-1-A	47	M20×1.5	24	25.5	66	8	22	0.7	8	1.5	36
24	CFH 24-A	62	M24×1.5	29	30.5	80	8	25	0.8	8	1.5	40
24	CFH 24-1-A	72	M24×1.5	29	30.5	80	8	25	0.8	8	1.5	40
30	CFH 30-A	80	M30×1.5	35	37	100	8	32	1	8	2	46
30	CFH 30-1-A	85	M30×1.5	35	37	100	8	32	1	8	2	46
30	CFH 30-2-A	90	M30×1.5	35	37	100	8	32	1	8	2	46

Note) THK also manufactures types that have a driver groove and a greasing hole on the head. (Model numbers of types with a driver groove do not include symbol "-A" in the end.)
The seal must be used at temperature of 80℃ or below.
Those models marked with "∗" do not have a greasing hole and cannot be replenished with grease.

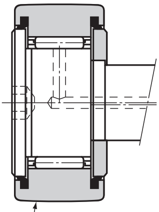
Model number coding

CFH24-1 M UU -A

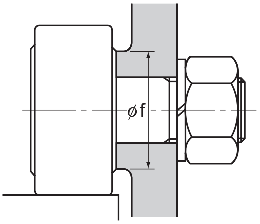
CFH24-1: Model number
M: Made of stainless steel
UU: With seal
-A: Stud with a hexagon socket



Model CFH-R



Model CFH⋯UUR



Unit: mm

	Basic load rating				Maximum permissible load	Track load capacity		Rotational speed limit *		Mass	
	With cage		Full-roller type			Cylindrical outer ring	Spherical outer ring	With cage	Full-roller type		
	C	C_0	C	C_0	F_0					Cage	Full rollers
	kN	kN	kN	kN	kN	kN	kN	min^{-1}	min^{-1}	g	g
	3.59	3.58	6.94	8.5	2.11	3.43	1.08	25000	11000	18.5	19
	4.17	4.65	8.13	11.2	4.73	4.02	1.37	20000	8700	28.5	29
	5.33	6.78	9.42	14.3	5.81	4.7	1.67	17000	7200	45	46
	5.33	6.78	9.42	14.3	5.81	5.49	2.06	17000	7200	60	61
	7.87	9.79	13.4	19.8	9.37	7.06	2.45	14000	5800	95	97
	7.87	9.79	13.4	19.8	9.37	7.45	2.74	14000	5800	105	107
	12	18.3	20.6	37.6	17.3	11.2	3.14	10000	4500	170	173
	14.7	25.2	25.2	51.3	26.1	14.4	3.72	8500	3800	250	255
	20.7	34.8	33.2	64.8	32.1	23.2	8.23	7000	3400	460	465
	20.7	34.8	33.2	64.8	32.1	21	7.15	7000	3400	385	390
	30.6	53.2	46.7	92.9	49.5	34.2	10.5	6500	2900	815	820
	30.6	53.2	46.7	92.9	49.5	39.8	12.9	6500	2900	1140	1140
	45.4	87.6	67.6	145	73.7	52.6	14.9	5000	2300	1870	1870
	45.4	87.6	67.6	145	73.7	56	16.1	5000	2300	2030	2030
	45.4	87.6	67.6	145	73.7	59.3	17.3	5000	2300	2220	2220

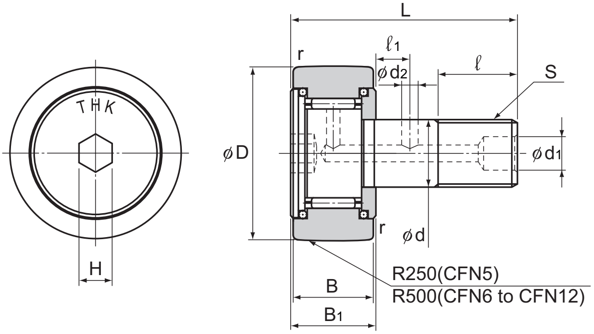
Note) The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 70% of this value is permitted.
THK also manufactures full-roller types.

Model number coding

CFH12 UU R -A

- CFH12: Model number
- UU: With seal
- R: Spherical outer ring
- -A: Stud with a hexagon socket

Model CFN-R-A(Cam Follower Containing Thrust Balls)



Stud diameter	Model No.	Main							
d	Spherical outer ring	Outer diameter D	Threaded S	Outer ring width B	B_1	Overall length L	d_1	d_2	ℓ
5	CFN 5R-A	13	M5×0.8	9	10	23	—*	—*	7.5
6	CFN 6R-A	16	M6×1	11	12	28	—*	—*	9
8	CFN 8R-A	19	M8×1.25	11	12	32	—*	—*	11
10	CFN 10R-A	22	M10×1.25	12	13	36	—*	—*	13
12	CFN 12R-A	30	M12×1.5	14	15	40	6	3	14

Note) Those models marked with "＊" do not have a greasing hole and cannot be replenished with grease.

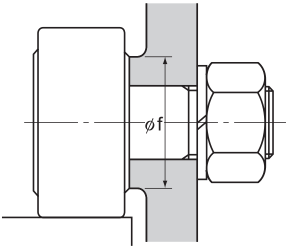
Model number coding

CFN12 R -A

Model number

Stud with a hexagon socket

Spherical outer ring

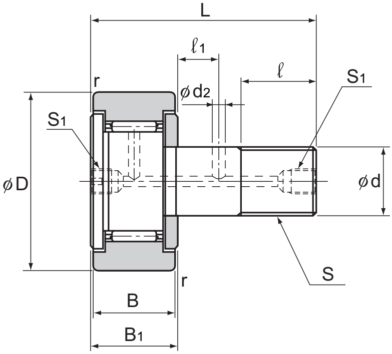


Unit: mm

dimensions					Basic load rating		Permissible thrust load	Maximum permissible load	Track load capacity	Rotational speed limit *	Mass
	ℓ_1	H	r	Shoulder height f (Min.)	C kN	C_0 kN	N	F_0 kN	kN	min^{-1}	g
	—	3	0.5	10	3.14	2.77	160	1.42	0.53	29000	10.5
	—	3	0.5	12	3.59	3.58	250	2.11	1.08	25000	18.5
	—	4	0.5	14	4.17	4.65	290	4.73	1.37	20000	28.5
	—	5	1	16.5	5.33	6.78	400	5.81	1.67	17000	45
	6	6	1.5	21.5	7.87	9.79	680	9.37	2.45	14000	95

Note) The rotation speed limit value in the table (*) applies to models using grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted.

Model CFT (Cam Follower with Tapped Greasing Hole (Cylindrical Outer Ring)), Model CFT-M (Made of Stainless Steel)
Model CFT-R (Cam Follower with Tapped Greasing Hole (Spherical Outer Ring)), Model CFT-MR (Made of Stainless Steel)



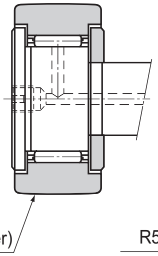
Stud diameter d	Model No.	Main dimensions										
		Outer diameter D	Threaded S	Outer ring width B	B_1	Overall length L	S_1	d_2	ℓ	ℓ_1	r	Shoulder height f (Min.)
6	CFT 6	16	M6×1	11	12	28	M6×0.75*	—	9	—	0.5	11
8	CFT 8	19	M8×1.25	11	12	32	M6×0.75*	—	11	—	0.5	13
10	CFT 10	22	M10×1.25	12	13	36	M6×0.75*	—	13	—	1	15
10	CFT 10-1	26	M10×1.25	12	13	36	M6×0.75*	—	13	—	1	15
12	CFT 12	30	M12×1.5	14	15	40	M6×0.75	3	14	6	1.5	20
12	CFT 12-1	32	M12×1.5	14	15	40	M6×0.75	3	14	6	1.5	20
16	CFT 16	35	M16×1.5	18	19.5	52	PT 1/8	3	18	8	1.5	24
18	CFT 18	40	M18×1.5	20	21.5	58	PT 1/8	3	20	8	1.5	26
20	CFT 20	52	M20×1.5	24	25.5	66	PT 1/8	4	22	9	1.5	36
20	CFT 20-1	47	M20×1.5	24	25.5	66	PT 1/8	4	22	9	1.5	36
24	CFT 24	62	M24×1.5	29	30.5	80	PT 1/8	4	25	11	1.5	40
24	CFT 24-1	72	M24×1.5	29	30.5	80	PT 1/8	4	25	11	1.5	40
30	CFT 30	80	M30×1.5	35	37	100	PT 1/8	4	32	15	2	46
30	CFT 30-1	85	M30×1.5	35	37	100	PT 1/8	4	32	15	2	46
30	CFT 30-2	90	M30×1.5	35	37	100	PT 1/8	4	32	15	2	46

Note) The seal must be used at temperature of 80℃ or below.
Those models marked with "∗" have a greasing hole only on the head.

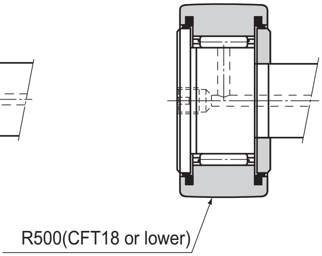
Model number coding

CFT30-1 M UU R

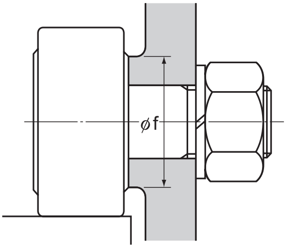
Model number
Made of stainless steel
With seal
Spherical outer ring



Model CFT-R



Model CFT⋯UUR



Unit: mm

	Basic load rating				Maximum permissible load	Track load capacity		Rotational speed limit *		Mass	
	With cage		Full-roller type			Cylindrical outer ring	Spherical outer ring	With cage	Full-roller type		
	C	C_0	C	C_0	F_0					Cage	Full rollers
	kN	kN	kN	kN	kN	kN	kN	min^{-1}	min^{-1}	g	g
	3.59	3.58	6.94	8.5	2.11	3.43	1.08	25000	11000	18.5	19
	4.17	4.65	8.13	11.2	4.73	4.02	1.37	20000	8700	28.5	29
	5.33	6.78	9.42	14.3	5.81	4.7	1.67	17000	7200	45	46
	5.33	6.78	9.42	14.3	5.81	5.49	2.06	17000	7200	60	61
	7.87	9.79	13.4	19.8	9.37	7.06	2.45	14000	5800	95	97
	7.87	9.79	13.4	19.8	9.37	7.45	2.74	14000	5800	105	107
	12	18.3	20.6	37.6	17.3	11.2	3.14	10000	4500	170	173
	14.7	25.2	25.2	51.3	26.1	14.4	3.72	8500	3800	250	255
	20.7	34.8	33.2	64.8	32.1	23.2	8.23	7000	3400	460	465
	20.7	34.8	33.2	64.8	32.1	21	7.15	7000	3400	385	390
	30.6	53.2	46.7	92.9	49.5	34.2	10.5	6500	2900	815	820
	30.6	53.2	46.7	92.9	49.5	39.8	12.9	6500	2900	1140	1140
	45.4	87.6	67.6	145	73.7	52.6	14.9	5000	2300	1870	1870
	45.4	87.6	67.6	145	73.7	56	16.1	5000	2300	2030	2030
	45.4	87.6	67.6	145	73.7	59.3	17.3	5000	2300	2220	2220

Note) The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 70% of this value is permitted.
THK also manufactures full-roller types.

Accessories for the Cam Follower

Table1 shows accessories for standard types of Cam Followers. The dedicated grease nipple is attached at your request. If desiring the dedicated grease nipple, add symbol "N" to the end of the model number.

Example: CF 12 UUR -N

Dedicated grease nipple

Table1 Accessories

Model No.		Plug[note 1]	Plug[note 2]	Nut JIS Class 2	Grease[note 3]
CF CFH	Without seal	Included in package	Included in package	Included in package	Not contained
	With seal	Included in package	Included in package	Included in package	Filled with grease
CFN		Included in package	Included in package	Included in package	Filled with grease
CFT	Without seal	—	—	Included in package	Not contained
	With seal	—	—	Included in package	Filled with grease

Note1) The plug is used to prevent grease from leaking. However, it is not included in the packages of model CF5, and hexagon socket types of models CFN10 (R)-A and CF (CFH) 10-1 (R)-A or lower.

Note2) The plug is used to close an unused greasing hole. However, it is not attached to model CF (CFH) 10-1 or lower.

Note3) All models without a greasing hole are filled with grease when assembled regardless of whether a seal is attached or not.

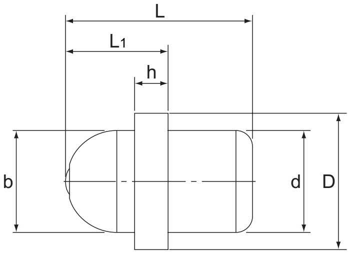


Table2 Specification Table for Grease Nipples

Supported models	Nipple dimensions						Nipple model No.
CF, CFN, CFH	d	b	D	h	L	L_1	
5	3.1	6	7.5	1.5	9	5.5	NP3.2×3.5
6 to 10	4	6	7.5	1.5	10	5.5	PB1021B
12 to 18	6	6	8	2	11	6	NP6×5
20 to 30	8	6	10	3	16	7	NP8×9

Note) The grease nipple is not attached to models CFN10 (R)-A and CF (CFH) 10-1 (R)-A or lower.

Roller Follower

THK General Catalog

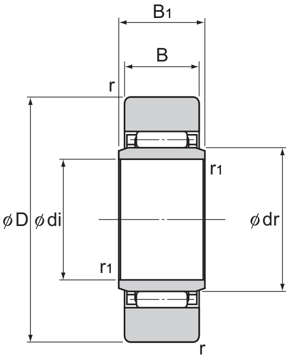
B Product Specifications

Dimensional Drawing, Dimensional Table

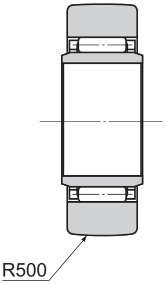
A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Models NAST (Separable Type with a Cylindrical Outer Ring), NAST-R (Separable Type with a Spherical Outer Ring)



Model NAST



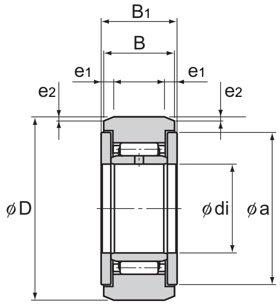
Model NAST-R

Unit: mm

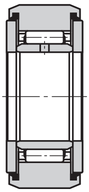
Model No.	Main dimensions							Basic load rating		Track load capacity		Rotational speed limit *	Mass
	Inner diameter	Inscribed bore diameter	Outer diameter					C	C_0	Cylindrical outer ring	Spherical outer ring		
	di	dr	D	B_1	B	r	r_1	kN	kN	kN	kN	min^{-1}	g
NAST 6	6	10	19	10	9.8	0.5	0.5	4.12	4.55	3.53	1.37	20000	17.8
NAST 8	8	12	24	10	9.8	1	0.5	5.68	5.89	4.02	1.86	17000	28
NAST 10	10	14	30	12	11.8	1.5	0.5	9.7	9.67	5.59	2.45	15000	50
NAST 12	12	16	32	12	11.8	1.5	0.5	10.4	10.9	5.98	2.74	13000	58
NAST 15	15	20	35	12	11.8	1.5	0.5	12.3	14.3	6.57	3.14	10000	62
NAST 17	17	22	40	16	15.8	1.5	0.5	17.4	20.9	10.9	3.72	9500	110
NAST 20	20	25	47	16	15.8	1.5	0.5	19.2	24.5	12.7	4.61	8500	155
NAST 25	25	30	52	16	15.8	1.5	0.5	20.7	28.4	14.1	5.29	7000	180
NAST 30	30	38	62	20	19.8	1.5	1	30.3	45.4	22.1	6.66	5500	320
NAST 35	35	42	72	20	19.8	1.5	1	32.2	50.6	25.7	8.13	5000	440
NAST 40	40	50	80	20	19.8	2	1.5	35.7	61.6	26.9	9.31	4000	530
NAST 45	45	55	85	20	19.8	2	1.5	37.1	66.4	28.5	10.1	4000	580
NAST 50	50	60	90	20	19.8	2	1.5	38.7	71.8	30.2	11	3500	635

Note) The rotation speed limit value in the table (*) applies to models using grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted.
Stainless steel types are also available. Contact THK for details.

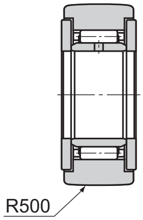
Models NAST-ZZ (Separable Type with a Cylindrical Outer Ring and Side Plates), NAST-ZZR (Separable Type with a Spherical Outer Ring and Side Plates)



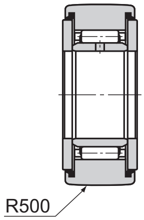
Model NAST-ZZ



Model NAST-ZZUU



Model NAST-ZZR



Model NAST-ZZUUR

Unit: mm

Model No.	Main dimensions							Basic load rating		Track load capacity		Rotational speed limit *	Mass
	Inner diameter	Outer diameter						C	C_0	Cylindrical outer ring	Spherical outer ring		
	di	D	B_1	B	a	e_1	e_2	kN	kN	kN	kN	min^{-1}	g
NAST 6ZZ	6	19	14	13.8	14	2.5	0.8	4.12	4.55	3.53	1.37	20000	24.5
NAST 8ZZ	8	24	14	13.8	17.5	2.5	0.8	5.68	5.89	4.51	1.86	17000	39
NAST 10ZZ	10	30	16	15.8	23.5	2.5	0.8	9.7	9.67	6.86	2.45	15000	65
NAST 12ZZ	12	32	16	15.8	25.5	2.5	0.8	10.4	10.9	7.35	2.74	13000	75
NAST 15ZZ	15	35	16	15.8	29	2.5	0.8	12.3	14.3	8.04	3.14	10000	83
NAST 17ZZ	17	40	20	19.8	32.5	3	1	17.4	20.9	11.8	3.72	9500	135
NAST 20ZZ	20	47	20	19.8	38	3	1	19.2	24.5	13.8	4.61	8500	195
NAST 25ZZ	25	52	20	19.8	43	3	1	20.7	28.4	15.3	5.29	7000	225
NAST 30ZZ	30	62	25	24.8	50.5	4	1.2	30.3	45.4	22.1	6.66	5500	400
NAST 35ZZ	35	72	25	24.8	53.5	4	1.2	32.2	50.6	25.7	8.13	5000	550
NAST 40ZZ	40	80	26	25.8	61.5	4	1.2	35.7	61.1	30.3	9.31	4000	710
NAST 45ZZ	45	85	26	25.8	66.5	4	1.2	37.1	66.4	31.1	10.1	4000	760
NAST 50ZZ	50	90	26	25.8	76	4	1.2	38.7	71.8	34	11	3500	830

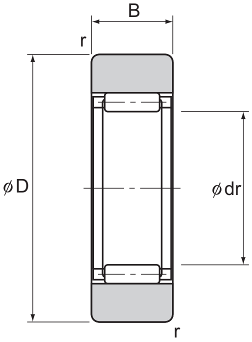
Note) The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 40% of this value is permitted.
Stainless steel types are also available. Contact THK for details.
The seal must be used at temperature of 80℃ or below.

Model number coding

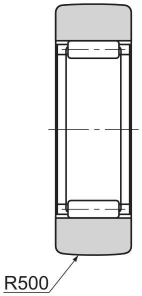
NAST 25 ZZ UU R

With seal

Models RNAST (Separable Type with a Cylindrical Outer Ring and No Inner Ring), RNAST-R (Separable Type with a Spherical Outer Ring and No Inner Ring)



Model RNAST



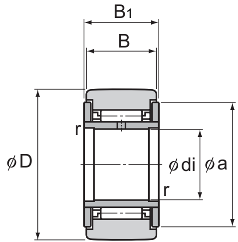
Model RNAST-R

Unit: mm

Model No.	Main dimensions				Basic load rating		Track load capacity		Rotational speed limit *	Mass
	Inscribed bore diameter dr	Outer diameter D	B	r	C kN	C_0 kN	Cylindrical outer ring kN	Spherical outer ring kN	min^{-1}	g
RNAST 5	7	16	7.8	0.5	2.74	2.39	2.35	1.08	30000	8.9
RNAST 6	10	19	9.8	0.5	4.12	4.55	3.53	1.37	20000	13.9
RNAST 8	12	24	9.8	1	5.68	5.89	4.02	1.86	17000	23.5
RNAST 10	14	30	11.8	1.5	9.7	9.67	5.59	2.45	15000	42.5
RNAST 12	16	32	11.8	1.5	10.4	10.9	5.98	2.74	13000	49.5
RNAST 15	20	35	11.8	1.5	12.3	14.3	6.57	3.14	10000	50
RNAST 17	22	40	15.8	1.5	17.4	20.9	10.9	3.72	9500	90
RNAST 20	25	47	15.8	1.5	19.2	24.5	12.7	4.61	8500	135
RNAST 25	30	52	15.8	1.5	20.7	28.4	14.1	5.29	7000	152
RNAST 30	38	62	19.8	1.5	30.3	45.4	22.1	6.66	5500	255
RNAST 35	42	72	19.8	1.5	32.2	50.6	25.7	8.13	5000	375
RNAST 40	50	80	19.8	2	35.7	61.6	26.9	9.31	4000	420
RNAST 45	55	85	19.8	2	37.1	66.4	28.5	10.1	4000	460
RNAST 50	60	90	19.8	2	38.7	71.8	30.2	11	3500	500

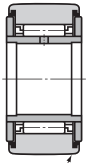
Note) The rotation speed limit value in the table (*) applies to models using grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted.
Stainless steel types are also available. Contact THK for details.

Models NART-R (Non-separable Type with a Spherical Outer Ring), NART-VR (Non-separable Type with a Spherical Outer Ring and Full Balls)



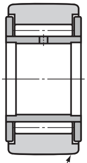
R500 (model NART17 or lower)
R1000 (model NART20 or higher)

Model NART-R



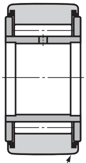
R500 (model NART17 or lower)
R1000 (model NART20 or higher)

Model NART-UUR



R500 (model NART17 or lower)
R1000 (model NART20 or higher)

Model NART-VR



R500 (model NART17 or lower)
R1000 (model NART20 or higher)

Model NART-VUUR

Unit: mm

Model No.	Main dimensions							Basic load rating				Track load capacity	Rotational speed limit *		Mass	
	Inner diameter	Outer diameter					Oil hole	With cage		Full rollers		Spherical outer ring	With cage	Full rollers	With cage	Full rollers
	di	D	B_1	B	a	r	d_1	C kN	C_0 kN	C kN	C_0 kN	kN	min^{-1}	min^{-1}	g	g
NART 5R	5	16	12	11	12	0.5	1.5	2.84	2.65	6.46	7.81	1.08	25000	10500	14.5	15.1
NART 6R	6	19	12	11	14	0.5	1.5	3.33	3.35	7.58	10.2	1.37	20000	8700	20.5	21.5
NART 8R	8	24	15	14	17.5	0.5	1.5	5.68	5.89	11.7	15.6	1.86	17000	7000	41.5	42.5
NART 10R	10	30	15	14	23.5	0.5	2	7.94	7.59	15.8	18.5	2.45	15000	5700	64.5	66.5
NART 12R	12	32	15	14	25.5	0.5	2	8.53	8.44	17	21	2.74	13000	5200	71	73
NART 15R	15	35	19	18	29	0.5	2	13.7	16.4	25.3	36.9	3.14	10000	4300	102	106
NART 17R	17	40	21	20	32.5	0.5	2	17.4	19.3	32	46.6	3.72	9500	3900	149	155
NART 20R	20	47	25	24	38	0.5	2.5	22.9	30.6	41.7	67.7	7.15	8000	3400	250	255
NART 25R	25	52	25	24	43	0.5	2.5	24.6	33.3	45.4	79.5	8.23	7000	3000	285	295
NART 30R	30	62	29	28	50.5	0.5	3	33.4	51.4	60	111	10.5	5500	2400	470	485
NART 35R	35	72	29	28	53.5	1	3	35.5	57.3	63.2	123	12.9	5000	2200	640	655
NART 40R	40	80	32	30	61.5	1	3	44.6	81.4	76.4	166	14.9	4000	1900	845	865
NART 45R	45	85	32	30	66.5	1	3	46.6	88.6	80.5	183	16.1	4000	1700	915	935
NART 50R	50	90	32	30	76	1	3	48.3	95.7	84.4	200	17.3	3500	1600	980	1010

Note) The rotation speed limit value in the table (*) applies to models that have no seal and use grease lubrication. With those models using oil lubrication, up to 130% of this value is permitted. With those attached with seals, up to 40% of this value is permitted.
Stainless steel types are also available. Contact THK for details.
The seal must be used at temperature of 80℃ or below.

Model number coding

NART 15 V UU R

With seal

Spherical Plain Bearing

THK General Catalog

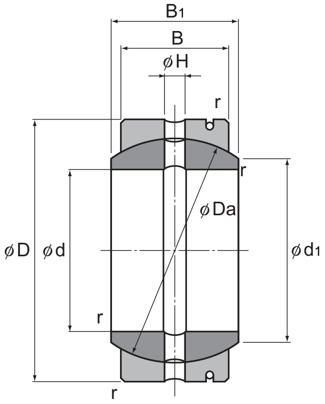
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

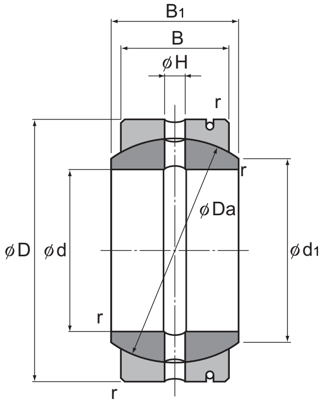
* Please see the separate "A Technical Descriptions of the Products".

Model SB



Unit: mm

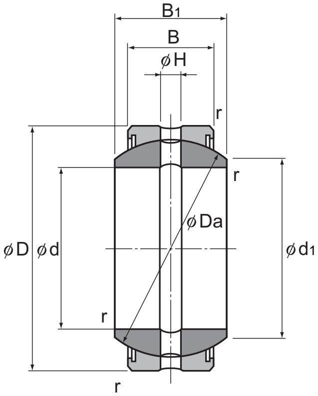
Model No.	Main dimensions								Basic load rating		Mass
	Inner diameter d	Outer diameter D	Outer ring width B	Inner ring width B_1	d_1	Da	H	r	C kN	C_0 kN	kg
SB 12	12	22	9	11	14	18	1.5	0.5	3.82	95.3	0.019
SB 15	15	26	11	13	17.5	22	2.5	0.5	5.69	142	0.028
SB 20	20	32	14	16	23	28	2.5	0.5	9.22	230	0.053
SB 22	22	37	16	19	25.5	32	2.5	0.5	12.1	301	0.085
SB 25	25	42	18	21	29	36	4	0.5	15.3	381	0.116
SB 30	30	50	23	27	36	45	4	1	24.3	609	0.225
SB 35	35	55	26	30	40	50	4	1	30.6	765	0.3
SB 40	40	62	28	33	44	55	4	1	36.3	906	0.375
SB 45	45	72	31	36	50.5	62	6	1	45.2	1130	0.6
SB 50	50	80	36	42	58.5	72	6	1	61	1530	0.87
SB 55	55	90	40	47	64.5	80	6	1	75.3	1880	1.26
SB 60	60	100	45	53	72.5	90	6	1	95.3	2380	1.7
SB 65	65	105	47	55	76	94	6	1	104	2600	2.05



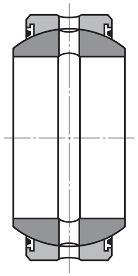
Unit: mm

Model No.	Main dimensions								Basic load rating		Mass
	Inner diameter d	Outer diameter D	Outer ring width B	Inner ring width B_1	d_1	Da	H	r	C kN	C_0 kN	kg
SB 70	70	110	50	58	81.5	100	8	1	118	2940	2.22
SB 75	75	120	55	64	89.5	110	8	1	142	3560	3.02
SB 80	80	130	60	70	97.5	120	8	1	170	4240	3.98
SB 85	85	135	63	74	100.5	125	8	1	185	4640	4.29
SB 90	90	140	65	76	105.5	130	8	1	199	4970	4.71
SB 95	95	150	70	82	113.5	140	8	1	230	5760	6.05
SB 100	100	160	75	88	121.5	150	10	1.5	265	6620	7.42
SB 110	110	170	80	93	130	160	10	1.5	301	7530	8.55
SB 115	115	180	85	98	132.5	165	10	1.5	330	8250	10.3
SB 120	120	190	90	105	140	175	10	1.5	371	9260	12.4
SB 130	130	200	95	110	148.5	185	10	1.5	414	10300	13.8
SB 150	150	220	105	120	166	205	10	1.5	507	12600	17

Model SA1



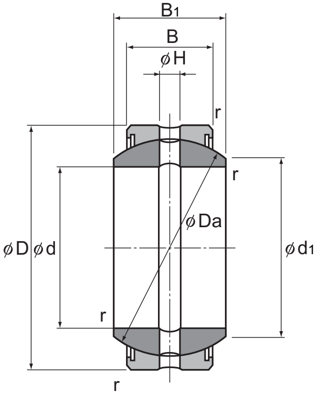
Model SA1



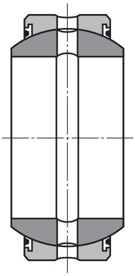
Model SA1-UU

Unit: mm

Model No.		Main dimensions								Basic load rating		Mass
Standard type	Seal type	Inner diameter d	Outer diameter D	Outer ring width B	Inner ring width B_1	d_1	Da	H	r	C kN	C_0 kN	kg
SA1 12	SA1 12UU	12	22	7	10	15	18	1.5	0.3	2.94	74.1	0.017
SA1 15	SA1 15UU	15	26	9	12	18.4	22	2.5	0.3	4.7	117	0.032
SA1 17	SA1 17UU	17	30	10	14	20.7	25	2.5	0.3	5.88	147	0.049
SA1 20	SA1 20UU	20	35	12	16	24.2	29	2.5	0.3	8.23	205	0.065
SA1 25	SA1 25UU	25	42	16	20	29.3	35.5	4	0.3	13.3	334	0.115
SA1 30	SA1 30UU	30	47	18	22	34.2	40.7	4	0.3	17.3	431	0.16
SA1 35	SA1 35UU	35	55	20	25	39.8	47	4	1	22.1	553	0.258
SA1 40	SA1 40UU	40	62	22	28	45	53	4	1	27.5	686	0.315
SA1 45	SA1 45UU	45	68	25	32	50.8	60	6	1	35.3	882	0.413
SA1 50	SA1 50UU	50	75	28	35	56	66	6	1	43.5	1090	0.56
SA1 60	SA1 60UU	60	90	36	44	66.8	80	6	1.5	67.7	1700	1.1
SA1 70	SA1 70UU	70	105	40	49	77.9	92	8	1.5	86.6	2170	1.54



Model SA1



Model SA1-UU

Unit: mm

Model No.		Main dimensions								Basic load rating		Mass
Standard type	Seal type	Inner diameter d	Outer diameter D	Outer ring width B	Inner ring width B_1	d_1	Da	H	r	C kN	C_0 kN	kg
SA1 80	SA1 80UU	80	120	45	55	89.4	105	8	1.5	111	2780	2.29
SA1 90	SA1 90UU	90	130	50	60	98.1	115	8	2	135	3380	2.84
SA1 100	SA1 100UU	100	150	55	70	109.5	130	8	2	169	4210	4.43
SA1 110	SA1 110UU	110	160	55	70	121.2	140	8	2	181	4530	4.94
SA1 120	SA1 120UU	120	180	70	85	135.6	160	8	2	264	6590	8.12
SA1 140	SA1 140UU	140	210	70	90	155.9	180	8	3	296	7410	11.3
SA1 160	SA1 160UU	160	230	80	105	170.2	200	10	3	376	9410	14.4
SA1 180	SA1 180UU	180	260	80	105	199	225	10	3	424	10600	18.9
SA1 200	SA1 200UU	200	290	100	130	213.5	250	10	3	588	14700	28.1
SA1 220	SA1 220UU	220	320	100	135	239.6	275	10	3.5	647	16200	36.1
SA1 240	SA1 240UU	240	340	100	140	265.3	300	10	3.5	706	17600	40.4

Note) Model numbers "...100" or higher have double-slit outer rings.

Link Ball®

General Catalog

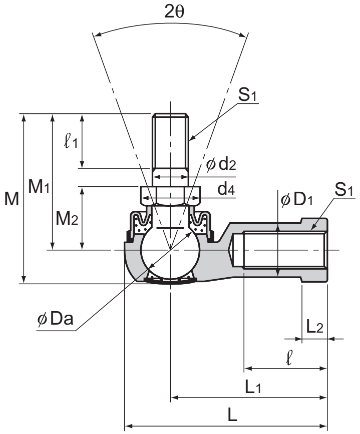
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model AL



Model No.	Outer dimensions			Threaded	Holder dimensions					
	Length L	Diameter D	Height M	S_1 JIS Class 2	L_1	ℓ	L_2	D_1	D_2	W $^{0}_{-0.3}$
AL 4D	24.5	13	20	M4×0.7	18	8	4	7.5	9.5	8
AL 5D	34.5	15	26.7	M5×0.8	27	15	4	9	12	10
AL 6D	38.5	17	32.6	M6×1	30	16	5	10	13	11
AL 8D	46	20	38.6	M8×1.25	36	19	6	13	16	14
AL 10D	56	26	46.3	M10×1.25	43	23	7	15.5	19	17
AL 10BD	56	26	52.3	M10×1.5	43	23	7	15.5	19	17

[Material]

Holder : A-1 alloy (see A-925)
Ball shank : Lightly Carburized Carbon Steel Ball: 650 Hv or higher
Shank S35C (20 to 28 HRC)
Chromate treatment
Boot : NBR special synthetic rubber

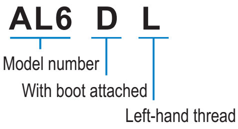
[Spherical Clearance]

Perpendicular to the axis : 0.02 to 0.06mm
Axial direction : 0.3mm or less

[Tolerance of the Mating Hole of the Ball Shank]

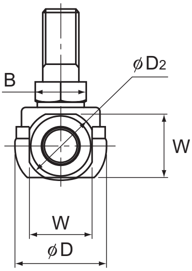
H10 is recommended.

Model number coding



AL6 D L

Model number
With boot attached
Left-hand thread

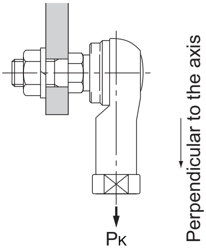


Unit: mm

	Ball shank dimensions						Ball diameter	Permissible tilt angles	Applied static load	Yield-point strength	Mass
	d_2 h9	M_1	M_2 ±0.3	ℓ_1	Hexagon B $^{0}_{-0.3}$	d_4	Da	2θ°	C_s N	P_k N	g
	4	15	7	6	7	8.1	7.938	40	4510	1370	7
	5	21	10	8	8	9.2	9.525	40	6470	2250	12
	6	26	11	11	10	11.6	11.112	40	9900	3920	18
	8	31	14	12	12	13.8	12.7	40	12500	6570	32
	10	37	17	15	14	16.2	15.875	40	18300	11300	65
	10	43	17	21	14	16.2	15.875	40	18300	11300	68

[Yield-Point Strength]

It indicates the strength in the direction shown in the figure below.



[Lubrication]

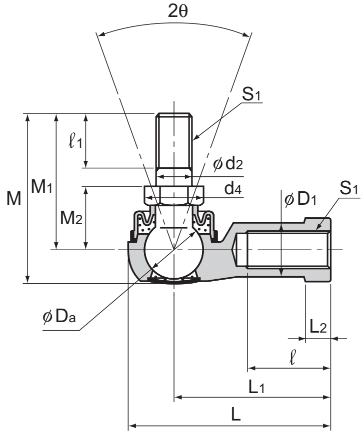
Lithium soap group grease No. 2 is contained in the boot and the cap.

[Identification of Left-hand Thread]

If the female threading is left-handed, its identification depends on the marking.

Threaded	Identification
	Cap marking
Right-hand	—
Left-hand	“L” mark

Model BL



Model No.	Outer dimensions			Threaded	Holder dimensions					
	Length L	Diameter D	Height M	S_1 JIS Class 2	L_1	ℓ	L_2	D_1	D_2	W $^{0}_{-0.3}$
BL 6D	38	16	32.6	M6×1	30	16	5	10	13	11
BL 8D	45.5	19	38.6	M8×1.25	36	19	6	12.5	16	14
BL 10D	55.5	25	46.3	M10×1.25	43	23	7	14.5	19	17
BL 10BD	55.5	25	52.3	M10×1.5	43	23	7	14.5	19	17
BL 12D	64.5	29	52.7	M12×1.25	50	26	8	17.5	22	19
BL 12BD	64.5	29	59.7	M12×1.75	50	26	8	17.5	22	19
BL 14D	74	34	68.4	M14×1.5	57	30	10	20	25	22
BL 14BD	74	34	74.4	M14×2	57	30	10	20	25	22
BL 16D	83	38	74	M16×1.5	64	34	11	22	27	24
BL 16BD	83	38	80	M16×2	64	34	11	22	27	24

[Material]

Holder	: High strength zinc alloy (see A-926)
Ball shank	: Lightly Carburized Carbon Steel Ball: 650 Hv or higher Shank S35C (20 to 28 HRC) Chromate treatment
Boot	: NBR special synthetic rubber

[Spherical Clearance]

Perpendicular to the axis : 0.02 to 0.06mm
Axial direction : 0.3mm or less

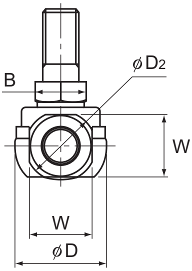
[Tolerance of the Mating Hole of the Ball Shank]

H10 is recommended.

Model number coding

BL6 D L

Model number
With boot attached
Left-hand thread

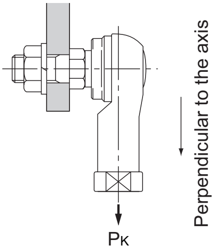


Unit: mm

	Ball shank dimensions						Ball diameter	Permissible tilt angles	Applied static load	Yield-point strength	Mass
	d₂ h9	M₁	M₂ ±0.3	ℓ₁	Hexagon B 0 −0.3	d₄	Da	2θ°	Cs N	Pk N	g
	6	26	11	11	10	11.6	11.112	40	9900	3920	26
	8	31	14	12	12	13.8	12.7	40	12500	6570	49
	10	37	17	15	14	16.2	15.875	40	18300	11300	87
	10	43	17	21	14	16.2	15.875	40	18300	11300	90
	12	42	19	17	17	19.6	19.05	40	26700	16400	143
	12	49	19	24	17	19.6	19.05	40	26700	16400	148
	14	56	21.5	22	19	21.9	22.225	40	36400	19800	235
	14	62	21.5	28	19	21.9	22.225	40	36400	19800	245
	16	60	23.5	23	22	25.4	22.225	30	36400	26900	315
	16	66	23.5	29	22	25.4	22.225	30	36400	26900	325

[Yield-Point Strength]

It indicates the strength in the direction shown in the figure below.



[Lubrication]

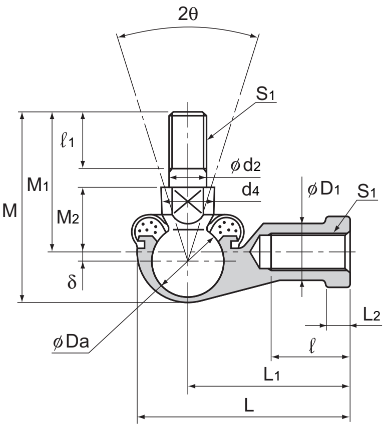
Lithium soap group grease No. 2 is contained in the boot and the cap.

[Identification of Left-hand Thread]

If the female threading is left-handed, its identification depends on the marking.

Threaded	Identification
	Cap marking
Right-hand	—
Left-hand	“L” mark

Model RBL



Model No.	Outer dimensions			Threaded	Holder dimensions					
	Length L	Diameter D	Height M	S_1 JIS Class 2	L_1	L_2	ℓ	D_1	D_2	W $^{0}_{-0.3}$
RBL 5D	35	16	29	M5×0.8	27	4	14	9	11	9
RBL 6D	40	19	35.5	M6×1	30	5	14	10	13	11
RBL 8D	48	23	42.5	M8×1.25	36	5	17	12.5	16	14
RBL 10D	57	27	50.5	M10×1.25	43	6.5	21	15	19	17
RBL 10BD	57	27	56.5	M10×1.5	43	6.5	21	15	19	17
RBL 12D	66	31	57.5	M12×1.25	50	6.5	25	17.5	22	19
RBL 12BD	66	31	64.5	M12×1.75	50	6.5	25	17.5	22	19
RBL 14D	75	35	73.5	M14×1.5	57	8	26	20	25	22
RBL 14BD	75	35	79.5	M14×2	57	8	26	20	25	22
RBL 16D	84	39	79.5	M16×1.5	64	8	32	22	27	22
RBL 16BD	84	39	85.5	M16×2	64	8	32	22	27	22
RBL 18D	93	44	90	M18×1.5	71	10	34	25	31	27
RBL 20D	99	44	90	M20×1.5	77	10	35	27.5	34	30
RBL 22D	109	50	95	M22×1.5	84	12	41	30	37	32

Note) The model numbers in dimmed type indicate semi-standard types. We recommend using model BL on B-836 .

[Material]

Holder	: High strength zinc alloy (see A-926)
Ball shank	: Lightly Carburized Carbon Steel Ball: 650 Hv or higher Shank S35C Chromate treatment
Boot	: NBR special synthetic rubber

[Spherical Clearance]

Perpendicular to the axis : 0.02 to 0.06mm
Axial direction : 0.3mm or less

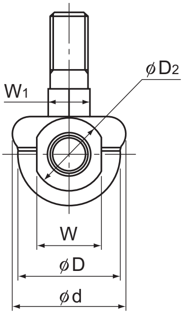
[Tolerance of the Mating Hole of the Ball Shank]

H10 is recommended.

Model number coding

RBL10 D L

Model number
With boot attached
Left-hand thread



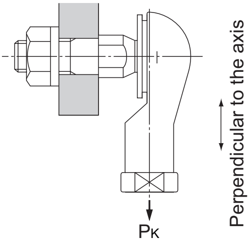
Unit: mm

	Ball shank dimensions						Boot	Eccen-tricity	Ball diameter	Permissible tilt angles	Applied static load	Yield-point strength	Mass
	d_2 h9	M_1	M_2 ±0.3	ℓ_1	W_1 $^{0}_{-0.3}$	d_4	d	σ	Da	2θ°	C_S N	P_k N	g
	5	21	10	8	7	9	19	1	11.112	45	9220	2250	24
	6	26	11	11	8	10	20	1.2	12.7	45	12100	3530	37
	8	31	14	12	10	12	24	2	15.875	45	19100	6570	67
	10	37	17	15	11	14	30	2.5	19.05	45	27500	10700	110
	10	43	17	21	11	14	30	2.5	19.05	45	27500	10700	113
	12	42	19	17	17	19	32	2	22.225	45	37500	16400	165
	12	49	19	24	17	19	32	2	22.225	45	37500	16400	170
	14	56	21.5	22	17	19	38	2	25.4	45	48900	19800	255
	14	62	21.5	28	17	19	38	2	25.4	45	48900	19800	260
	16	60	23.5	23	19	22	44	2	25.4	35	48900	26900	335
	16	66	23.5	29	19	22	44	2	25.4	35	48900	26900	340
	18	68	26.5	25	20	23	48	4.5	28.575	35	61900	33300	465
	20	68	27	25	24	29	50	2	28.575	35	61900	45900	540
	22	70	28	26	24	27	54	5	31.75	27	75400	48000	715

Note) The permissible tilting angle of types without boot are greater by approximately 5°.

[Yield-Point Strength]

It indicates the strength in the direction shown in the figure below.



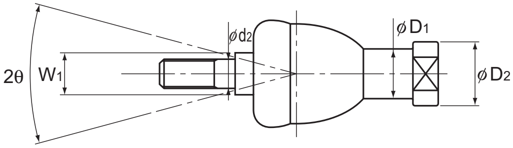
[Lubrication]

Lithium soap group grease No. 2 is contained in the boot.

[Identification of Left-hand Thread]

If the female threading is left-hand, symbol "L" is added. The actual product is marked with symbol "L" on the wrench flat.

Model RBI



Model No.	Outer dimensions		Threaded	Holder dimensions						Shaft diameter
	Length L	Diameter D	S_1 JIS Class 2	L_1	L_2	ℓ	D_1	D_2	W $^{0}_{-0.3}$	d_2 h9
RBI 5D	46	17	M5×0.8	24	4	12	9	11	9	5
RBI 6D	55.2	20	M6×1	28	5	15	10	13	11	6
RBI 8D	65	24	M8×1.25	32	5	16	12.5	16	14	8
RBI 10D	74.5	28	M10×1.25	35	6.5	18	15	19	17	10
RBI 10BD	80.5	28	M10×1.5	35	6.5	18	15	19	17	10
RBI 12D	84	32	M12×1.25	40	6.5	20	17.5	22	19	12
RBI 12BD	91	32	M12×1.75	40	6.5	20	17.5	22	19	12
RBI 14D	103	36	M14×1.5	45	8	25	20	25	22	14
RBI 14BD	109	36	M14×2	45	8	25	20	25	22	14
RBI 16D	112	40	M16×1.5	50	8	27	22	27	22	16
RBI 16BD	118	40	M16×2	50	8	27	22	27	22	16
RBI 18D	130.5	45	M18×1.5	58	10	32	25	31	27	18
RBI 20D	133	45	M20×1.5	63	10	38	27.5	34	30	20
RBI 22D	145	50	M22×1.5	70	12	43	30	37	32	22

[Material]

Holder	: High strength zinc alloy (see A-926)
Ball shank	: Bearing steel ball Hardness: 650 Hv or higher Shank S35C Chromate treatment
Boot	: NBR special synthetic rubber

[Spherical Clearance]

Perpendicular to the axis : 0.03mm or less
Axial direction : 0.1mm or less

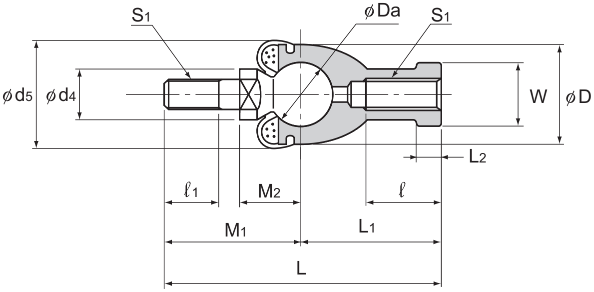
[Tolerance of the Mating Hole of the Ball Shank]

H10 is recommended.

Model number coding

RBI10 D L

RBI10 — Model number
D — With boot attached
L — Left-hand thread



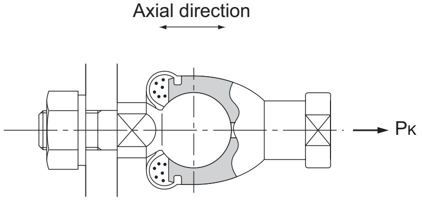
Unit: mm

	Ball shank dimensions					Boot	Ball diameter	Permissible tilt angles	Applied static load		Yield-point strength	Mass
	M_1	M_2 ±0.3	ℓ_1	W_1 0 −0.3	d_4	d_5	Da	2θ°	Tensile C_S N	Compressive C_S N	P_k N	g
	22	11	8	7	9	20	11.112	25	5690	11400	2840	25
	27.2	12.2	11	8	10	20	12.7	25	7450	14900	3730	40
	33	16	12	10	12	24	15.875	25	11700	23200	5880	75
	39.5	19.5	15	11	14	30	19.05	25	16800	33500	8430	120
	45.5	19.5	21	11	14	30	19.05	25	16800	33500	8430	123
	44	21	17	17	19	32	22.225	25	22800	45600	11400	185
	51	21	24	17	19	32	22.225	25	22800	45600	11400	190
	58	23.5	22	17	19	38	25.4	17	29800	59600	14900	275
	64	23.5	28	17	19	38	25.4	17	29800	59600	14900	280
	62	25.5	23	19	22	44	25.4	17	29800	59600	14900	360
	68	25.5	29	19	22	44	25.4	17	29800	59600	14900	370
	72.5	31	25	20	23	45	28.575	17	37700	75400	18900	535
	70	29	25	24	29	50	28.575	10	37700	75400	18900	570
	75	33	26	24	27	52	31.75	10	46600	93100	23500	755

Note) The permissible tilting angle of types without boot are greater by approximately 5°.

[Yield-Point Strength]

It indicates the strength in the direction shown in the figure below.



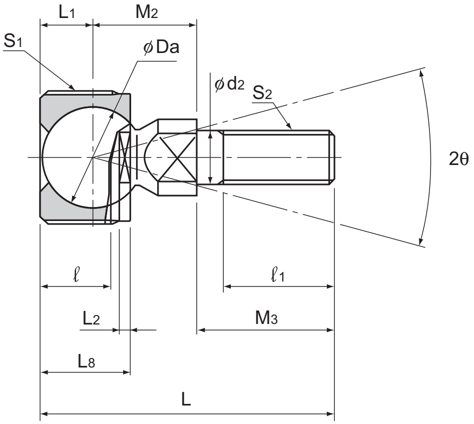
[Lubrication]

Lithium soap group grease No. 2 is contained in the boot.

[Identification of Left-hand Thread]

If the female threading is left-hand, symbol "L" is added.
The actual product is marked with symbol "L" on the holder.

Model TBS



Model No.	Outer dimensions		Holder dimensions					Shaft diameter	
	Threaded S_1 JIS Class 2	Length L	L_8	ℓ	L_1	L_2	W $^{0}_{-0.3}$	d_2 h9	Threaded S_2 JIS Class 2
TBS 6	M20×1.5	34.2	11.5	8	7	2	17	6	M6×1
TBS 8	M22×1.5	41.5	14.5	11	8.5	2	19	8	M8×1.25
TBS 10	M25×1.5	55.5	17	13.5	10	2	22	10	M10×1.5
TBS 12	M30×1.5	63	20	15.5	12	3	27	12	M12×1.75

[Material]

Holder	: High strength zinc alloy (see A-926)
Ball shank	: Bearing steel ball Hardness: 650 Hv or higher Shank S35C Chromate treatment

[Spherical Clearance]

Perpendicular to the axis	: 0.03mm or less
Axial direction	: 0.1mm or less

[Female Threading for Attaching the Outer Ring]

JIS Class 2 thread

[Yield-Point Strength]

It indicates the strength in the direction shown in the Fig.1.

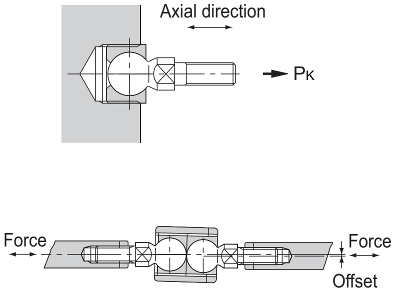
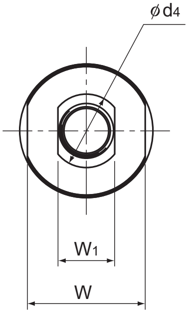


Fig.1



Unit: mm

	Ball shank dimensions					Ball diameter	Permissible tilt angles	Applied static load			Yield-point strength	Mass
								Perpendicular to the axis	Axial direction			
	d_4	M_2	M_3	ℓ_1	W_1 $^{\ 0}_{-0.3}$	Da	2θ°	C_s N	C_{Sa} (Tensile) N	C_{Sa} (Compressive) N	P_k N	g
	10	12.2	15	11	8	12.7	30	13700	4900	12000	2450	30
	12	16	17	12	10	15.875	30	24600	10400	17600	5200	50
	14	19.5	26	21	11	19.05	30	32700	14400	25000	7250	80
	19	21	30	24	17	22.225	30	44000	18300	35000	9220	130

[Example of Installation]

As shown in the Fig.2 below, compared with the conventional installation using a frog-shaped joint, model TBS can be installed more compactly and more easily.

[Lubrication]

Since the holder has an oil pocket, it allows grease to be replenished as necessary.

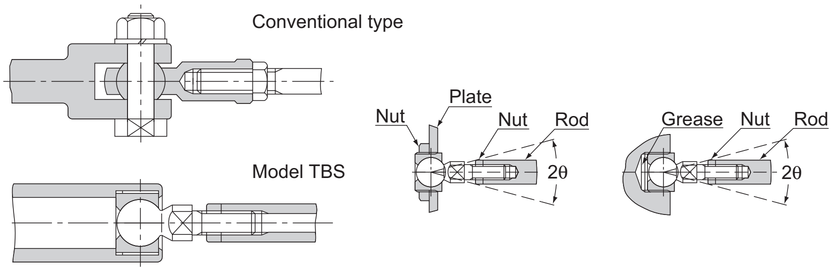


Fig.2

Rod End

General Catalog

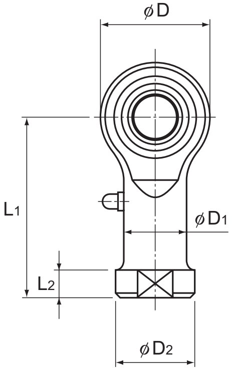
B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Model PHS (Female Threading Type)



Model No.	Outer dimensions			Threaded	Holder Dimensions			
	Length L	Diameter D	Width B_1 $^{0}_{-0.1}$	S_1 JIS Class 2	W $^{0}_{-0.2}$	D_1	D_2	B ±0.1
PHS 5	35	16	8	M5×0.8	9	9	11	6
PHS 6	39	18	9	M6×1	11	10	13	6.75
PHS 8	47	22	12	M8×1.25	14	12.5	16	9
PHS 10	56	26	14	M10×1.5	17	15	19	10.5
PHS 12	65	30	16	M12×1.75	19	17.5	22	12
PHS 14	74	34	19	M14×2	22	20	25	13.5
PHS 16	83	38	21	M16×2	22	22	27	15
PHS 18	92	42	23	M18×1.5	27	25	31	16.5
PHS 20	100	46	25	M20×1.5	30	27.5	34	18
PHS 22	109	50	28	M22×1.5	32	30	37	20
PHS 25	124	60	31	M24×2	36	33.5	42	22
PHS 30	145	70	37	M30×2	41	40	50	25

[Material]

Holder : S35C (Chromate treatment)
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)
Bush : Special copper alloy

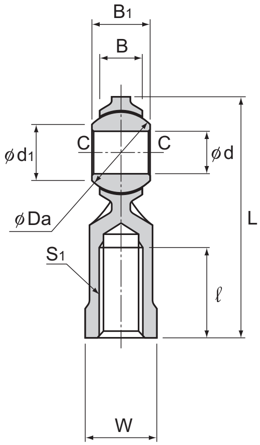
[Fitting with the Shaft]

Condition	Dimensional tolerance of the shaft
Normal load	h7
Indeterminate load	p6

Model number coding

PHS10 L

PHS10 — Model number
L — Left-hand thread



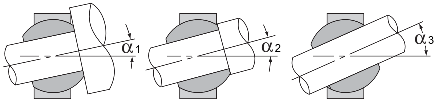
Unit: mm

L_1	L_2	ℓ	Grease nipple	Spherical inner ring dimensions				Permissible tilt angles			Static applied load Radial	Mass
				d H7	Ball diameter Da mm (inch)	d_1	C	α_1°	α_2°	α_3°	C_s N	g
27	4	14	PB107	5	11.112($^7/_{16}$)	7.7	0.3	8	13	30	5590	16.5
30	5	14		6	12.7($^1/_2$)	9	0.3	8	13	30	6860	25
36	5	17		8	15.875($^5/_8$)	10.4	0.5	8	14	25	9800	43
43	6.5	21		10	19.05($^3/_4$)	12.9	0.5	8	14	25	13200	72
50	6.5	24		12	22.225($^7/_8$)	15.4	0.5	8	13	25	16700	107
57	8	27		14	25.4(1)	16.9	0.7	10	16	24	20600	160
64	8	33		16	28.575(1$^1/_8$)	19.4	0.7	9	15	24	25000	210
71	10	36		18	31.75(1$^1/_4$)	21.9	0.7	9	15	24	29400	295
77	10	40		20	34.925(1$^3/_8$)	24.4	0.7	9	15	24	34300	380
84	12	43		22	38.1(1$^1/_2$)	25.8	0.7	10	15	23	41200	490
94	12	48	A-M6F	25	42.862(1$^{11}/_{16}$)	29.6	0.8	9	15	23	72500	750
110	15	56		30	50.8(2)	34.8	0.8	10	17	23	92200	1130

[Clearance]

Unit: mm

Radial clearance	0.035 or less
Axial clearance	0.1 or less



Permissible Tilt Angles

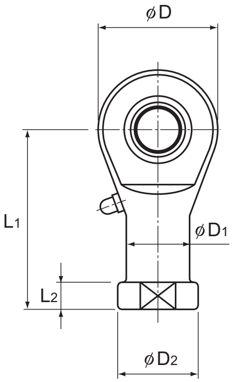
[Lubrication]

Apply lubricant before using the product. The holder has a greasing hole and an oil groove; they allow grease to be replenished through the grease nipple as necessary.

[Identification of Left-hand Thread]

If the female threading is left-hand, symbol "L" is added.
The actual product is marked with symbol "L" on the holder.

Model RBH (Die Cast, Low Price Type)



Model No.	Outer dimensions			Threaded	Holder Dimensions			
	Length L	Diameter D	Width B_1 $^{0}_{-0.1}$	S_1 JIS Class 2	W $^{0}_{-0.3}$	D_1	D_2	B
RBH 5	35.5	17	8	M5×0.8	9	9	11	6
RBH 6	39.7	19.5	9	M6×1	11	10	13	6.75
RBH 8	48	24	12	M8×1.25	14	12.5	16	9
RBH 10	57	28	14	M10×1.5	17	15	19	10.5
RBH 12	66	32	16	M12×1.75	19	17.5	22	12
RBH 14	75	36	19	M14×2	22	20	25	13.5
RBH 16	84	40	21	M16×2	22	22	27	15
RBH 18	93.5	45	23	M18×1.5	27	25	31	16.5
RBH 20	101.5	49	25	M20×1.5	30	27.5	34	18
RBH 22	111	54	28	M22×1.5	32	30	37	20

[Material]

Holder : High strength zinc alloy (see A-942)
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)

[Fitting with the Shaft]

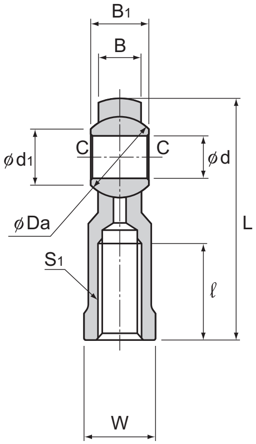
Condition	Dimensional tolerance of the shaft
Normal load	h7
Indeterminate load	p6

Model number coding

RBH10 L

RBH10: Model number

L: Left-hand thread



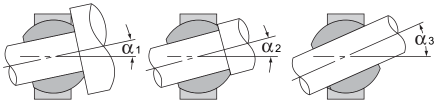
Unit: mm

			Grease nipple	Spherical inner ring dimensions				Permissible tilt angles			Static applied load Radial	Mass
L_1	L_2	ℓ		d H7	Ball diameter Da mm (inch)	d_1	C	α_1°	α_2°	α_3°	C_s N	g
27	4	16	PB107	5	11.112($^{7}/_{16}$)	7.7	0.3	8	13	30	5490	16
30	5	16		6	12.7($^{1}/_{2}$)	9	0.3	8	13	30	6760	21
36	5	19		8	15.875($^{5}/_{8}$)	10.4	0.5	8	14	25	9610	43
43	6.5	23		10	19.05($^{3}/_{4}$)	12.9	0.5	8	14	25	13000	68
50	6.5	27		12	22.225($^{7}/_{8}$)	15.4	0.5	8	13	25	16400	100
57	8	30		14	25.4(1)	16.9	0.7	10	16	24	20200	142
64	8	36		16	28.575(1$^{1}/_{8}$)	19.4	0.7	9	15	24	24600	185
71	10	40		18	31.75(1$^{1}/_{4}$)	21.9	0.7	9	15	24	28800	265
77	10	43		20	34.925(1$^{3}/_{8}$)	24.4	0.7	9	15	24	33600	334
84	12	47		22	38.1(1$^{1}/_{2}$)	25.8	0.7	10	15	23	40400	454

[Clearance]

Unit: mm

Radial clearance	0.03 or less
Axial clearance	0.1 or less



Permissible Tilt Angles

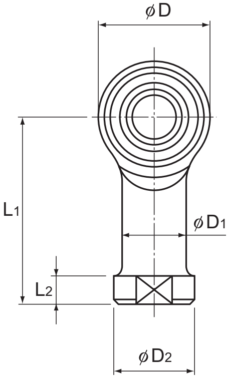
[Lubrication]

Apply lubricant before using the product. The holder has a greasing hole and an oil groove; they allow grease to be replenished through the grease nipple as necessary.

[Identification of Left-hand Thread]

If the female threading is left-hand, symbol "L" is added.
The actual product is marked with symbol "L" on the holder.

Model NHS-T (No Lubrication Type)



Model No.	Outer dimensions			Threaded	Holder Dimensions			
	Length L	Diameter D	Width B1 0 −0.1	S1 JIS Class 2	W 0 −0.2	D1	D2	B +0.1 −0.4
NHS 3T	27	12	6	M3×0.5	7	6.5	8	4.5
NHS 4T	31	14	7	M4×0.7	8	8	9.5	5.3
NHS 5T	35	16	8	M5×0.8	9	9	11	6
NHS 6T	39	18	9	M6×1	11	10	13	6.75
NHS 8T	47	22	12	M8×1.25	14	12.5	16	9
NHS 10T	56	26	14	M10×1.5	17	15	19	10.5
NHS 12T	65	30	16	M12×1.75	19	17.5	22	12
NHS 14T	74	34	19	M14×2	22	20	25	13.5
NHS 16T	83	38	21	M16×2	22	22	27	15
NHS 18T	92	42	23	M18×1.5	27	25	31	16.5
NHS 20T	100	46	25	M20×1.5	30	27.5	34	18
NHS 22T	109	50	28	M22×1.5	32	30	37	20

[Material]

Holder : S35C (Chromate treatment)
For NHS3T and NHS4T, S20C
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)
Bush : Self-lubricating synthetic resin

[Fitting with the Shaft]

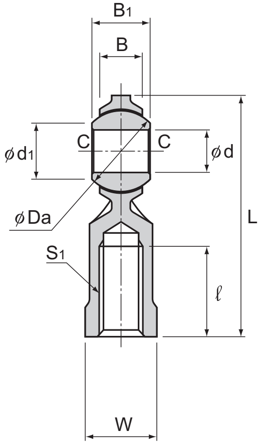
Condition	Dimensional tolerance of the shaft
Normal load	h7
Indeterminate load	p6

Model number coding

NHS10T L

Model number

Left-hand thread



Unit: mm

				Spherical inner ring dimensions				Permissible tilt angles			Static applied load Radial	Mass
	L_1	L_2	ℓ	d H7	Ball diameter Da mm (inch)	d_1	C	α_1°	α_2°	α_3°	C_S N	g
	21	3	10	3	9.525($^{3}/_{8}$)	7.4	0.3	8	10	42	1570	6.5
	24	4	12	4	10.319($^{13}/_{32}$)	7.6	0.3	9	11	35	2250	10
	27	4	14	5	11.112($^{7}/_{16}$)	7.7	0.3	8	13	30	3920	16.5
	30	5	14	6	12.7($^{1}/_{2}$)	9	0.3	8	13	30	5000	25
	36	5	17	8	15.875($^{5}/_{8}$)	10.4	0.5	8	14	25	7450	43
	43	6.5	21	10	19.05($^{3}/_{4}$)	12.9	0.5	8	14	25	9410	72
	50	6.5	24	12	22.225($^{7}/_{8}$)	15.4	0.5	8	13	25	11000	107
	57	8	27	14	25.4(1)	16.9	0.7	10	16	24	15200	160
	64	8	33	16	28.575(1$^{1}/_{8}$)	19.4	0.7	9	15	24	20200	210
	71	10	36	18	31.75(1$^{1}/_{4}$)	21.9	0.7	9	15	24	25200	295
	77	10	40	20	34.925(1$^{3}/_{8}$)	24.4	0.7	9	15	24	27800	380
	84	12	43	22	38.1(1$^{1}/_{2}$)	25.8	0.7	10	15	23	35900	490

[Clearance]

Unit: mm

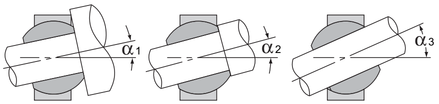
Radial clearance	0.035 or less
Axial clearance	0.1 or less

[Initial Lubrication]

This model can be used without lubrication. However, if desiring to provide initial lubrication, apply oil or grease to the spherical area.

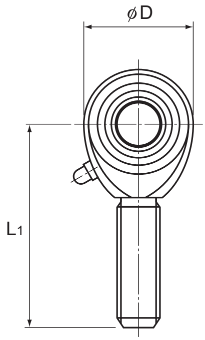
[Identification of Left-hand Thread]

If the female threading is left-hand, symbol "L" is added.
The actual product is marked with symbol "L" on the holder.



Permissible Tilt Angles

Model POS (Male Thread Type)



Model No.	Outer dimensions			Threaded	Holder Dimensions	
	Length L	Diameter D	Width B_1 $^{\ 0}_{-0.1}$	S_1 JIS Class 2	B ±0.1	L_1
POS 5	41	16	8	M5×0.8	6	33
POS 6	45	18	9	M6×1	6.75	36
POS 8	53	22	12	M8×1.25	9	42
POS 10	61	26	14	M10×1.5	10.5	48
POS 12	69	30	16	M12×1.75	12	54
POS 14	77	34	19	M14×2	13.5	60
POS 16	85	38	21	M16×2	15	66
POS 18	93	42	23	M18×1.5	16.5	72
POS 20	101	46	25	M20×1.5	18	78
POS 22	109	50	28	M22×1.5	20	84
POS 25	124	60	31	M24×2	22	94
POS 30	145	70	37	M30×2	25	110

[Material]

Holder : S35C (Chromate treatment)
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)
Bush : Special copper alloy

[Fitting with the Shaft]

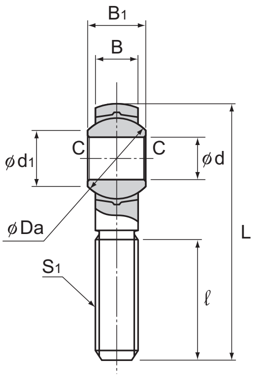
Condition	Dimensional tolerance of the shaft
Normal load	h7
Indeterminate load	p6

Model number coding

POS10 L

POS10 — Model number

L — Left-hand thread



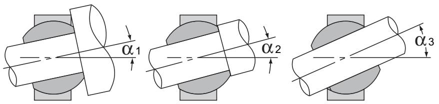
Unit: mm

		Grease nipple	Spherical inner ring dimensions				Permissible tilt angles			Static applied load Radial	Mass
	ℓ		d H7	Ball diameter Da mm (inch)	d_1	C	α_1°	α_2°	α_3°	C_s N	g
	20	—	5	11.112(7/16)	7.7	0.3	8	13	30	3430	12.5
	22		6	12.7(1/2)	9	0.3	8	13	30	4900	19
	25	PB107	8	15.875(5/8)	10.4	0.5	8	14	25	6860	32
	29		10	19.05(3/4)	12.9	0.5	8	14	25	10800	54
	33		12	22.225(7/8)	15.4	0.5	8	13	25	16700	85
	36		14	25.4(1)	16.9	0.7	10	16	24	20600	126
	40		16	28.575(1 1/8)	19.4	0.7	9	15	24	25000	185
	44		18	31.75(1 1/4)	21.9	0.7	9	15	24	29400	260
	47		20	34.925(1 3/8)	24.4	0.7	9	15	24	34300	340
	51		22	38.1(1 1/2)	25.8	0.7	10	15	23	41200	435
	57	A-M6F	25	42.862(1 11/16)	29.6	0.8	9	15	23	72500	650
	66		30	50.8(2)	34.8	0.8	10	17	23	92200	1070

[Clearance]

Unit: mm

Radial clearance	0.035 or less
Axial clearance	0.1 or less



Permissible Tilt Angles

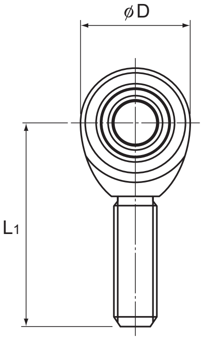
[Lubrication]

Apply lubricant before using the product. The holder has a greasing hole and an oil groove; they allow grease to be replenished through the grease nipple as necessary. To lubricate the product, replenish grease from the holder greasing hole for models POS5 and 6, or from the grease nipple for other models.

[Identification of Left-hand Thread]

If the male thread is left-hand, symbol "L" is added.
The actual product is marked with symbol "L" on the holder.

Model NOS-T (No Lubrication, Male Thread Type)



Model No.	Outer dimensions			Threaded	Holder Dimensions	
	Length L	Diameter D	Width B_1 $^{0}_{-0.1}$	S_1 JIS Class 2	B $^{+0.1}_{-0.4}$	L_1
NOS 3 T	33	12	6	M3×0.5	4.5	27
NOS 4 T	37	14	7	M4×0.7	5.3	30
NOS 5 T	41	16	8	M5×0.8	6	33
NOS 6 T	45	18	9	M6×1	6.75	36
NOS 8 T	53	22	12	M8×1.25	9	42
NOS 10 T	61	26	14	M10×1.5	10.5	48
NOS 12 T	69	30	16	M12×1.75	12	54
NOS 14 T	77	34	19	M14×2	13.5	60
NOS 16 T	85	38	21	M16×2	15	66
NOS 18 T	93	42	23	M18×1.5	16.5	72
NOS 20 T	101	46	25	M20×1.5	18	78
NOS 22 T	109	50	28	M22×1.5	20	84

[Material]

Holder : S35C (Chromate treatment)
For NOS3T and NOS4T, S20C
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)
Bush : Self-lubricating synthetic resin

[Fitting with the Shaft]

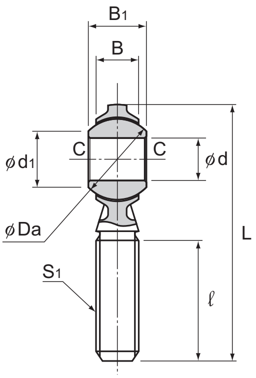
Condition	Dimensional tolerance of the shaft
Normal load	h7
Indeterminate load	p6

Model number coding

NOS10T L

NOS10T: Model number

L: Left-hand thread



Unit: mm

		Spherical inner ring dimensions				Permissible tilt angles			Static applied load Radial	Mass
	ℓ	d H7	Ball diameter Da mm (inch)	d_1	C	α_1°	α_2°	α_3°	C_s N	g
	15	3	9.525($^3/_8$)	7.4	0.3	8	10	42	1570	4.5
	17	4	10.319($^{13}/_{32}$)	7.6	0.3	9	11	35	2250	7
	20	5	11.112($^7/_{16}$)	7.7	0.3	8	13	30	3430	12.5
	22	6	12.7($^1/_2$)	9	0.3	8	13	30	4900	19
	25	8	15.875($^5/_8$)	10.4	0.5	8	14	25	6860	32
	29	10	19.05($^3/_4$)	12.9	0.5	8	14	25	9410	54
	33	12	22.225($^7/_8$)	15.4	0.5	8	13	25	11000	85
	36	14	25.4(1)	16.9	0.7	10	16	24	15200	126
	40	16	28.575(1$^1/_8$)	19.4	0.7	9	15	24	20200	185
	44	18	31.75(1$^1/_4$)	21.9	0.7	9	15	24	25200	260
	47	20	34.925(1$^3/_8$)	24.4	0.7	9	15	24	27800	340
	51	22	38.1(1$^1/_2$)	25.8	0.7	10	15	23	35900	435

[Clearance]

Unit: mm

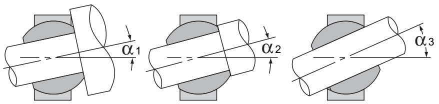
Radial clearance	0.035 or less
Axial clearance	0.1 or less

[Initial Lubrication]

This model can be used without lubrication. However, if desiring to provide initial lubrication, apply oil or grease to the spherical area.

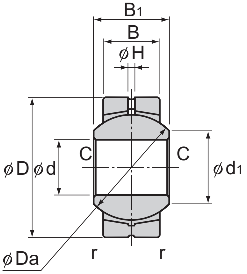
[Identification of Left-hand Thread]

If the male thread is left-hand, symbol "L" is added.



Permissible Tilt Angles

Model PB (Standard Type)



Unit: mm

Model No.	Main dimensions							Ball diameter	Permissible tilt angles			Static applied load Radial	Mass
	Inner diameter d H7	Outer diameter D h6	Outer ring width B ±0.1	Inner ring width B_1 $^{0}_{-0.1}$	d_1	H	C, r	Da mm (inch)	α_1°	α_2°	α_3°	C_s N	g
PB 5	5	16	6	8	7.7	1	0.3	11.112($^{7}/_{16}$)	8	13	30	7840	8.5
PB 6	6	18	6.75	9	9	1	0.3	12.7($^{1}/_{2}$)	8	13	30	9800	13
PB 8	8	22	9	12	10.4	1	0.5	15.875($^{5}/_{8}$)	8	14	25	16700	24
PB 10	10	26	10.5	14	12.9	1.2	0.5	19.05($^{3}/_{4}$)	8	14	25	23500	39
PB 12	12	30	12	16	15.4	1.5	0.5	22.225($^{7}/_{8}$)	8	13	25	31400	58
PB 14	14	34	13.5	19	16.9	1.5	0.7	25.4(1)	10	16	24	40200	84
PB 16	16	38	15	21	19.4	2.5	0.7	28.575(1$^{1}/_{8}$)	9	15	24	50000	111
PB 18	18	42	16.5	23	21.9	2.5	0.7	31.75(1$^{1}/_{4}$)	9	15	24	61800	160
PB 20	20	46	18	25	24.4	2.5	0.7	34.925(1$^{3}/_{8}$)	9	15	24	73500	210
PB 22	22	50	20	28	25.8	2.5	0.7	38.1(1$^{1}/_{2}$)	10	15	23	88200	265
PB 25	25	56	22	31	29.6	3	0.8	42.862(1$^{11}/_{16}$)	9	15	23	111000	390
PB 30	30	66	25	37	34.8	3	0.8	50.8(2)	10	17	23	148000	610

[Material]

Outer ring : S35C
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)
Bush : Special copper alloy

[Fitting with the Shaft]

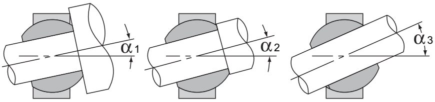
For the fitting between the shaft and the housing, the following values are recommended.

Condition		Shaft	Housing
Inner ring rotational load	Normal load	m6	H7
	Indeterminate load	n6	
Outer ring rotational load	Normal load	h7	M7
	Indeterminate load	k6	

[Clearance]

Unit: mm

Radial clearance	0.035 or less
Axial clearance	0.1 or less

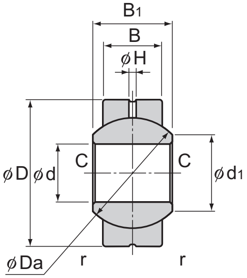


Permissible Tilt Angles

[Lubrication]

Apply lubricant before using the product.
The holder has a greasing hole and an oil groove; they allow grease to be replenished through the grease nipple as necessary.

Model PBA (Die Cast Type)



Unit: mm

Model No.	Main dimensions							Ball diameter	Permissible tilt angles			Static applied load Radial	Mass
	Inner diameter d H7	Outer diameter D h8	Outer ring width B ±0.1	Inner ring width B_1 $^{0}_{-0.1}$	d_1	H	C, r	Da mm (inch)	α_1°	α_2°	α_3°	C_s N	g
PBA 5	5	16	6	8	7.7	1	0.3	11.112($^{7}/_{16}$)	8	13	30	7840	8.5
PBA 6	6	18	6.75	9	9	1	0.3	12.7($^{1}/_{2}$)	8	13	30	9800	13
PBA 8	8	22	9	12	10.4	1	0.5	15.875($^{5}/_{8}$)	8	14	25	16700	24
PBA 10	10	26	10.5	14	12.9	1.2	0.5	19.05($^{3}/_{4}$)	8	14	25	23500	39
PBA 12	12	30	12	16	15.4	1.5	0.5	22.225($^{7}/_{8}$)	8	13	25	31400	58
PBA 14	14	34	13.5	19	16.9	1.5	0.7	25.4(1)	10	16	24	40200	84
PBA 16	16	38	15	21	19.4	2.5	0.7	28.575(1$^{1}/_{8}$)	9	15	24	50000	111
PBA 18	18	42	16.5	23	21.9	2.5	0.7	31.75(1$^{1}/_{4}$)	9	15	24	61800	160
PBA 20	20	46	18	25	24.4	2.5	0.7	34.925(1$^{3}/_{8}$)	9	15	24	73500	210
PBA 22	22	50	20	28	25.8	2.5	0.7	38.1(1$^{1}/_{2}$)	10	15	23	88200	265

[Material]

Outer ring : High strength zinc alloy (see A-942)
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)

[Fitting with the Shaft]

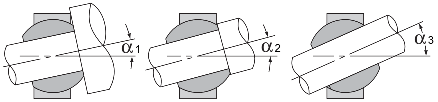
For the fitting between the shaft and the housing, the following values are recommended.

Condition		Shaft	Housing
Inner ring rotational load	Normal load	m6	H7
	Indeterminate load	n6	
Outer ring rotational load	Normal load	h7	M7
	Indeterminate load	k6	

[Clearance]

Unit: mm

Radial clearance	0.035 or less
Axial clearance	0.1 or less

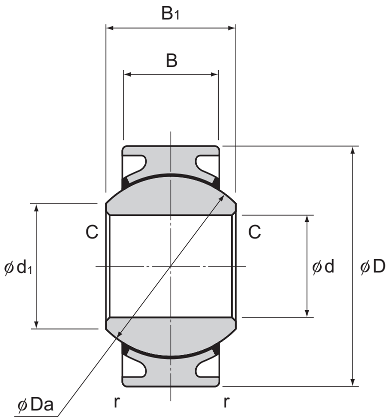


Permissible Tilt Angles

[Lubrication]

Apply lubricant before using the product.
The holder has a greasing hole and an oil groove; they allow grease to be replenished through the grease nipple as necessary.

Model NB-T (No Lubrication Type)



Unit: mm

Model No.	Outer dimensions						Ball diameter	Permissible tilt angles			Static applied load Radial	Mass
	Inner diameter d H7	Outer diameter D h7	Outer ring width B ±0.1	Inner ring width B_1 $^{0}_{-0.1}$	d_1	C, r	Da mm (inch)	α_1°	α_2°	α_3°	C_S N	g
NB 14T	14	34	13.5	19	16.9	0.7	25.4(1)	10	16	24	20200	84
NB 16T	16	38	15	21	19.4	0.7	28.575($1^{1}/_{8}$)	9	15	24	25200	111
NB 18T	18	42	16.5	23	21.9	0.7	31.75($1^{1}/_{4}$)	9	15	24	30800	160
NB 20T	20	46	18	25	24.4	0.7	34.925($1^{3}/_{8}$)	9	15	24	36900	210
NB 22T	22	50	20	28	25.8	0.7	38.1($1^{1}/_{2}$)	10	15	23	44800	265

[Material]

Outer ring : S35C
Spherical inner ring : SUJ2, 58 HRC or higher
(Hard chrome plated except for the inner surface of the inner ring)
Bush : Self-lubricating synthetic resin

[Fitting with the Shaft]

For the fitting between the shaft and the housing, the following values are recommended.

Condition		Shaft	Housing
Inner ring rotational load	Normal load	m6	H7
	Indeterminate load	n6	
Outer ring rotational load	Normal load	h7	M7
	Indeterminate load	k6	

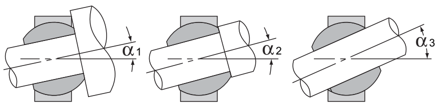
[Clearance]

Unit: mm

Radial clearance	0.035 or less
Axial clearance	0.1 or less

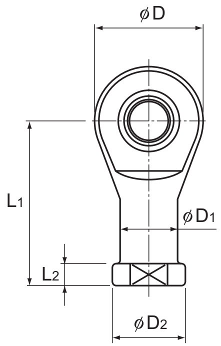
[Initial Lubrication]

This model can be used without lubrication. However, if desiring to provide initial lubrication, apply oil or grease to the spherical area.



Permissible Tilt Angles

Model HS (No Lubrication, Corrosion-resistant Type)/ Build to Order



Model No.	Outer dimensions			Threaded	Holder Dimensions					
	Length L	Diameter D	Width B1 $^{0}_{-0.1}$	S1 JIS Class 2	W $^{0}_{-0.3}$	D1	D2	B	L1	L2
HS 5	35.5	17	8	M5×0.8	9	9	11	6	27	4
HS 6	39.7	19.5	9	M6×1	11	10	13	6.75	30	5
HS 8	48	24	12	M8×1.25	14	12.5	16	9	36	5
HS 10	57	28	14	M10×1.5	17	15	19	10.5	43	6.5
HS 12	66	32	16	M12×1.75	19	17.5	22	12	50	6.5

[Material]

Holder : Aluminum alloy
Spherical inner ring : SUJ2, 600 Hv or higher (corrosion resistant coated)
Bush : Special fluorine resin with fiber

[Fitting with the Shaft]

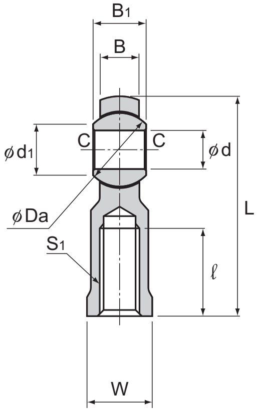
Condition	Dimensional tolerance of the shaft
Normal load	h7
Indeterminate load	n6, p6

Model number coding

HS10 L

HS10: Model number

L: Left-hand thread



Unit: mm

		Spherical inner ring dimensions				Permissible tilt angles			Static applied load Radial	Yield-point strength	Mass
	ℓ	d G7	Ball diameter Da mm (inch)	d_1	C	α_1°	α_2°	α_3°	C_S N	P_K N	g
	16	5	11.112($^7/_{16}$)	7.7	0.3	7	13	30	5590	3920	9
	16	6	12.7($^1/_2$)	9	0.3	7	13	30	6860	5290	15
	19	8	15.875($^5/_8$)	10.4	0.5	8	14	25	9800	8330	26
	23	10	19.05($^3/_4$)	12.9	0.5	8	14	25	13200	10800	41
	27	12	22.225($^7/_8$)	15.4	0.5	8	13	25	16700	14700	60

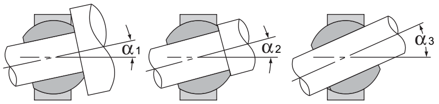
[Clearance]

Unit: mm

Radial clearance	0.03 or less
Axial clearance	0.1 or less

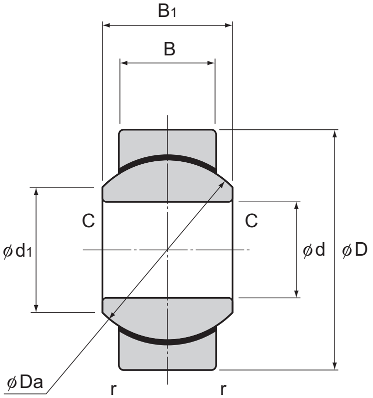
[Identification of Left-hand Thread]

If the female threading is left-hand, symbol "L" is added.
The actual product is marked with symbol "L" on the holder.



Permissible Tilt Angles

Model HB (No Lubrication Type)/ Build to Order



Unit: mm

Model No.	Outer dimensions						Ball diameter	Permissible tilt angles			Static applied load Radial	Mass
	Inner diameter d G7	Outer diameter D h7	Outer ring width B ±0.1	Inner ring width B_1 $^{0}_{-0.1}$	d_1	C, r	Da mm (inch)	α_1°	α_2°	α_3°	C_s N	g
HB 5	5	16	6	8	7.7	0.3	11.112(7/16)	7	13	30	13100	8.5
HB 6	6	18	6.75	9	9	0.3	12.7(1/2)	7	13	30	16900	13
HB 8	8	22	9	12	10.4	0.5	15.875(5/8)	8	14	25	28000	24
HB 10	10	26	10.5	14	12.9	0.5	19.05(3/4)	8	14	25	39200	39
HB 12	12	30	12	16	15.4	0.5	22.225(7/8)	8	13	25	52500	58

[Material]

Outer ring : Zinc alloy
Spherical inner ring : SUJ2, 600 Hv or higher (corrosion resistant coated)
Bush : Special fluorine resin with fiber

[Fitting with the Shaft]

For the fitting between the shaft and the housing, the following values are recommended.

Condition		Shaft	Housing
Inner ring rotational load	Normal load	m6	H7
	Indeterminate load	n6	
Outer ring rotational load	Normal load	h7	M7
	Indeterminate load	k6	

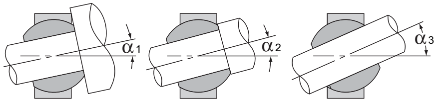
[Clearance]

Unit: mm

Radial clearance	0.03 or less
Axial clearance	0.1 or less

[Initial Lubrication]

This model can be used without lubrication. However, if desiring to provide initial lubrication, apply oil or grease to the spherical area.



Permissible Tilt Angles

Accessories for Lubrication

THK General Catalog

B Product Specifications

Dimensional Drawing, Dimensional Table

A Technical Descriptions of the Products (Separate)

* Please see the separate "A Technical Descriptions of the Products".

Lubrication Equipment

Grease Gun Unit MG70

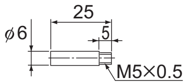
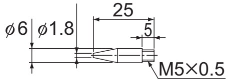
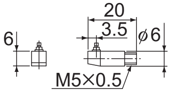
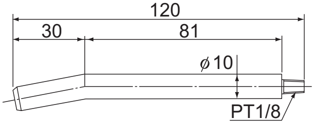
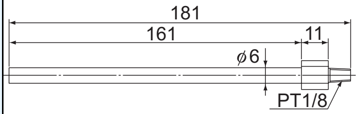
- ●Discharge pressure: 19.6 MPa max ●Discharge rate: 0.6 cc/stroke ●Grease: 70 g bellows cartridge
- ●Overall length: 235 mm (excluding the nozzle) ●Weight: 480 g (including the nozzle, excluding the grease)

Grease Gun Unit MG70 is capable of lubricating small to large types of LM Guides by replacing dedicated nozzles (attached). For small LM Guides, MG70 is provided with dedicated attachments. The user can select from these attachments according to the model number and the installation space. MG70 has a slit window, allowing the user to check the remaining amount of grease.

It is equipped with a bellows cartridge that can hold 70 g of grease and is replaceable without smirching your hand. It supports a wide range of grease products, including AFA Grease, AFB-LF Grease, AFC Grease and AFE-CA Grease, to meet varied conditions. This enables you to make a selection according to the area requiring grease. (See A-959 to A-969.)

Since the grease to be used is sold separately, you must purchase it separately.

Table for Supported Model Numbers

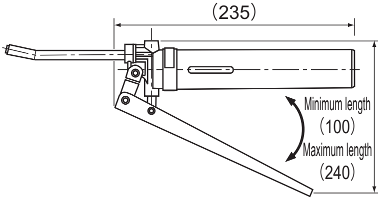
Type	Dimensions	Supported model numbers	
Type N		LM Guide	Models SSR15, SHS15, SR15, HSR12, HSR15, CSR15, HRW17, GSR15, RSR15, RSH15, HCR12 and HCR15
		Cam Follower	Models CF, CFN and CFH
		Rod End	Models PHS5 to 22, RBH and POS8 to 22
Type P		LM Guide	Models HSR8, HSR10, HRW12, HRW14, RSR12 and RSH12
Type L		LM Guide	Models HSR8, HSR10, HRW12, HRW14, RSR12 and RSH12
Type H		LM Guide	Models with grease nipple M6F or PT1/8
		Ball screw	
		Rod End	Models PHS25, PHS30, POS25 and POS30
Dedicated nozzle type U		—	—

Note) Types P and L are also capable of greasing less accessible areas other than the model numbers above (by dropping grease on the raceway).

Model number coding

MG70

(THK offers grease guns only for a 70g cartridge.)

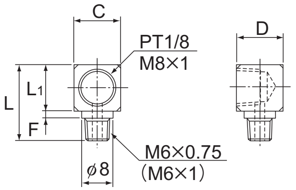


Accessories for Lubrication

Special Plumbing Fixtures

For centralized greasing and oil lubrication, special plumbing fixtures are available from THK. When ordering an LM system, specify the model number, mounting orientation and piping direction. We will ship the LM system attached with the corresponding fixture.

LF-A
LF-B
LF-E

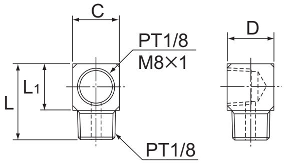


Unit: mm

Model	Screw	L	L1	F	C	D
LF-A (LF-E)	PT1/8	20	12	2	12	12
LF-B	M8×1	18.5	10	2.5	9.5	18

*LF-E: the same size with LF-A; mounting screw: M6×1

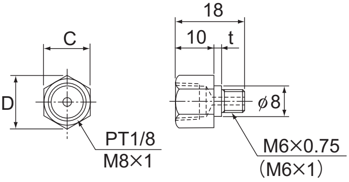
LF-C
LF-D



Unit: mm

Model	Screw	L	L1	C	D
LF-C	PT1/8	20	12	12	12
LF-D	M8×1	18	10	10	18

SF-A
SF-B
SF-E

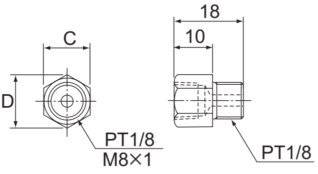


Unit: mm

Model	Screw	t	C	D
SF-A (SF-E)	PT1/8	2	12	13.8
SF-B	M8×1	2	10	11.5

*SF-E: the same size with SF-A; mounting screw: M6×1

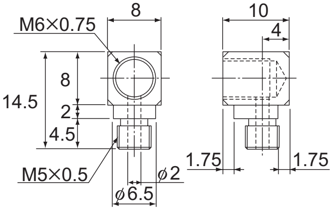
SF-C
SF-D



Unit: mm

Model	Screw	C	D
SF-C	PT1/8	12	13.8
SF-D	M8×1	10	11.5

LD



Unit: mm

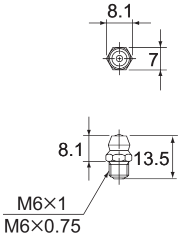
Model	Screw
LD	M6×0.75

Accessories for Lubrication

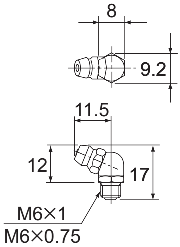
Grease Nipple

THK provides various types of grease nipples needed for the lubrication of LM systems.

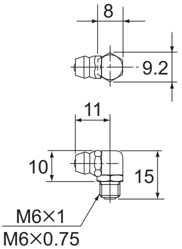
A-MT6×1 (M6×1)
A-M6F (M6×0.75)



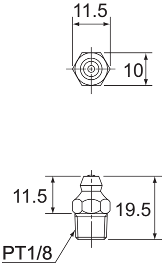
B-MT6×1 (M6×1)
B-M6F (M6×0.75)



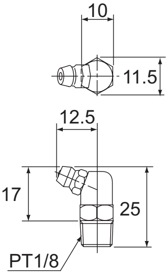
C-MT6×1 (M6×1)
C-M6F (M6×0.75)



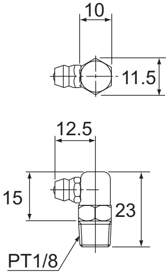
A-PT1/8



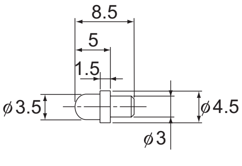
B-PT1/8



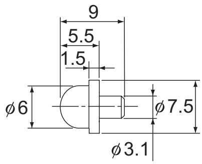
C-PT1/8



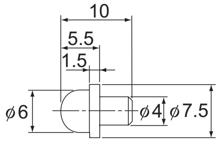
PB107



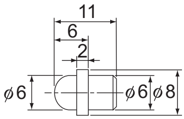
NP3.2×3.5



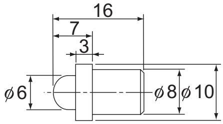
PB1021B



NP6×5



NP8×9



Index of Model Numbers

- LM Guide
- LM Guide Actuator
- LM Actuator
- Ball Spline
- Spline Nut
- Linear Bushing
- LM Stroke
- Precision Linear Pack
- Cross Roller Guide/Ball Guide
- Cross Roller Table
- Linear Ball Slide
- LM Roller
- Flat Roller
- Slide Pack
- Slide Rail
- Ball Screw
- Lead Screw Nut
- Change Nut
- Cross-Roller Ring
- Cam Follower
- Roller Follower
- Spherical Plain Bearing
- Link Ball
- Rod End
- Accessories for Lubrication

LM Guide
LM Guide Actuator
LM Actuator
Ball Spline
Spline Nut
Linear Bushing
LM Stroke
Precision Linear Pack
Cross Roller Guide/Ball Guide
Cross Roller Table
Linear Ball Slide
LM Roller
Flat Roller
Slide Pack
Slide Rail
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