Linear Bushing Series

Linear Bushing / Guide Ball Bushing / LM Stroke

For details, visit THK at **www.thk.com**

*Product information is updated regularly on the THK website.

THK CO., LTD.
TOKYO, JAPAN

CATALOG No.388E

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Linear Bushing

Features of the Linear Bushing

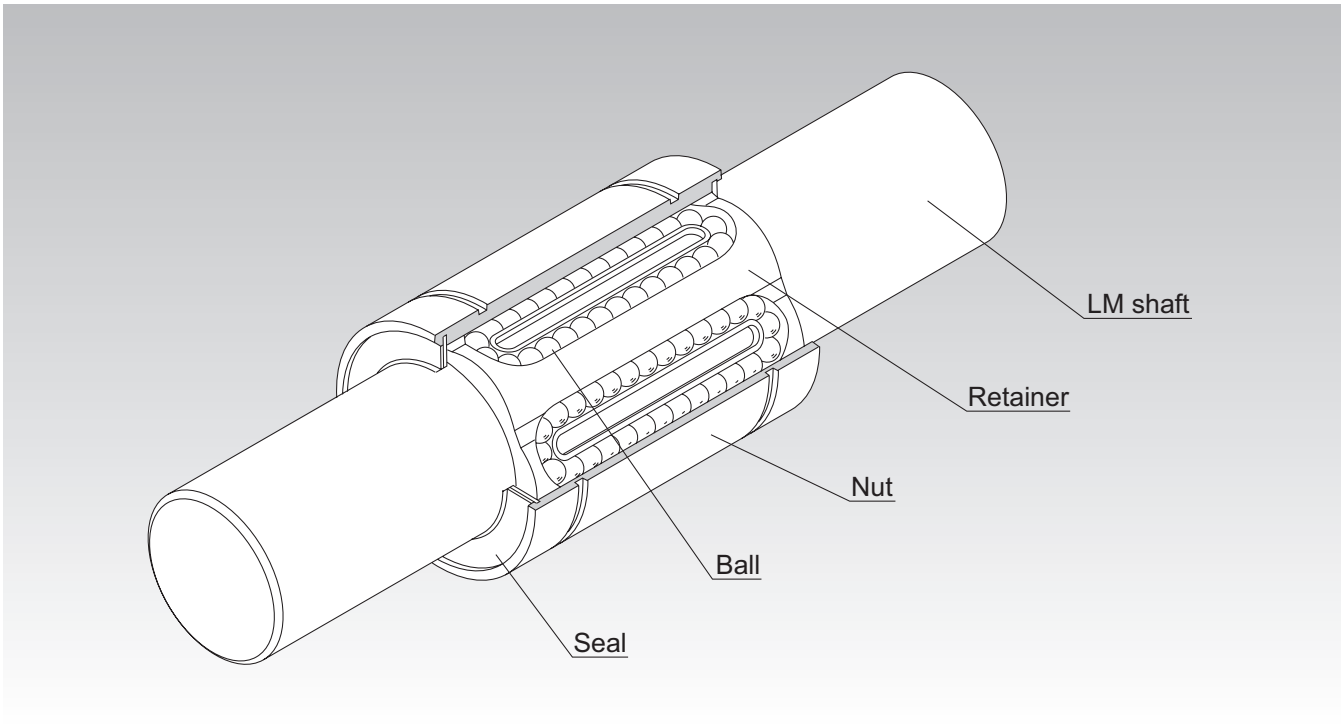


Fig.1 Structure of Linear Bushing Model LM···UU

Structure and Features

Linear Bushing is a product used in combination with a cylindrical LM shaft to perform 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 smooth motion.
The nut uses high-carbon chromium bearing steel and its outer and inner surfaces are ground after being heat-treated.
Linear Bushing is used for office equipment, medical equipment, packaging machines, etc. without vibration, impact, etc. with light load.
However, it cannot be used with load in the rotational direction.

[Interchangeability]

The Linear Bushing and LM shaft are interchangeable with each other, so they can be used in combination freely.

[Low Noise]

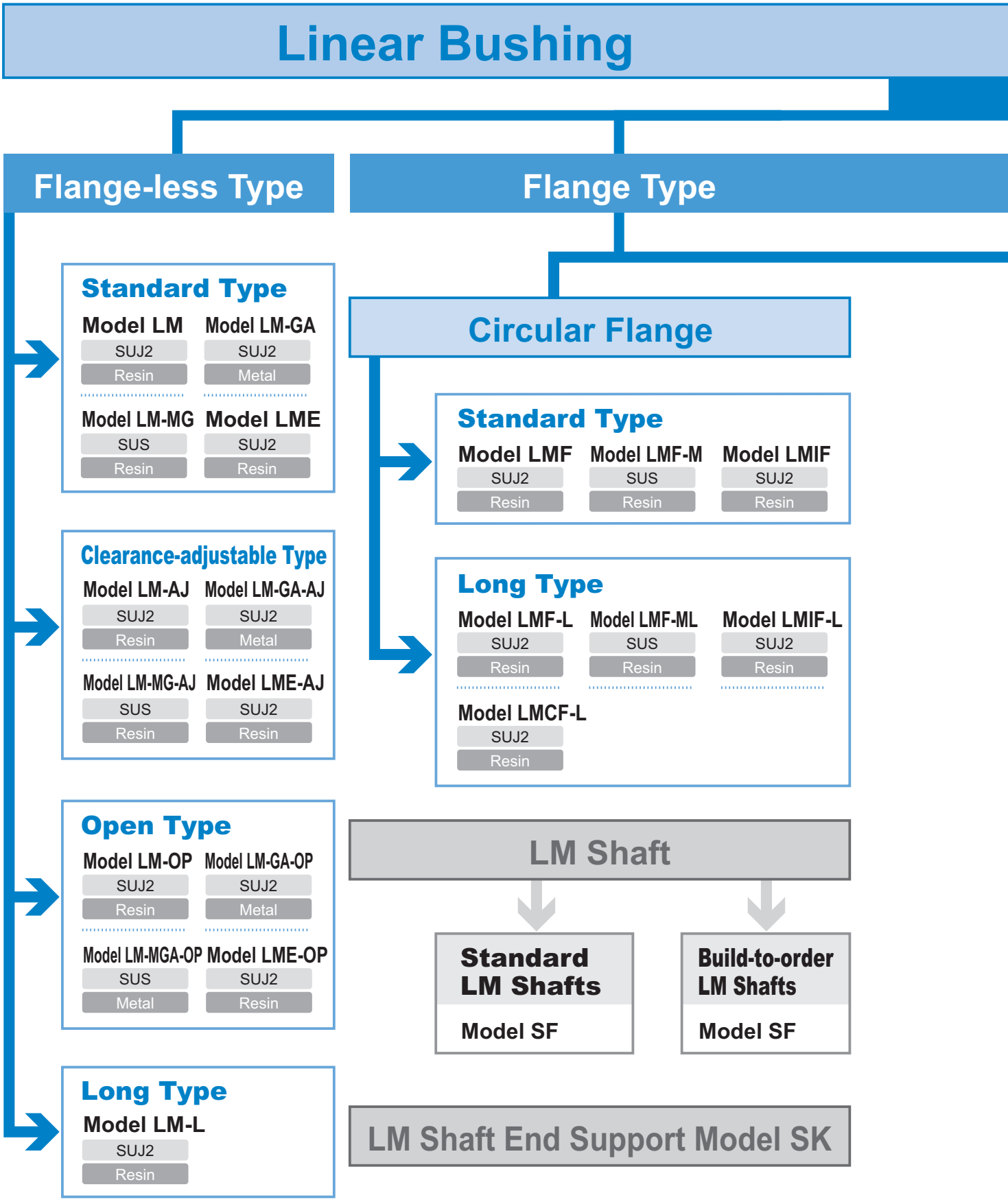
The standard type contains a retainer integral-molded with resin to prevent the balls from falling, so lownoise smooth operation is possible.

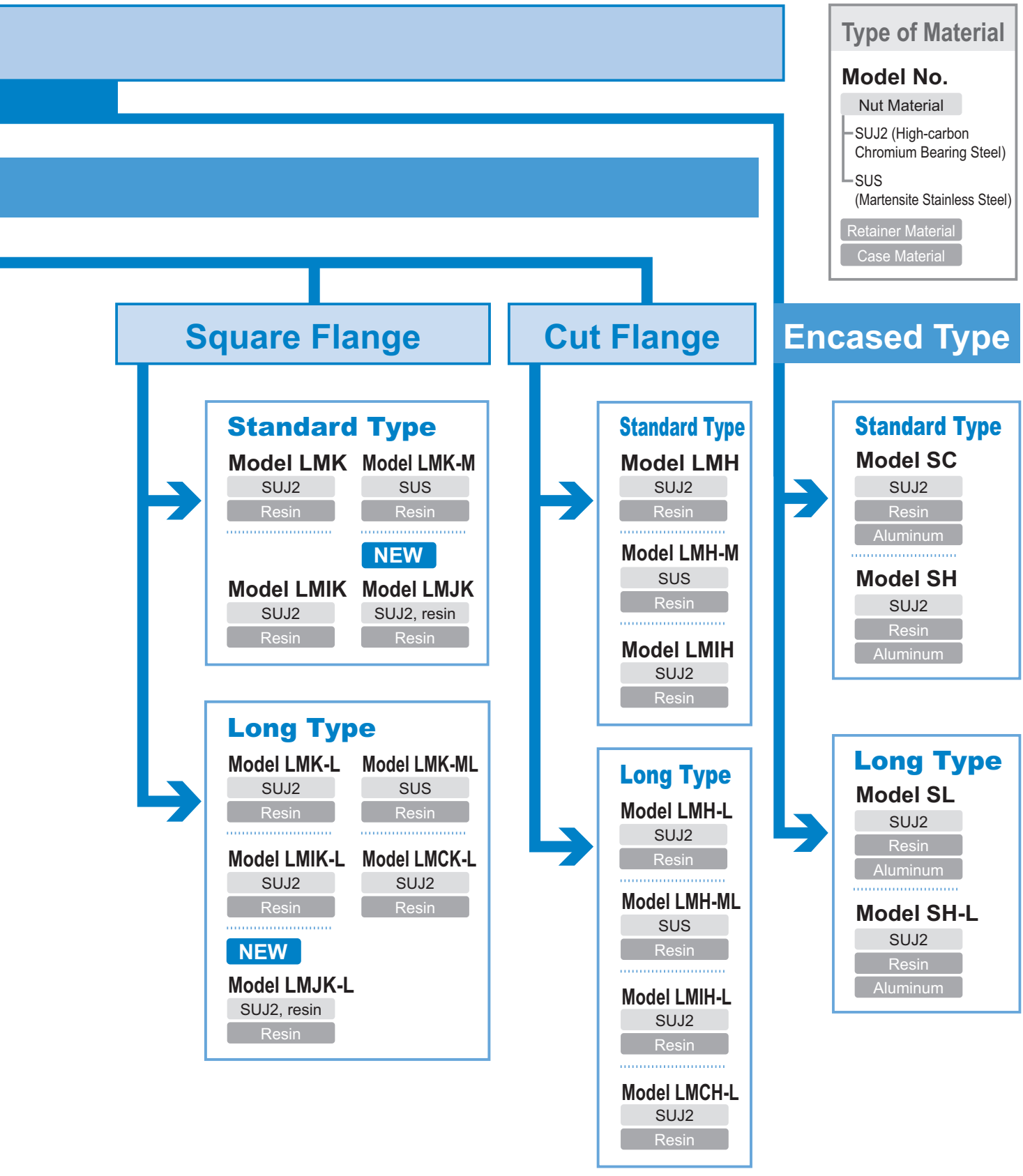
[Wide Array of Types]

A wide array of types are available, such as standard type, clearance-adjustable type, open type, long type, flange type, Fitted flange type, center flange type and LM case unit, allowing the user to select a type that meets the intended use.

Classification table of the Linear Bushing

Classification Table

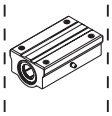



Type of Material
Model No.
Nut Material
SUJ2 (High-carbon Chromium Bearing Steel)
SUS (Martensite Stainless Steel)
Retainer Material
Case Material
Square Flange
Cut Flange
Encased Type
Standard Type
Model LMK
SUJ2
Resin
Model LMK-M
SUS
Resin
NEW
Model LMIK
SUJ2
Resin
Model LMJK
SUJ2, resin
Resin
Long Type
Model LMK-L
SUJ2
Resin
Model LMK-ML
SUS
Resin
Model LMIK-L
SUJ2
Resin
Model LMCK-L
SUJ2
Resin
NEW
Model LMJK-L
SUJ2, resin
Resin
Standard Type
Model LMH
SUJ2
Resin
Model LMH-M
SUS
Resin
Model LMIH
SUJ2
Resin
Long Type
Model LMH-L
SUJ2
Resin
Model LMH-ML
SUS
Resin
Model LMIH-L
SUJ2
Resin
Model LMCH-L
SUJ2
Resin
Standard Type
Model SC
SUJ2
Resin
Aluminum
Model SH
SUJ2
Resin
Aluminum
Long Type
Model SL
SUJ2
Resin
Aluminum
Model SH-L
SUJ2
Resin
Aluminum

Model No. - Size list

Size	Flange-less Type												
	Standard type	Clearance-adjustable type	Open type	Standard type	Clearance-adjustable type	Open type	Standard type	Clearance-adjustable type	Open type	Standard type	Clearance-adjustable type	Open type	
	 LM  LM-L	 LM-AJ	 LM-OP	 LM-GA	 LM-GA-AJ	 LM-GA-OP	 LM-MG	 LM-MG-AJ	 LM-MGA-OP	 LME	 LME-AJ	 LME-OP	
3	○●												
4	○●												
5	○●									○	○		
6	○	○		○			●	●					
8	○	○		○			●	●		○	○		
10	○	○		○			●	●					
12	○	○		○	○	○	●	●		○	○		
13	○	○	○	○	○	○	●	●	●				
16	○	○	○	○	○	○	●	●	●	○	○	○	
20	○	○	○	○	○	○	●	●	●	○	○	○	
25	○	○	○	○	○	○	●	●	●	○	○	○	
30	○	○	○	○	○	○	●	●	●	○	○	○	
35	○	○	○	○	○	○	●	●	●				
38				○	○	○							
40	○	○	○	○	○	○	●	●	●	○	○	○	
50	○	○	○	○	○	○				○	○	○	
60	○	○	○	○	○	○				○	○	○	
80				○	○	○				○	○	○	
100				○	○	○							
120				○	○	○							

○: Made of SUJ2
●: Made of SUS

	Flange Type										Encased Type		
	Standard				Fitted			Center					
	Round	Square	Square	Cut flange	Round	Square	Cut flange	Round	Square	Cut flange			
	 LMF LMF-M	 LMK LMK-M	 LMJK	 LMH LMH-M	 LMIF	 LMIK	 LMIH				 SC		 SH
	 LMF-L LMF-ML	 LMK-L LMK-ML	 LMJK-L	 LMH-L LMH-ML	 LMIF-L	 LMIK-L	 LMIH-L	 LMCF-L	 LMCK-L	 LMCH-L		 SL	 SH-L
													○
													○
													○
	○●	○●		○●	○	○	○	○	○	○	○	○	○
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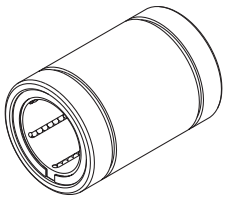
	○	○									○		
	○	○									○		
	○	○									○		
	○	○											

Types and Features

Standard type

Most standard type.

- Model LM ·····Made of SUJ2
  Metric series used widely in Japan
- Model LM-GA ·····Made of SUJ2
  Metal retainer type
- Model LM-MG ·····Made of SUS
- Model LME ·····Made of SUJ2
  Metric series used widely in Europe

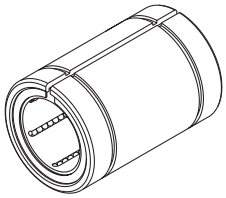


Standard Type

Clearance-adjustable type

Type with the same dimensions as the standard type, whose 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 be adjusted.

- Model LM-AJ/LM-GA-AJ/LME-AJ ·····Made of SUJ2
- Model LM-MG-AJ·····Made of SUS

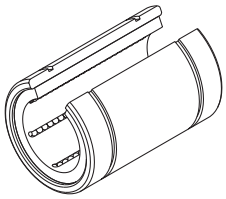


Clearance-adjustable Type

Open type

Type with the nut 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 to avoid deflection. In addition, clearance can easily be adjusted.

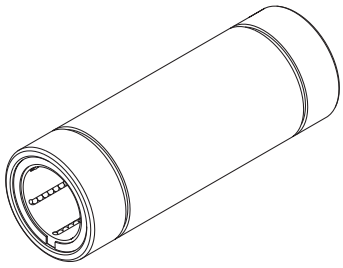
- Model LM-OP/LM-GA-OP/LME-OP ·····Made of SUJ2
- Model LM-MGA-OP·····Made of SUS



Open Type

Long type

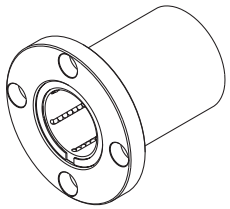
Long LM type.
Containing two units of the standard retainer, so the load rating is great.
Model LM-L ·····Made of SUJ2



Long Type

Flanged Type (Round)

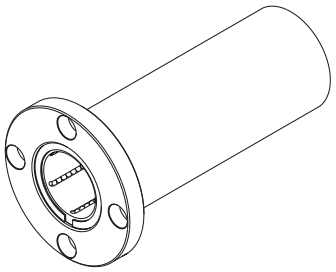
Type with a round flange at the edge of the nut.
This enables the Linear Bushing to be directly mounted onto the housing with bolts, thus achieving easy installation.
Model LMF····· Made of SUJ2
Model LMF-M ····· Made of SUS



Flanged Type (Round)

Flanged Type (Round) - Long

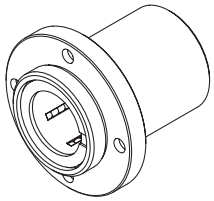
Long LMF type.
Containing two units of the standard retainer, so the load rating is great.
Model LMF-L ····· Made of SUJ2
Model LMF-ML ····· Made of SUS



Flanged Type (Round) - Long

Fitted Flanged Type (Round)

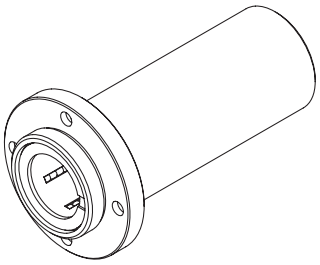
Since the fitted part is short, the linear bushing tends not to protrude into the other side, so space is saved on the side opposite the mounting.
Model LMIF ·····Made of SUJ2



Fitted Flanged Type (Round)

Fitted Flanged Type (Round) - Long

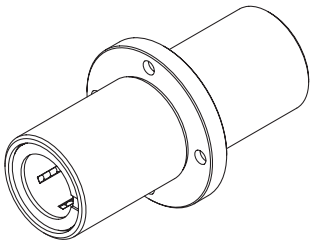
Long LMIF type.
Since this contains two units of the standard retainer, the load rating is great.
Model LMIF-L ·····Made of SUJ2



Fitted Flanged Type (Round) - Long

Center Flanged Type (Round) - Long

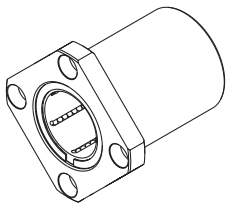
LMIF-L type with the flange placed in the center. Since the work can be mounted around the center of the nut, the load and space are distributed in a balanced manner to both sides of the flange.
It is suitable when you want to divide the stroke into equal halves in both directions.
Model LMCF-L ·····Made of SUJ2



Center Flanged Type (Round) - Long

Flanged Type (Square)

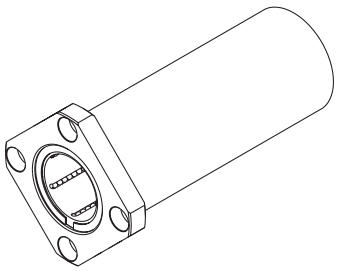
LMF type with four parts of the flange cut to a square shape.
Since the height is lower than the circular flange type, compact design is allowed.
Model LMK ····· Made of SUJ2
Model LMK-M ····· Made of SUS



Flanged Type (Square)

Flanged Type (Square) - Long

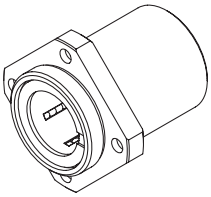
Long LMK type.
Since this contains two units of the standard retainer, the load rating is great.
Model LMK-L····· Made of SUJ2
Model LMK-ML ····· Made of SUS



Flanged Type (Square) - Long

Fitted Flanged Type (Square)

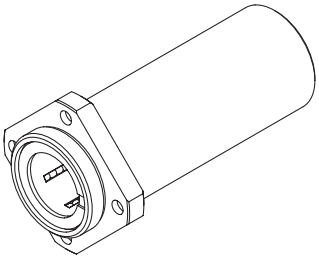
LMIF type with four parts of the flange cut to a square shape.
Since the height is lower than the circular flange type, compact design is allowed.
Model LMIK ····· Made of SUJ2



Fitted Flanged Type (Square)

Fitted Flanged Type (Square) - Long

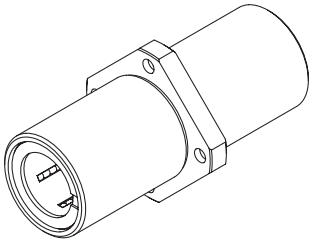
Long LMIK type.
Since this contains two units of the standard retainer, the load rating is great.
Model LMIK-L ····· Made of SUJ2



Fitted Flanged Type (Square) - Long

Center Flanged Type (Square) - Long

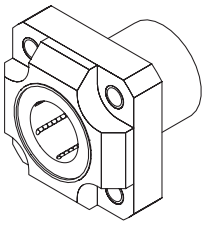
Model LMIK-L type with the flange placed in the center.
Since the work can be mounted around the center of the nut, the load and space are distributed in a balanced manner to both sides of the flange.
It is suitable when you want to divide the stroke into equal halves in both directions.
Model LMCK-L ····· Made of SUJ2



Center Flanged Type (Square) - Long

Lightweight Flanged Type (Square) NEW

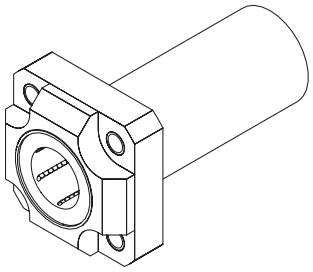
Type with high-strength plastic used for the flange.
The weight is lighter than the metal flange.
The weight can be lighter by mounting in the moving part.
Model LMJK ····· Made of SUJ2



Lightweight Flanged Type (Square)

Lightweight Flanged Type (Square) - Long NEW

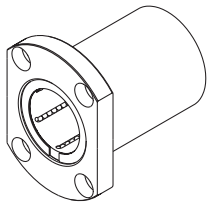
Long LMJK type.
Since this contains two units of the standard retainer, the load rating is great.
Model LMJK-L ····· Made of SUJ2



Lightweight Flanged Type (Square) - Long

Flanged Type (Cut Flange)

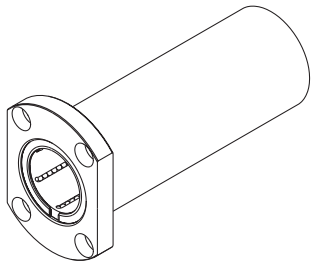
LMF type with the flange cut flat at the top and bottom.
Since the height is lower than the square flange type, compact design is allowed.
The rows of balls in the Linear Bushing are arranged so that two rows receive the load from the flat side.
Model LMH ·····Made of SUJ2
Model LMH-M ·····Made of SUS



Flanged Type (Cut Flange)

Flanged Type (Cut Flange) - Long

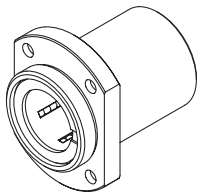
Long LMH type.
Containing two units of the standard retainer, so the load rating is great.
Model LMH-L·····Made of SUJ2
Model LMH-ML ·····Made of SUS



Flanged Type (Cut Flange) - Long

Fitted Flanged Type (Ovular)

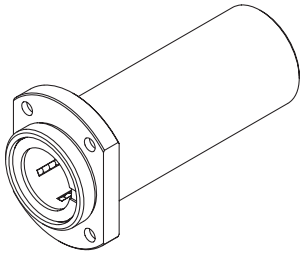
LMIF type with the flange cut flat at the top and bottom.
Since the height is lower than the square flange type, compact design is allowed.
The rows of balls in the Linear Bushing are arranged so that two rows receive the load from the flat side.
Model LMIH ·····Made of SUJ2



Fitted Flanged Type (Ovular)

Fitted Flanged Type (Ovular) - Long

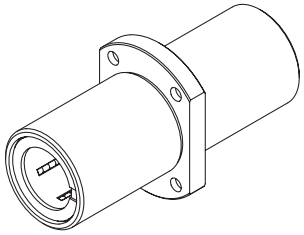
Long LMIH type.
Containing two units of the standard retainer, so the load rating is great.
Model LMIH-L ·····Made of SUJ2



Fitted Flanged Type (Ovular) - Long

Center Flanged Type (Ovular) - Long

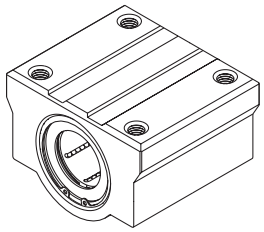
LMIH-L type with the flange placed in the center.
Since the work can be mounted near the center of the nut, the load and space are distributed in a balanced manner to both sides of the flange.
It is suitable when you want to divide the stroke into equal halves in both directions.
Model LMCH-L ·····Made of SUJ2



Center Flanged Type (Ovular) - Long

Linear Bushing Model SC

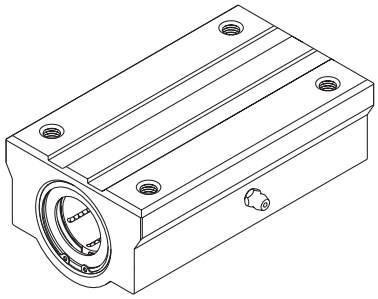
It is a case unit where the standard type of Linear Bushing is incorporated into a small, lightweight aluminum casing. This model can easily be mounted simply by securing it to the table with bolts.



Linear Bushing Model SC

Linear Bushing (Long) Model SL

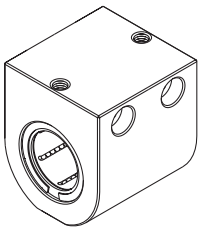
Long SC type.
This model contains two units of the standard type Linear Bushing in an aluminum casing.



Linear Bushing (Long) Model SL

Linear Bushing Model SH

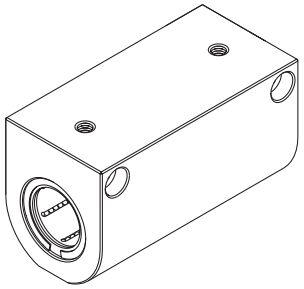
It is a case unit where the standard type of Linear Bushing is incorporated into a smaller and lighter aluminum casing than model SC.
This model allows even more compact design than model SC.
Additionally, it is structured so that two rows of balls receive the load from the top of the casing.



Linear Bushing Model SH

Linear Bushing (Long) Model SH-L

Long type model SH.
This model contains two units of the standard type Linear Bushing in an aluminum casing.



Linear Bushing (Long) Model SH-L

Standard LM Shafts

THK manufactures high quality, dedicated LM shafts for Linear Bushing model LM series.

Standard LM Shafts

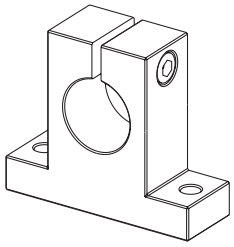
Build-to-order LM Shafts

THK also manufactures specially machined shafts at your request.

Build-to-order LM Shafts

LM Shaft End Support Model SK

An aluminum-made light fulcrum for securing an LM shaft.
It can be fixed without specially machined LM Shafts.

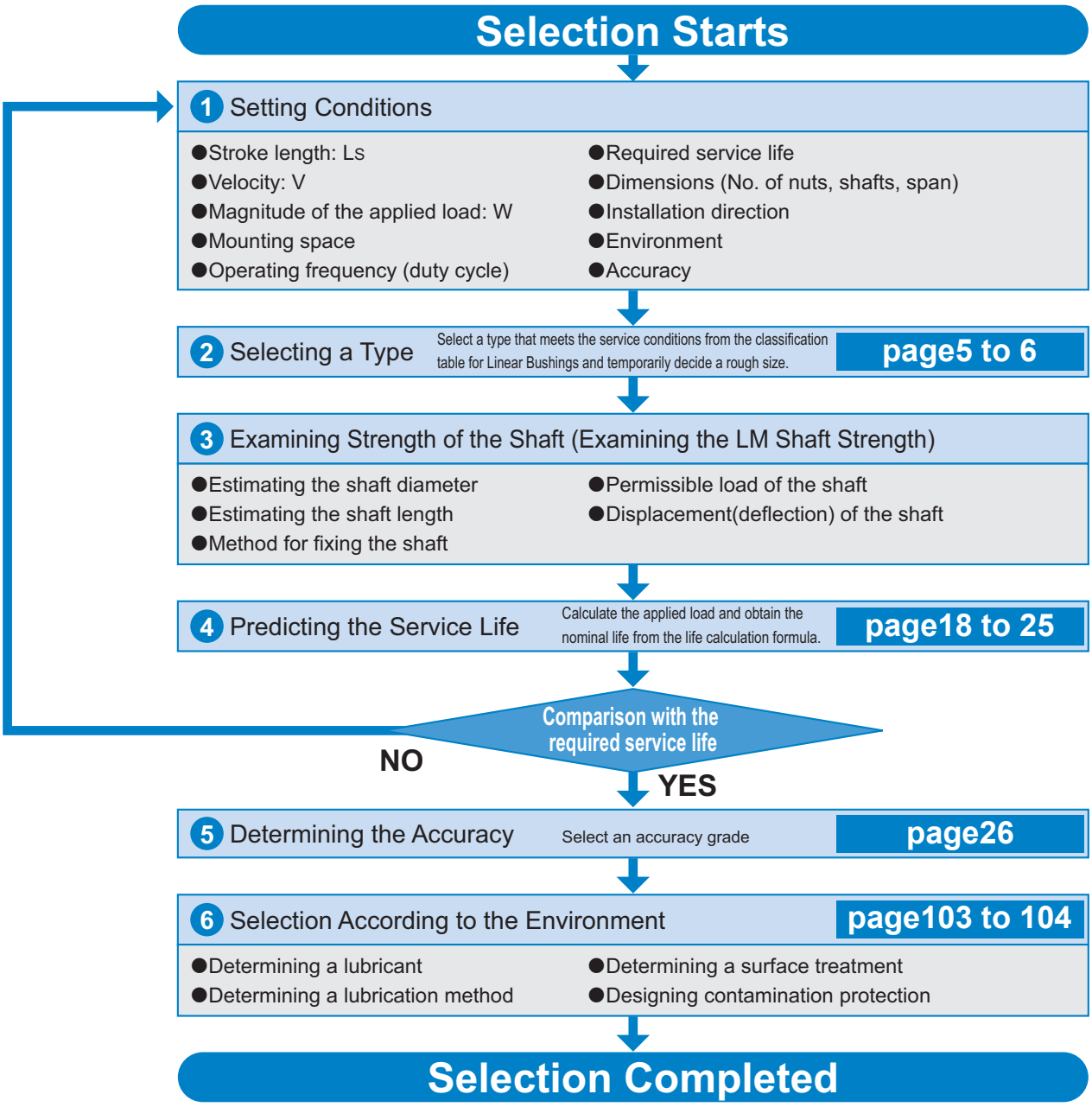


LM Shaft End Support Model SK

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.



Rated Load and Nominal Life

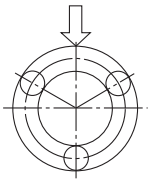
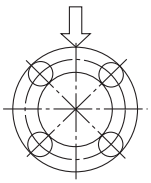
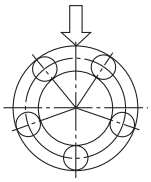
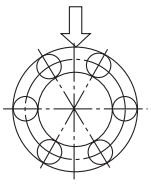
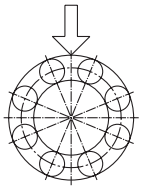
Load Rating

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 receives a 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 Table1.

Table1 Rated load of the Linear Bushing

Rows of balls	Positions of rows of balls	Load Rating
3 rows		1×C
4 rows		1.41×C
5 rows		1.46×C
6 rows		1.28×C
8 rows		1.25×C

For specific values for “C” above, see the respective specification table.

[Precautions To Be Taken if an Eccentric Load Is Applied]

Since Linear Bushing is not suitable for application of an eccentric load, we recommend using Guide Ball Bushing or Ball Spline.

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_H	: Hardness factor	(see Fig.1 on **page20**)
f_T	: Temperature factor	(see Fig.2 on **page20**)
f_C	: Contact factor	(see Table5 on **page20**)
f_W	: Load factor	(see Table6 on **page20**)

● 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 (with a moment applied)	(N)	K	: Equivalent factors	(see Table2 to Table4)
			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.

Table2 Equivalent Factors of Model LM

Model No.	Equivalent factor: K	
	Single nut	Double nuts
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 the following models are the same as that for model LM.
Models LMF, LMIF, LMK, LMIK, LMJK, LMH, LMIH and SC

Table3 Equivalent Factors of Model LME

Model No.	Equivalent factor: K	
	Single nut	Double nuts
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

Table4 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 the following models are the same as that for model LM-L.
Models LMF-L, LMIF-L, LMCF-L, LMK-L, LMIK-L, LMCK-L, LMJK-L, LMH-L, LMIH-L and LMCH-L

■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.

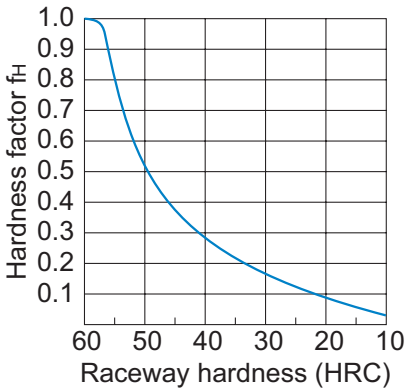


Fig.1 Hardness Factor (f_H)

■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.

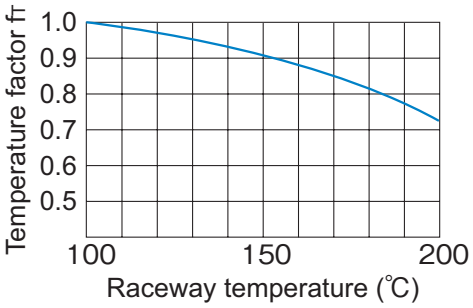


Fig.2 Temperature Factor (f_T)

■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 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 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 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

[Calculating the Service Life Time]

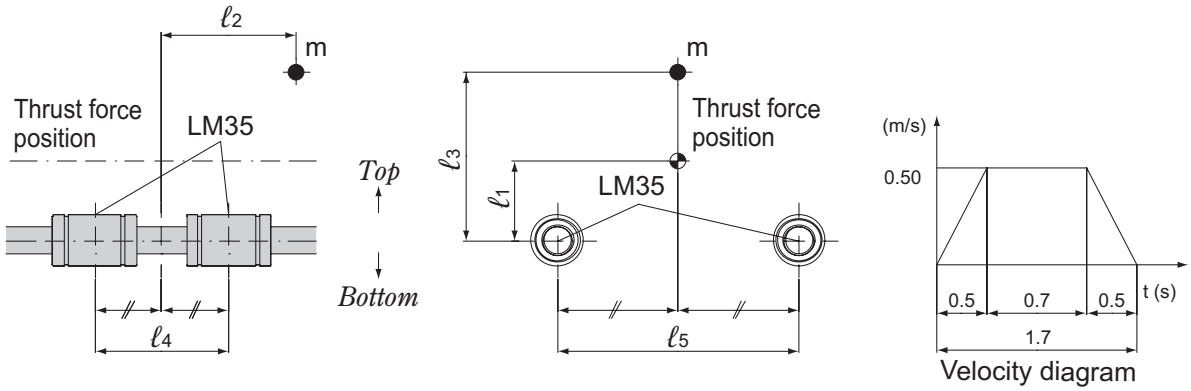
When the nominal life (L) has been obtained, if the stroke length and the number of reciprocations per minute are constant, the service life time is obtained using the following equation.

$$L_h = \frac{L \times 10^3}{2 \times \ell_s \times n_1 \times 60}$$

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

Example of Calculating the Nominal Life (1) - Horizontal Mount -

[Conditions]



Assumed model number:LM35 (Basic dynamic load rating: C = 1670 N,Basic static load rating: C_0 = 3140 N)
Mass: m = 30 kg
Gravitational acceleration: g = 9.807 m/s²
Velocity: v = 0.50 m/s
Acceleration: α = 0.98 m/s²
Acceleration/deceleration time: t = 0.5 s
Stroke: S_t = 600 mm (Acceleration: Constant velocity: Deceleration = 125:350:125)
Dimension: ℓ_1 = 30 mm (Dimension from the thrust force position to the center of Linear Bushing)
ℓ_2 = 40 mm (Dimension from the mass position to the center between Linear Bushings)
ℓ_3 = 70 mm (Dimension from the mass position to the center of Linear Bushing)
ℓ_4 = 100 mm (Dimension between Linear Bushings)
ℓ_5 = 150 mm (Dimension between LM shafts)

1.Applied load

Calculate the moment Mn applied to Linear bushing during acceleration, constant velocity, and deceleration by the mass m.

■Applied moment during acceleration M_1

$M_1 = mg \times \ell_2 + m\alpha \times (\ell_3 - \ell_1) = 12945$ (N·mm) – (a)

■Applied moment during constant velocity M_2

$M_2 = mg \times \ell_2 = 11769$ (N·mm) – (b)

■Applied moment during deceleration M_3

$M_3 = mg \times \ell_2 - m\alpha \times (\ell_3 - \ell_1) = 10593$ (N·mm) – (c)

The equivalent radial load Pn which is thought to be applied with each moment and radial load by Linear Bushing is calculated by the following relational expression.

● Relational expression between the moment Mn and equivalent radial load Pn

$$Pn = \frac{mg}{4} + \frac{Mn}{\ell_4 \times 2} \quad (N)$$

Pn : Equivalent radial load (N)
Mn : Load moment (N/mm)
ℓ_4 : Dimension between Linear Bushings (mm)

■Equivalent radial load during acceleration P_1

From expression (a)

$$P_1 = \frac{mg}{4} + \frac{M_1}{\ell_4 \times 2} = 139 \quad (N)$$

■Equivalent radial load during constant velocity P_2

From expression (b)

$$P_2 = \frac{mg}{4} + \frac{M_2}{\ell_4 \times 2} = 133 \quad (N)$$

■Equivalent radial load during deceleration P_3

From expression (c)

$$P_3 = \frac{mg}{4} + \frac{M_3}{\ell_4 \times 2} = 127 \quad (N)$$

2.Static safety factor

As stated above, it is during acceleration (P_1) that the maximum load is applied to Linear Bushing, so the static safety factor f_s is as follows.

$$f_S = \frac{C_0}{P_1} = 22.5$$

f_s : Static safety factor
C_0 : Basic static load rating (N)

3.Nominal life

Calculate the average load P_m.

$$P_m = \sqrt[3]{\frac{1}{S_t}\left(P_1^3 \times 125 + P_2^3 \times 350 + P_3^3 \times 125 \right)} = 134 \ (N)$$

Calculate the nominal L.

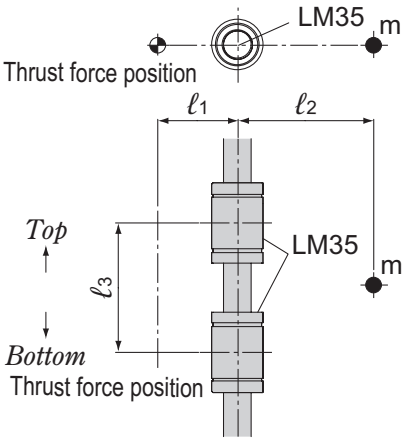
$$L = \left(\frac{f_T \cdot f_c}{f_w} \cdot \frac{C}{P_m} \right)^3 \times 50 = 28600 \ (km)$$

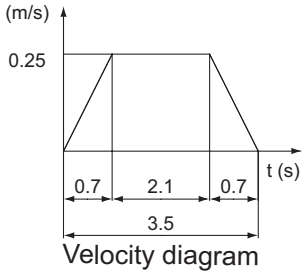
L : Nominal life (km)
C : Basic dynamic load rating (N)
P_m : Average load (N)
f_T : Temperature factor = 1 (from **page20**)
f_C : Contact factor = 1 (from **page20**)
f_W : Load factor = 1.5 (from **page20**)

From these, the static safety factor is 22.5 and the nominal life is 28600km in the above-mentioned use of model LM35.

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

[Conditions]





Assumed model number:LM35(Basic dynamic load rating:C = 1670 N, Basic static load rating: C_0 = 3140 N)

Mass: m = 30 kg

Gravitational acceleration: g = 9.807 m/s^2

Velocity: v = 0.25 m/s

Acceleration:α = 0.36 m/s^2

Acceleration/deceleration time:t = 0.7 s

Stroke: S_t = 700 mm (Acceleration: Constant velocity: Deceleration = 87.5:525:87.5)

Dimension: ℓ_1 = 50 mm (Dimension from the thrust force position to the center of Linear Bushing)

ℓ_2 = 70 mm (Dimension from the mass position to the center between Linear Bushings)

ℓ_3 = 150 mm (Dimension between Linear Bushings)

1.Applied load

Calculate the moment Mn applied to Linear bushing during acceleration, constant velocity, and deceleration by the mass m.

■Applied moment during upward acceleration M_1

$M_1 = mg \times (\ell_1+\ell_2) + m\alpha \times (\ell_1+\ell_2) = 36602$ (N·mm) – (a)

■Applied moment during upward constant velocity M_2

$M_2 = mg \times (\ell_1+\ell_2) = 35306$ (N·mm) – (b)

■Applied moment during upward deceleration M_3

$M_3 = mg \times (\ell_1+\ell_2) - m\alpha \times (\ell_1+\ell_2) = 34010$ (N·mm) – (c)

■Applied moment during downward acceleration M_4

$M_4 = mg \times (\ell_1+\ell_2) - m\alpha \times (\ell_1+\ell_2) = 34010$ (N·mm) – (d)

■Applied moment during downward constant velocity M_5

$M_5 = mg \times (\ell_1+\ell_2) = 35306$ (N·mm) – (e)

■Applied moment during downward acceleration M_6

$M_6 = mg \times (\ell_1+\ell_2) + m\alpha \times (\ell_1+\ell_2) = 36602$ (N·mm) – (f)

The equivalent radial load Pn which is thought to be applied with each moment is calculated by the following relational expression.

● Relational expression between the moment Mn and equivalent radial load Pn

$$Pn = \frac{Mn}{\ell_3} \quad (N)$$

Pn : Equivalent radial load (N)
Mn : Load moment (N/mm)
ℓ_3 : Dimension between Linear Bushings (mm)

■Equivalent radial load during upward acceleration P_1

From expression (a)

$$P_1 = \frac{M_1}{\ell_3} = 244 \quad (N)$$

■Equivalent radial load during upward constant velocity P_2

From expression (b)

$$P_2 = \frac{M_2}{\ell_3} = 236 \quad (N)$$

■Equivalent radial load during upward deceleration P_3

From expression (c)

$$P_3 = \frac{M_3}{\ell_3} = 227 \quad (N)$$

■Equivalent radial load during downward acceleration P_4

From expression (d)

$$P_4 = \frac{M_4}{\ell_3} = 227 \quad (N)$$

■Equivalent radial load during downward constant velocity P_5

From expression (e)

$$P_5 = \frac{M_5}{\ell_3} = 236 \quad (N)$$

■Equivalent radial load during downward deceleration P_6

From expression (f)

$$P_6 = \frac{M_6}{\ell_3} = 244 \quad (N)$$

2.Static safety factor

As stated above, it is during upward acceleration (P_1) and downward deceleration (P_6) that the maximum load is applied to Linear Bushing, so the static safety factor f_s is as follows.

$$f_S = \frac{C_0}{P_1} = \frac{C_0}{P_6} = 12.8$$

f_s : Static safety factor

C_0 : Basic static load rating (N)

3.Nominal life

Calculate the average load P_m.

$$P_m = \sqrt[3]{\frac{1}{2 \times S_t}\left(\begin{array}{l} P_1^3 \times 87.5 + P_2^3 \times 525 + P_3^3 \times 87.5 + \\ P_4^3 \times 87.5 + P_5^3 \times 525 + P_6^3 \times 87.5 \end{array}\right)} = 236 \text{ (N)}$$

P_m : Average load (N)

S_t : Stroke (mm)

Calculate the nominal life L.

$$L = \left(\frac{f_T \cdot f_C}{f_W} \cdot \frac{C}{P_m}\right)^3 \times 50 = 5240 \text{ (km)}$$

L : Nominal life (km)

C : Basic dynamic load rating (N)

P_m : Average load (N)

f_T : Temperature factor = 1 (from **page20**)

f_C : Contact factor = 1 (from **page20**)

f_W : Load factor = 1.5 (from **page20**)

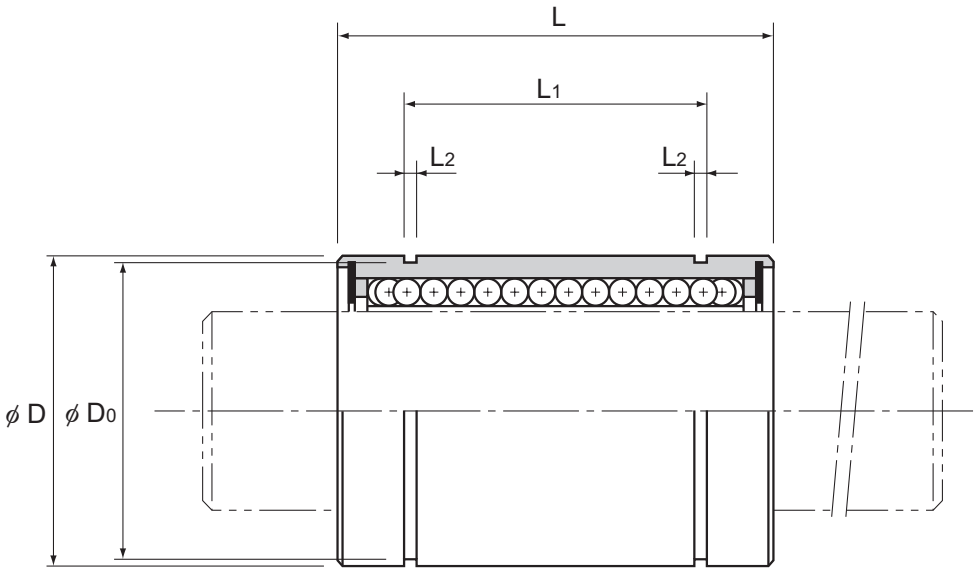
From these, the static safety factor is 12.8 and the nominal life is 5240km in the above-mentioned use of model LM35.

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.)

For the clearance-adjustable type (-AJ) and open type (-OP), the inscribed bore diameter tolerance, the outer diameter tolerance, and the eccentricity indicate the values before the division of the nut.

Model LM

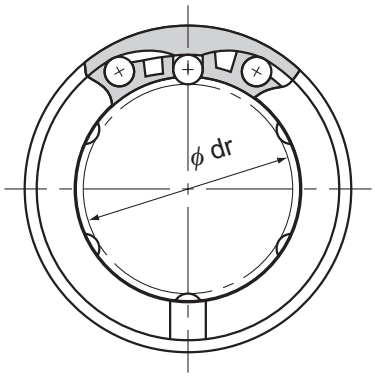


Model No.			Ball rows	Main						
				Inscribed bore diameter			Outer diameter		Length	
					Tolerance			Tolerance		
Standard type	Clearance-adjustable type	Open type		dr	Precision	High	D	Precision/high	L	Tolerance
LM 3	—	—	4	3	0 –0.005	0 –0.008	7	0 –0.009	10	0 –0.12
LM 4	—	—	4	4			8		12	
LM 5	—	—	4	5			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	—	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	

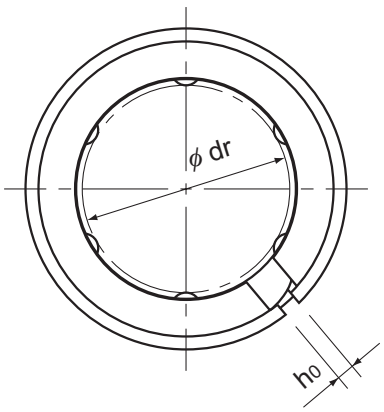
Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If the ambient temperature exceeds 80℃, use the type equipped with a metal retainer (model LM-GA).
If requiring a type equipped with a seal, indicate it when placing an order.

(Example) LM13 UU
Seal attached on both ends of the nut

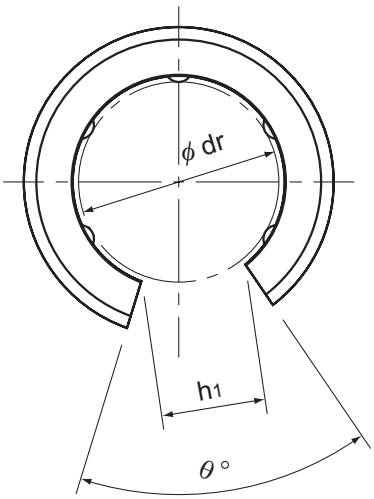
For the clearance-adjustable type (-AJ) and open type (-OP), the inscribed bore diameter tolerance, the outer diameter tolerance, and the eccentricity indicate the values before the division of the nut.



Model LM



Model LM-AJ



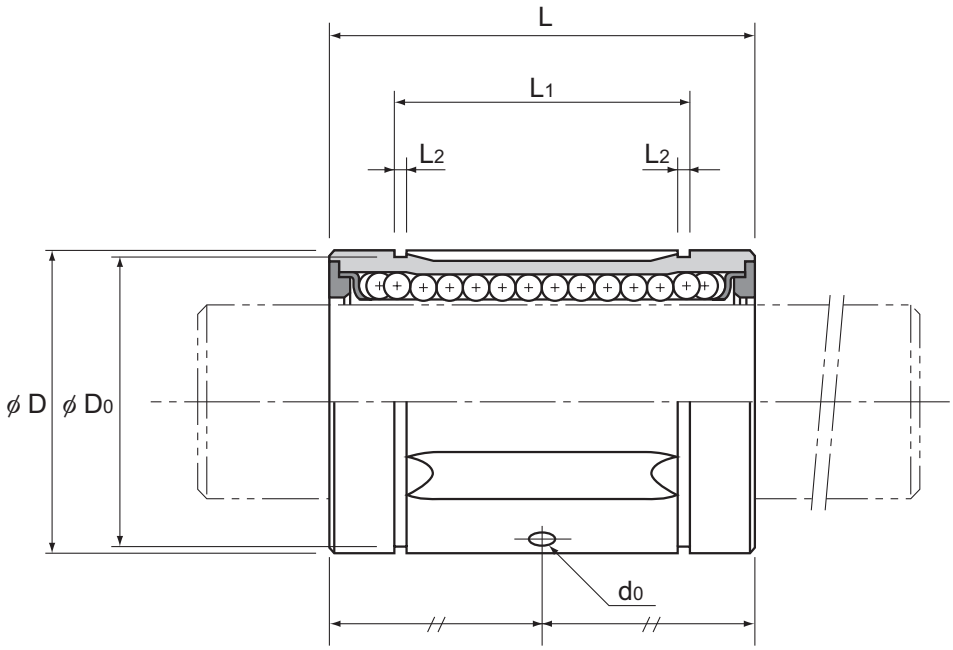
Model LM-OP

Unit: mm

dimensions								Eccentricity (max) μm		Radial clearance tolerance μm	Basic load rating		Mass g
	L_1	Tolerance	L_2	D_0	h_0	h_1	θ°	Precision	High		C N	C_0 N	
	—	—	—	—	—	—	—	4	8	–2	88.2	108	1.6
	—	—	—	—	—	—	—	4	8	–3	88.2	127	2.2
	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	9.3
	17.5		1.1	14.3	1	—	—	8	12	–5	265	402	13.5
	22		1.3	18	1	—	—	8	12	–5	373	549	25
	23		1.3	20	1.5	—	—	8	12	–5	412	598	28
	23		1.3	22	1.5	9	80	8	12	–7	510	775	38
	26.5		1.6	27	1.5	11	60	8	12	–7	775	1180	78
	30.5		1.6	30.5	1.5	11	60	10	15	–9	863	1370	86
	41	0 –0.3	1.85	38	2	12	50	10	15	–9	980	1570	210
	44.5		1.85	43	2.5	15	50	10	15	–9	1570	2750	221
	49.5		2.1	49	2.5	17	50	12	20	–13	1670	3140	358
	60.5		2.1	57	3	20	50	12	20	–13	2160	4020	557
	74		2.6	76.5	3	25	50	12	20	–13	3820	7940	1418
	85		3.15	86.5	3	30	50	17	25	–16	4710	10000	1733

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.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LM-GA (Metal Retainer Type)

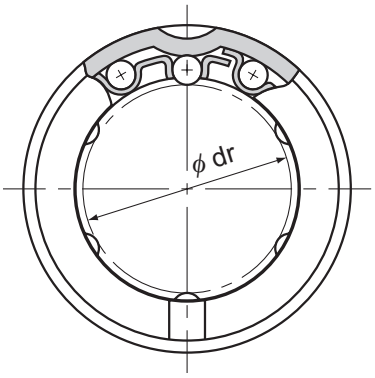


Model No.			Ball rows	Main						
				Inscribed bore diameter			Outer diameter		Length	
					Tolerance			Tolerance		
Standard type	Clearance-adjustable type	Open type		dr	Precision	High	D	Precision/high	L	Tolerance
LM 6GA	—	—	3	6	0 −0.006	0 −0.009	12	0 −0.011	19	0 −0.2
LM 8SGA	—	—	3	8			15		17	
LM 8GA	—	—	3	8			15		24	
LM 10GA	—	—	4	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	

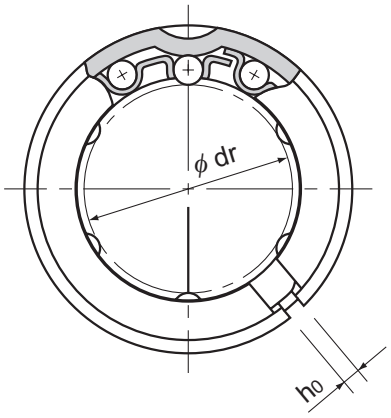
Note) If requiring a type equipped with a seal, indicate it when placing an order. (seal heat resistance: 80℃.)

(Example) LM50GA UU
Seal attached on both ends of the nut

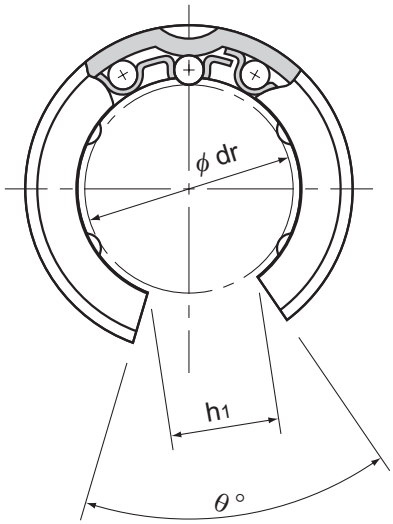
For the clearance-adjustable type (-AJ) and open type (-OP), the inscribed bore diameter tolerance, the outer diameter tolerance, and the eccentricity indicate the values before the division of the nut.



Model LM-GA



Model LM-GA-AJ



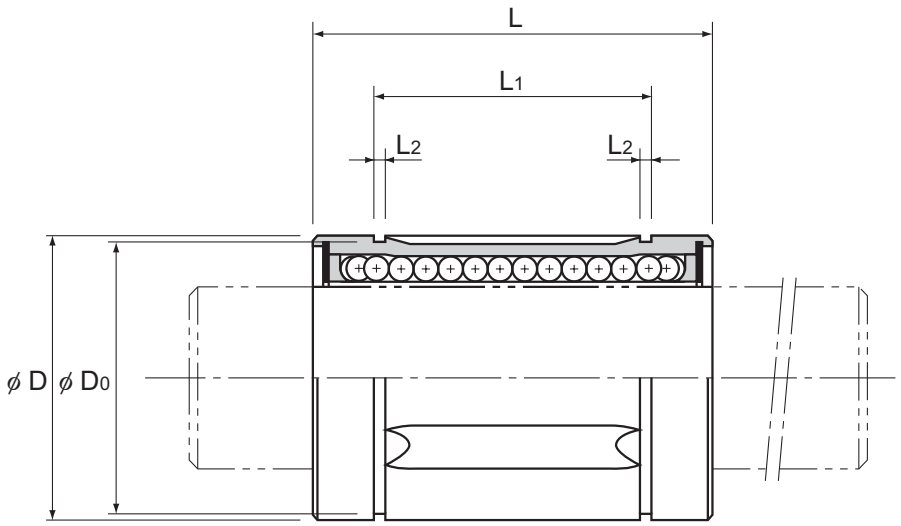
Model LM-GA-OP

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	High	μm	C N	C_0 N	g
	13.5	0 –0.2	1.1	11.5	—	—	—	—	8	12	–5	206	265	7
	11.5		1.1	14.3	—	—	—	—	8	12	–5	176	225	10
	17.5		1.1	14.3	—	—	—	—	8	12	–5	265	402	14
	22		1.3	18	—	—	—	2	8	12	–5	373	549	27
	23		1.3	20	1.5	7.5	80	2	8	12	–5	412	598	31
	23		1.3	22	1.5	9	80	2	8	12	–7	510	775	41
	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	92
	41	0 –0.3	1.85	38	2	13	60	3	10	15	–9	980	1570	200
	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	370
	58.5		2.1	54.5	3	18	50	3	12	20	–13	2160	4020	490
	60.5		2.1	57	3	20	50	3	12	20	–13	2160	4020	590
	74		2.6	76.5	3	25	50	4	12	20	–13	3820	7940	1500
	85		3.15	86.5	3	30	50	4	17	25	–16	4710	10000	1850
	105.5	0 –0.4	4.15	116	3	40	50	4	17	25	–16	7350	16000	4200
	125.5		4.15	145	3	50	50	4	20	30	–20	14100	34800	8200
	158.6		4.15	175	4	85	80	5	20	30	–25	16400	40000	15500

Note) When using the Linear Bushing on a single shaft, use two or more bushings on the same shaft to minimize a moment load, and secure a large distance between the units.
Model LM-GA has oil holes as a standard feature.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LM-MG (Stainless Steel Type)



Model No.			Ball rows	Main						
				Inscribed bore diameter			Outer diameter		Length	
					Tolerance			Tolerance		
Standard type	Clearance-adjustable type	Open type		dr	Precision	High	D	Precision/high	L	Tolerance
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	∗ LM13MGA-OP	4	13			23		32	
∗ LM 16MG	∗ LM 16MG-AJ	∗ LM16MGA-OP	4	16			28		37	
∗ LM 20MG	∗ LM 20MG-AJ	∗ LM20MGA-OP	5	20	0 –0.007	0 –0.010	32	0 –0.016	42	0 –0.3
∗ LM 25MG	∗ LM 25MG-AJ	∗ LM25MGA-OP	5	25			40		59	
∗ LM 30MG	∗ LM 30MG-AJ	∗ LM30MGA-OP	6	30			45		64	
∗ LM 35MG	∗ LM 35MG-AJ	∗ LM35MGA-OP	6	35	0 –0.008	0 –0.012	52	0 –0.019	70	
∗ LM 40MG	∗ LM 40MG-AJ	∗ LM40MGA-OP	6	40			60		80	

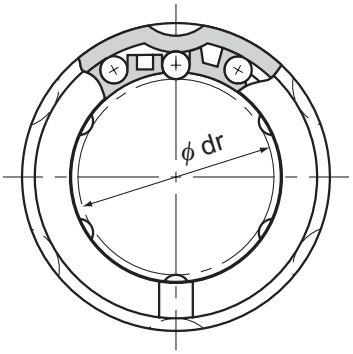
Note) Since this model contains a synthetic resin retainer, do not use it at temperature exceeding 80℃.
If the ambient temperature exceeds 80℃, use the type equipped with a metal retainer and indicate “A” at the end of the model number.
(For those marked with ∗ in the table, metal retainers are available. Only metal retainer is available for open type.)
(Metal retainer types of models LM6MG, 8SMG and 8MG each have 3 rows of balls.)

(Example) LM30MG A
A: High temperature symbol

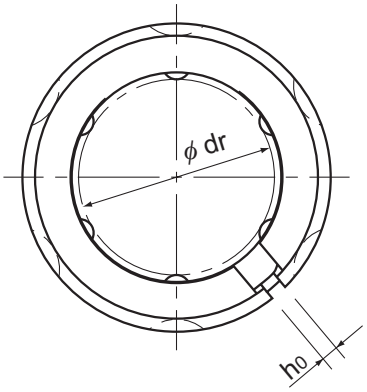
If requiring a type equipped with a seal, indicate it when placing an order. (seal heat resistance: 80℃.)

(Example) LM30MG UU
UU: Seal attached on both ends of the nut

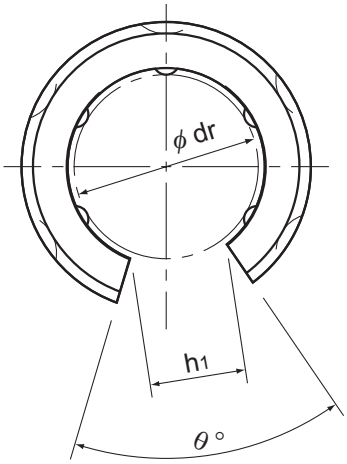
For the clearance-adjustable type (-AJ) and open type (-OP), the inscribed bore diameter tolerance, the outer diameter tolerance, and the eccentricity indicate the values before the division of the nut.



Model LM-MG



Model LM-MG-AJ



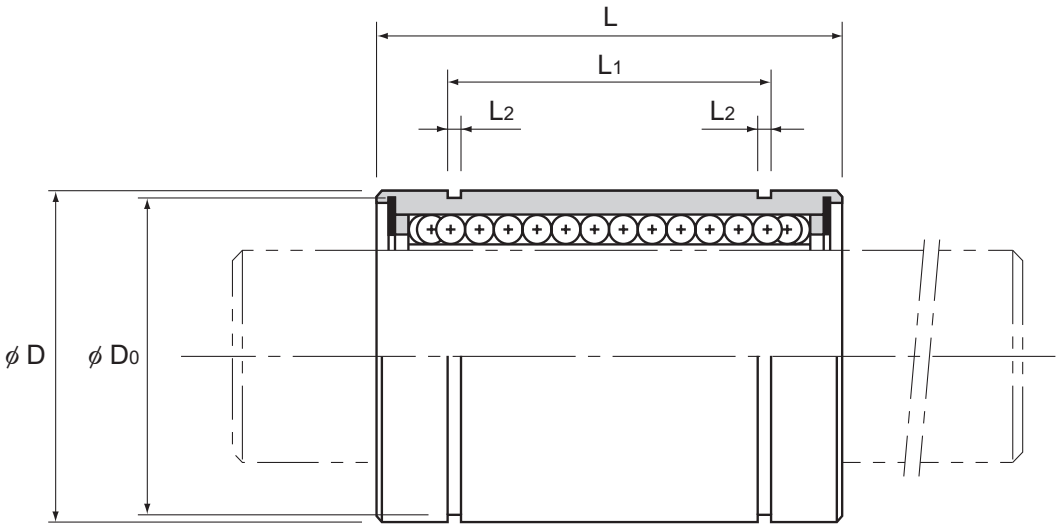
Model LM-MGA-OP

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	High	μm	C N	C_0 N	g
	—	—	—	—	—	—	—	4	8	–2	88.2	108	1.6
	—	—	—	—	—	—	—	4	8	–3	88.2	127	2.2
	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	6
	11.5		1.1	14.3	1	—	—	8	12	–5	176	225	9
	17.5		1.1	14.3	1	—	—	8	12	–5	265	402	13
	22		1.3	18	1	—	—	8	12	–5	373	549	23
	23		1.3	20	1.5	—	—	8	12	–5	412	598	27
	23		1.3	22	1.5	9	80	8	12	–7	510	775	35
	26.5		1.6	27	1.5	11	80	8	12	–7	775	1180	59
	30.5		1.6	30.5	1.5	11	60	10	15	–9	863	1370	79
	41	0 –0.3	1.85	38	2	12	50	10	15	–9	980	1570	170
	44.5		1.85	43	2.5	15	50	10	15	–9	1570	2750	220
	49.5		2.1	49	2.5	17	50	12	20	–13	1670	3140	330
	60.5		2.1	57	3	20	50	12	20	–13	2160	4020	530

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.
When using the Linear Bushing on a single shaft, use two or more bushings on the same shaft to minimize a moment load, and secure a large distance between the units.

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	—	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 80GA	LME 80GA-AJ	LME 80GA-OP	6	80	+0.016 –0.004	120		165	

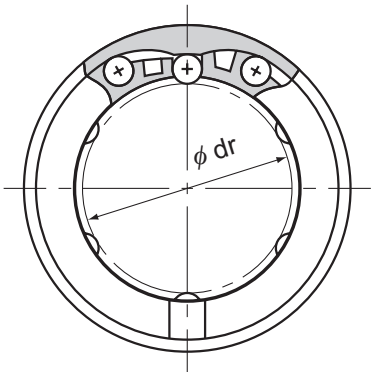
Note) Since Linear Bushing models LME60 or smaller models are incorporated with a synthetic resin retainer, do not use them at temperature exceeding 80℃.
If the ambient temperature exceeds 80℃, use the type equipped with a metal retainer and indicate “A” at the end of the model number.

(Example) LME20G A
High temperature symbol

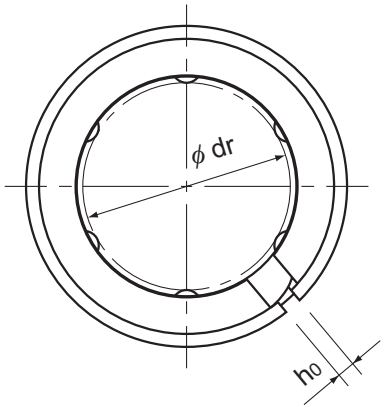
If requiring a type equipped with a seal, indicate it when placing an order. (seal heat resistance: 80℃.)

(Example) LME16 UU
Seal attached on both ends of the nut

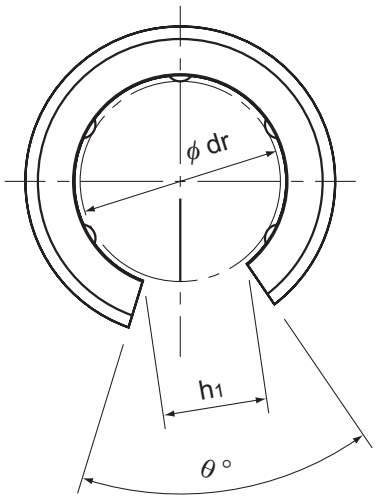
For the clearance-adjustable type (-AJ) and open type (-OP), the inscribed bore diameter tolerance, the outer diameter tolerance, and the eccentricity indicate the values before the division of the nut.



Model LME



Model LME-AJ



Model LME-OP

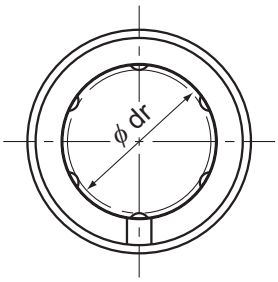
Unit: mm

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	11.4
	16.5		1.1	15.2	1	—	—	12	–5	265	402	18.5
	22.9		1.3	21	1.5	—	—	12	–7	510	775	37
	24.9		1.3	24.9	1.5	10	78	12	–7	775	1180	52
	31.5		1.6	30.3	2	10	60	15	–9	863	1370	89
	44.1	0 –0.3	1.85	37.5	2	12.5	60	15	–9	980	1570	203
	52.1		1.85	44.5	2	12.5	50	15	–9	1570	2750	306
	60.6		2.15	59	3	16.8	50	17	–13	2160	4020	673
	77.6		2.65	72	3	21	50	17	–13	3820	7940	1025
	101.7	0 –0.4	3.15	86.5	3	27.2	54	20	–16	4710	10000	1914
	133.7		4.15	116	3	36.3	54	20	–16	7350	16000	4800

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.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LME-GA

Model LM-L

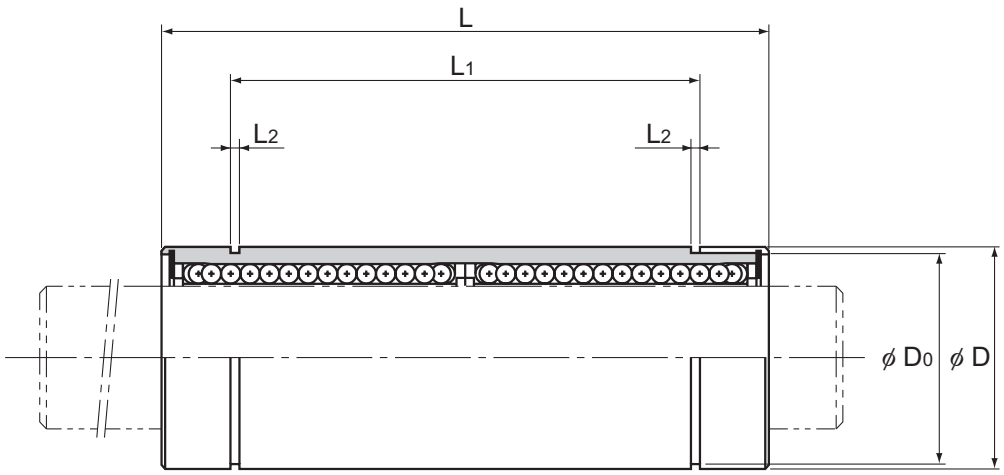


Model LM-L

Model No.	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

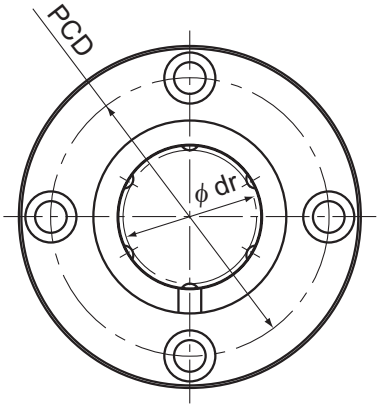


Unit: mm

dimensions				Eccentricity (max)	Radial clearance tolerance	Basic load rating		Mass
L_1	Tolerance	L_2	D_0	μm	μm	C N	C_0 N	g
—	—	—	—	10	–2	139	216	3
—		—	—	10	–3	139	254	4
20	0 –0.3	1.1	9.6	10	–3	263	412	10
27		1.1	11.5	15	–5	324	529	15
35		1.1	14.3	15	–5	431	784	26
44		1.3	18	15	–5	588	1100	48
46		1.3	20	15	–5	657	1200	56
46		1.3	22	15	–7	814	1570	75
53		1.6	27	15	–7	1230	2350	147
61		1.6	30.5	20	–9	1400	2750	163
82	0 –0.4	1.85	38	20	–9	1560	3140	397
89		1.85	43	20	–9	2490	5490	434
99		2.1	49	25	–13	2650	6270	696
121		2.1	57	25	–13	3430	8040	1087
148		2.6	76.5	25	–13	6080	15900	2770
170		3.15	86.5	25	–16	7650	20000	3340

Note) A stainless steel type is also available. Contact THK for details.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMF

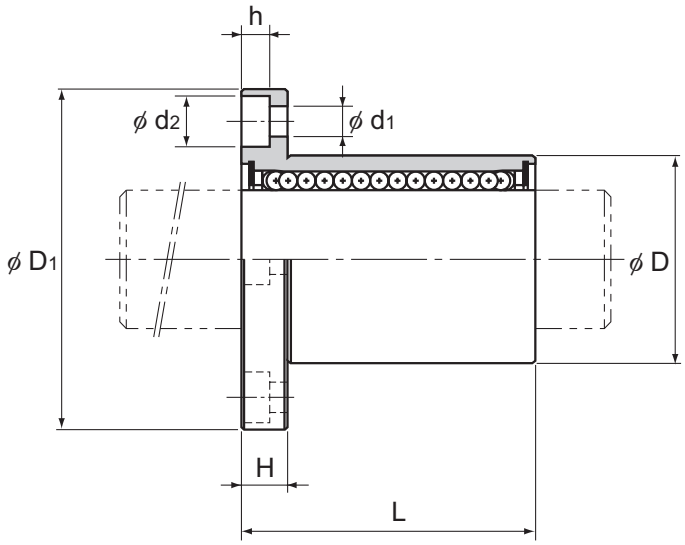


Model LMF

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		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

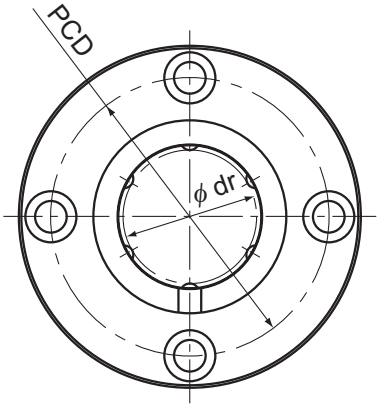


Unit: mm

				Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic load rating		
	H	PCD	Mounting hole $d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	Mass g
	5	20	3.4×6.5×3.3	12	12	–5	206	265	23
	5	24	3.4×6.5×3.3	12	12	–5	176	225	29
	5	24	3.4×6.5×3.3	12	12	–5	265	402	33
	6	29	4.5×8×4.4	12	12	–5	373	549	59
	6	32	4.5×8×4.4	12	12	–5	412	598	68
	6	33	4.5×8×4.4	12	12	–7	510	775	80
	6	38	4.5×8×4.4	12	12	–7	775	1180	126
	8	43	5.5×9.2×5.4	15	15	–9	863	1370	160
	8	51	5.5×9.2×5.4	15	15	–9	980	1570	305
	10	60	6.6×11×6.5	15	15	–9	1570	2750	422
	10	67	6.6×11×6.5	20	20	–13	1670	3140	583
	13	78	9×14×8.6	20	20	–13	2160	4020	960
	13	98	9×14×8.6	20	20	–13	3820	7940	1920
	18	112	11×17.5×10.8	25	25	–13	4710	10000	2720

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMF-M (Stainless Steel Type)

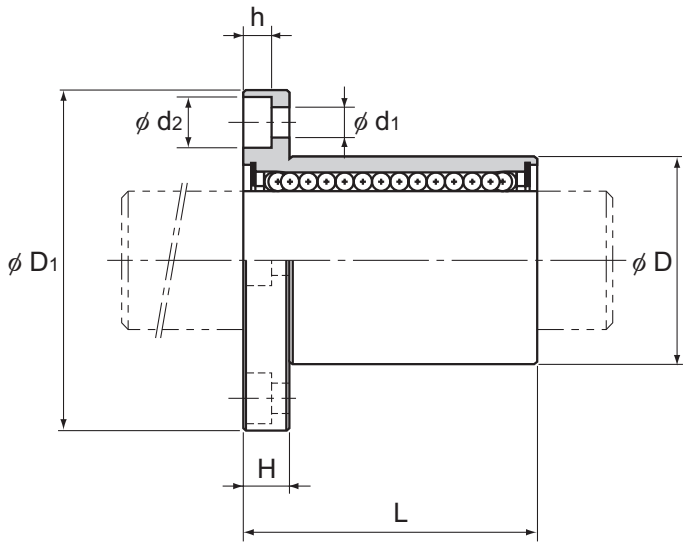


Model LMF-M

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		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
Seal attached on both ends of the nut

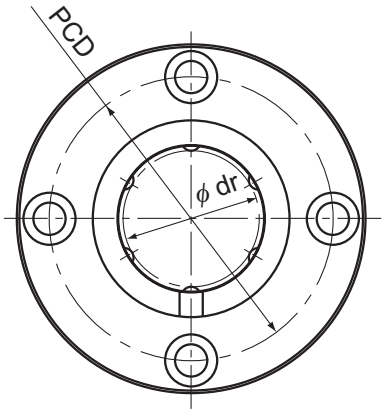


Unit: mm

				Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic load rating		
	H	PCD	Mounting hole $d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	Mass g
	5	20	3.4×6.5×3.3	12	12	–5	206	265	23
	5	24	3.4×6.5×3.3	12	12	–5	176	225	29
	5	24	3.4×6.5×3.3	12	12	–5	265	402	33
	6	29	4.5×8×4.4	12	12	–5	373	549	59
	6	32	4.5×8×4.4	12	12	–5	412	598	68
	6	33	4.5×8×4.4	12	12	–7	510	775	80
	6	38	4.5×8×4.4	12	12	–7	775	1180	126
	8	43	5.5×9.2×5.4	15	15	–9	863	1370	160
	8	51	5.5×9.2×5.4	15	15	–9	980	1570	305
	10	60	6.6×11×6.5	15	15	–9	1570	2750	422

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

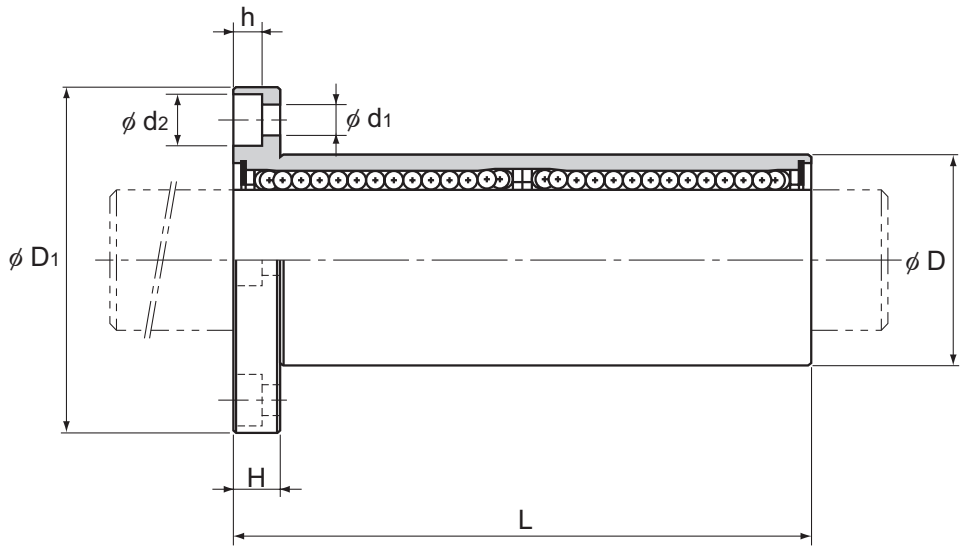
Model LMF-L



Model LMF-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	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
UU: Seal attached on both ends of the nut

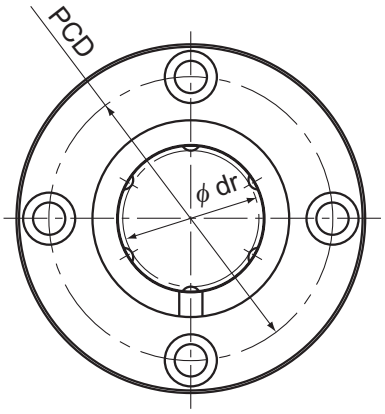


Unit: mm

	H	PCD	Mounting hole $d_1 \times d_2 \times h$	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	15	15	–5	324	529	29
	5	24	3.4×6.5×3.3	15	15	–5	431	784	45
	6	29	4.5×8×4.4	15	15	–5	588	1100	81
	6	32	4.5×8×4.4	15	15	–5	657	1200	93
	6	33	4.5×8×4.4	15	15	–7	814	1570	115
	6	38	4.5×8×4.4	15	15	–7	1230	2350	194
	8	43	5.5×9.2×5.4	20	20	–9	1400	2750	250
	8	51	5.5×9.2×5.4	20	20	–9	1560	3140	500
	10	60	6.6×11×6.5	20	20	–9	2490	5490	646
	10	67	6.6×11×6.5	25	25	–13	2650	6270	930
	13	78	9×14×8.6	25	25	–13	3430	8040	1488
	13	98	9×14×8.6	25	25	–13	6080	15900	3268
	18	112	11×17.5×10.8	25	25	–13	7650	20000	4342

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMF-ML (Stainless Steel Type)

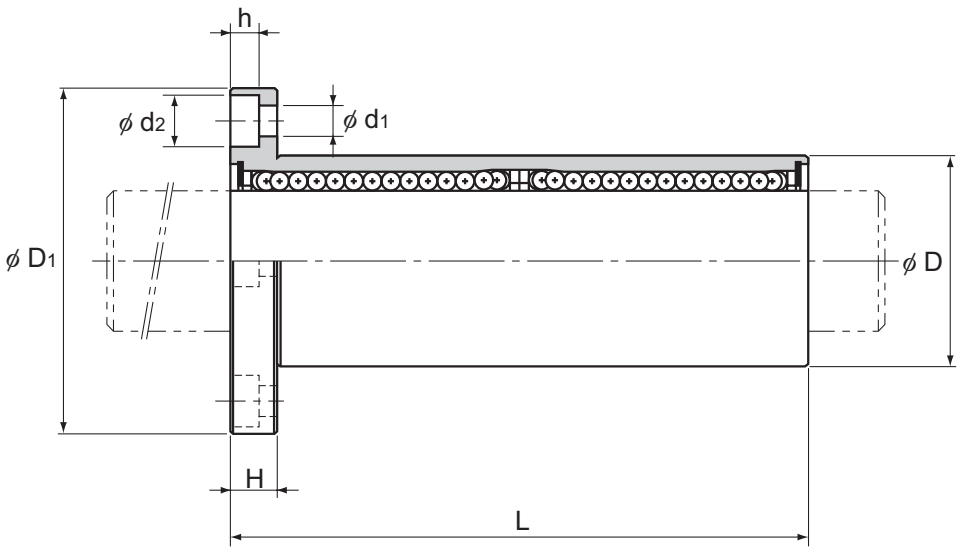


Model LMF-ML

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	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

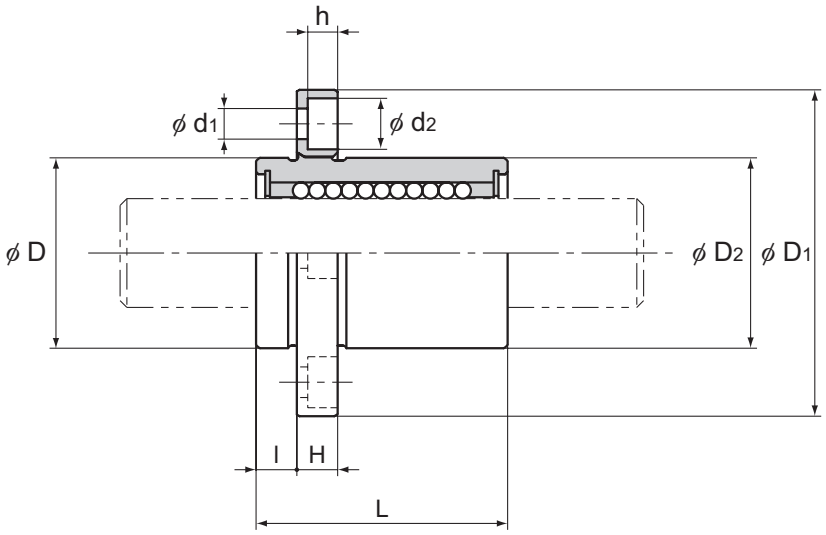


Unit: mm

	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
	5	20	3.4×6.5×3.3	15	15	–5	324	529	29
	5	24	3.4×6.5×3.3	15	15	–5	431	784	45
	6	29	4.5×8×4.4	15	15	–5	588	1100	81
	6	32	4.5×8×4.4	15	15	–5	657	1200	93
	6	33	4.5×8×4.4	15	15	–7	814	1570	115
	6	38	4.5×8×4.4	15	15	–7	1230	2350	194
	8	43	5.5×9.2×5.4	20	20	–9	1400	2750	250
	8	51	5.5×9.2×5.4	20	20	–9	1560	3140	500
	10	60	6.6×11×6.5	20	20	–9	2490	5490	646

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMIF

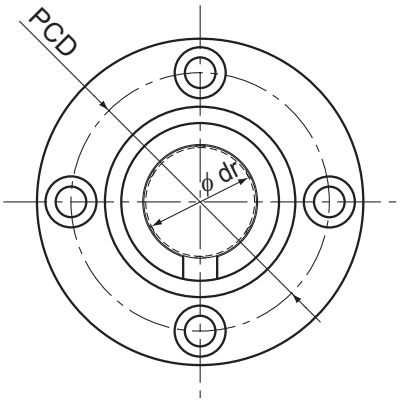


Model LMIF

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMIF 6	4	6	0 –0.009	12	0 –0.011	19	±0.3	28	0 –0.2
LMIF 8		8		15		24		32	
LMIF 10		10		19	0 –0.013	29		39	
LMIF 12		12		21		30		42	
LMIF 13		13		23		32		43	
LMIF 16	5	16		28		37		48	
LMIF 20		20	0 –0.010	32	0 –0.016	42		54	
LMIF 25	6	25		40		59		62	

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) LMIF16 UU
UU: Seal attached on both ends of the nut

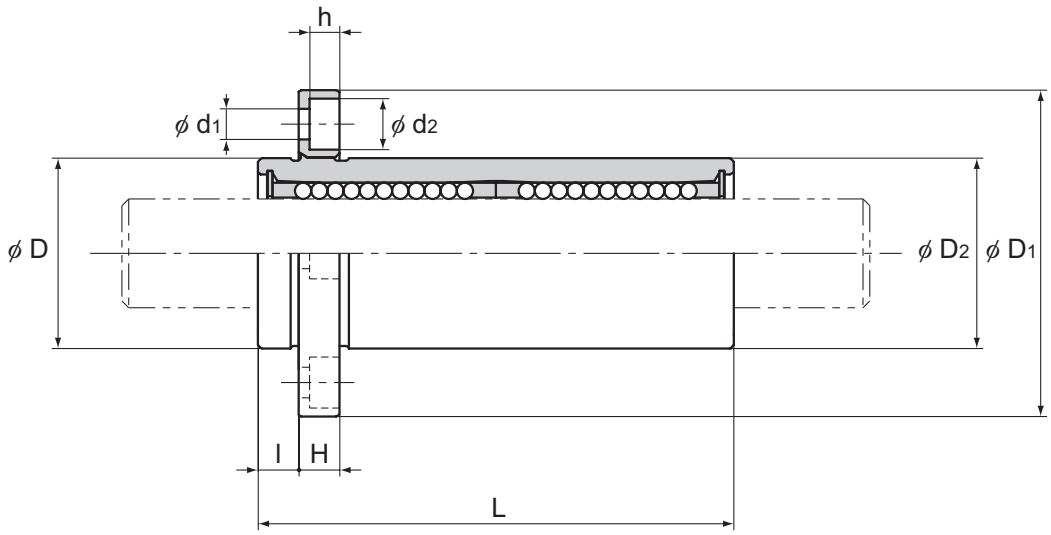


Unit: mm

	Length						Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	l	Tolerance	D_2	H	PCD	Mounting hole $d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	g
	5	±0.2	12	5	20	3.4×6×3.3	12	12	–5	206	265	24
			15		24		12		–5	265	402	34
	6		19	6	29	4.5×7.5×4.4	12		–5	373	549	61
			21		32		12		–5	412	598	69
			23		33		12		–7	510	775	81
			28		38		12		–7	775	1180	125
	8		32	8	43	5.5×9×5.4	15	15	–9	863	1370	166
			40		51		15		–9	980	1570	305

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMIF-L

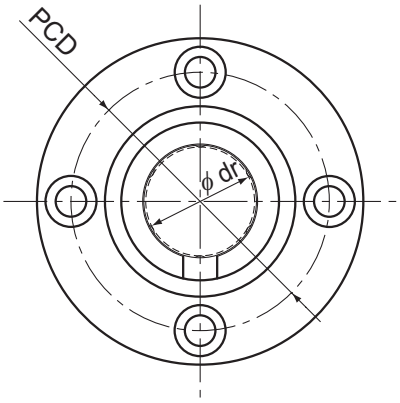


Model LMIF-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMIF 6L	4	6	0 –0.010	12	0 –0.013	35	±0.3	28	0 –0.2
LMIF 8L		8		15		45		32	
LMIF 10L		10		19	0 –0.016	55		39	
LMIF 12L		12		21		57		42	
LMIF 13L		13		23		61		43	
LMIF 16L	5	16		28		70		48	
LMIF 20L		20	0 –0.012	32	0 –0.019	80		54	
LMIF 25L	6	25		40		112		62	

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) LMIF16L UU
Seal attached on both ends of the nut

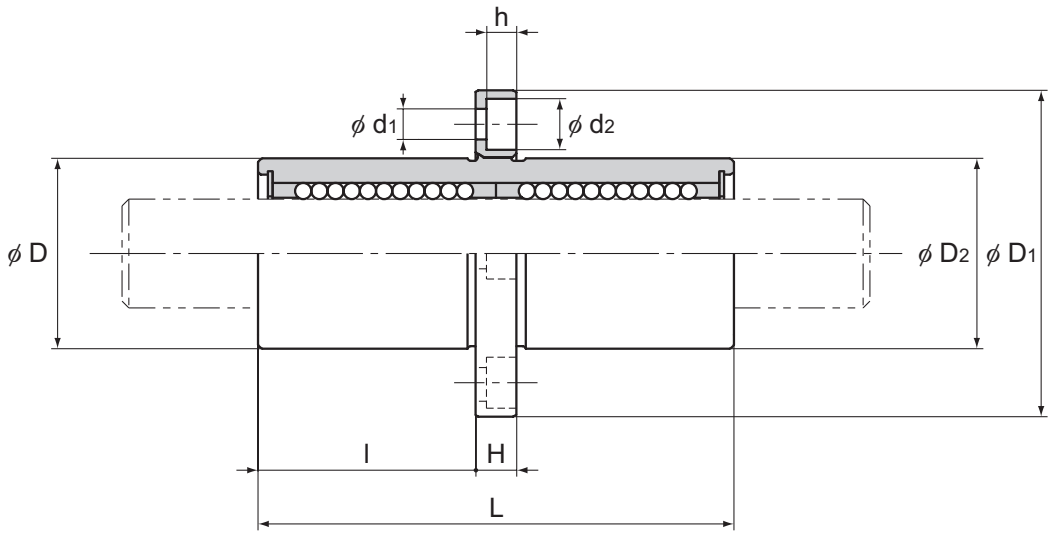


Unit: mm

	Length		D_2	H	PCD	Mounting hole $d_1 \times d_2 \times h$	Flange perpendicularity μm	Eccentricity (max) μm	Radial clearance tolerance μm	Basic Load Rating C N	Basic Load Rating C_0 N	Mass g
	l	Tolerance										
	5	±0.2	12	5	20	3.4×6×3.3	12	12	–5	324	529	30
			15		24		12		–5	431	784	46
	6		19	6	29	4.5×7.5×4.4	12		–5	588	1100	83
			21		32		12		–5	657	1200	95
			23		33		12		–7	814	1570	117
			28		38		12		–7	1230	2350	196
	8		32	8	43	5.5×9×5.4	15	15	–9	1400	2750	244
			40		51		15		–9	1560	3140	498

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMCF-L

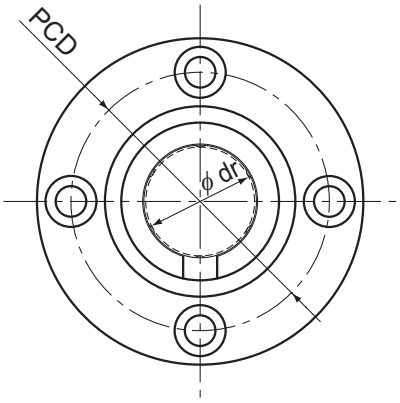


Model LMCF-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMCF 6L	4	6	0 –0.010	12	0 –0.013	35	±0.3	28	0 –0.2
LMCF 8L		8		15		45		32	
LMCF 10L		10		19	0 –0.016	55		39	
LMCF 12L		12		21		57		42	
LMCF 13L		13		23		61		43	
LMCF 16L	5	16		28		70		48	
LMCF 20L		20	0 –0.012	32	0 –0.019	80		54	
LMCF 25L	6	25		40		112		62	

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) LMCF16L UU
Seal attached on both ends of the nut

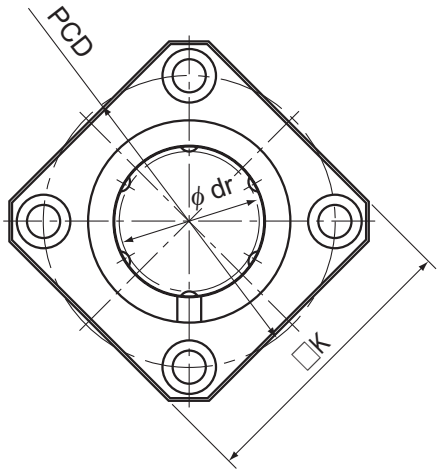


Unit: mm

	Length		D_2	H	PCD	Mounting hole	Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	l	Tolerance				$d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	g
	15	±0.2	12	5	20	3.4×6×3.3	12	12	–5	324	529	30
	20		15		24		12		–5	431	784	46
	24.5		19	6	29	4.5×7.5×4.4	12		–5	588	1100	83
	25.5		21		32		12		–5	657	1200	95
	27.5		23		33		12		–7	814	1570	117
	32		28		38		12		–7	1230	2350	196
	36		32	8	43	5.5×9×5.4	15	15	–9	1400	2750	244
	52		40		51		15		–9	1560	3140	498

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMK

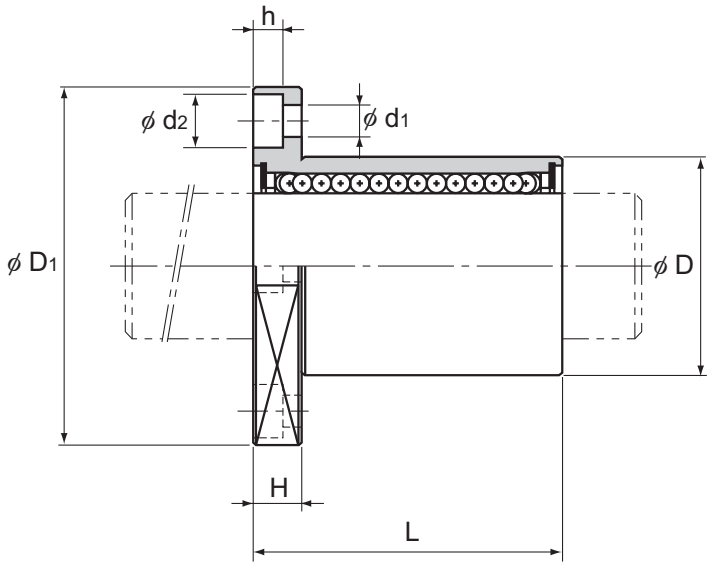


Model LMK

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		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

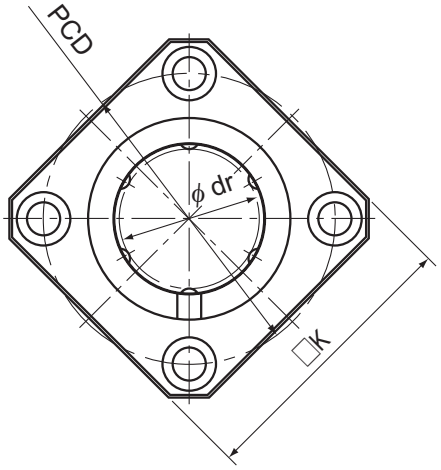


Unit: mm

	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	17
	25	5	24	3.4×6.5×3.3	12	12	–5	176	225	25
	25	5	24	3.4×6.5×3.3	12	12	–5	265	402	26
	30	6	29	4.5×8×4.4	12	12	–5	373	549	45
	32	6	32	4.5×8×4.4	12	12	–5	412	598	50
	34	6	33	4.5×8×4.4	12	12	–7	510	775	67
	37	6	38	4.5×8×4.4	12	12	–7	775	1180	105
	42	8	43	5.5×9.2×5.4	15	15	–9	863	1370	130
	50	8	51	5.5×9.2×5.4	15	15	–9	980	1570	270
	58	10	60	6.6×11×6.5	15	15	–9	1570	2750	344
	64	10	67	6.6×11×6.5	20	20	–13	1670	3140	487
	75	13	78	9×14×8.6	20	20	–13	2160	4020	790
	92	13	98	9×14×8.6	20	20	–13	3820	7940	1705
	106	18	112	11×17.5×10.8	25	25	–13	4710	10000	2278

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMK-M (Stainless Steel Type)

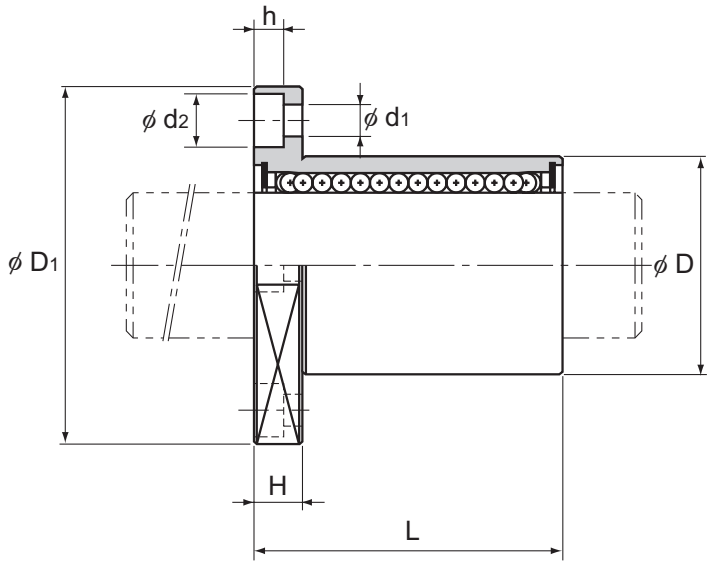


Model LMK-M

Model No.	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

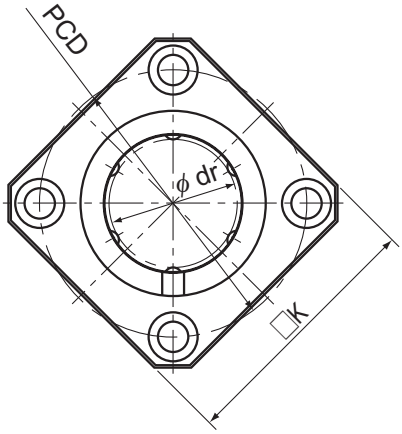


Unit: mm

					Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic load rating		
	K	H	PCD	Mounting hole $d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	Mass g
	22	5	20	3.4×6.5×3.3	12	12	–5	206	265	17
	25	5	24	3.4×6.5×3.3	12	12	–5	176	225	25
	25	5	24	3.4×6.5×3.3	12	12	–5	265	402	26
	30	6	29	4.5×8×4.4	12	12	–5	373	549	45
	32	6	32	4.5×8×4.4	12	12	–5	412	598	50
	34	6	33	4.5×8×4.4	12	12	–7	510	775	67
	37	6	38	4.5×8×4.4	12	12	–7	775	1180	105
	42	8	43	5.5×9.2×5.4	15	15	–9	863	1370	130
	50	8	51	5.5×9.2×5.4	15	15	–9	980	1570	270
	58	10	60	6.6×11×6.5	15	15	–9	1570	2750	344

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMK-L

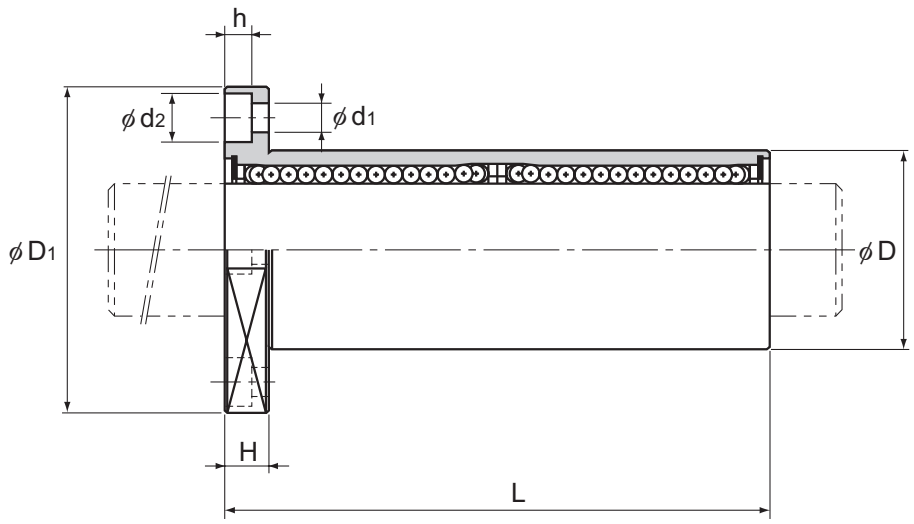


Model LMK-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	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

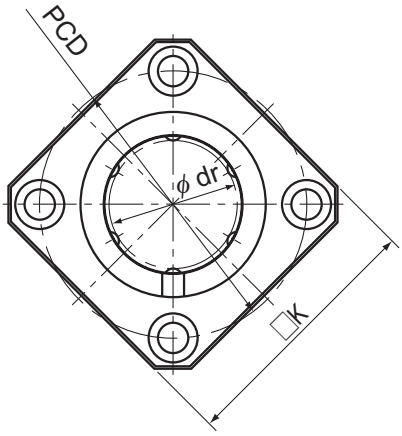


Unit: mm

	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	15	15	–5	324	529	24
	25	5	24	3.4×6.5×3.3	15	15	–5	431	784	39
	30	6	29	4.5×8×4.4	15	15	–5	588	1100	68
	32	6	32	4.5×8×4.4	15	15	–5	657	1200	76
	34	6	33	4.5×8×4.4	15	15	–7	814	1570	100
	37	6	38	4.5×8×4.4	15	15	–7	1230	2350	176
	42	8	43	5.5×9.2×5.4	20	20	–9	1400	2750	210
	50	8	51	5.5×9.2×5.4	20	20	–9	1560	3140	466
	58	10	60	6.6×11×6.5	20	20	–9	2490	5490	569
	64	10	67	6.6×11×6.5	25	25	–13	2650	6270	825
	75	13	78	9×14×8.6	25	25	–13	3430	8040	1321
	92	13	98	9×14×8.6	25	25	–13	6080	15900	2952
	106	18	112	11×17.5×10.8	25	25	–13	7650	20000	3883

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMK-ML (Stainless Steel Type)

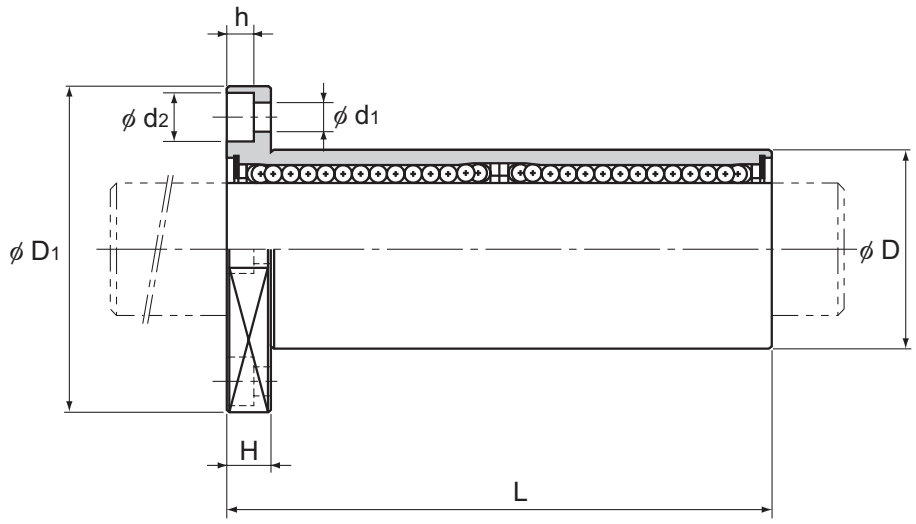


Model LMK-ML

Model No.	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

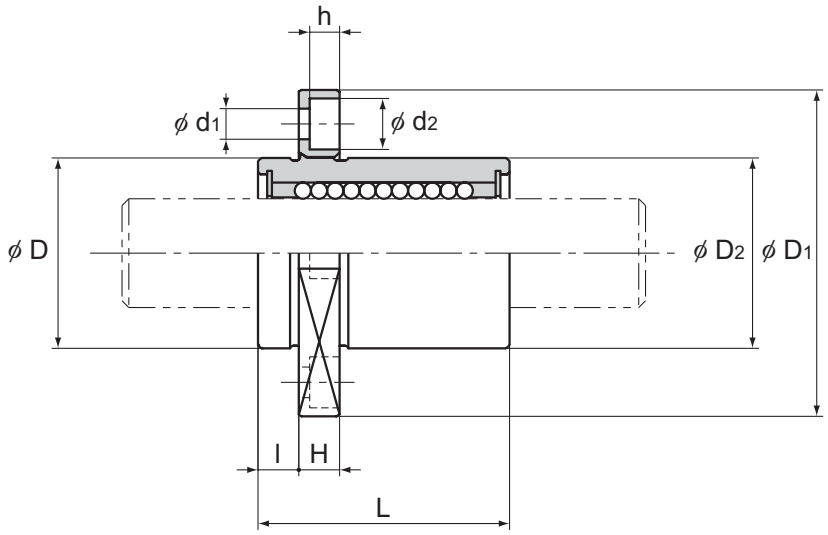


Unit: mm

	K	H	PCD	Mounting hole $d_1 \times d_2 \times h$	Flange perpendicularity μm	Eccentricity (max) μm	Radial clearance tolerance μm	Basic load rating C N	Basic load rating C_0 N	Mass g
	22	5	20	3.4×6.5×3.3	15	15	–5	324	529	24
	25	5	24	3.4×6.5×3.3	15	15	–5	431	784	39
	30	6	29	4.5×8×4.4	15	15	–5	588	1100	68
	32	6	32	4.5×8×4.4	15	15	–5	657	1200	76
	34	6	33	4.5×8×4.4	15	15	–7	814	1570	100
	37	6	38	4.5×8×4.4	15	15	–7	1230	2350	176
	42	8	43	5.5×9.2×5.4	20	20	–9	1400	2750	210
	50	8	51	5.5×9.2×5.4	20	20	–9	1560	3140	466
	58	10	60	6.6×11×6.5	20	20	–9	2490	5490	569

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMIK

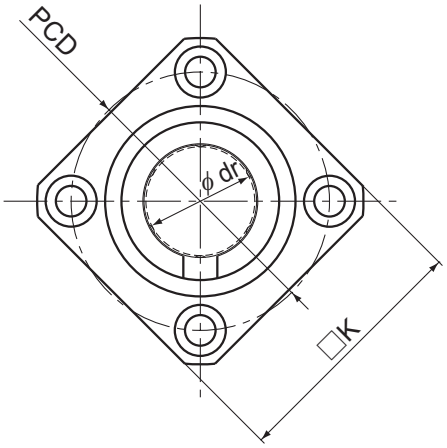


Model LMIK

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMIK 6	4	6	0 –0.009	12	0 –0.011	19	±0.3	28	0 –0.2
LMIK 8		8		15		24		32	
LMIK 10		10		19	0 –0.013	29		39	
LMIK 12		12		21		30		42	
LMIK 13		13		23		32		43	
LMIK 16	5	16		28		37		48	
LMIK 20		20	0 –0.010	32	0 –0.016	42		54	
LMIK 25	6	25		40		59		62	

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) LMIK16 UU
UU: Seal attached on both ends of the nut

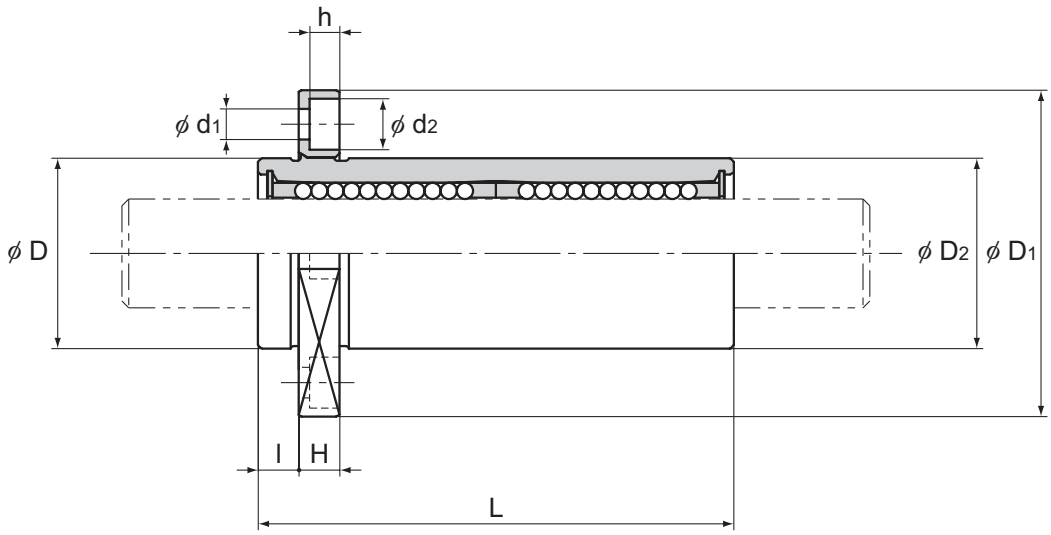


Unit: mm

	Length							Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	l	Tolerance	D_2	H	K	PCD	Mounting hole $d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	g
	5	±0.2	12	5	22	20	3.4×6×3.3	12	12	–5	206	265	18
			15		25	24		12		–5	265	402	27
	6		19	6	30	29	4.5×7.5×4.4	12		–5	373	549	46
			21		32	32		12		–5	412	598	52
			23		34	33		12		–7	510	775	65
			28		37	38		12		–7	775	1180	104
	8		32	8	42	43	5.5×9×5.4	15	15	–9	863	1370	131
			40		50	51		15		–9	980	1570	267

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMIK-L

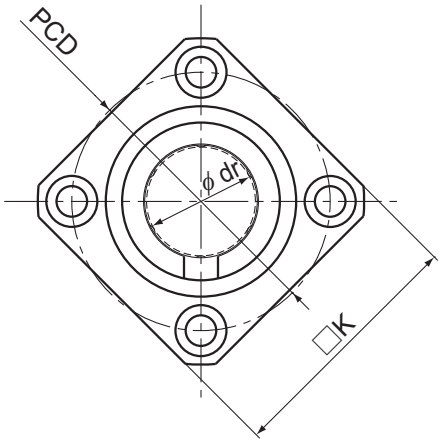


Model LMIK-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMIK 6L	4	6	0 –0.010	12	0 –0.013	35	±0.3	28	0 –0.2
LMIK 8L		8		15		45		32	
LMIK 10L		10		19	0 –0.016	55		39	
LMIK 12L		12		21		57		42	
LMIK 13L		13		23		61		43	
LMIK 16L	5	16		28		70		48	
LMIK 20L		20	0 –0.012	32	0 –0.019	80		54	
LMIK 25L	6	25		40		112		62	

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) LMIK16L UU
Seal attached on both ends of the nut

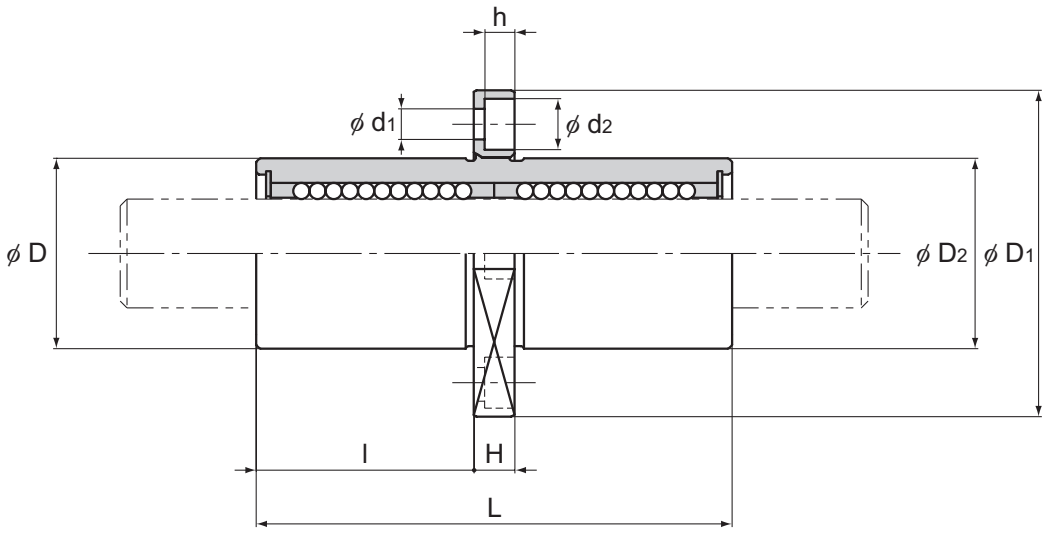


Unit: mm

	Length							Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	l	Tolerance	D_2	H	K	PCD	$d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	g
	5	±0.2	12	5	22	20	3.4×6×3.3	12	12	–5	324	529	25
			15		25	24		12		–5	431	784	39
	6		19	6	30	29	4.5×7.5×4.4	12		–5	588	1100	69
			21		32	32		12		–5	657	1200	78
			23		34	33		12		–7	814	1570	101
			28		37	38		12		–7	1230	2350	174
	8		32	8	42	43	5.5×9×5.4	15	15	–9	1400	2750	210
			40		50	51		15		–9	1560	3140	461

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMCK-L

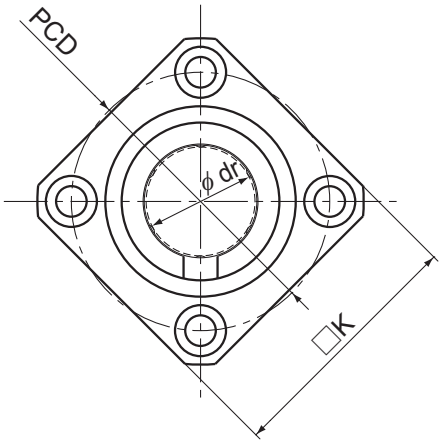


Model LMCK-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMCK 6L	4	6	0 –0.010	12	0 –0.013	35	±0.3	28	0 –0.2
LMCK 8L		8		15		45		32	
LMCK 10L		10		19	0 –0.016	55		39	
LMCK 12L		12		21		57		42	
LMCK 13L		13		23		61		43	
LMCK 16L	5	16		28		70		48	
LMCK 20L		20	0 –0.012	32	0 –0.019	80		54	
LMCK 25L	6	25		40		112		62	

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) LMCK16L UU
Seal attached on both ends of the nut

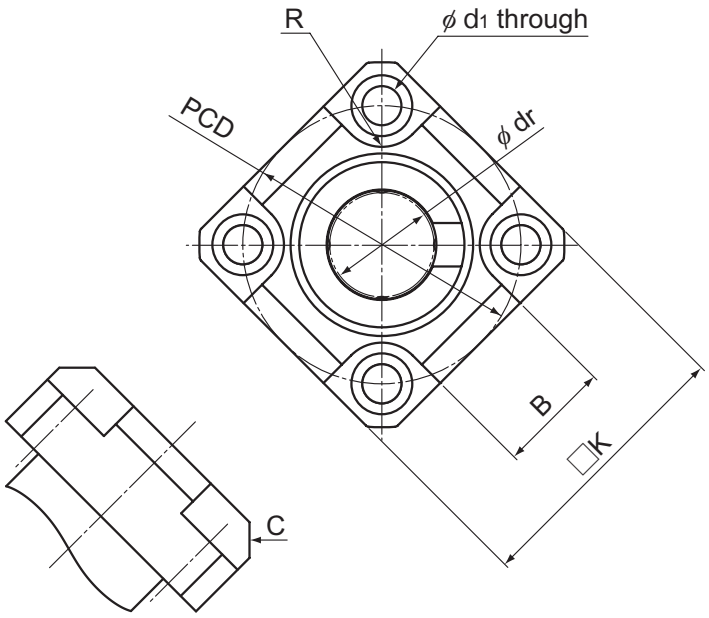


Unit: mm

	Length							Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	l	Tolerance	D_2	H	K	PCD	$d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	g
	15	±0.2	12	5	22	20	3.4×6×3.3	12	12	–5	324	529	25
	20		15		25	24		12		–5	431	784	39
	24.5		19	6	30	29	4.5×7.5×4.4	12		–5	588	1100	69
	25.5		21		32	32		12		–5	657	1200	78
	27.5		23		34	33		12		–7	814	1570	101
	32		28		37	38		12		–7	1230	2350	174
	36		32	8	42	43	5.5×9×5.4	15	15	–9	1400	2750	210
	52		40		50	51		15		–9	1560	3140	461

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMJK

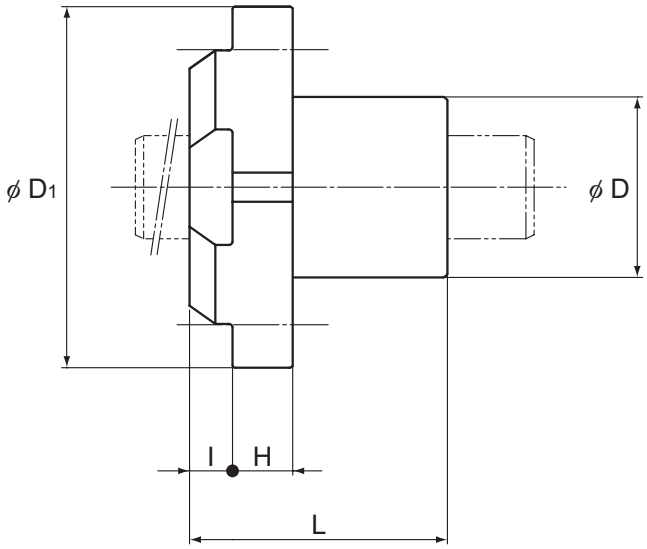


Model LMJK

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMJK 8	4	8	0 –0.009	15	0 –0.011	24	0 –0.2	32	0 –0.2
LMJK 10	4	10		19	0 –0.013	29		39	
LMJK 12	4	12		21		30		42	
LMJK 16	5	16		28		37		48	
LMJK 20	5	20	0 –0.010	32	0 –0.016	42		54	
LMJK 25	6	25		40		59	0 –0.3	62	

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.

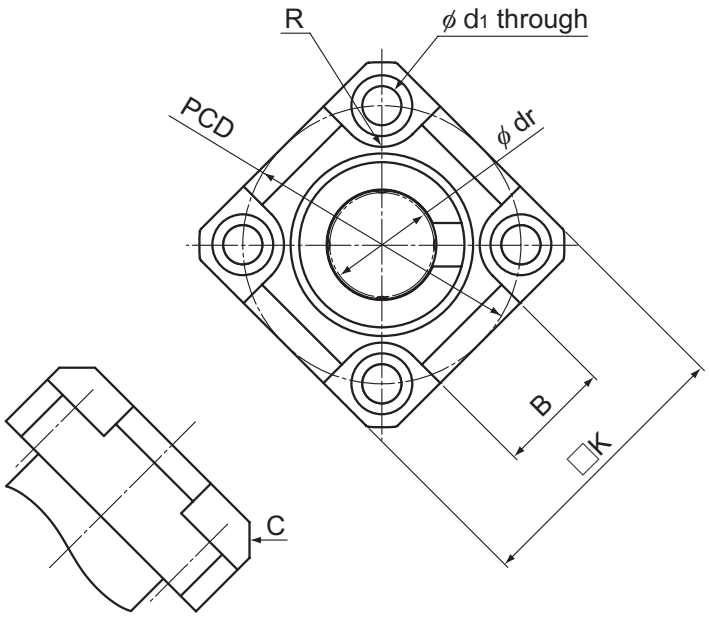
(Example) LMJK8 UU
Seal attached on both ends of the nut



Unit: mm

									Flange	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		
	K	B	R	H	I	C	PCD	Mounting hole d_1	perpendicularity μm	μm	μm	C N	C_0 N	Mass g
	25	10	R4	6	4	C3	24	3.4	12	12	–5	265	402	20
	30	12	R5	7	5		29	4.5				373	549	35
	32	13					32					412	598	38
	37	18					38				–7	775	1180	88
	42	21		10	6		43	5.5	15	15		863	1370	104
	50	26	R6				51				–9	980	1570	234

Model LMJK-L

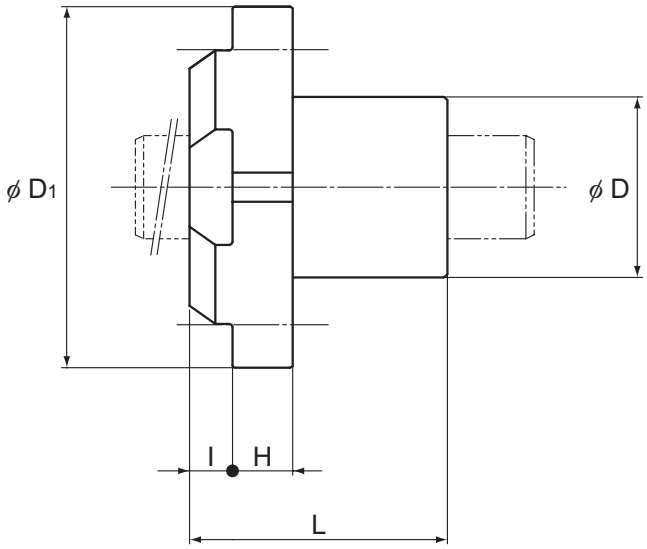


Model LMJK-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMJK 8L	4	8	0 –0.010	15	0 –0.013	45	0 –0.3	32	0 –0.2
LMJK 10L	4	10		19	0 –0.016	55		39	
LMJK 12L	4	12		21		57		42	
LMJK 16L	5	16		28		70		48	
LMJK 20L	5	20	0 –0.012	32	0 –0.019	80		54	
LMJK 25L	6	25		40		112	0 –0.4	62	

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.

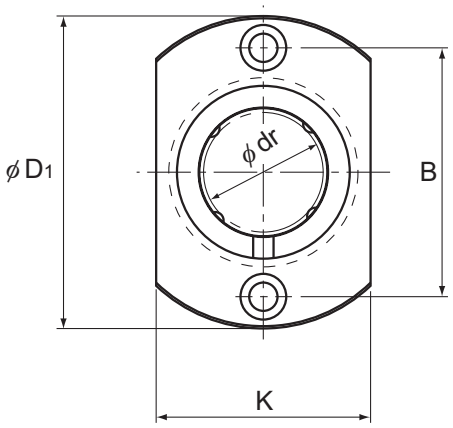
(Example) LMJK8L UU
Seal attached on both ends of the nut



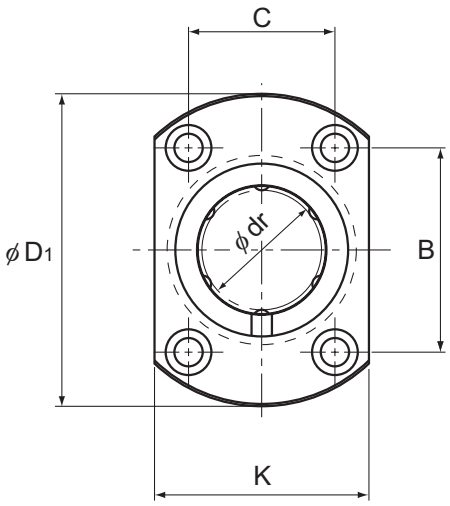
Unit: mm

									Flange	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		
	K	B	R	H	I	C	PCD	Mounting hole d_1	perpendicularity μm	μm	μm	C N	C_0 N	Mass g
	25	10	R4	6	4	C3	24	3.4	15	15	–5	431	784	32
	30	12	R5	7	5		29	4.5				588	1100	58
	32	13					32					657	1200	63
	37	18					38				–7	1230	2350	158
	42	21		10	6		43	5.5	20	20		1400	2750	182
	50	26	R6				51				–9	1560	3140	421

Model LMH



Models LMH 6 to 13



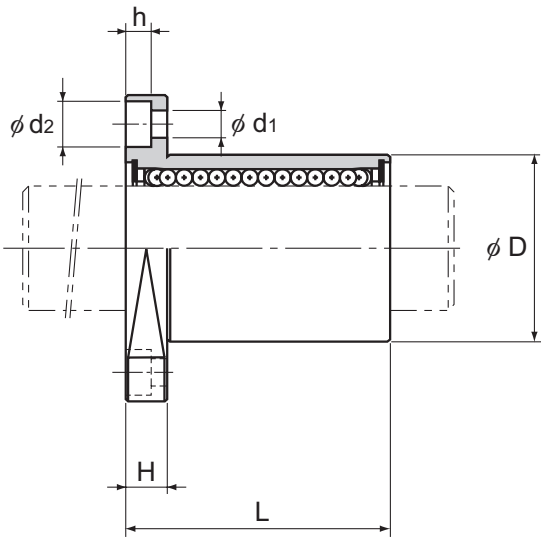
Models LMH 16 to 30

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		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 8S	4	8		15		17		32	
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

UU: Seal attached on both ends of the nut

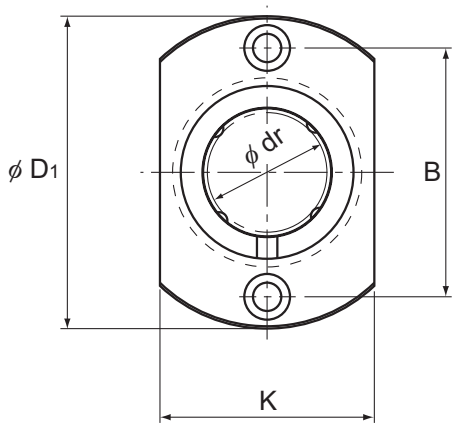


Unit: mm

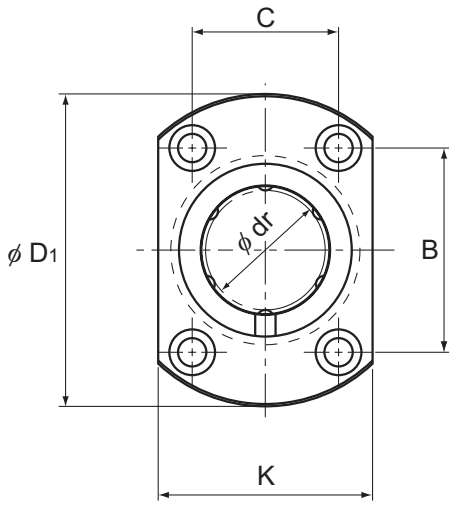
	K	H	B	C	Mounting hole $d_1 \times d_2 \times h$	Flange perpendicularity μm	Eccentricity (max) μm	Radial clearance tolerance μm	Basic load rating C N	Basic load rating C_0 N	Mass g
	18	5	20	—	3.4×6.5×3.3	12	12	–5	206	265	20
	21	5	24	—	3.4×6.5×3.3	12	12	–5	176	225	24
	21	5	24	—	3.4×6.5×3.3	12	12	–5	265	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	56
	29	6	33	—	4.5×8×4.4	12	12	–7	510	775	69
	34	6	31	22	4.5×8×4.4	12	12	–7	775	1180	111
	38	8	36	24	5.5×9.2×5.4	15	15	–9	863	1370	140
	46	8	40	32	5.5×9.2×5.4	15	15	–9	980	1570	279
	51	10	49	35	6.6×11×6.5	15	15	–9	1570	2750	351

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMH-M (Stainless Steel Type)



Models LMH 6M to 13M

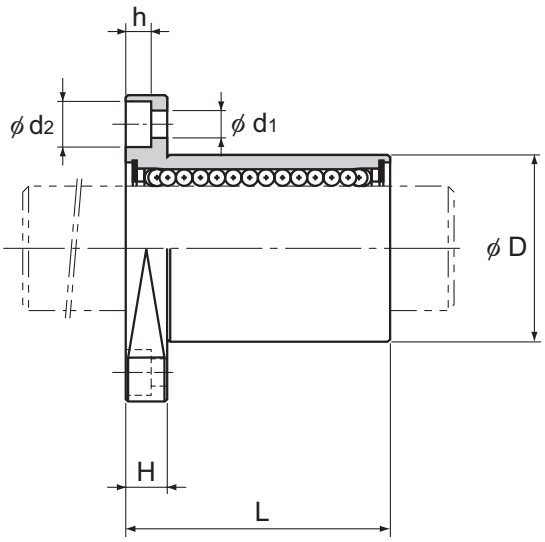


Models LMH 16M to 30M

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMH 6M	4	6	0 –0.009	12	0 –0.011	19	0 –0.2	28	0 –0.2
LMH 8SM	4	8		15		17		32	
LMH 8M	4	8		15		24		32	
LMH 10M	4	10		19	0 –0.013	29		39	
LMH 12M	4	12		21		30		42	
LMH 13M	4	13		23		32		43	
LMH 16M	5	16		28		37		48	
LMH 20M	5	20	0 –0.010	32	0 –0.016	42		54	
LMH 25M	6	25		40		59	0 –0.3	62	
LMH 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) LMH16M UU
Seal attached on both ends of the nut

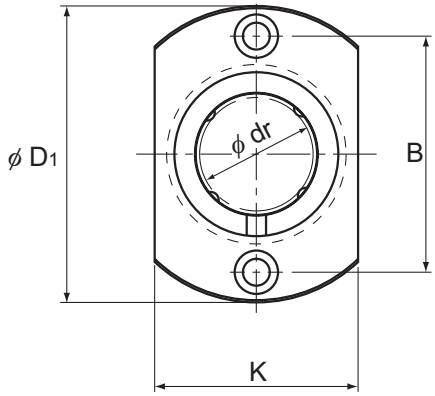


Unit: mm

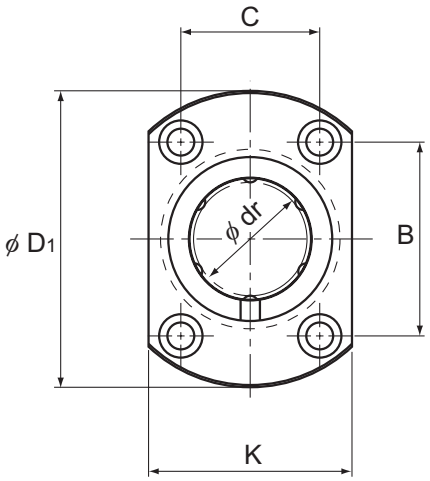
	K	H	B	C	Mounting hole $d_1 \times d_2 \times h$	Flange perpendicularity μm	Eccentricity (max) μm	Radial clearance tolerance μm	Basic load rating C N	Basic load rating C_0 N	Mass g
	18	5	20	—	3.4×6.5×3.3	12	12	–5	206	265	20
	21	5	24	—	3.4×6.5×3.3	12	12	–5	176	225	24
	21	5	24	—	3.4×6.5×3.3	12	12	–5	265	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	56
	29	6	33	—	4.5×8×4.4	12	12	–7	510	775	69
	34	6	31	22	4.5×8×4.4	12	12	–7	775	1180	111
	38	8	36	24	5.5×9.2×5.4	15	15	–9	863	1370	140
	46	8	40	32	5.5×9.2×5.4	15	15	–9	980	1570	279
	51	10	49	35	6.6×11×6.5	15	15	–9	1570	2750	351

Note) Since the nut and the balls use stainless steel, these models are highly resistant to corrosion and environment.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMH-L



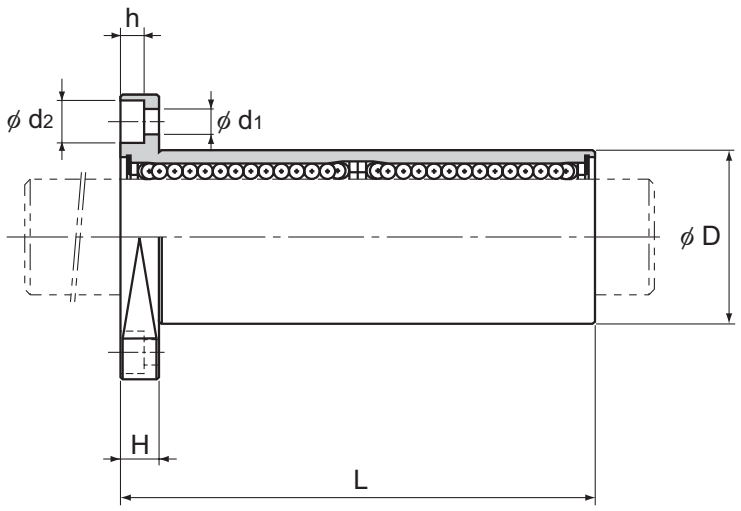
Models LMH 6L to 13L



Models LMH 16L to 30L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		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

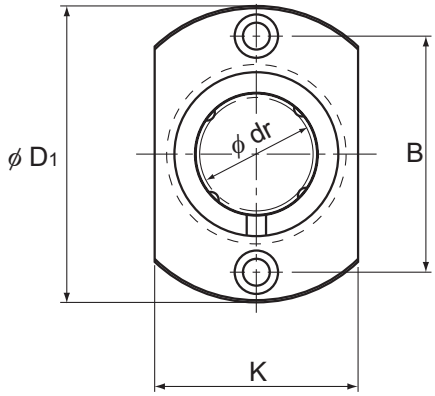


Unit: mm

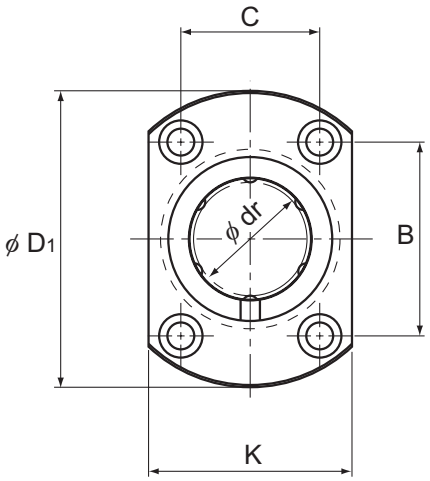
	K	H	B	C	Mounting hole $d_1 \times d_2 \times h$	Flange perpendicularity μm	Eccentricity (max) μm	Radial clearance tolerance μm	Basic load rating C N	Basic load rating C_0 N	Mass g
	18	5	20	—	3.4×6.5×3.3	15	15	–5	324	529	27
	21	5	24	—	3.4×6.5×3.3	15	15	–5	431	784	41
	25	6	29	—	4.5×8×4.4	15	15	–5	588	1100	72
	27	6	32	—	4.5×8×4.4	15	15	–5	657	1200	81
	29	6	33	—	4.5×8×4.4	15	15	–7	814	1570	105
	34	6	31	22	4.5×8×4.4	15	15	–7	1230	2350	182
	38	8	36	24	5.5×9.2×5.4	20	20	–9	1400	2750	217
	46	8	40	32	5.5×9.2×5.4	20	20	–9	1560	3140	477
	51	10	49	35	6.6×11×6.5	20	20	–9	2490	5490	575

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMH-ML (Stainless Steel Type)



Models LMH 6ML to 13ML

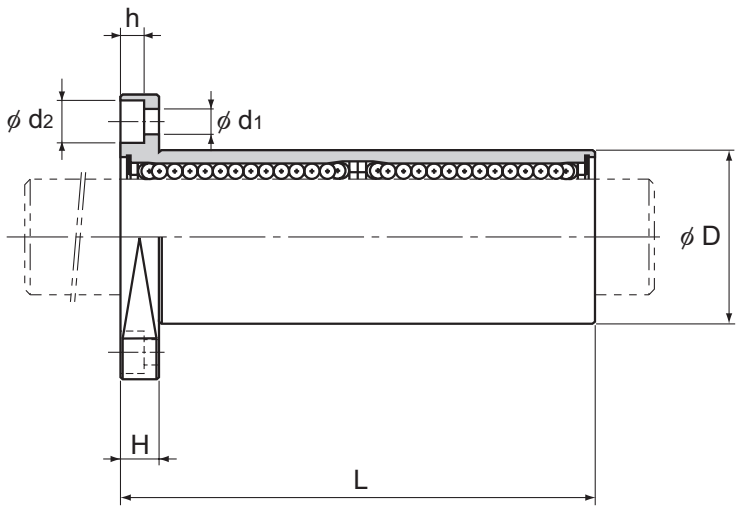


Models LMH 16ML to 30ML

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMH 6ML	4	6	0 –0.010	12	0 –0.013	35	0 –0.3	28	0 –0.2
LMH 8ML	4	8		15		45		32	
LMH 10ML	4	10		19	0 –0.016	55		39	
LMH 12ML	4	12		21		57		42	
LMH 13ML	4	13		23		61		43	
LMH 16ML	5	16		28		70		48	
LMH 20ML	5	20	0 –0.012	32	0 –0.019	80		54	
LMH 25ML	6	25		40		112	0 –0.4	62	
LMH 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) LMH20ML UU
Seal attached on both ends of the nut

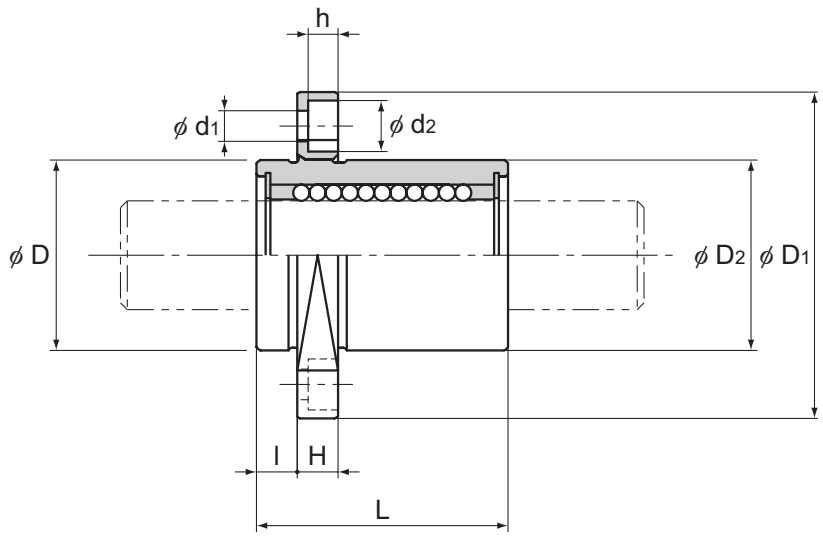


Unit: mm

	K	H	B	C	Mounting hole $d_1 \times d_2 \times h$	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	27
	21	5	24	—	3.4×6.5×3.3	15	15	–5	431	784	41
	25	6	29	—	4.5×8×4.4	15	15	–5	588	1100	72
	27	6	32	—	4.5×8×4.4	15	15	–5	657	1200	81
	29	6	33	—	4.5×8×4.4	15	15	–7	814	1570	105
	34	6	31	22	4.5×8×4.4	15	15	–7	1230	2350	182
	38	8	36	24	5.5×9.2×5.4	20	20	–9	1400	2750	217
	46	8	40	32	5.5×9.2×5.4	20	20	–9	1560	3140	477
	51	10	49	35	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.
If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMIH

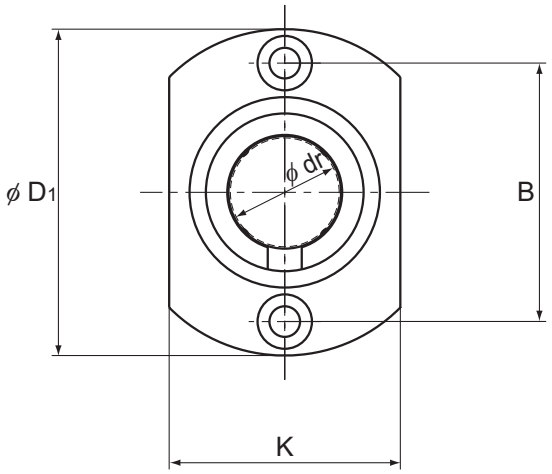


Model LMIH

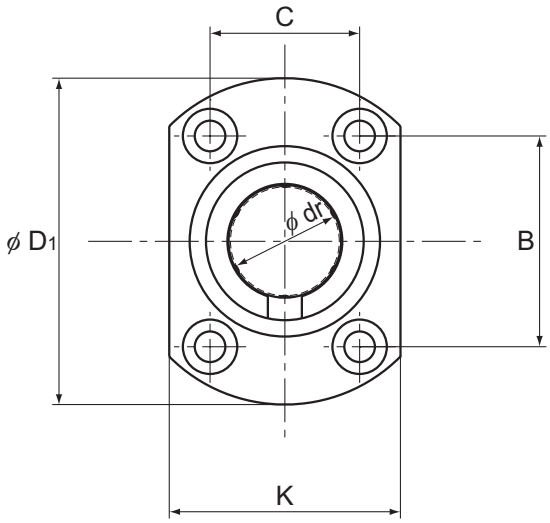
Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMIH 6	4	6	0 –0.009	12	0 –0.011	19	±0.3	28	0 –0.2
LMIH 8		8		15		24		32	
LMIH 10		10		19	0 –0.013	29		39	
LMIH 12		12		21		30		42	
LMIH 13		13		23		32		43	
LMIH 16	5	16		28		37		48	
LMIH 20		20	0 –0.010	32	0 –0.016	42		54	
LMIH 25	6	25		40		59		62	

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) LMIH16 UU
UU: Seal attached on both ends of the nut



Models LMIH 6 to 13



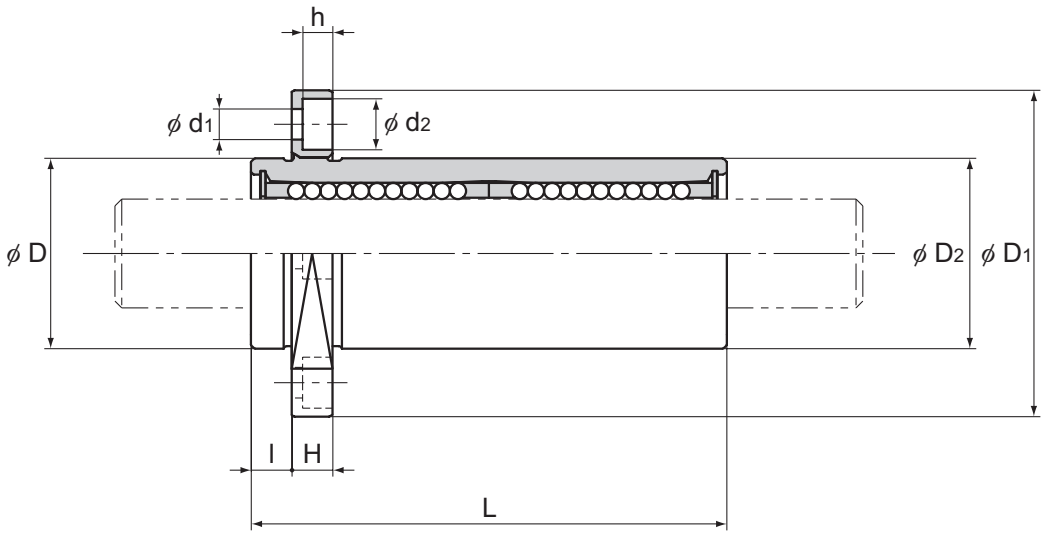
Models LMIH 16 to 25

Unit: mm

	Length								Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	l	Tolerance	D_2	H	K	B	C	Mounting hole $d_1 \times d_2 \times h$	μm	μm	μm	C N	C_0 N	g
	5	±0.2	12	5	18	20	—	3.4×6×3.3	12	12	–5	206	265	20
			15		21	24	—		12		–5	265	402	29
	6		19	6	25	29	—	4.5×7.5×4.4	12		–5	373	549	50
			21		27	32	—		12		–5	412	598	57
			23		29	33	—		12		–7	510	775	70
			28		34	31	22		12		–7	775	1180	111
	8		32	8	38	36	24	5.5×9×5.4	15	15	–9	863	1370	140
			40		46	40	32		15		–9	980	1570	276

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMIH-L

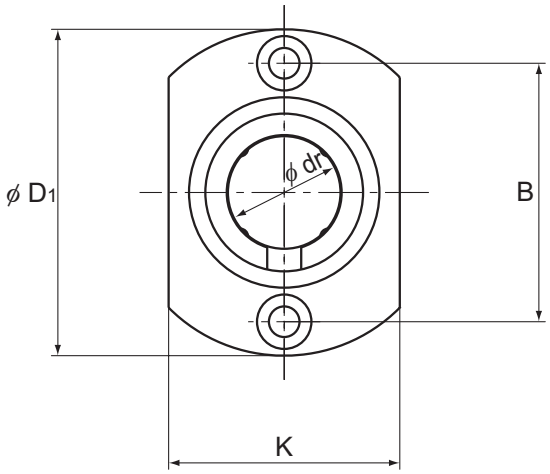


Model LMIH-L

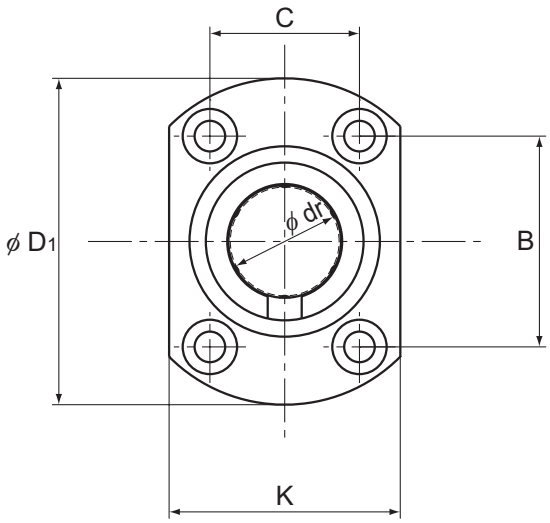
Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMIH 6L	4	6	0 –0.010	12	0 –0.013	35	±0.3	28	0 –0.2
LMIH 8L		8		15		45		32	
LMIH 10L		10		19	0 –0.016	55		39	
LMIH 12L		12		21		57		42	
LMIH 13L		13		23		61		43	
LMIH 16L	5	16		28		70		48	
LMIH 20L		20	0 –0.012	32	0 –0.019	80		54	
LMIH 25L	6	25		40		112		62	

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) LMIH16L UU
Seal attached on both ends of the nut



Models LMIH 6L to 13L



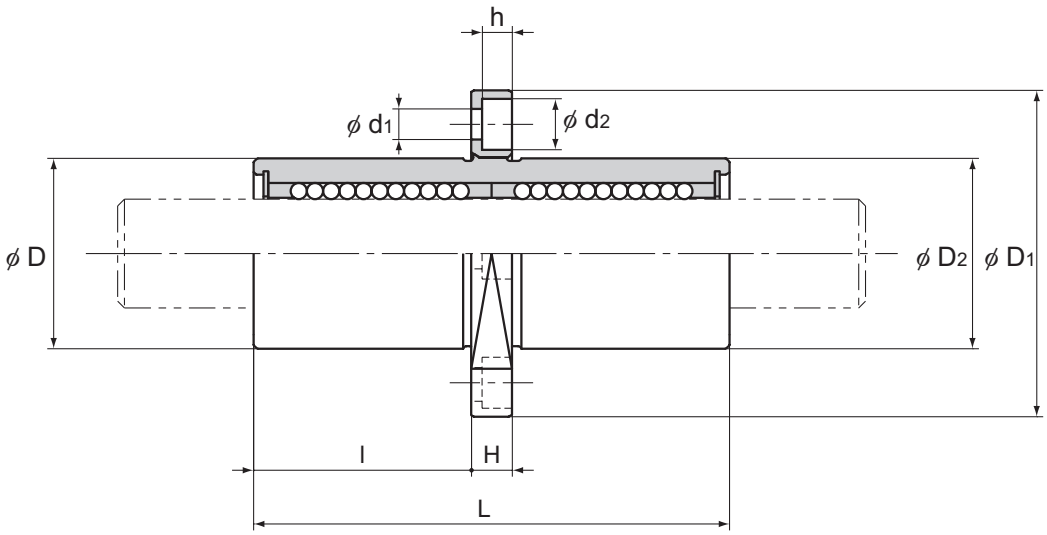
Models LMIH 16L to 25L

Unit: mm

									Flange	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	Length							Mounting hole	perpendicularity			C	C_0	
	l	Tolerance	D_2	H	K	B	C	$d_1 \times d_2 \times h$	μm	μm	μm	N	N	g
	5	±0.2	12	5	18	20	—	3.4×6×3.3	12	12	–5	324	529	26
			15		21	24	—		12		–5	431	784	41
	6		19	6	25	29	—	4.5×7.5×4.4	12		–5	588	1100	73
			21		27	32	—		12		–5	657	1200	83
			23		29	33	—		12		–7	814	1570	106
			28		34	31	22		12		–7	1230	2350	180
	8		32	8	38	36	24	5.5×9×5.4	15	15	–9	1400	2750	219
			40		46	40	32		15		–9	1560	3140	470

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model LMCH-L

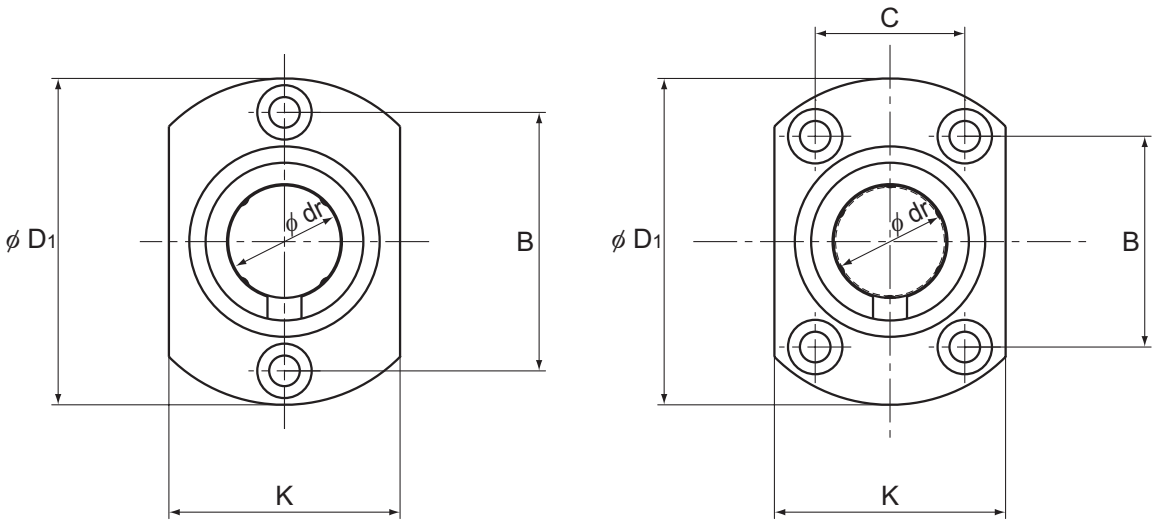


Model LMCH-L

Model No.	Ball rows	Main dimensions							
		Inscribed bore diameter		Outer diameter		Overall length		Flange diameter	
		dr	Tolerance	D	Tolerance	L	Tolerance	D_1	Tolerance
LMCH 6L	4	6	0 –0.010	12	0 –0.013	35	±0.3	28	0 –0.2
LMCH 8L		8		15		45		32	
LMCH 10L		10		19	0 –0.016	55		39	
LMCH 12L		12		21		57		42	
LMCH 13L		13		23		61		43	
LMCH 16L	5	16		28		70		48	
LMCH 20L		20	0 –0.012	32	0 –0.019	80		54	
LMCH 25L	6	25		40		112		62	

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) LMCH16L UU
Seal attached on both ends of the nut



Models LMCH 6L to 13L

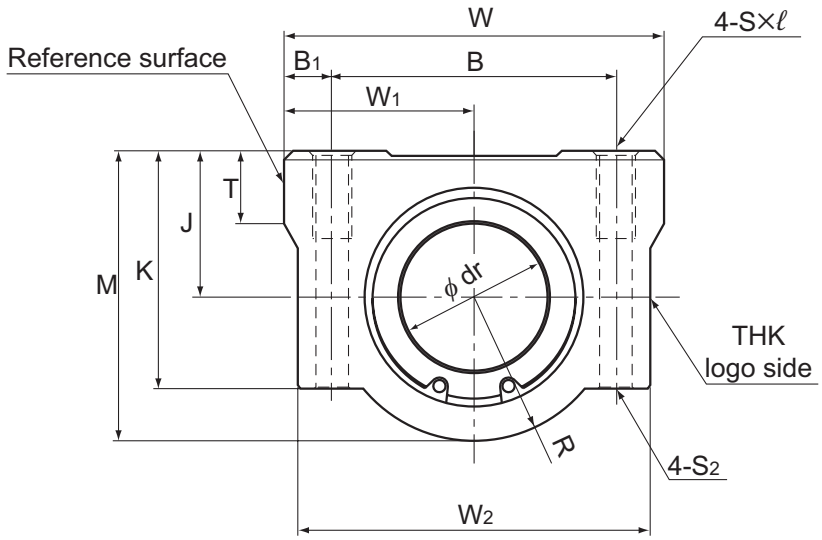
Models LMCH 16L to 25L

Unit: mm

									Flange perpendicularity	Eccentricity (max)	Radial clearance tolerance	Basic Load Rating		Mass
	Length							Mounting hole				C	C_0	
	l	Tolerance	D_2	H	K	B	C	$d_1 \times d_2 \times h$	μm	μm	μm	N	N	g
	15	±0.2	12	5	18	20	—	3.4×6×3.3	12	12	–5	324	529	26
	20		15		21	24	—		12		–5	431	784	41
	24.5		19	6	25	29	—	4.5×7.5×4.4	12		–5	588	1100	73
	25.5		21		27	32	—		12		–5	657	1200	83
	27.5		23		29	33	—		12		–7	814	1570	106
	32		28		34	31	22		12		–7	1230	2350	180
	36		32	8	38	36	24	5.5×9×5.4	15	15	–9	1400	2750	219
	52		40		46	40	32		15		–9	1560	3140	470

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Models SC6 to 30



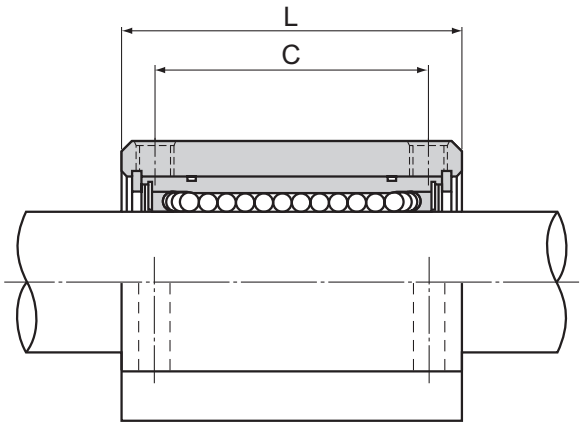
Models SC6 to 30

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

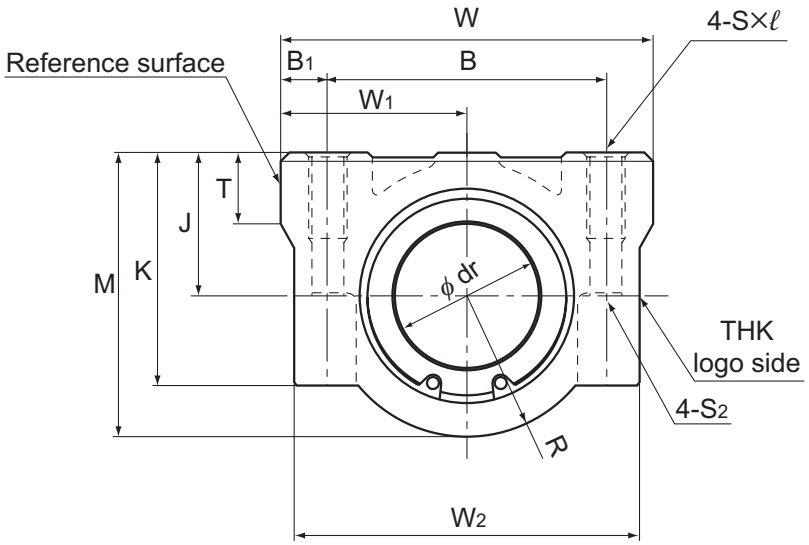


Unit: mm

							Model No. of Linear Bushing to be combined	Basic load rating		Unit
					Inscribed bore diameter			C	C_0	Mass
	K	W_2	T	R	dr	Tolerance		N	N	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

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Models SC35 to 50



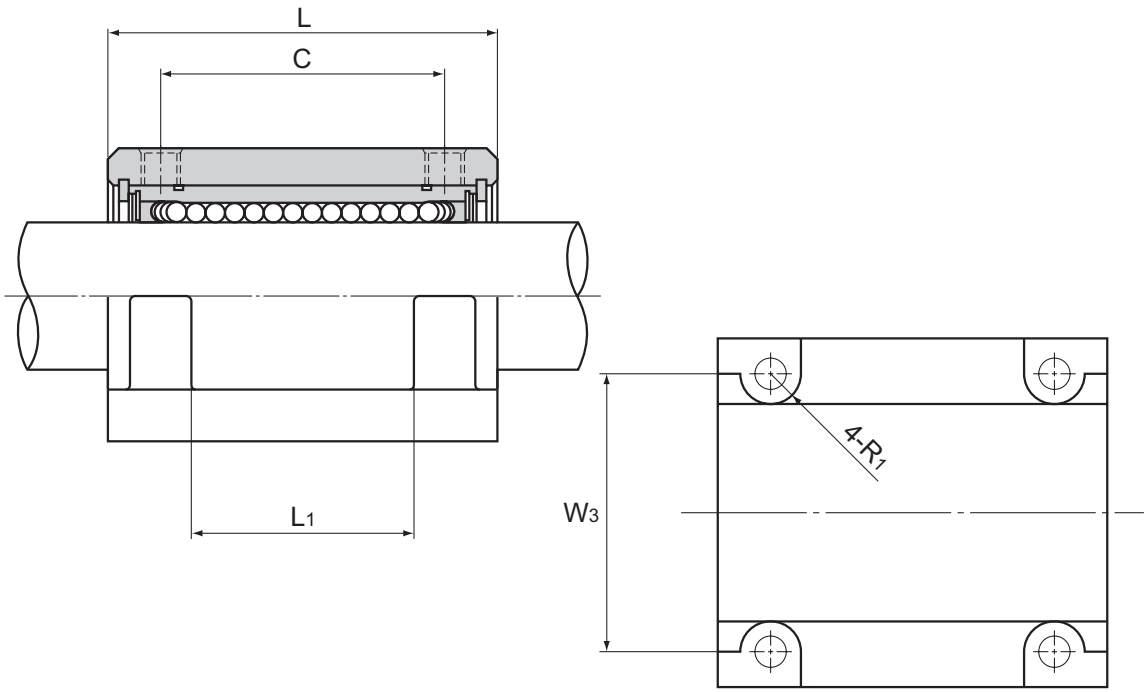
Models SC35 to 50

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



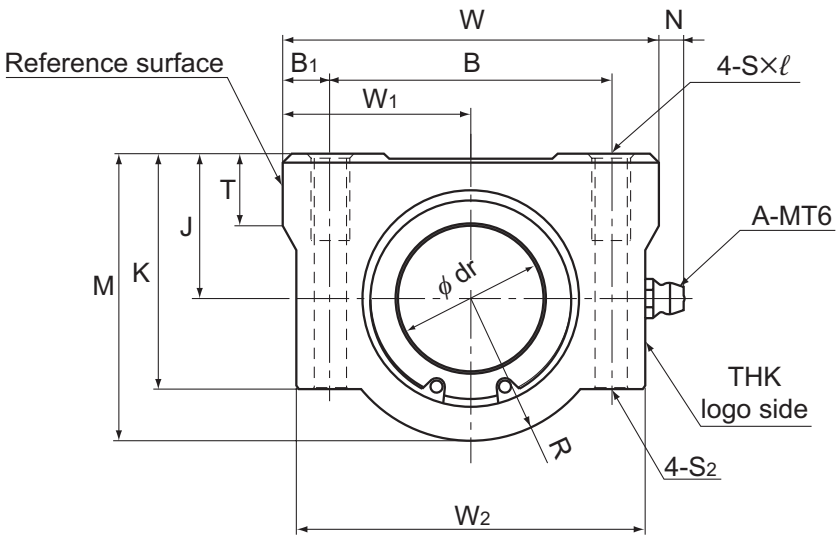
Bottom surface of models SC35 to 50

Unit: mm

									Model No. of Linear Bushing to be combined	Basic load rating		Unit
						Inscribed bore diameter				C	C_0	Mass
	W_2	W_3	L_1	T	R	R_1	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

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model SL



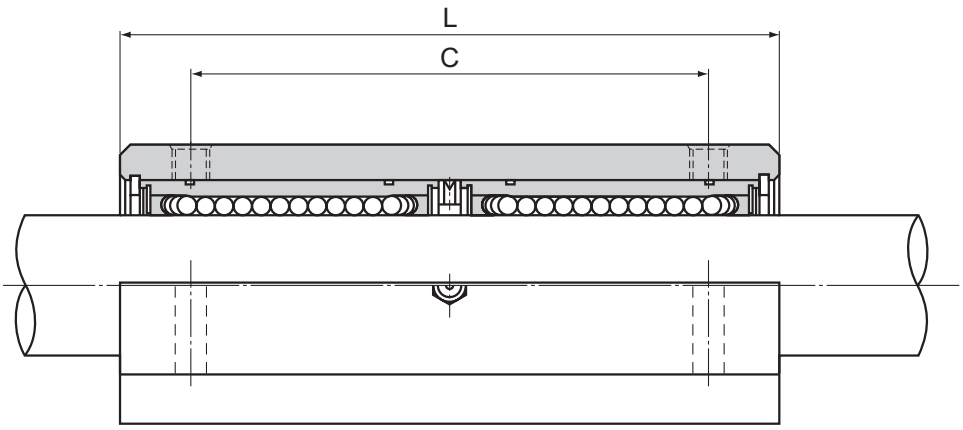
Model SL

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

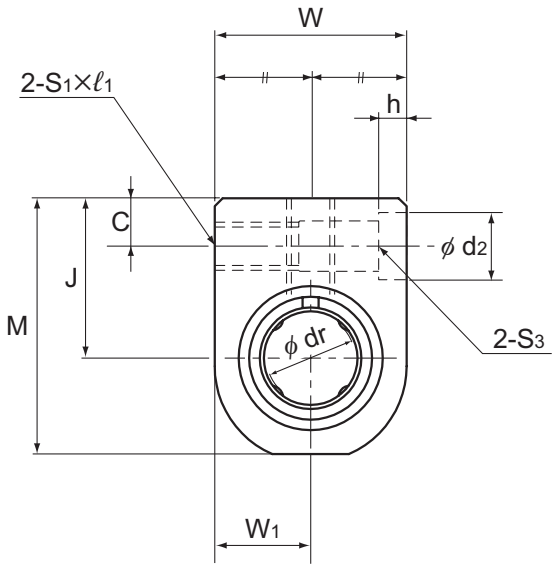
Linear Bushing to be combined	Examle of model No.	
Both end attached with seal	SL 13UU	Standard stock
Without seal	SL 13	Build to order
Made of stainless steel; both end attached with seal	SL 13MUU	Build to order



Unit: mm

								Model No. of Linear Bushing to be combined	Basic load rating		Unit
					Inscribed bore diameter				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

Model SH



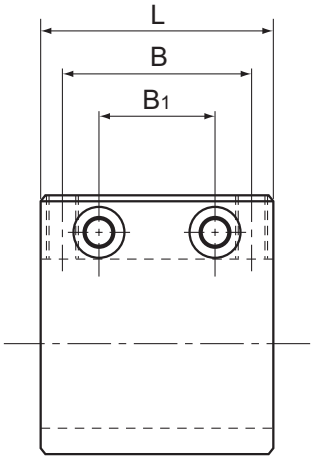
Model SH

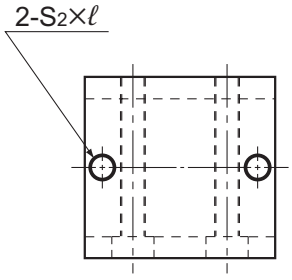
Model No.	Outer dimensions			LM casing dimensiones					
	Height	Width	Length	Mounting hole position			Tap		Through bolt
	M	W	L	B	B_1	C	$S_1 \times \ell_1$	$S_2 \times \ell$	model No,S_3
SH 3UU	14	10	13	—	8	3	M3×6	M3×5.5	M2
SH 4UU	16	12	15	—	10	3	M3×6	M3×6	M2
SH 5UU	18	14	17	—	12	3	M3×6	M3×6	M2
SH 6UU	22	16	24	18	9	5	M4×8	M4×8	M3
SH 8UU	26	20	27	20	10	5	M4×8	M5×8.5	M3
SH 10UU	32	26	35	27	15	6	M5×10	M6×9.5	M4
SH 12UU	34	28	35	27	15	6	M5×10	M6×9.5	M4
SH 13UU	36	30	36	28	16	6	M5×10	M6×9.5	M4
SH 16UU	42	36	40	32	18	6	M5×10	M6×10	M4
SH 20UU	49	42	44	36	22	7	M6×12	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.

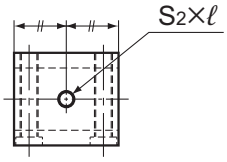
Example of Model Number for Use in Combination with Linear Bushing Units

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



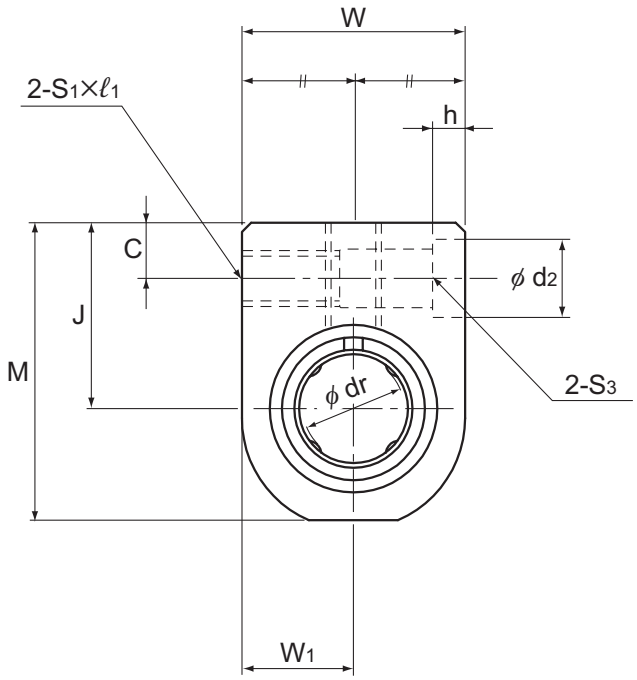
Top surface of models SH3 to SH5

Unit: mm

	Center height J ±0.02	W_1 ±0.02	d_2	h	Inscribed bore diameter dr	Inscribed bore diameter Tolerance	Model No. of Linear Bushing to be combined	Basic load rating C N	Basic load rating C_0 N	Unit Mass 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
	16	10	6.5	3.3	8		LM8UU	265	402	34
	19	13	8	4.4	10		LM10UU	373	549	67
	20	14	8	4.4	12		LM12UU	412	598	74
	21	15	8	4.4	13		LM13UU	510	775	91
	24	18	8	4.4	16		LM16UU	775	1180	157
	28	21	9.5	5.4	20	0 –0.010	LM20UU	863	1370	206

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Model SH-L



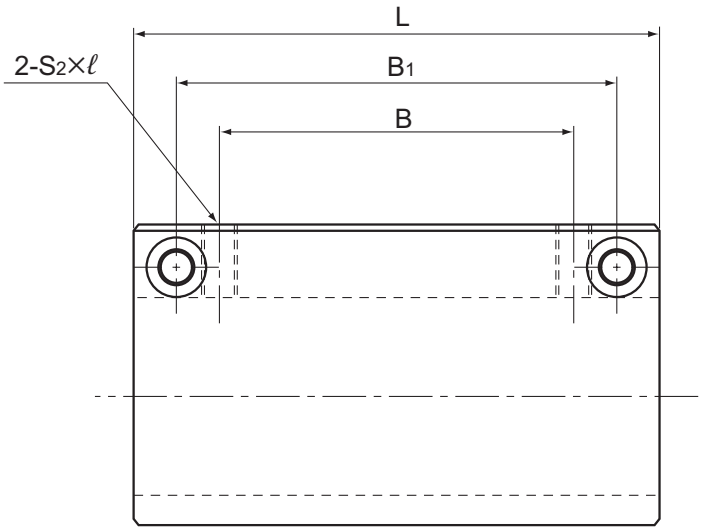
Model SH-L

Model No.	Outer dimensions			LM casing dimensiones					
	Height	Width	Length	Mounting hole position			Tap		Through bolt
	M	W	L	B	B_1	C	$S_1 \times \ell_1$	$S_2 \times \ell$	model No,S_3
SH 3LUU	14	10	23	10	18	3	M3×6	M3×5.5	M2
SH 4LUU	16	12	27	14	22	3	M3×6	M3×6	M2
SH 5LUU	18	14	32	18	26	3	M3×6	M3×6	M2
SH 6LUU	22	16	40	20	30	5	M4×8	M4×8	M3
SH 8LUU	26	20	52	30	42	5	M4×8	M5×8.5	M3
SH 10LUU	32	26	60	36	50	6	M5×10	M6×9.5	M4
SH 12LUU	34	28	62	36	50	6	M5×10	M6×9.5	M4
SH 13LUU	36	30	66	40	54	6	M5×10	M6×9.5	M4
SH 16LUU	42	36	76	52	66	6	M5×10	M6×10	M4
SH 20LUU	49	42	86	58	72	7	M6×12	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

Center height J ±0.02	W1 ±0.02	d2	h	Inscribed bore diameter dr	Inscribed bore diameter Tolerance	Model No. of Linear Bushing to be combined	Basic load rating C N	Basic load rating C0 N	Unit Mass g
9	5	4.2	1.5	3	0 –0.008	LM3U	139	216	8.6
10	6	4.2	1.5	4		LM4U	139	254	14
11	7	4.2	1.5	5		LM5U	263	412	22
14	8	6.5	3.3	6	0 –0.009	LM6U	324	529	37
16	10	6.5	3.3	8		LM8U	431	784	68
19	13	8	4.4	10		LM10U	588	1100	125
20	14	8	4.4	12		LM12U	657	1200	140
21	15	8	4.4	13		LM13U	814	1570	176
24	18	8	4.4	16		LM16U	1230	2350	309
28	21	9.5	5.4	20	0 –0.010	LM20U	1400	2750	413

Note) If an oil hole is required, this can be indicated by appending “OH” to the end of the model number.
For further information, contact THK.

Standard LM Shafts

THK manufactures high quality, dedicated LM shafts for Linear Bushing model LM series.

(1) [Major materials]

- SUJ2 (high-carbon chromium bearing steel)
- THK5SP (THK standard material)
- SUS440C equivalent

[Hardness]

58 to 64 HRC

[Hardened layer depth]

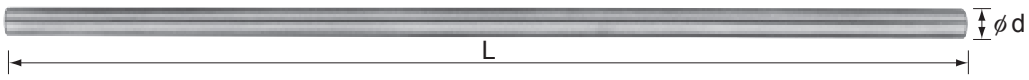
0.8 to 2.5mm(varies with shaft diameter)

[Surface roughness]

Ra0.20 to Ra0.40

[Straightness of the LM shaft]

50μm/300mm or less



Model No.	Shaft diameter		Overall LM shaft length: L mm														Linear Bushing Inscribed bore diameter
	d	Tolerance g6μm	100	200	300	400	500	600	700	800	1000	1200	1300	1500	2000	3000	
SF 3	3	−2 −8	◎	◎													3
SF 4	4	−4 −12	◎	◎													4
SF 5	5		◎	◎	◎												5
SF 6	6		◎	◎	◎	◎											6
SF 8	8	−5 −14	◎	◎	◎	◎	◎										8
SF 10	10		◎	◎	◎	◎	◎	◎	◎	◎							10
SF 12	12	−6 −17		◎	◎	◎	◎	◎		◎	◎						12
SF 13	13		◎	◎	◎	◎	◎	◎	◎	◎	◎						13
SF 16	16		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎		◎			16
SF 20	20	−7 −20		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎			20
SF 25	25			◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎			25
SF 30	30				◎	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎		30
SF 35	35	−9 −25					◎	◎		◎	◎	◎		◎	◎		35
SF 38	38							○			○	○			○		38
SF 40	40						◎	◎	◎	◎	◎	◎	◎	◎	◎	○	40
SF 50	50						◎	◎		◎	◎	◎	◎	◎	◎	○	50
SF 60	60	−10 −29									○	○			○	○	60
SF 80	80										○	○			○	○	80
SF 100	100	−12 −34									○	○			○	○	100

Note) ◎ indicates standard stock; ○ indicates semi-standard stock.

(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.

[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.

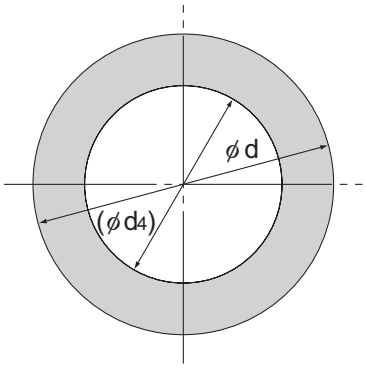


Table1 Dimensions of Hollow LM Shafts Unit: mm

Supported model numbers	LM shaft outer diameter d	Inner diameter (ϕd4)	Mass (kg/m)	
			Solid shaft	Hollow shaft
SF 8	8	3	0.4	0.34
SF 10	10	4	0.62	0.52
SF 12	12	6	0.89	0.67
SF 13	13	7	1.05	0.75
SF 16	16	9	1.59	1.09
SF 20	20	10	2.47	1.86
SF 20	20	14	2.47	1.26
SF 25	25	15	3.86	2.47
SF 30	30	16	5.56	3.98
SF 35	35	20	7.57	5.1
∗ SF 38	38	22	8.92	5.93
SF 40	40	22	9.88	6.89
SF 50	50	25	15.5	11.6
SF 60	60	32	22.3	16.0
∗ SF 80	80	52.5	39.6	22.5
∗ SF 100	100	67.5	61.8	33.7

Models marked with "∗" are build-to-order items.

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.

Specially Machined Types

THK also supports special machining processes such as tapping, milling, threading, through hole and end journals, as shown in the Fig.1, at your request.

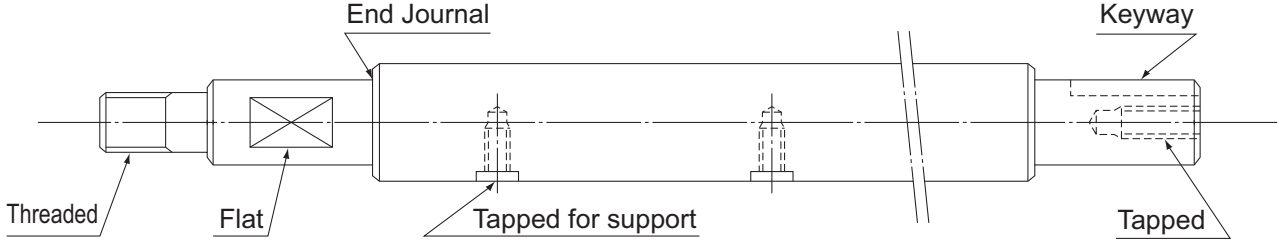


Fig.1

Dedicated Shafts

The dedicated 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.
See the following specifications for the material and heat treatment when manufacturing a dedicated shaft, because the surface roughness of the shaft significantly influences the service life.

[Material]

Generally, the following materials are used for surface hardening through induction-hardening.

- SUJ2(ISO B1: high-carbon chromium bearing steel)
- SK3 to 6(ISO C105U: carbon tool steel)
- S55C(ISO C55: carbon steel for machine structural use)

For special applications, martensite stainless steel SUS440C, which is corrosion resistant, may also be used.

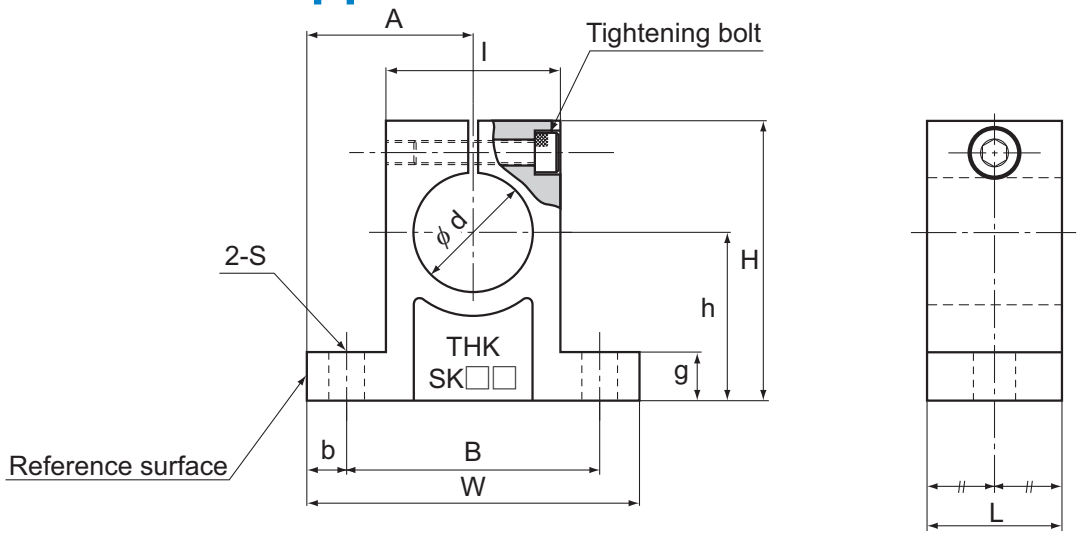
[Hardness]

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 Ra 0.40 or less.

LM Shaft End Support 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

Table of Rows of Balls and Masses for Clearance-adjustable Typesand 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	7.5	—	—	—
8	LM 8S-AJ	4	9	—	—	—
	LM 8-AJ	4	13	—	—	—
10	LM 10-AJ	4	24.5	—	—	—
12	LM 12-AJ	4	27	—	—	—
13	LM 13-AJ	4	37.5	LM 13-OP	3	30
16	LM 16-AJ	5(4)	76	LM 16-OP	4(3)	60
20	LM 20-AJ	5	83	LM 20-OP	4	70
25	LM 25-AJ	6(5)	200	LM 25-OP	5(4)	180
30	LM 30-AJ	6	216	LM 30-OP	5	185
35	LM 35-AJ	6	352	LM 35-OP	5	303
38	LM 38-AJ	6	475	LM 38-OP	5	400
40	LM 40-AJ	6	548	LM 40-OP	5	471
50	LM 50-AJ	6	1401	LM 50-OP	5	1225
60	LM 60-AJ	6	1715	LM 60-OP	5	1465
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.

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.

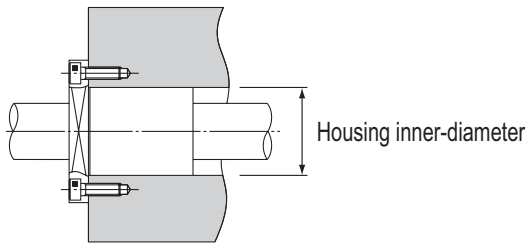


Table1 Housing Inner-diameter Tolerance

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
LM-L	High accuracy grade (no symbol)	H7	J7
LMF			
LMF-L			
LMIF			
LMIF-L			
LMCF-L			
LMK			
LMK-L			
LMIK			
LMIK-L			
LMCK-L			
LMJK			
LMJK-L			
LMH			
LMH-L			
LMIH			
LMIH-L			
LMCH-L			

[Clearance between the Nut and the LM Shaft]

It is recommended to 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, do not 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).

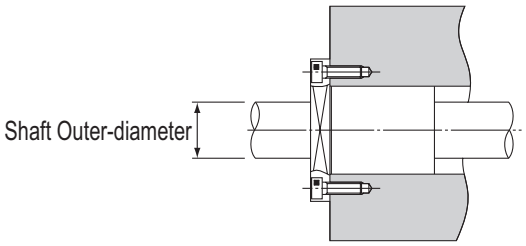


Table2 Shaft Outer-diameter Tolerance

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
LM-L	High accuracy grade (no symbol)	f6, g6	h6
LMF			
LMF-L			
LMIF			
LMIF-L			
LMCF-L			
LMK			
LMK-L			
LMIK			
LMIK-L			
LMCK-L			
LMJK			
LMJK-L			
LMH			
LMH-L			
LMIH			
LMIH-L			
LMCH-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 **page97**.

● 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.

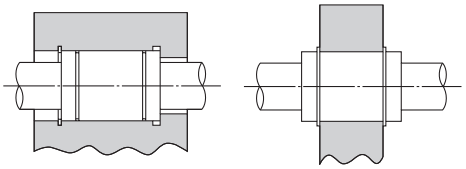


Fig.1 Snap Ring

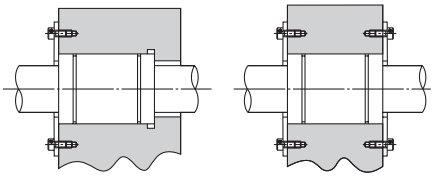


Fig.2 Stopper Plate

■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 80GA	—	120	120	120
LM 100GA	—	(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.

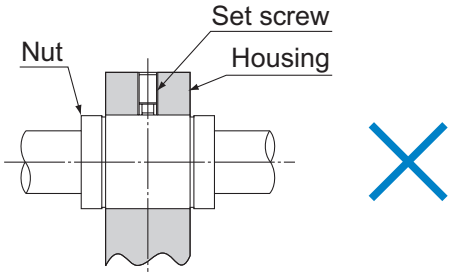


Fig.3

■ 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.4.)

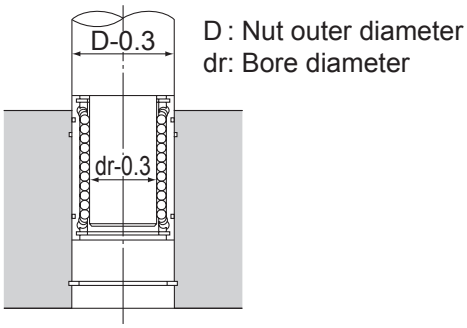


Fig.4

● 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.5.)

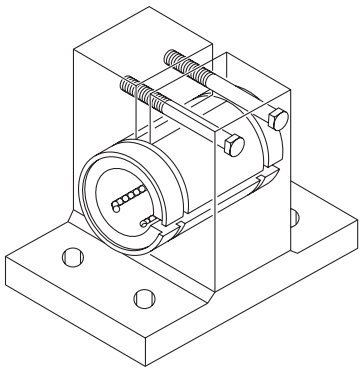


Fig.5

● 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.6.

Open types are normally used with a light preload. Be sure not to give an excessive preload.

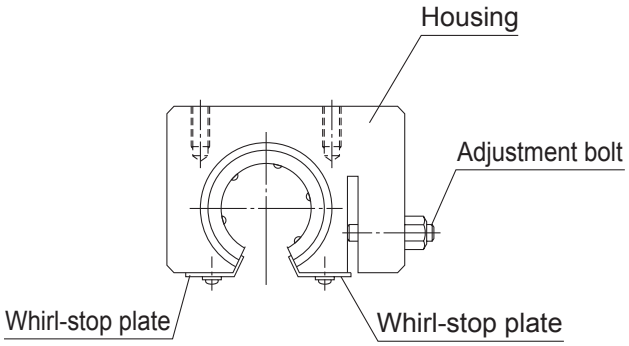


Fig.6

■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.7.

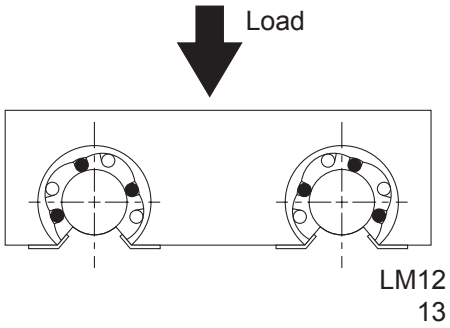
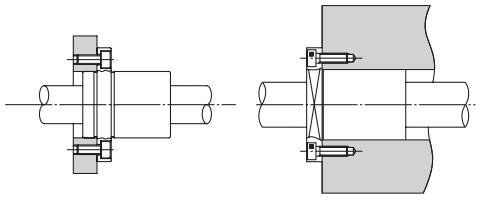


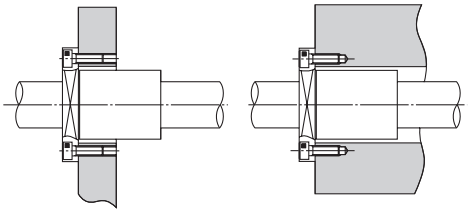
Fig.7

● Installing a Flanged Type

With the models of flanged types (circular, square, and cut flange), the nut is integrated with a flange. Therefore, the Linear Bushing can be mounted only via the flange.

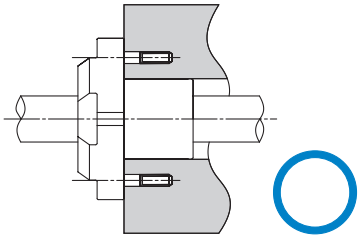


Mounted via socket and spigot joint

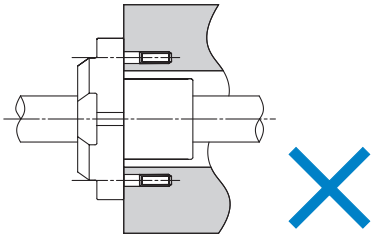


Mounted via a flange only

However, model LMJK is installed in the spigot of the nut. Do not install the flange alone.



Mounted via socket and spigot joint



Mounted via a flange only

[Installing an LM Case Unit]

● Attaching Model SC (SL)

Models SC and SL can be attached from the top or bottom using bolts (See Fig.8.)

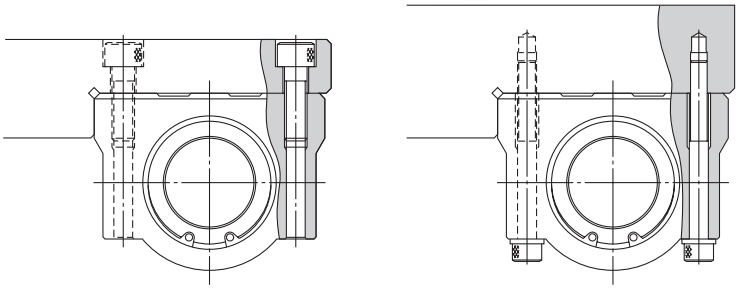
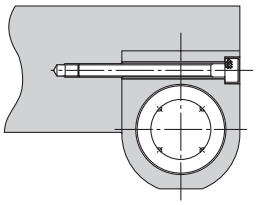


Fig.8

● Attaching Model SH (SH-L)

Models SH and SH-L can be attached from the top or bottom and right or left using bolts (See Fig.9.)

Basic installation



Alternative installation

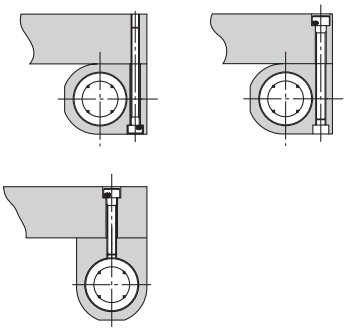


Fig.9

[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, contamination by foreign material, damage to internal components or balls may fall out. (See Fig.10.)

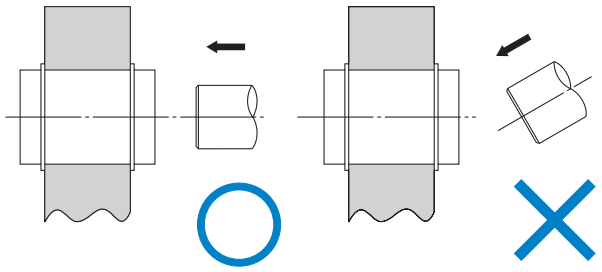


Fig.10

[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 to prevent the Linear Bushing from coming off. Be sure to use the snap ring or stopper plate as shown in Fig.11.

Also make sure to impregnate the felt with sufficient lubricant before attaching it.

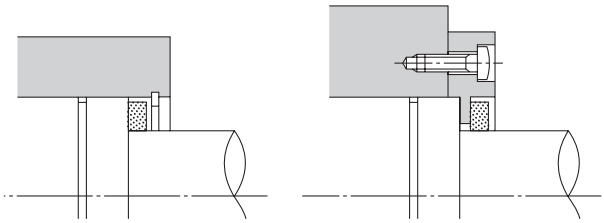
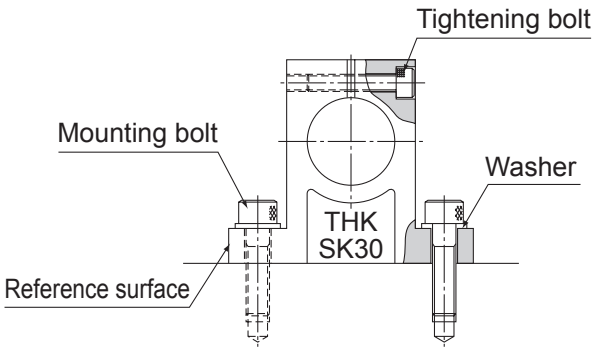


Fig.11

[Mounting the Shaft End Support]

With LM Shaft End model SK, the LM shaft can be fixed with tightening bolts.



[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 **page19**.)

[Rotational Use Not Allowed]

The Linear Bushing is not suitable for rotational use for a structural reason. (See Fig.12.)

Forcibly rotating it may cause an unexpected accident.

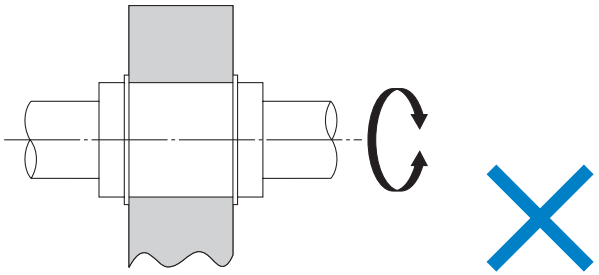


Fig.12

Lubrication

The Linear Bushing requires grease or oil as a lubricant for its operation.

[Grease Lubrication]

Before mounting the product onto the LM shaft, apply grease to each row of balls inside the Guide Ball Bushing.
Thereafter apply grease as necessary, in accordance with usage and other conditions noted above, or attach housing as shown in Fig.1, or apply grease directly to the LM shaft.
We recommend using high-quality lithium-soap group grease No. 2.

[Oil Lubrication]

To lubricate, apply lubricant to the LG shaft one drop at a time, as needed, or attach housing as shown in Fig.1 , in the same manner as when lubricating with grease.
Commonly used lubricants include turbine oil, machine oil, and spindle oil.

In addition to the procedures described the above, an oil hole or grease nipple can also be used for lubrication. For further information, contact THK.

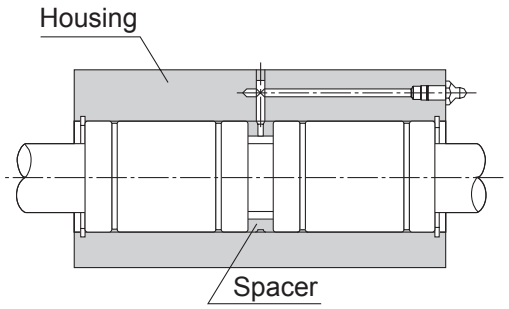


Fig.1

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.

Dust prevention

Entrance of dust or other foreign material into the Linear Bushing will cause abnormal wear or shorten the service life. When entrance of dust or other foreign material is a possibility, it is important to select effective seals and/or a dust-control device that meets the service 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]

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. (See Table1.)

[Dimensions of the Felt Seal]

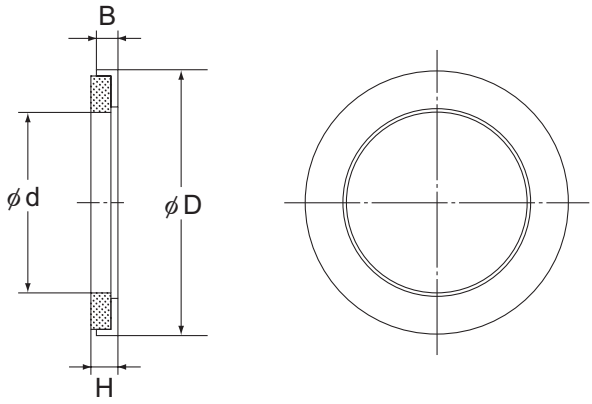


Table1 Major Dimensions of FLM

Unit: mm

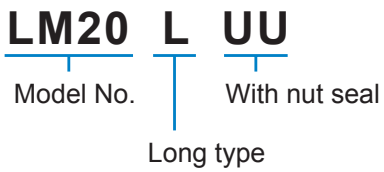
Model No.	Main dimensions				Supoprted linear bushing model
	d	D	B	H	
FLM 6	6	12	2	2	LM 6
FLM 8	8	15	2	2	LM 8
FLM 10	10	19	3	3	LM 10
FLM 12	12	21	3	3	LM 12
FLM 13	13	23	3	3	LM 13
FLM 16	16	28	4	5	LM 16
FLM 20	20	32	4	5	LM 20
FLM 25	25	40	5	6	LM 25
FLM 30	30	45	5	6	LM 30
FLM 35	35	52	5	6	LM 35
FLM 38	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

Model Number Coding

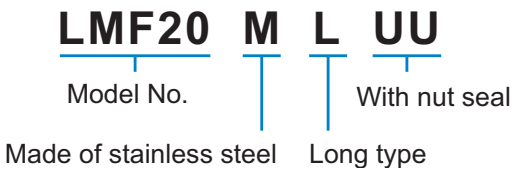
Model number configurations differ depending on the model features. Refer to the corresponding sample model number configuration.

[Linear Bushing]

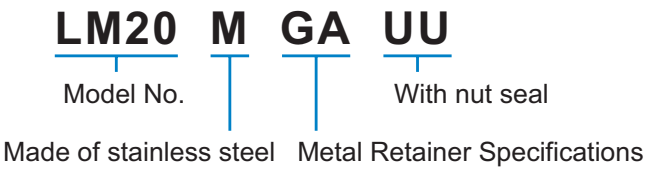
● **Plastic resin cages standard type**
models LM, LME, LM-L, LMF, LMF-L, LMIF, LMIF-L, LMCF-L, LMK, LMK-L, LMIK, LMIK-L, LMCK-L, LMJK, LMJK-L, LMH, LMH-L, LMIH, LMIH-L, LMCH-L, SC, SL, SH, SH-L



● **Plastic resin cages Stainless steel type**
models LM-M, LM-MG, LMF-M, LMF-ML, LMK-M, LMK-ML, LMH-M, LMH-ML



● **Metal cage type**
models LM-GA, LM-MGA, LME-GA



■Notes on Ordering

For high temperature applications, a double-ended nut seal (symbol: UU) can be fitted to linear bushes for metal cages. However, cages without seals are recommended since the seal is only heat resistant to a temperature of 80°C.

[LM Shaft]

● Model SF

SF25 g6 -500L K

- SF25: Model No.
- 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.
*For information shaft diameters, permissible shaft diameter error and standard stock lengths, see **page93**.

[LM Shaft End Support]

● Model SK

SK20

Model No.

[Felt Seal]

● Model FLM

FLM 20

Model No.

[Handling]

(1) Disassembling each part may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Take care not to drop or strike the Linear Bushing. Doing so may cause injury or damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
(3) When handling the product, wear protective gloves, safety shoes, etc., as necessary to ensure safety.

[Precautions on Use]

(1) Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
(2) If the product is used in an environment where cutting chips, coolant, corrosive solvents, water, etc., may enter the product, use bellows, covers, etc., to prevent them from entering the product.
(3) Do not use the product at temperature of 80℃ or higher. Exposure to higher temperatures may cause the resin/rubber parts to deform/be damaged.
(4) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(5) Micro-strokes tend to obstruct oil film to form on the raceway in contact with the rolling element, and may lead to fretting corrosion. Take consideration using grease offering excellent fretting prevention. It is also recommended that a stroke movement corresponding to the length of the outer cylinder be made on a regular basis to make sure oil film is formed between the raceway and rolling element.
(6) Do not use undue force when fitting parts (pin, key, etc.) to the product. This may generate permanent deformation on the raceway, leading to loss of functionality.
(7) Insert the shaft straight through the opening. Inserting the shaft at an angle can introduce foreign matter, damage internal components, or cause balls to fall out.
(8) Using this product with any balls removed may result in premature damage.
(9) Please contact THK if any balls fall out; do not use the product if any balls are missing.
(10) If an attached component is insufficiently rigid or mounted incorrectly, the bearing load will be concentrated at one location and performance will decline significantly. Make sure the housing and base are sufficiently rigid, the anchoring bolts are strong enough, and the component is mounted correctly.

[Lubrication]

(1) Thoroughly wipe off anti-rust oil and feed lubricant before using the product.
(2) Do not mix different lubricants. Mixing greases using the same type of thickening agent may still cause adverse interaction between the two greases if they use different additives, etc.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, use the grease appropriate for the specification/environment.
(4) To lubricate the product, apply lubricant directly to the raceway surface and execute a few preliminary strokes to ensure that the interior is fully lubricated.
(5) The consistency of grease changes according to the temperature. Take note that the slide resistance of the Linear Bushing also changes as the consistency of grease changes.

(6) After lubrication, the slide resistance of the Linear Bushing may increase due to the agitation resistance of grease. Be sure to perform a break-in to let the grease spread fully, before operating the machine.
(7) Excess grease may scatter immediately after lubrication, so wipe off scattered grease as necessary.
(8) The properties of grease deteriorate and its lubrication performance drops over time, so grease must be checked and added properly according to the use frequency of the machine.
(9) Although the lubrication interval may vary according to use conditions and the service environment, lubrication should be performed approximately every 100 km in travel distance (three to six months). Set the final lubrication interval/amount based on the actual machine.

[Storage]

When storing the Linear Bushing, enclose it in a package designated by THK and store it in a room while avoiding high temperature, low temperature and high humidity.

[Disposal]

Dispose of the product properly as industrial waste.

Guide Ball Bushing

Features of the Guide Ball Bushing

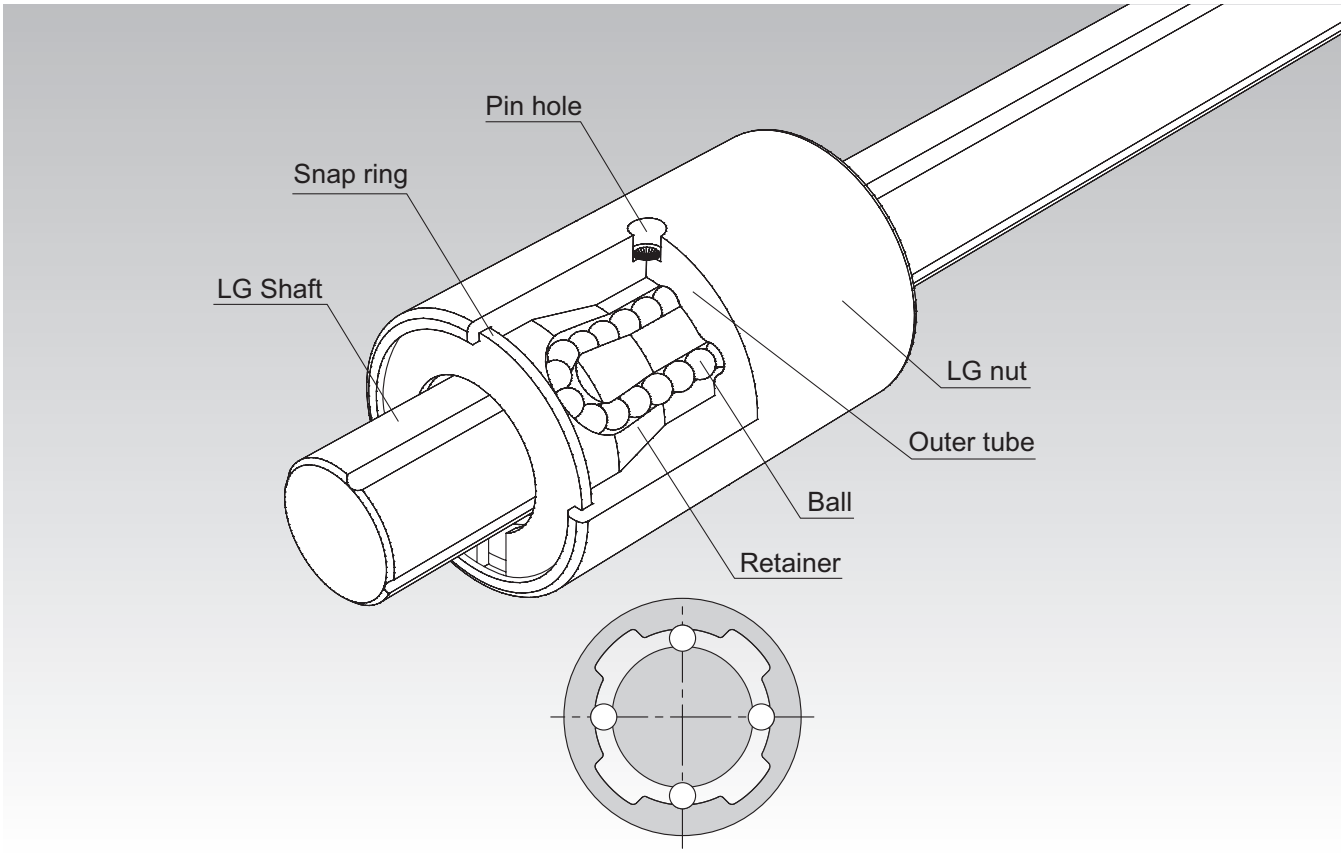


Fig.1 Structure of the Guide Ball Bushing model LG

Structure and Features

Since model LG has 4 rows of circular arc grooves (raceways), it does not need a mechanism to prevent the outer tube from rotating. In addition, its load rating is much larger than Linear Bushing model LM with the same dimensions. Therefore, replacing the Linear Bushing with the Guide Ball Bushing will reduce the size and cost of the guide unit and extend the service life.

[Higher Load Rating than the Linear Bushing]

Since model LG ensures an R contact through the use of circular arc grooves for ball contact, it achieves a load rating more than twice that of point-contact Linear Bushing model LM with the same size.

[A Rotation Stopper is Unnecessary Because of Raceways]

Since model LG has circular arc grooves, it does not need a rotation stopper required for Linear Bushing model LM, and allows the machine design to be compact.

[Interchangeable in Dimensions with Linear Bushing Model LM]

Since the LG nut of model LG has the same outer diameter and length as that of Linear Bushing model, LM, it is possible to replace Linear Bushing model LM with Guide Ball Bushing model LG as assemblies.

[Various Combinations of Nut and Shaft are Available (Any Combination is Allowed)]

As with the Linear Bushing, any combination of the LG nut and the LG shaft of model LG is allowed.

Examples of Changing the Linear Bushing to the Guide Ball Bushing

[Advantage of using the Guide Ball Bushing 1: Longer service life]

Since model LG has a rated load more than 2.4 times the Linear Bushing with the same dimensions, replacing the Linear Bushing with model LG will increase the service life by more than 13.8 times.

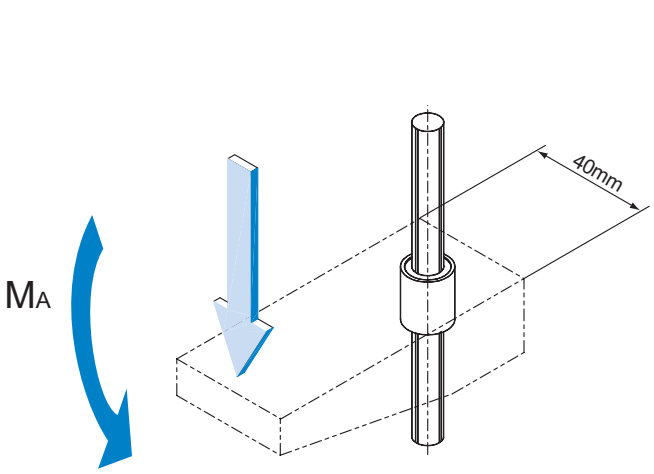
Table1 Comparison of the service life between Guide Ball Bushing mode LG and Linear Bushing model LM

Model No.	Basic dynamic load rating: C [N]	Load rating ratio	Service life ratio
LG4S	335	3.8 times	54.8 times
LM4	88.2		
LG6S	494	2.4 times	13.8 times
LM6	206		
LG8S	796	3.0 times	27.0 times
LM8	265		

[Advantage of using the Guide Ball Bushing 2: Smaller machine size]

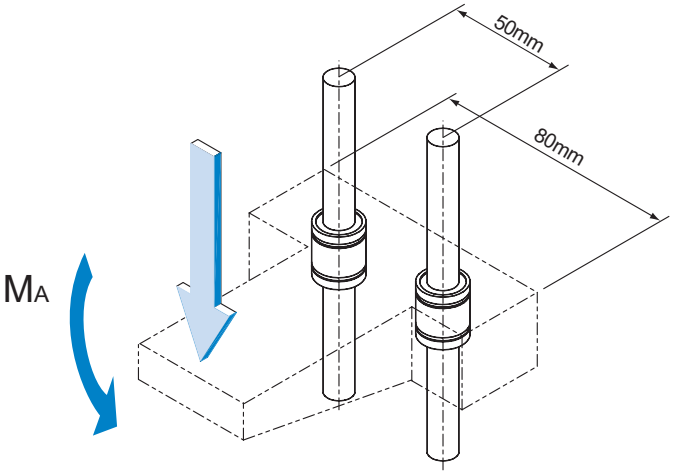
Since the Linear Bushing is not suitable for applications where a load in the rotational direction is applied, it is necessary to use two or more Linear Bushing units in parallel or have a rotation stopper mechanism even under conditions where a torque is not applied. In contrast, the Guide Ball Bushing, which has a structure containing four rows of circular arc grooves, is operable with a single shaft and therefore contributes to downsizing the machine, unless an excessive load is applied.

Achieves a load carrying capacity approximately three times the Linear Bushing in a half space



* A rotation stopper mechanism using a pin is provided

One unit of Guide Ball Bushing model LG8S is used



Two units of Linear Bushing model LM8 are used

Table2 Comparison of the permissible moment between Guide Ball Bushing mode LG and Linear Bushing model LM

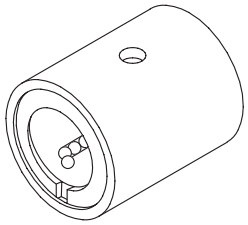
Model No.	Permissible moment: M_A [N-m]
One unit of LG8S is used	1.46
Two units of LM8 are used	0.45

Types of the Guide Ball Bushing

Types and Features

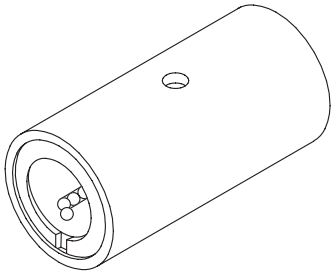
Model LG-S

In this type, the outer diameter and the length of the LG nut are the same as that of Linear Bushing model LM. It can be interchanged with model LM.



Model LG-L

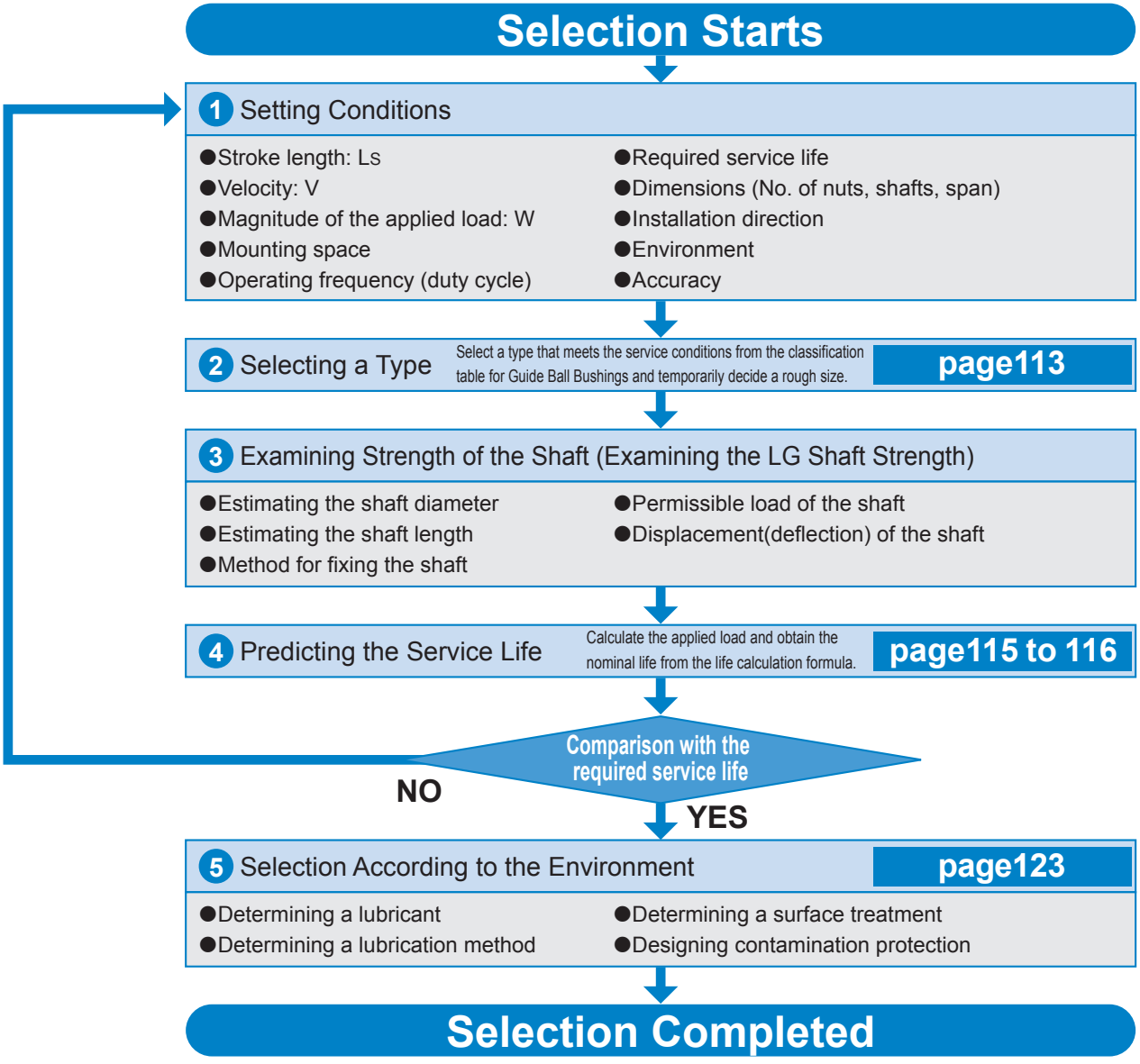
Model LG-L is a long type in which the overall length of the LG nut is longer than that of model LG-S to increase the load carrying capacity.



Flowchart for Selecting a Guide Ball Bushing

Steps for Selecting a Guide Ball Bushing

The following flowchart should be used as a guide for selecting a Guide Ball Bushing.

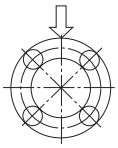


Rated Load and Nominal Life

Load Rating

The rated load of the Guide Ball 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 Guide Ball Bushing is mounted so that two rows of balls evenly receive the load in the load direction, the rated load changes as shown in Table1.

Table1 Rated load of the Guide Ball Bushing

Rows of balls	Ball position	Load Rating
4 rows		1.41×C

Note: For specific values for "C" above, see the respective specification table.

[Precautions To Be Taken if an Eccentric Load Is Applied]

Model LG achieves a much higher load-carrying capacity in receiving the eccentric load (moment and torque) than Linear Bushing model LM because of 4 rows of raceways. However, under conditions where the eccentric load is larger, the product may result in poor operation or early failure. In such cases, we recommend using Ball Spline model LBS or LT, both of which have larger load-carrying capacities.

Calculating the Nominal Life

The nominal life of the Guide Ball 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_H : Hardness factor (see Fig.1 on **page116**)
f_T : Temperature factor
f_C : Contact factor (see Table4 on **page116**)
f_W : Load factor (see Table5 on **page116**)

● 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 (with a moment applied) (N)
K : Equivalent factors (see Table2 to Table3)
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.

Table2 Equivalent Factors of Model LG-S

Model No.	Equivalent factor: K	
	Single nut	Double blocks
LG 4S	1.062	0.193
LG 6S	0.885	0.121
LG 8S	0.708	0.096

Table3 Equivalent Factors of Model LG-L

Model No.	Equivalent factor: K
	Single nut
LG 4L	0.733
LG 6L	0.465
LG 8L	0.442

■f_H: Hardness Factor

To maximize the load capacity of the Guide Ball 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 Guide Ball Bushing has sufficient hardness.

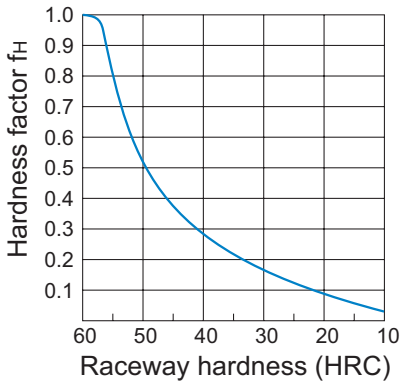


Fig.1 Hardness Factor (f_H)

■f_T:Temperature factor

The temperature of the environment where the Guide Ball Bushing is used must be 80℃ or below. Therefore, adopt a temperature factor is f_T = 1.0.

The Guide Ball Bushing does not support high temperature. Therefore, if the environment temperature exceeds 80℃, it is necessary to use another product.

■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 Table4.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in Table4.

Table4 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 Guide Ball 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 Table5.

Table5 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

[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})

Accuracy Standards

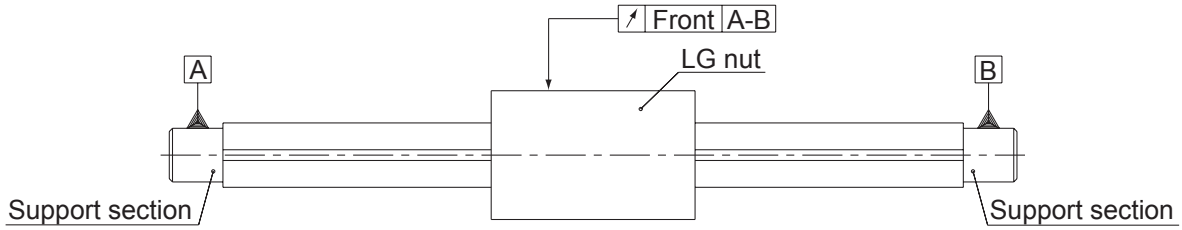


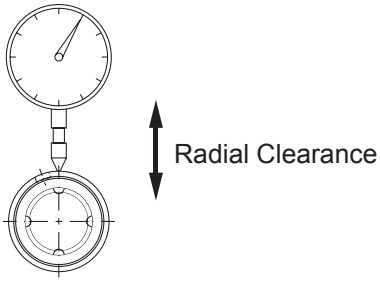
Table6 Run-out of the outer diameter of the nut relative to the support section of the shaft

Unit: μm

Overall shaft length (mm)		Run-out(max)*
–	200 or less	72
Above 200	250 or less	133

*: The value if the radial clearance is zero

[Radial Clearance]



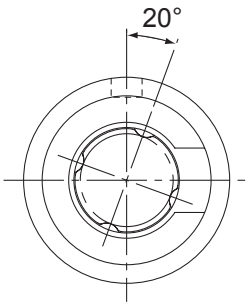
Measurement of a radial clearance

Radial Clearance

Unit: μm

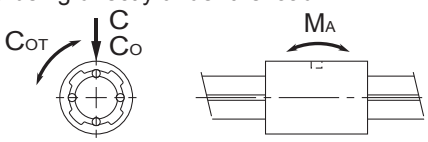
Normal clearance
0 to +10

Model LG



Model No.	Shaft Diameter D_0 h7	Nut dimensions					
		Outer diameter		Length		Pin hole	
		D	Tolerance	L	Tolerance	b +0.05 0	t +0.08 −0.02
LG4S	4	8	0 −0.009	12	0 −0.12	1.2	0.8
LG4L		8		19		1.2	0.8
LG6S	6	12	0 −0.011	19	0 −0.2	1.5	1.2
LG6L		12		27		1.5	1.2
LG8S	8	15		24		2	1.5
LG8L		15		30		2	1.5

Note) The basic load ratings each indicate the value when one row of balls receiving a load are directly under the load.
The permissible torques each represent a reference value when the radial clearance is maximum (+10μm).
The permissible moments each indicate a reference value when the radial clearance is the maximum (+10μm) with one row of balls receiving a load being directly under the load.



Model number coding

① LG shaft only

LG4 -100L

Model No.

Overall LG shaft length

② LG nut only

LG4S

Model No.

③ A set product consisting of an LG shat and an LG nut

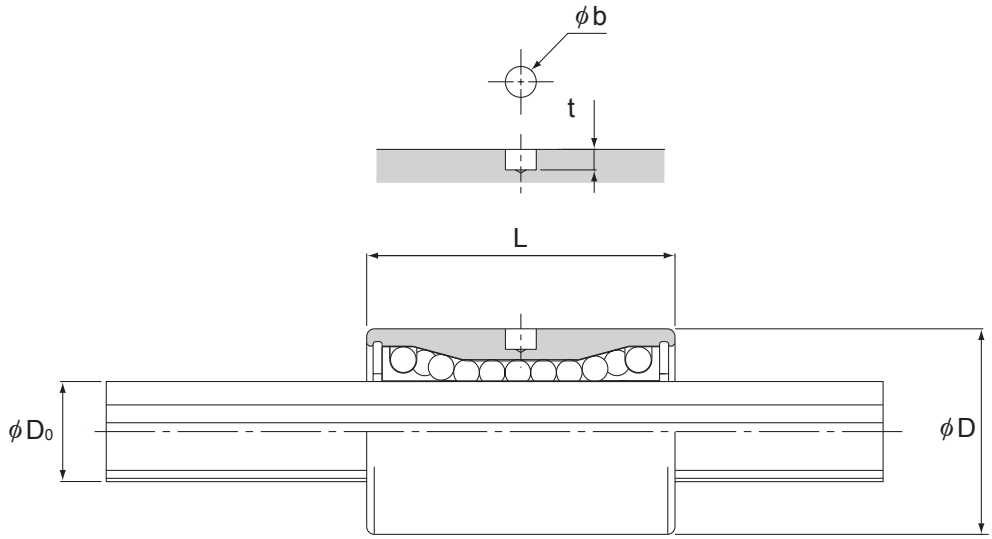
2 LG4S +100L

Number of LG nuts on one shaft (no symbol for one nut)

Model No.

Overall LG shaft length

Note) Model LG guide ball bushing available as LG shaft ①, or the LG nut ② separate.
A set consisting of an ③ LG shaft + an LG nut is also available if so desired.
A special radial clearance, designated grease application (standard type is applied only with antirust oil) and surface treatment (THK AP-C treatment, THK AP-CF treatment, THK AP-HC treatment) are also available.
Contact THK for details.

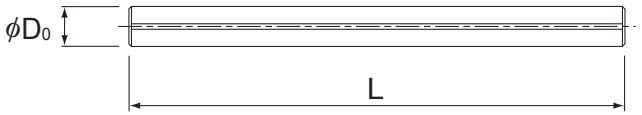


Unit: mm

	Basic load rating (radial)		Permissible torque	Permissible moment	Mass
	C N	C_0 N	C_{0T} N-m	M_A N-m	g
	335	473	0.066	0.33	2.5
	466	757	0.105	0.71	4.0
	494	681	0.241	0.74	10.5
	860	1499	0.530	1.71	14.0
	796	1065	0.838	1.46	16.5
	1203	1916	1.509	2.66	22.0

[LG Shaft]

Material: SUJ2
Hardness: 56 to 64 HRC



LG shaft dimensions

Unit: mm

Model No.	Shaft diameter D_0 h7	Standard length L				Maximum manufac-turing length	Mass (g/m)
LG4	4	100	150	—	—	150	95
LG6	6	100	150	200	—	200	220
LG8	8	100	150	200	250	250	390

Assembling the Guide Ball Bushing

[Inner Diameter of the Housing]

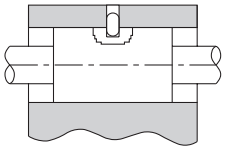
Table1 shows recommended housing inner-diameter tolerance for the Guide Ball Bushing. When fitting the Guide Ball Bushing with the housing, loose fit is normally recommended. If the clearance needs to be smaller, provide transition fit.

Table1 Housing Inner-diameter Tolerance

General conditions	H6
If the accuracy does not need to be very high	H7

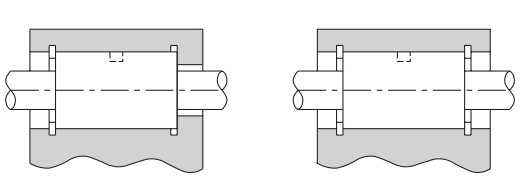
[Mounting the Nut]

● Mounting model LG using a pin

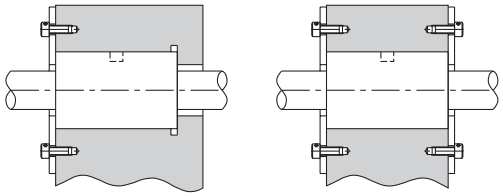


Although the Guide Ball Bushing does not require a large amount of strength for securing it in the LG shaft direction, do not support the nut only with driving fitting. For the housing inner-diameter tolerance, see Table1.

● Mounting model LG as with the standard type of Linear Bushing



Snap Ring



Stopper Plate

■Snap Ring for Installation

To secure the Guide Ball Bushing model LG, snap rings indicated in Table2 are available.

Table2 Types of Snap Rings

Model No.	Snap ring	
	For inner surface	
	Needle snap ring	C-shape snap ring
LG 4	8	—
LG 6	12	12
LG 8	15	15

■Set Screws Not Allowed

Securing the nut by pressing the outer surface with one set screw as shown in Fig.1 will cause the nut to be deformed.

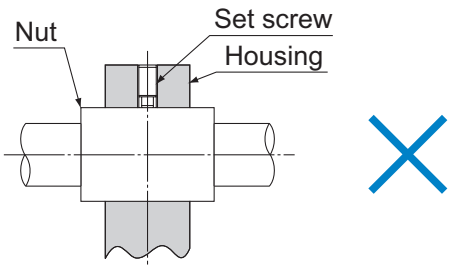


Fig.1

■Incorporating the LG Nut

When incorporating the LG nut 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.2)

Unit: mm

Model No.	dr	Tolerance
LG 4S/LG 4L	3.6	–0.1 –0.3
LG 6S/LG 6L	5.6	
LG 8S/LG 8L	7.5	

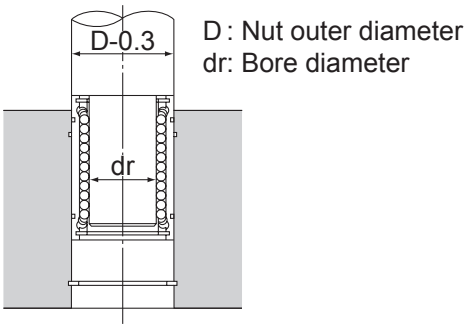


Fig.2

[Assembling the LG Nut with the LG Shaft of the Guide Ball Bushing]

(1) When assembling the LG nut with the LG shaft, align the position of the balls inside the LG nut with the position of the groove of the LG shaft, then insert the LG shaft into the LG nut straightforward and gradually. If the LG shaft is tilted when it is inserted, balls may bounce out or damage the circulating part.

(2) If the LG shaft is stuck in the middle of insertion, do not force it into the nut. Instead, but pull it out first, re-check the ball position and the LG shaft groove position, and then insert it straightforward and gradually.

(3) After assembling the LG nut with the LG shaft, check that the LG nut or the LG shaft smoothly moves. If the shaft was forced into the nut, function could be lost even if the product looks intact.

[When Under a Moment Load]

When using the Guide Ball Bushing, make sure that the load is evenly distributed on the whole ball raceway. In particular, if a moment load is applied, use two or more LG nuts on the same LG shaft and secure an adequately large distance between the units.

Also if it is used with the moment load, calculate the equivalent radial load and confirm the model.

(See **page115**.)

Lubrication

The Guide Ball Bushing requires grease or oil as a lubricant for its operation.

[Grease Lubrication]

Before mounting the product onto the LG shaft, apply grease to each row of balls inside the Guide Ball Bushing.
Thereafter apply grease as necessary, in accordance with usage and other conditions noted above, or attach housing as shown in Fig.1, or apply grease directly to the LG shaft.
We recommend using high-quality lithium-soap group grease No. 2.

[Oil Lubrication]

To lubricate, apply lubricant to the LG shaft one drop at a time, as needed, or attach housing as shown in Fig.1 , in the same manner as when lubricating with grease.
Commonly used lubricants include turbine oil, machine oil, and spindle oil.

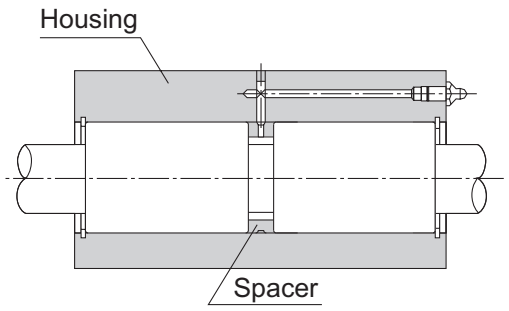


Fig.1

In addition to the procedures described the above, an oil hole or grease nipple can also be used for lubrication. For further information, contact THK.

Dust prevention

Entrance of dust or other foreign material into the Guide Ball Bushing will cause abnormal wear or shorten the service life. When entrance of dust or other foreign material is a possibility, it is important to select effective seals and/or dust-control device that meets the service environment conditions.
In addition, THK produces round bellows. Contact us for details.

Model Number Coding

Model number configurations differ depending on the model features. Refer to the corresponding sample model number configuration.

[Guide Ball Bushing]

Estimates and orders should be made for LG shafts alone or LG nuts alone in principle.
A set consisting of an LG shaft and an LH nut is also available if desired by the customer. Contact THK for details.

● Models LG-S and LG-L

- LG shaft only

LG4 -100L

Model No. of LG shaft

Overall LG shaft length (in mm)

- LG nut only

LG4S

Model No. of LG nut

- Combination of LG shaft and LG nut

2 LG4S +100L

Number of LG nuts on one shaft (no symbol for one nut)

Model No. of LG nut

Overall LG shaft length (in mm)

A special radial clearance, designated grease application (standard product is applied with antirust oil only), and surface treatment (THK AP-C treatment, THK AP-CF treatment, THK AP-HC treatment) are also available.
Contact THK for details.

[Handling]

(1) Disassembling each part may cause dust to enter the system or degrade mounting accuracy of parts. Do not disassemble the product.
(2) Take care not to drop or strike the Guide Ball Bushing. Doing so may cause injury or damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
(3) When handling the product, wear protective gloves, safety shoes, etc., as necessary to ensure safety.

[Precautions on Use]

(1) Prevent foreign material, such as cutting chips or coolant, from entering the product. Failure to do so may cause damage.
(2) If the product is used in an environment where cutting chips, coolant, corrosive solvents, water, etc., may enter the product, use bellows, covers, etc., to prevent them from entering the product.
(3) Do not use the product at temperature of 80℃ or higher. Exposure to higher temperatures may cause the resin/rubber parts to deform/be damaged.
(4) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(5) Micro-strokes tend to obstruct oil film to form on the raceway in contact with the rolling element, and may lead to fretting corrosion. Take consideration using grease offering excellent fretting prevention. It is also recommended that a stroke movement corresponding to the length of the outer cylinder be made on a regular basis to make sure oil film is formed between the raceway and rolling element.
(6) Do not use undue force when fitting parts (pin, key, etc.) to the product. This may generate permanent deformation on the raceway, leading to loss of functionality.
(7) Insert the shaft straight through the opening. Inserting the shaft at an angle can introduce foreign matter, damage internal components, or cause balls to fall out.
(8) Using this product with any balls removed may result in premature damage.
(9) Please contact THK if any balls fall out; do not use the product if any balls are missing.
(10) If an attached component is insufficiently rigid or mounted incorrectly, the bearing load will be concentrated at one location and performance will decline significantly. Make sure the housing and base are sufficiently rigid, the anchoring bolts are strong enough, and the component is mounted correctly.

[Lubrication]

(1) Thoroughly wipe off anti-rust oil and feed lubricant before using the product.
(2) Do not mix different lubricants. Mixing greases using the same type of thickening agent may still cause adverse interaction between the two greases if they use different additives, etc.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, use the grease appropriate for the specification/environment.
(4) To lubricate the product, apply lubricant directly to the raceway surface and execute a few preliminary strokes to ensure that the interior is fully lubricated.
(5) The consistency of grease changes according to the temperature. Take note that the slide resistance of the Guide Ball Bushing also changes as the consistency of grease changes.

(6) After lubrication, the slide resistance of the Guide Ball Bushing may increase due to the agitation resistance of grease. Be sure to perform a break-in to let the grease spread fully, before operating the machine.
(7) Excess grease may scatter immediately after lubrication, so wipe off scattered grease as necessary.
(8) The properties of grease deteriorate and its lubrication performance drops over time, so grease must be checked and added properly according to the use frequency of the machine.
(9) The greasing interval varies depending on the use condition and service environment. Set the final lubrication interval/amount based on the actual machine.

[Storage]

When storing the Guide Ball Bushing, enclose it in a package designated by THK and store it in a room while avoiding high temperature, low temperature and high humidity.

[Disposal]

Dispose of the product properly as industrial waste.

LM Stroke / Miniature Stroke / Die-setting Ball Cage

ST

LM Stroke Models ST, ST-B and STI

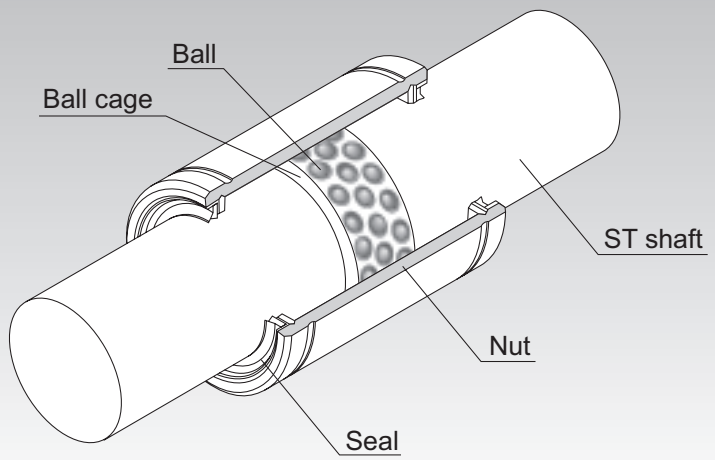


Fig.1 Structure of LM Stroke Model ST

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.

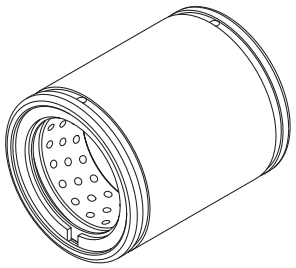
[High Accuracy at a Low Price]

A highly accurate slide unit can be produced at a low price.

Types and Features

Light Load Type Model ST

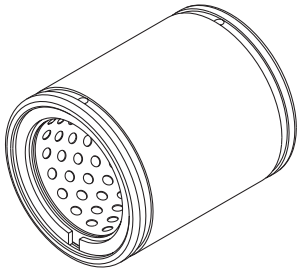
Model ST is a light load type that allows for a long stroke.
Shaft diameter:ϕ6 to ϕ100
In addition, a type attached with seal is available. Model ST-UU



Model ST

Medium Load Type Model ST-B

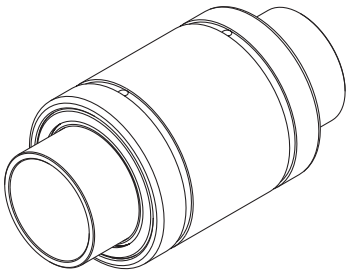
It has the same dimensions as model ST, but has a shorter stroke and achieves a rated load twice that of ST.
Shaft diameter:ϕ8 to ϕ100
In addition, a type attached with seal is available. Model ST-UUB



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 (N)
P_C : Calculated radial load (N)
f_H : Hardness factor (see Fig.2 on **page132**)
f_T : Temperature factor (see Fig.3 on **page132**)
f_C : Contact factor (see Table3 on **page132**)
f_W : Load factor (see Table4 on **page132**)

● When a Moment Load is Applied to a Single Nut

When a moment load is applied to a single nut, calculate the equivalent radial load from the moment.

$$P_u = K \cdot M$$

P_u : Equivalent radial load (with moment load) (N)
K : Equivalent factor (see Table1 to Table2)
M : Applied moment (N-mm)

P_u is assumed to be within the Basic Static Load Rating (C_o).

● When a Moment Load and a Radial Load are Simultaneously Applied

When a moment and a radial load are applied simultaneously, calculated the service life based on the sum of the radial load and the equivalent radial load.

Table1 Equivalent Factor of Model ST

Model No.	Equivalent factor: K
	Single nut
ST 6	0.726
ST 8	0.721
ST 10	0.489
ST 12	0.421
ST 16	0.408
ST 20	0.419
ST 25	0.42
ST 30	0.28
ST 35	0.285
ST 40	0.252
ST 45	0.251
ST 50	0.207
ST 55	0.206
ST 60	0.206
ST 70	0.206
ST 80	0.186
ST 90	0.185
ST 100	0.185

Table2 Equivalent Factor of Model ST-B

Model No.	Equivalent factor: K
	Single nut
ST 8B	0.444
ST 10B	0.301
ST 12B	0.259
ST 16B	0.251
ST 20B	0.258
ST 25B	0.257
ST 30B	0.171
ST 35B	0.175
ST 40B	0.154
ST 45B	0.154
ST 50B	0.127
ST 55B	0.127
ST 60B	0.127
ST 70B	0.127
ST 80B	0.114
ST 90B	0.114
ST 100B	0.114

■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.

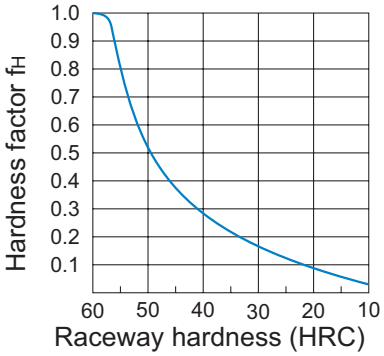


Fig.2 Hardness Factor (f_H)

■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.

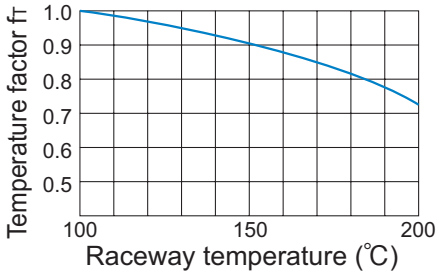


Fig.3 Temperature Factor (f_T)

■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 Table3.

Note) If uneven load distribution is expected in a large machine, take into account the respective contact factor indicated in table 3.

Table3 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 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
Medium	Medium 1<V≦2m/s	1.5 to 2
Strong	High V>2m/s	2 to 3.5

[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)	dm	: Pitch circle diameter (dm≒1.15×dr)	(mm)
n	: Revolutions per minute	(min^{-1})			
n_1	: Number of reciprocations per minute	(min^{-1})	dr	: Ball inscribed bore diameter	(mm)
ℓ_s	: Stroke length	(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 ≦5000

$\ell_s \cdot n_1$ ≦50000

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)

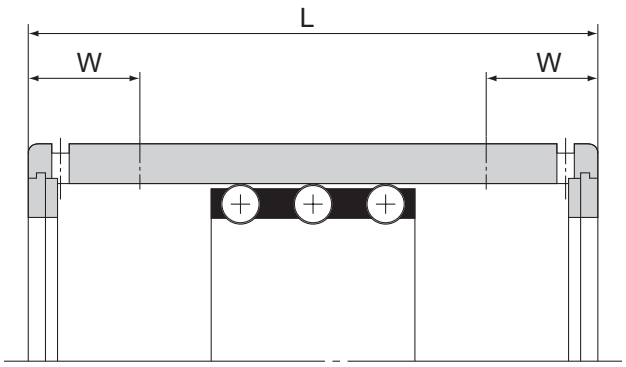


Fig.4 Measurement Range of the Nut

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 (ISO B1: high-carbon chromium bearing steel)
- SK3 to 6 (ISO C105U: carbon tool steel)
- S55C (ISO C55: carbon steel for machine structural use)

[Hardness]

We recommend surface hardness of 58HRC(≒653HV) 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.

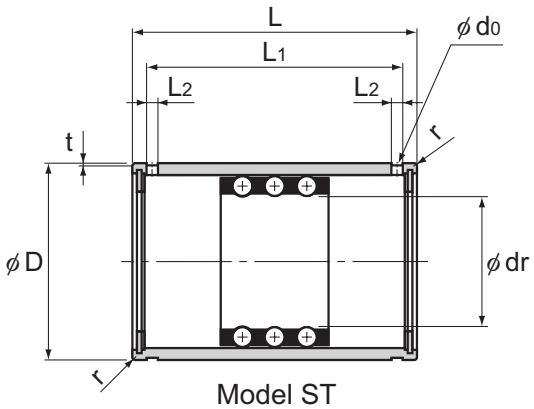
[Surface roughness]

To achieve smooth motion, the surface is normally finished to Ra 0.40 or less. If higher wear resistance is required, finish the surface to Ra 0.20 or less.

Installation of the ST Shaft

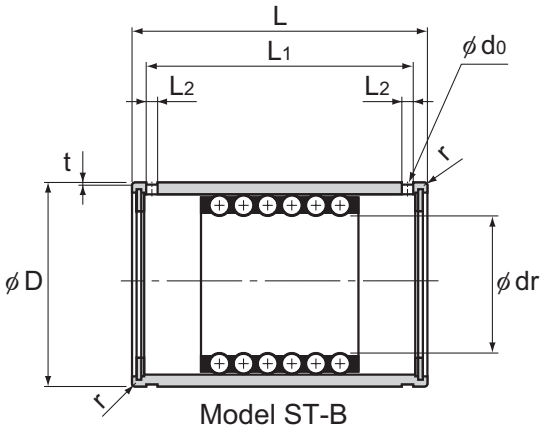
To install the ST shaft, drive it in to the designated depth. If the clearance is negative, a large driving force is required. However, do not forcibly hammer the shaft. Instead, apply a lubricant on the ST shaft first, and then gradually drive it in with a slight back action.

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 ST 8B	24 8	8	+0.022 +0.013	15	
ST 10 ST 10B	30 8	10		19	0 –0.009
ST 12 ST 12B	32 8	12	+0.027 +0.016	23	
ST 16 ST 16B	40 16	16		28	
ST 20 ST 20B	54 28	20	+0.033 +0.020	32	0 –0.011
ST 25 ST 25B	54 28	25		37	
ST 30 ST 30B	82 44	30		45	
ST 35 ST 35B	92 54	35	+0.041 +0.025	52	0 –0.013
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

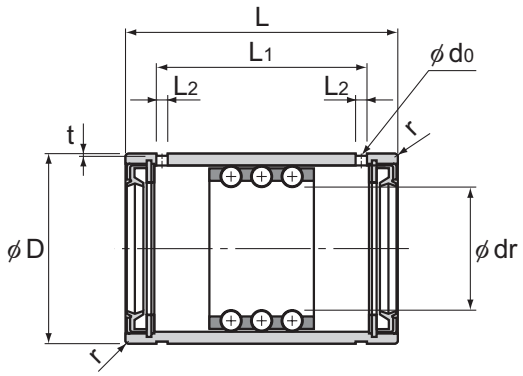


Model ST-B
(For medium load)

Unit: mm

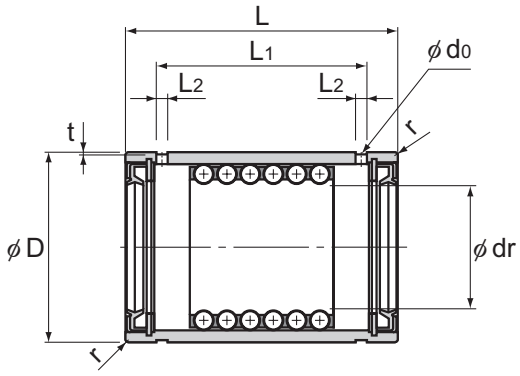
	Length		L_1	L_2	t	d_0	r	Basic dynamic load rating C kN	Basic static load rating C_0 kN	Mass g
	L	Tolerance								
	19	0 –0.2	13.5	1.1	0.25	—	0.3	0.98	0.23	8
	24		20.1	1.5	0.5	1.5	0.5	0.98 2.06	0.27 0.55	16.4 17.6
	30		25.7	1.5	0.5	1.5	0.5	2.35 4.61	0.62 1.27	31.5 34.5
	32		27.5	1.5	0.5	1.5	0.5	4.02 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
	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	
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		L_1	L_2	t	d_0	r	Basic dynamic load rating C kN	Basic static load rating C_0 kN	Mass g
	L	Tolerance								
	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
	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

MST

Miniature Stroke Model MST

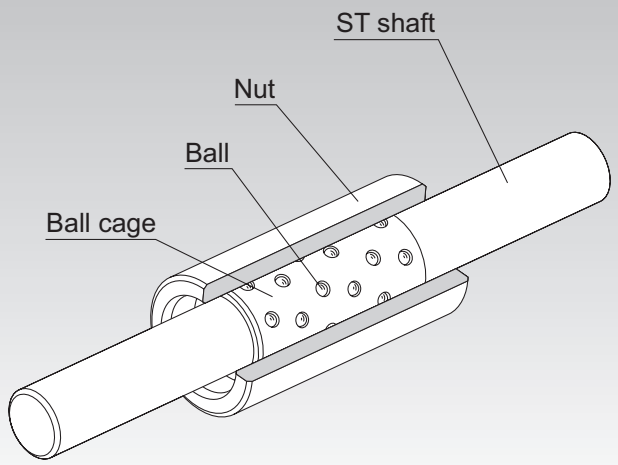


Fig.1 Structure of Miniature Stroke Model MST

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.

[High Accuracy]

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]

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 Design]

Use of a combination of balls with a 1 mm diameter and a thin nut allows a small sectional shape and space-saving design.

[Minimal Friction Coefficient]

Since the balls are in point-contact with the raceways, rolling loss is minimal and rolling motion with low-friction is achieved.

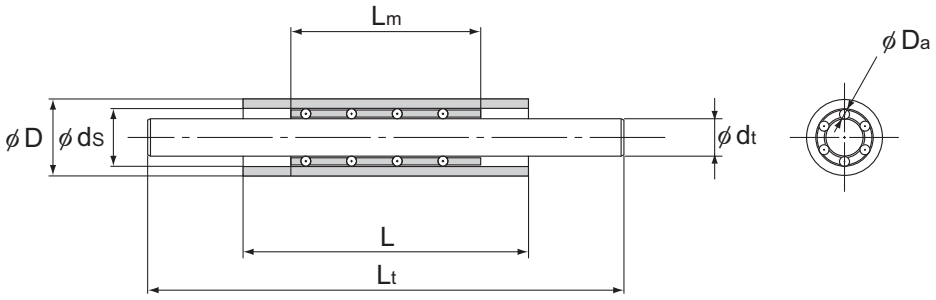
Fit

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.

Model MST



Combined model No.	Ball cage					Nut	
	Model No.	D_a	L_m (A)	Permissible load C_0 N	Mass g	Model No.	D
MST 3-A•B•C	M3510	1	10	68.6	0.7	S5710	7 $^{0}_{-0.006}$
	M3515		15	98	1.1	S5720	
	M3520		20	137	1.4	S5730	
MST 4-A•B•C	M4610	1	10	78.4	0.9	S6810	8 $^{0}_{-0.006}$
	M4615		15	118	1.4	S6820	
	M4620		20	157	1.9	S6830	
MST 5-A•B•C	M5710	1	10	98	1.1	S71010	10 $^{0}_{-0.006}$
	M5715		15	137	1.7	S71020	
	M5720		20	186	2.3	S71030	
MST 6-A•B•C	M6810	1	10	108	1.2	S81120	11 $^{0}_{-0.011}$
	M6815		15	157	2.0	S81130	
	M6820		20	216	2.6	S81140	

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
	d_s	L (B)	Mass g	Model No.	d_t	L_t (C)	Mass g	μm
	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

KS/BS

Die-setting Ball Cage Models KS and BS

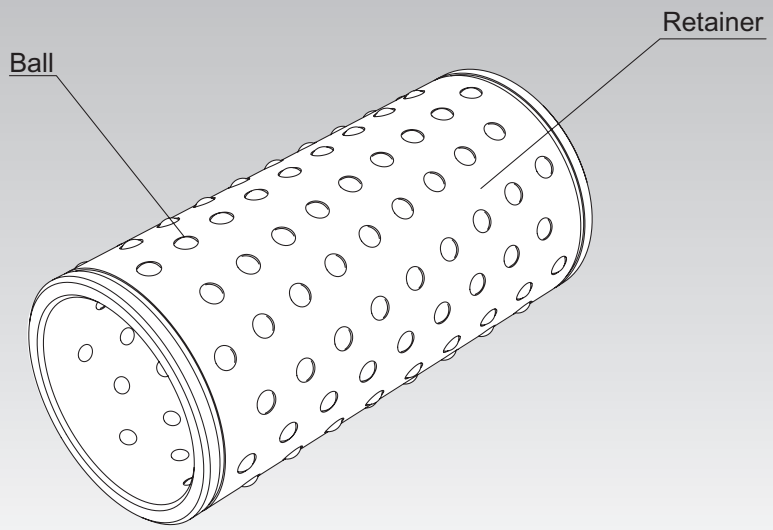


Fig.1 Structure of Die-setting Ball Cage Model KS

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 Nominal 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 **page131**.

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.

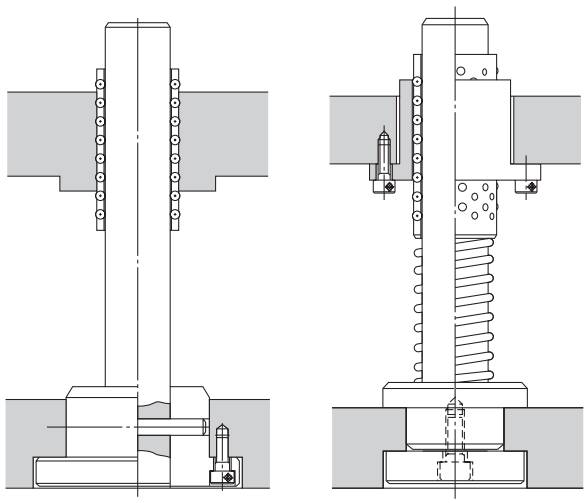
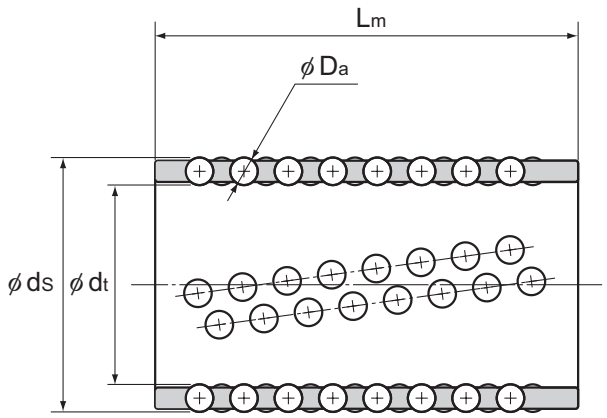


Fig.2 Example of Installation

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.

Model Number Coding

Model number configurations differ depending on the model features. Refer to the corresponding sample model number configuration.

[LM Stroke]

● **Models ST, ST-B, ST···UU and ST···UUB**

ST20UUB
Model No.

[Miniature Stroke]

● **Models M, S, T and MST**

- Ball Cage only

M4610
Model No.

- Nut only

S6820
Model No.

- ST shaft only

T460
Model No.

- Ball cage, nut and ST shaft combinations

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.

[Die-setting Ball Cage]

● **Models KS and BS**

KS3880
Model No.

[Handling]

(1) Do not disassemble the parts. This will result in loss of functionality.
(2) Take care not to drop or strike the LM Stroke. Doing so may cause injury or damage. Giving an impact to it could also cause damage to its function even if the product looks intact.
(3) When handling the product, wear protective gloves, safety shoes, etc., as necessary to ensure safety.

[Precautions on Use]

(1) With the model ST LM Stroke, intrusion of foreign matter can cause abnormal wear and reduce service life. If there is a risk of foreign material intruding, use a seal or another protective option suited to the usage conditions and surrounding environment. A highly abrasion-resistant synthetic rubber seal (model ST…UU) and dust-proof felt seal with low seal resistance (model ST…DD) are available for the model ST.
(2) If foreign material such as cutting chips adheres to the product, replenish the lubricant after cleaning the product.
(3) Do not use the product at temperature of 80℃ or higher. Exposure to higher temperatures may cause the resin/rubber parts to deform/be damaged.
(4) If the product is used in an environment where cutting chips, coolant, corrosive solvents, water, etc., may enter the product, use bellows, covers, etc., to prevent them from entering the product.
(5) Micro-strokes tend to obstruct oil film to form on the raceway in contact with the rolling element, and may lead to fretting corrosion. Take consideration using grease offering excellent fretting prevention. It is also recommended that a stroke movement corresponding to the length of the ball cage be made on a regular basis to make sure oil film is formed between the raceway and rolling element.
(6) Do not use undue force when fitting parts (pin, key, etc.) to the product. This may generate pressure marks on the raceway, leading to loss of functionality.
(7) Insert the shaft straight through the opening. Inserting the shaft at an angle can introduce foreign matter, damage internal components, or cause balls to fall out.
(8) Using this product with any balls removed may result in premature damage.
(9) Please contact THK if any balls fall out; do not use the product if any balls are missing.
(10) If an attached component is insufficiently rigid or mounted incorrectly, the bearing load will be concentrated at one location and performance will decline signifi cantly. Make sure the housing and base are sufficiently rigid, the anchoring bolts are strong enough, and the component is mounted correctly.

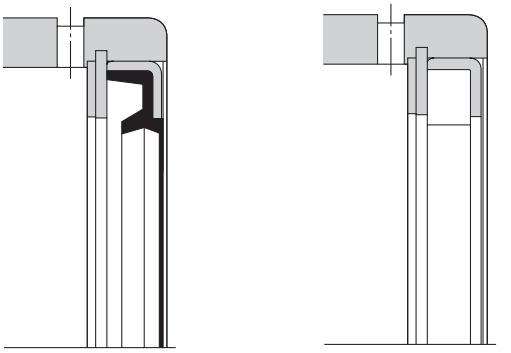


Fig.1 Seals used with the LM Stroke

[Lubrication]

(1) Thoroughly wipe off anti-rust oil and feed lubricant before using the product.
(2) Do not mix different lubricants. Mixing greases using the same type of thickening agent may still cause adverse interaction between the two greases if they use different additives, etc.
(3) When using the product in locations exposed to constant vibrations or in special environments such as clean rooms, vacuum and low/high temperature, use the grease appropriate for the specification/environment.
(4) When lubricating the product, apply grease directly on the raceway and stroke the product several times to let the grease spread inside.
(5) The consistency of grease changes according to the temperature. Take note that the slide resistance of the LM Stroke also changes as the consistency of grease changes.
(6) After lubrication, the slide resistance of the LM Stroke may increase due to the agitation resistance of grease. Be sure to perform a break-in to let the grease spread fully, before operating the machine.
(7) Excess grease may scatter immediately after lubrication, so wipe off scattered grease as necessary.
(8) The properties of grease deteriorate and its lubrication performance drops over time, so grease must be checked and added properly according to the use frequency of the machine.
(9) The greasing interval varies depending on the use condition and service environment. Set the final lubrication interval/amount based on the actual machine.
(10) The model ST LM Stroke can be lubricated with either oil or grease. Select the appropriate option in accordance with the DN value. THK recommends lithium grease no. 2.

[Storage]

When storing the LM Stroke, enclose it in a package designated by THK and store it in a room while avoiding high temperature, low temperature and high humidity.

[Disposal]

Dispose of the product properly as industrial waste.

Linear Bushing Series

- The photo may differ slightly in appearance from the actual product.
- The appearance and specifications of the product are subject to change without notice. Contact THK before placing an order.
- Although great care has been taken in the production of this catalog, THK will not take any responsibility for damage resulting from typographical errors or omissions.
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