

Miniature Linear Bushing

LMS

IKD Miniature Linear Bushing is a miniature type linear motion rolling guide which travels along a shaft to achieve endless linear motion. The shaft diameter is 3~5 mm. In the external cylinder of Miniature Linear Bushing, a retainer, steel balls and stop rings are compactly incorporated, and precise positioning accuracy can be obtained.

Low frictional linear motion

Steel balls are accurately guided by a retainer, so low frictional resistance and stable linear motion can be achieved.

Wide variations

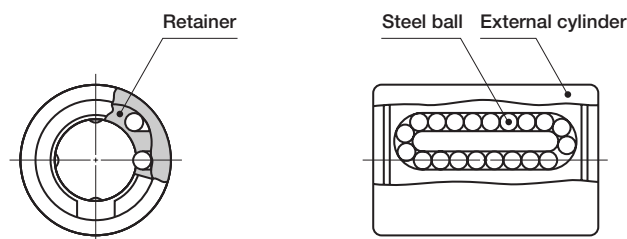
In addition to the standard type, the high-rigidity long type is available. These types can be selected to suit the requirements in applications.

Compact design

Miniature Linear Bushing is very small in size, allowing for compact assembly in machines and equipment.

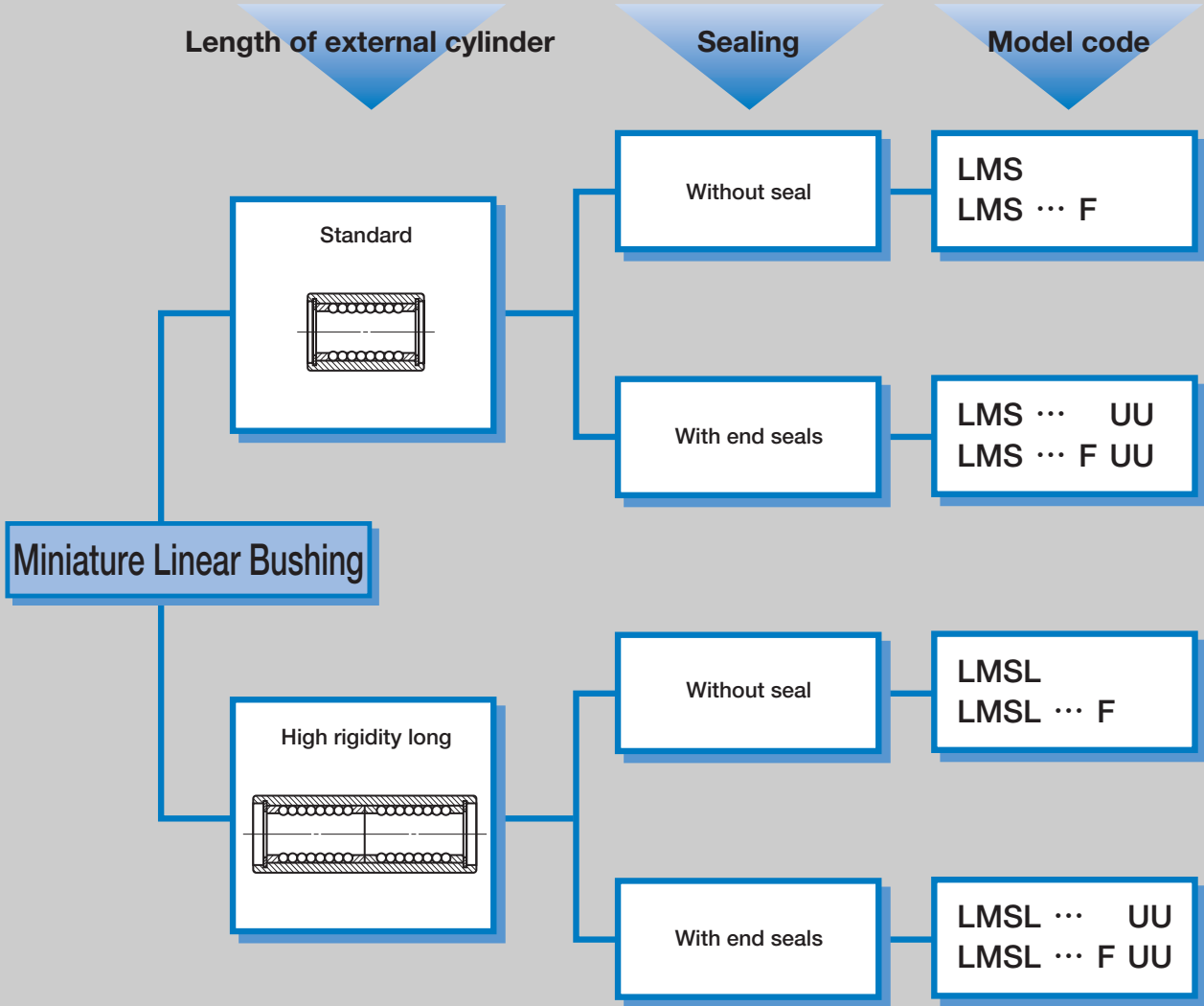
Stainless steel type

Miniature Linear Bushings made of stainless steel are also available. This type is suitable for applications where corrosion resistance is important.



Structure of Miniature Linear Bushing

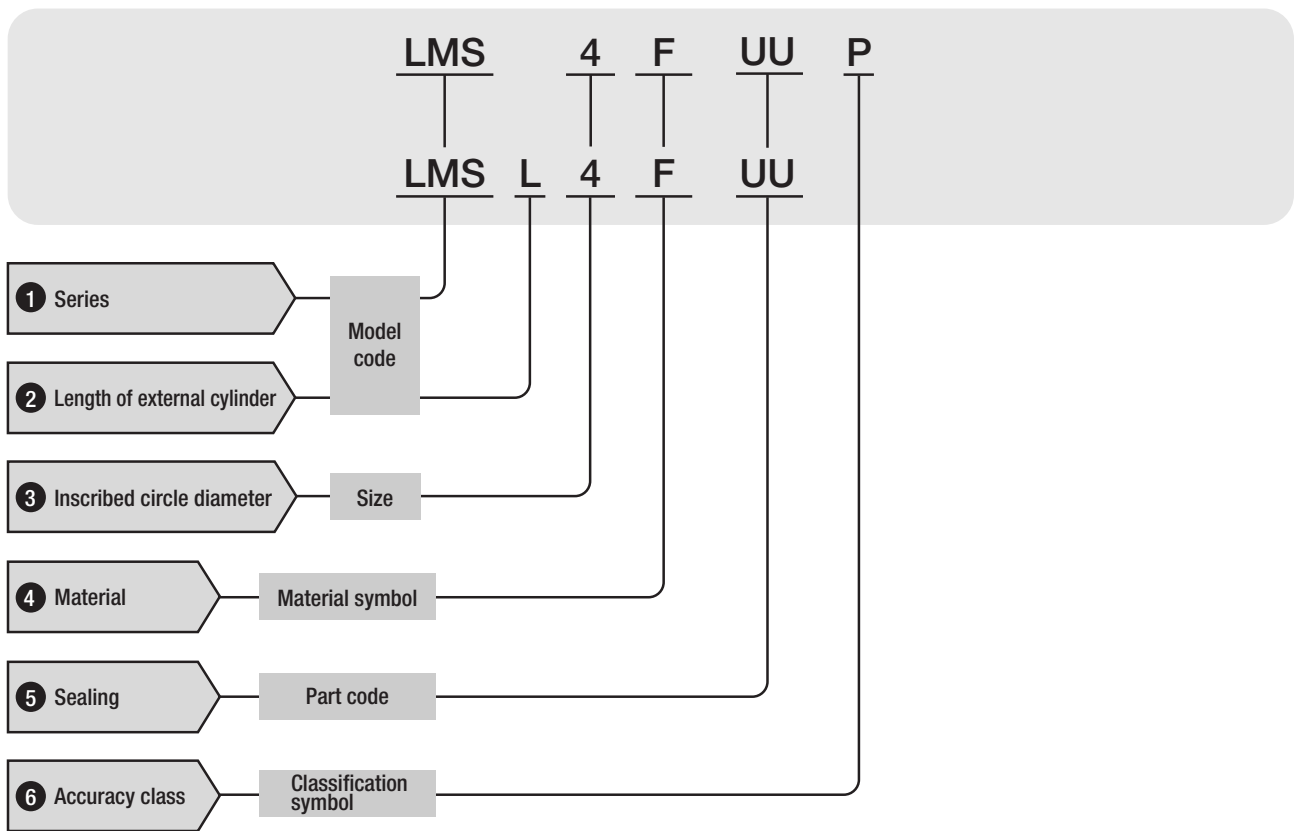
Miniature Linear Bushing series



Remark : "F" in the model codes indicates a stainless steel type.

● Identification number and specification

The specification of Miniature Linear Bushing is indicated by the identification number, consisting of a model code, a size, a material symbol, a part code and a classification symbol.



1 Series	LMS	
2 Length of external cylinder	Standard : No symbol High rigidity long : L	
3 Inscribed circle diameter	Indicate the inscribed circle diameter in mm.	
4 Material	High carbon steel made : No symbol Stainless steel made : F	Specify the component part material.
5 Sealing	Without seal : No symbol With two end seals : UU	Sealed type incorporates seals with superior dust protection performance in both ends of the external cylinder for preventing intrusion of foreign matter.
6 Accuracy class	High : No symbol Precision : P	For details of accuracy, see the table of dimensions on page E-173. The precision class is applicable to standard type only. When strict control of radial internal clearance is required, specially controlled products of which inscribed circle diameter is selected within the divisions of every 0.002 mm can be delivered. If required, consult IKO .

Load Rating

Summarized descriptions of load ratings of Miniature Linear Bushing are given below. For details of load rating definitions and load calculations, see "General description".

● Basic dynamic load rating C

The basic dynamic load rating is defined as the constant load both in direction and magnitude under which a group of identical Miniature Linear Bushings are individually operated and 90% of the units in the group can travel 50×10^3 meters free from material damage due to rolling contact fatigue.

● Basic static load rating C_0

The basic static load rating is defined as the static load that gives a prescribed constant contact stress at the center of the contact area between the rolling element and raceway receiving the maximum load.

● Relationships between load ratings and the position of ball circuits

Load ratings of Miniature Linear Bushing are affected by the position of the ball circuits. In the table of dimensions, two types of load ratings are shown corresponding to the load directions and steel ball circuit positions as shown in Fig. 1 and Fig. 2.

In Fig. 1 the load direction is in line with the steel ball circuit position and this direction is referred to as load direction A in the table of dimensions. In general, the load ratings for this direction are also used, when the load direction is indeterminate or the steel ball circuit position in relation to the load direction cannot be determined.

In Fig. 2, the load direction is pointed at the center of two ball circuits and this direction is referred to as load direction B in the table of dimensions. In general, a larger load can be received in this case compared with load direction A.

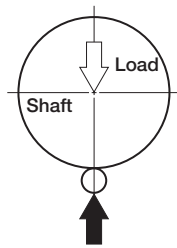


Fig. 1 Load direction A

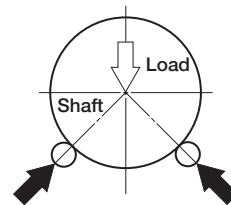


Fig. 2 Load direction B

Precautions for Use

① Raceway surface

Since Miniature Linear Bushings operate with a shaft as a raceway surface, the shaft should be heat-treated and ground. Recommended surface hardness, roughness and minimum effective hardening depth of the shaft are shown in Table 1.

Table 1 Surface hardness, roughness and minimum effective hardening depth

Item	Recommended value	Remark
Surface hardness	58~64HRC	When the raceway hardness is less than the necessary hardness, multiply load ratings by the hardness factor.
Surface roughness	0.2 μ mRa or better (0.8 μ mRy or better)	—
Effective hardening depth	0.8mm or more	—

② Lubrication

Miniature Linear Bushing can be used with oil or grease lubrication. It is a common practice to apply grease lightly on the shaft surface and steel balls for grease lubrication. A good quality lithium-soap base grease is recommended for grease lubrication.

③ When rotational motion is present

Miniature Linear Bushing can only be operated in linear motion and can not be rotated. When linear motion in short stroke length and rotation are both required, **IKO** Miniature Stroke Rotary Bushing (See page E-186.) is recommended.

④ Insertion of shaft

When Miniature Linear Bushing is assembled with the shaft, do not insert the shaft with angle. It is possible that the steel balls will fall out or the retainer will be deformed and smooth operation can not be obtained.

Precautions for Mounting

● Fit

Table 2 shows the recommended fit tolerances for Miniature Linear Bushing. Thickness of external cylinder is very thin. Therefore, when fitting it into the housing, epoxy type adhesive is recommended for fixing the external cylinder in the housing. Do not apply press fitting.

Table 2 Recommended fit tolerance
(Tolerance of shaft and housing bore)

unit : μm

Class \ Item	Shaft	Housing
High class	- 6 -14	+12 0
Precision class	- 4 - 9	+ 8 0

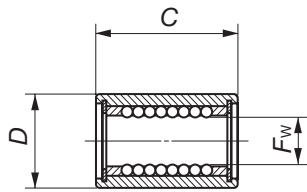
Accessories

● Steel shaft for Miniature Linear Bushing

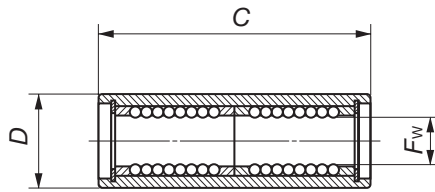
In order to achieve full performance of Miniature Linear Bushing, heat-treated and ground steel shafts with high accuracy and rigidity are available. For details, consult **IKO**.

IKO Miniature Linear Bushing

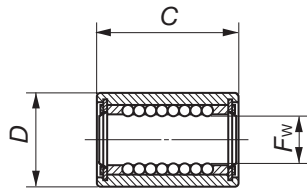
Standard : **LMS**
High rigidity long : **LMSL**



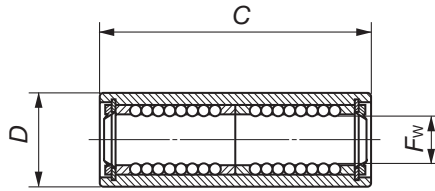
LMS
LMS...F



LMSL
LMSL...F



LMS... UU
LMS...F UU

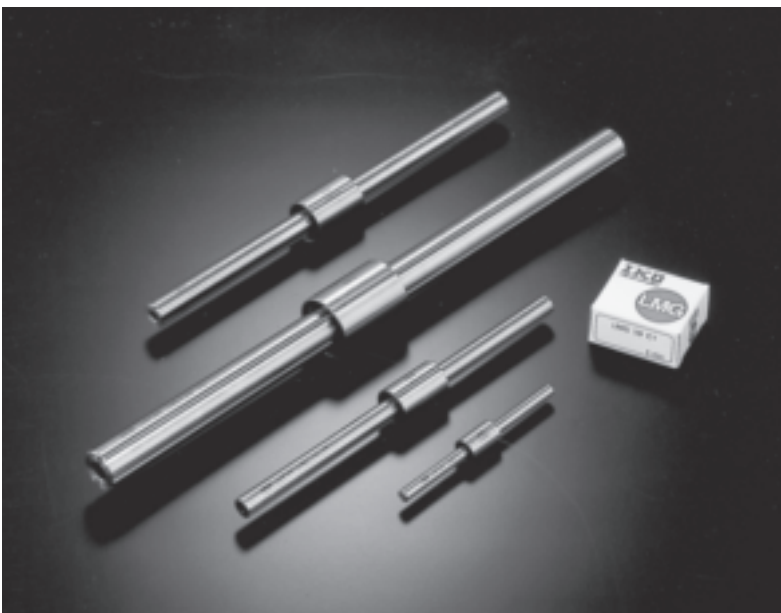


LMSL... UU
LMSL...F UU



Shaft diameter mm	Model number	Ball circuits	Mass (Ref.) g	Nominal dimensions and tolerances mm						Eccentricity		Basic dynamic load rating C		Basic static load rating Co			
				Fw	Tolerance μm		D	Tolerance μm		C	Tolerance μm	Max. μm		Load direction A N	Load direction B N	Load direction A N	Load direction B N
					Pre- cision	High		Pre- cision	High			Pre- cision	High				
3	LMS 3	4	1.8	3	7	0	0	10	0	2	4	18.4	21.2	39.4	55.8		
	LMS 3 F																
	LMS 3 UU																
	LMS 3 F UU		3.0	-	-10	-7	-8	19	-300	-	5	30.0	34.4	78.9	112		
	LMSL 3																
	LMSL 3 F UU																
4	LMS 4	4	2.8	4	8	0	0	12	0	2	4	23.5	27.0	48.6	68.7		
	LMS 4 F																
	LMS 4 UU																
	LMS 4 F UU		4.3	-	-10	-7	-8	23	-300	-	5	38.1	43.8	97.2	137		
	LMSL 4																
	LMSL 4 F UU																
5	LMS 5	4	3.8	5	10	0	0	15	0	2	4	51.3	59.0	108	152		
	LMS 5 F																
	LMS 5 UU																
	LMS 5 F UU		6.7	-	-10	-7	-8	29	-300	-	5	83.4	95.8	215	304		
	LMSL 5																
	LMSL 5 F UU																

Remark : In the tolerance and eccentricity columns, "Precision" refers to precision class and "High" refers to high class.



Stroke Rotary Bushings

Description of each series and Table of dimensions

E

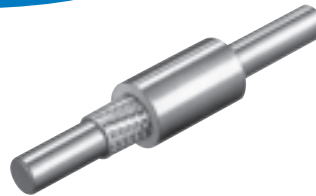
Stroke Rotary Bushing

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Miniature Stroke Rotary Bushing

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Stroke Rotary Cage

Page E-194 to E-199



In the table of dimensions, standard products are referred to using identification numbers marked with . The identification numbers marked with refer to our semi-standard products.