

LINEAR BUSHING

SAMICK Linear Bushing LM type is the linear motion system with unlimited stroke by sliding with LM rail. Because of the point contact between Balls and LM rail, minimum friction can be achieved and that can give you the high precision motion.

Components and Features

SAMICK LINEAR BUSHING SYSTEM

SAMICK LINEAR BUSHING

As shown in the SAMICK Linear Bushing LM type, the LM rail is the guide rail and the LM block is the moving part. The LM rail is the guide rail and the LM block is the moving part. The LM rail is the guide rail and the LM block is the moving part.

High precision Returner
The single body returner gives 4-5 digit accuracy. The returner is made of high precision material and is designed to give the highest precision.

LM Guide Unit
LM Guide Unit LM type is a guide rail of the LM system. It is made of high precision material and is designed to give the highest precision. The LM Guide Unit LM type is a guide rail of the LM system. It is made of high precision material and is designed to give the highest precision.

The structure of SAMICK Linear Bushing is standardized. The LM rail is made of high precision material and is designed to give the highest precision. The LM rail is made of high precision material and is designed to give the highest precision.

High Output Drive
The LM rail and LM block are made of high precision material and are designed to give the highest precision. The LM rail and LM block are made of high precision material and are designed to give the highest precision.

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SAMICK Linear Bushing, LM type is the linear motion system with unlimited stroke by applying with LM shaft. Because of the point contact between Balls and LM shaft, minimum friction can be acquired and that can give you the high precision motion.

Components and Features

As shown in Fig 3 SAMICK Linear Bushing serve the alignment of the balls toward the LM shaft by the single retainer and cylindrical shape of raceway. Outer sleeve is made of high-carbon chromium bearing steel, and inner and outer grinding process are applied after heat treatment.

Interchangeability

The dimensions of SAMICK Linear Bushing are standardized to have full interchangeability. LM shaft is provided with the cylindrical grinding to have high precision fitting clearance.

Rigid Outer Sleeve

Hardened and precisely ground outer sleeve is made of bearing steel, and can be directly assembled with the needle bearing on outer surface.

High precision Retainer

The single body retainer guides 4~6 ball circuits, and it gives the precision guiding against the balls moving direction and smooth motion.

LM Case Unit

LM Case Unit, SC type is consist of the light aluminum case and LM type Linear Bushing, so the assembly can be finished by simple bolting.

Longer life can be obtained by adjusting the ball circuits orientation of Linear Bushing against the direction of load.

Application

SAMICK Linear Bushing is widely used in precision equipments; computer and peripheral equipments, measuring equipments, auto recording equipments, and 3D measuring equipments, and linear motion systems in machine for mass production; multi-axis drilling machines, punching press, tool grinders, auto-gas cutters, printing machines, card selectors, food packing machines, and etc.

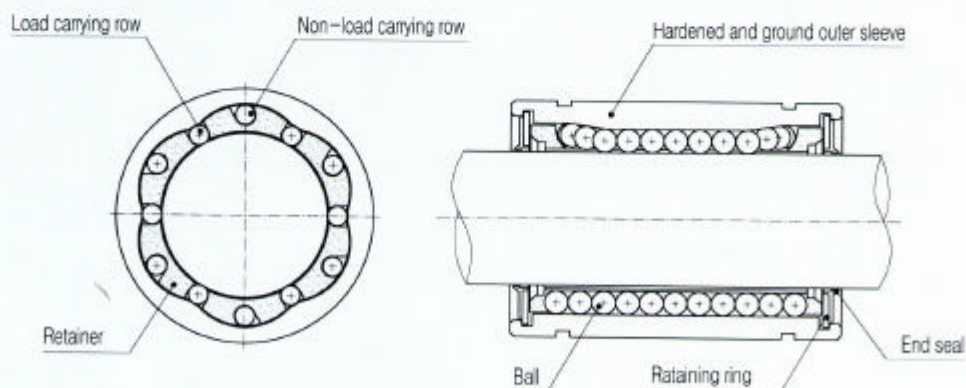
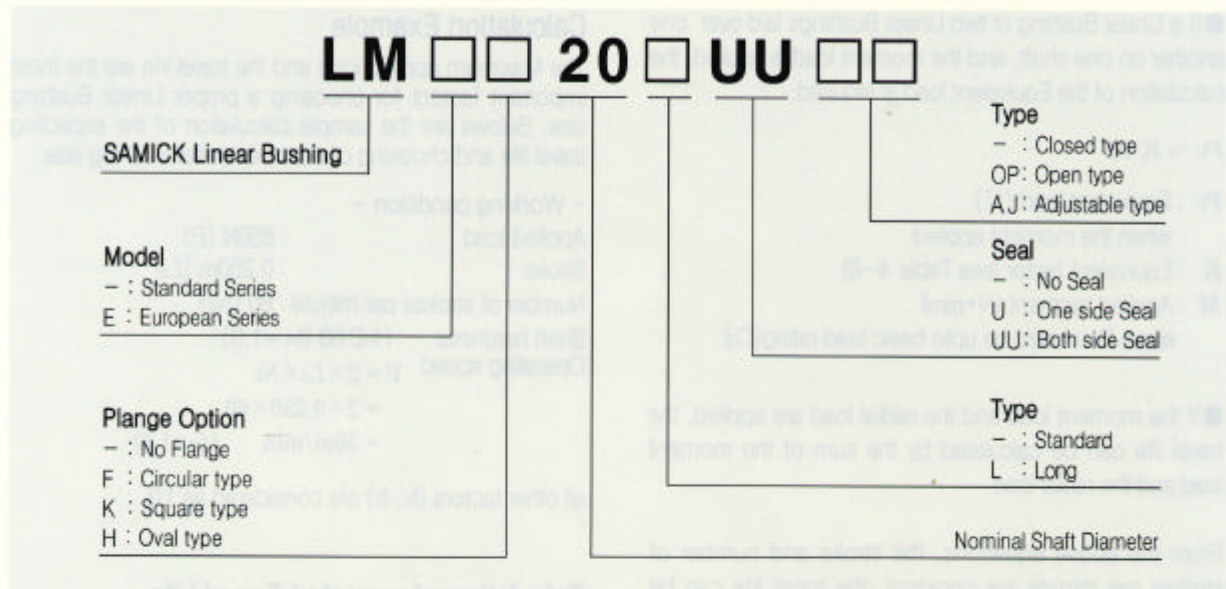


Fig 3 SAMICK LM Series Linear Bushing

Part Number Notation



Standard Tolerance

The tolerance of working bore diameter, outside diameter, and length are specified on the tables in this catalogue, and the value of working bore diameter and outside diameter for adjustable and open types are the obtained value before slotting process.

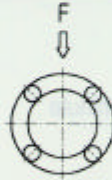
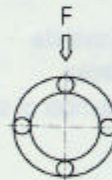
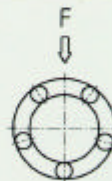
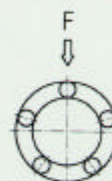
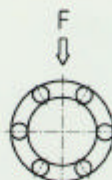
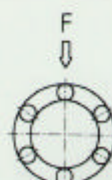
Load rating and Travel Life

The load rating of SAMICK Linear Bushing can be affected by the balls orientation against the load. The basic load rating in the table is the load rating of Linear Bushing when 1 (one) ball circuit are just beneath the load. As shown in Fig 4, If the ball are located on symmetrical position against the load, the load rating will be increased and the travel life will be extended.

$$L = \left[\frac{f_H \cdot f_C \cdot f_T}{f_W} \times \frac{C}{P} \right]^3 \times 50$$

- L** : Travel life (km)
C : Basic dynamic load rating (N)
P : Applied load (N)
f_H : Hardness factor (see Fig 1)
f_W : Load coefficient (see Table 3)
f_C : Contact factor (see Table 2)
f_T : Temperature factor (see Fig 3)

Fig 4 Load ratings and Orientation of Balls

No. of Ball Row	Orientation of Balls	
	Max. Load rating	Min. Load rating
4		
	$F = 1.41 \times C$	$F = C$
5		
	$F = 1.46 \times C$	$F = C$
6		
	$F = 1.26 \times C$	$F = C$

C : Load rating specified on the table

Linear Bushing System

● If a Linear Bushing or two Linear Bushings laid over one another on one shaft, and the moment load is applied, the calculation of the Equivalent load is required.

$$P_U \approx K \cdot M$$

P_U : Equivalent load (N)

when the moment applied

K : Equivalent factor (see Table 4~6)

M : Applied moment (N·mm)

where P_U should be upto basic load rating(C_0)

● If the moment load and the radial load are applied, the travel life can be calculated by the sum of the moment load and the radial load.

From the above equations, the stroke and number of strokes per minute are constant, the travel life can be calculated by following equation.

$$L_h = \frac{L \times 10^3}{2 \times L_s \times N_t \times 60}$$

L_h : Travel life (hr)

L_s : Stroke (m)

N_t : Number of strokes per minute (rpm)

Calculation Example

The Maximum applied load and the travel life are the most important factors for choosing a proper Linear Bushing size. Belows are the sample calculation of the expecting travel life and choosing of a proper Linear Bushing size.

- Working condition -

Applied load : 850N (P)

Stroke : 0.250m (L_s)

Number of strokes per minute : 60 (N_t)

Shaft hardness : HRC 60 ($f_H = 1.0$)

Operating speed $V = 2 \times L_s \times N_t$

$$= 2 \times 0.250 \times 60$$

$$= 30\text{m/min} \quad (f_H = 1.6)$$

all other factors (f_c, f_r) are considered as 1.0.

Calculation of expected Travel Life

Since, basic dynamic load rating is based on travel life of 50km and assuming all other factors as 1.0, you can choose the Linear Bushing size that you can expected travel life. Let's try LM40UU with the above working conditions.

$$L = \left(\frac{1.0 \times 1.0 \times 1.0}{1.6} \times \frac{2150}{850} \right)^3 \times 50$$

$$= 197.5\text{km}$$

$$L_h = \frac{197.5 \times 10^3}{2 \times 0.250 \times 60 \times 60}$$

$$= 109.7\text{hours}$$

Choosing a proper Linear Bushing

Let's assume our design travel life is 500hours;

$$L = 500 \times 2 \times 0.250 \times 10^{-3} \times 60 \times 60 = 900\text{km}$$

$$C = \frac{850 \times 1.6}{1.0 \times 1.0 \times 1.0} \times \sqrt[3]{\frac{900}{50}}$$

$$= 3564\text{N}$$

So, the proper Linear Bushing for above condition is LM50UU which has 3822N(390kgf) as the basic load rating.

Equivalent factor for Linear Bushing

Table 4 Equivalent factor for LM type

Part Number	Equivalent factor : K	
	Single	Double
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 40	0.117	0.040
LM 50	0.096	0.032
LM 60	0.093	0.028

note) the Equivalent factor for LMF, LMK, LMH, SC type are same as LM type.

Table 5 Equivalent factor for LM-L type

Part Number	Equivalent factor : K	
	Single	
LM 5L	0.223	
LM 6L	0.201	
LM 8L	0.151	
LM 10L	0.118	
LM 12L	0.113	
LM 13L	0.107	
LM 16L	0.096	
LM 20L	0.082	
LM 25L	0.060	
LM 30L	0.053	
LM 35L	0.050	
LM 40L	0.043	
LM 50L	0.034	
LM 60L	0.031	

note) the Equivalent factor for LMF-L, LMK-L, LMH-L type are same as LM-L type.

Table 6 Equivalent factor for LME type

Part Number	Equivalent factor : K	
	Single	Double
LME 5	0.669	0.123
LME 8	0.514	0.116
LME 12	0.389	0.090
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

Short stroke Applications

In applications when the stroke is short, the life of the shaft is shorter than that of the Linear Bushing. In short stroke applications, the required dynamic load rating must be multiplied by the factor Kc found on Fig 5.

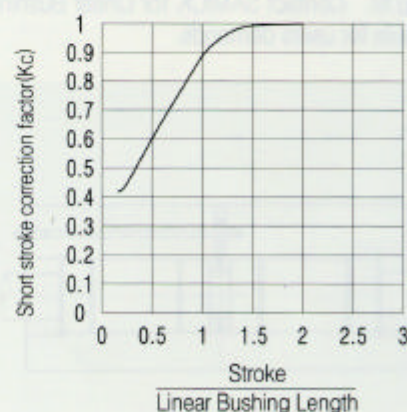


Fig 5 Short stroke correction factor(Kc)

Linear Bushing System

Lubrication and Friction

Lubrication

Usually, Linear Bushing is used with grease lubrication or oil lubrication but in some case, it is used without any lubrication.

Grease Lubrication

Before applying the grease, the anticorrosive oil must be removed by kerosene or organic solvent, and applying the grease after drying. Must applying grease directly on the ball for a both side sealed type (··UU), and applying same as above or applying on the shaft for a without sealed type. Lithium soap radical of viscosity mark No. 2 is recommended for use.

Oil Lubrication

There is no need to remove anticorrosive oil when oil is used for lubrication. ISO viscosity grade VG15~100 oil is usually used according to the temperature.

Operating Temp.	Viscosity
-30℃ ~ 50℃	VG 15 ~ 46
50℃ ~ 80℃	VG 46 ~ 100

The turbine oil, machine oil, and spindle oil are usually used as lubrication oil. Drop the oil on the shaft for lubrication, or supply it through an oil hole provided on the housing (Fig 6). Contact SAMICK for Linear Bushing with lubrication hole for users demands.

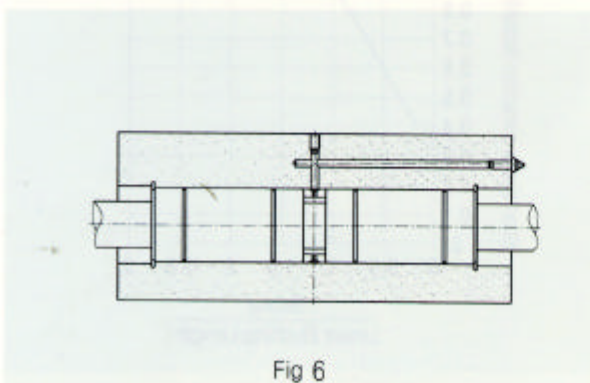


Fig 6

Because the seals remove the oil on shaft, dropping is not recommended for lubrication for both side seal type.

Coefficient of Friction

Linear Bushing has balls as rollong elements, so the balls can reduce the frictional resistance. Static friction, in pratical, is very low, and there is just little difference between static and dynamic friction, so, that stick-slip does not occur. Such low friction makes submicron feeding possible. The nomal friction coffdicient is on Fig 7, and the friction resistance can be calculated by following equation.

$$F = \mu \cdot P + f_s$$

F : Friction resistance force (N)

f_s : Resistant of seal (0.3~2.4N)

P : Applied load
(Perpendicular load against shaft core) (N)

μ : Friction coefficient(Static or dynamic)

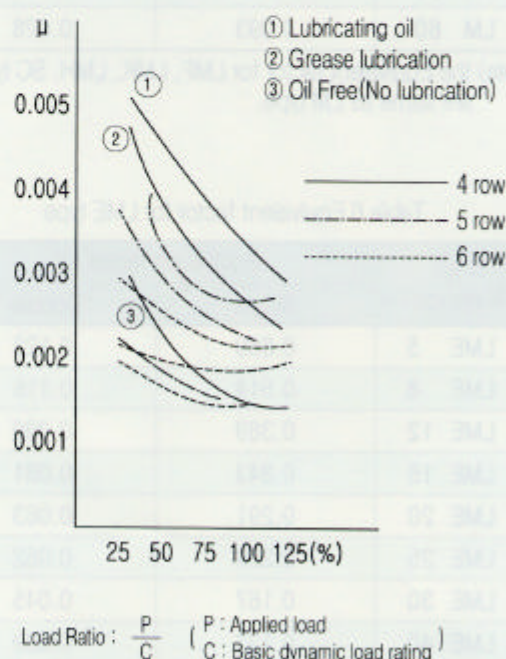


Fig 7 Coefficient of Kinetic Friction

Installation Guide

Tolerance of Housing Bore

Recommended tolerances of Housing bore for SAMICK Linear Bushing are in Table 7. Normal fit is standard, but for without clearance, press fit is also available.

Table 7 Tolerance for Housing Bore

Type		Case	
Part Number	Grade	Normal Fit	Pressed Fit
LM	High(H)	H7	J7
LME	—	H7	K6, J6
LMF	—	H7	J7
LMK			
LMH			
LM-L			
LMF-L			
LMK-L			
LMH-L			

Clearance of Outer Sleeve and Shaft

Normal fit is standard for using of Linear Bushing with LM shaft, and for without clearance, Tight fit is also available.

Table 8 Tolerance for Shaft Diameter

Type		LM Shaft	
Part Number	Grade	Normal Fit	Tight Fit
LM	High(H)	f6, g6	h6
LME	—	h7	k6
LMF	—	f6, g6	h6
LMK			
LMH			
LM-L			
LMF-L			
LMK-L			
LMH-L			

note) ◆ Negative diametral clearance should not exceed what is specified in the dimension table.

◆ Axial clearance of SC, SCW, SCV type are same as High grade.

Mounting

High holding strength toward LM shaft direction is not required, but just press fit only for mounting is not recommended.

Please see Table 7 for tolerance of Housing Bore.

Standard type

Possible mounting methods are illustrated in Fig 8 and Fig 9. Mount a Linear Bushing with retaining rings and cover plates.

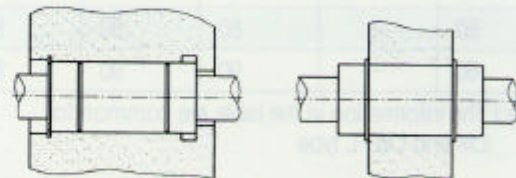


Fig 8 Mounting with retaining rings

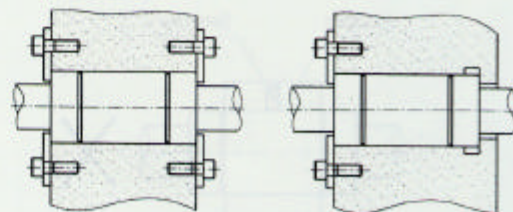


Fig 9 Mounting with cover plates

Linear Bushing System

Retaining ring for Mounting

Retaining rings for mounting LM type SAMICK Linear Bushing are used as shown in the table below.

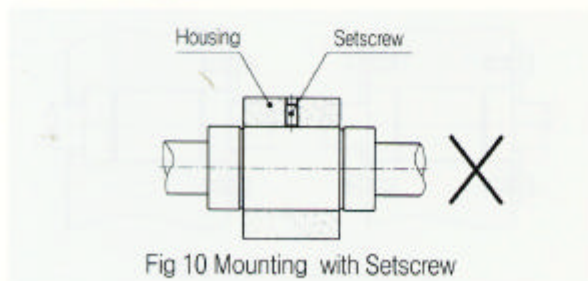
Table 9 Retaining ring dimensions

Part Number	Retaining ring			
	External (for Shaft)		Internal (for Bore)	
	C Type	NeedleType	C Type	NeedleType
LM 5	10	10	10	10
6	12	12	12	12
8	—	15	15	15
8S	—	15	15	15
10	19	19	19	19
12	21	21	21	21
13	23	22	23	—
16	28	—	28	28
20	32	—	32	32
25	40	40	40	40
30	45	45	45	45
35	52	52	52	52
40	—	60	60	60
50	—	80	80	80
60	—	90	90	90

note) The information in the table are common for LM and LM-L type

Mounting with Setscrew

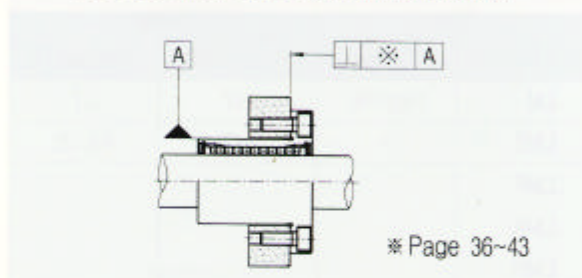
Mounting a Linear Bushing with a setscrew as shown in Fig 10 will cause deformation of the outer sleeve and should be avoided.



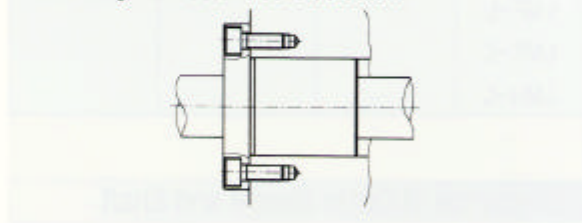
Flanged type

Mounting for LMF, LMK, LMH (Long type also), only mounting the flange with mounting bolt can be all of mounting because of its single body shape.

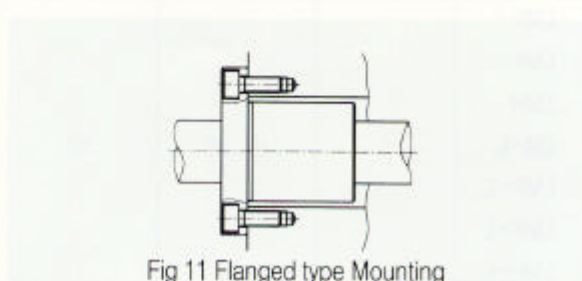
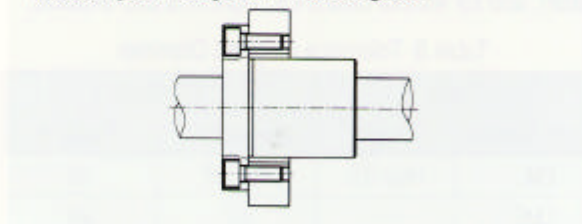
note) Geometric dimensional tolerance should be considered when outer sleeve is the datum for installation.



• Mounting from outer sleeve as datum



• Mounting of Flange with mounting bolt



Application

Mounting of Adjustable type

Adjustment of clearance for adjustable type (...AJ) and LM shaft can be obtained by assembling with the adjustable type Housing.

In this case, the slotted side of Linear Bushing should be located at 90° of open side of housing for equivalent deformation against radial direction. See Fig 12.

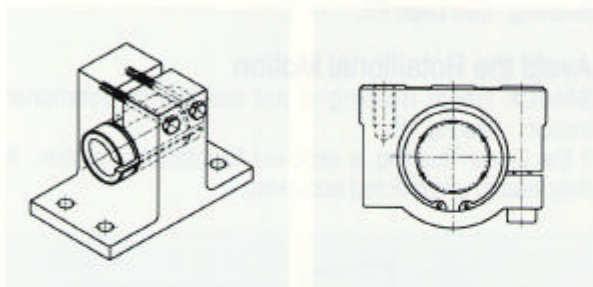


Fig 12 Mounting of adjustable type

Mounting of Open type

Open type (...OP) also can be used with clearance adjustable housing as shown on Fig 13.

Light pre-load is applied for normal using, but heavy pre-load should be avoid.

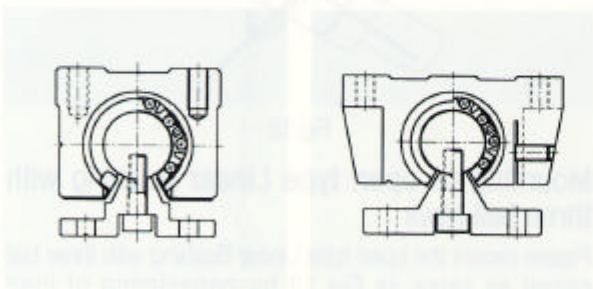


Fig 13 Mounting of Open type

Mounting of Shaft support

Shaft support, SK can be mounted with mounting bolt for table, and LM shaft can be mounted with tightening bolt.

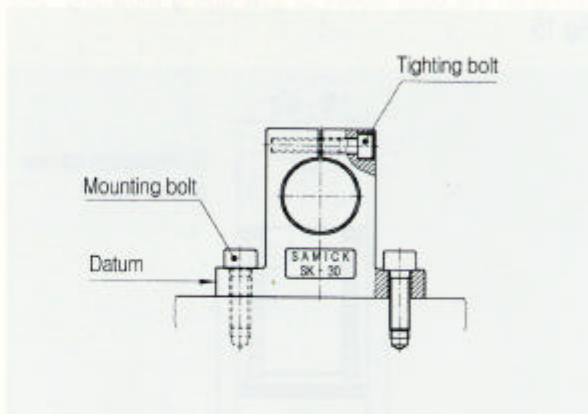


Fig 14 Mounting of Shaft Support

Mounting of LM Case Unit

Mounting of SC type

Mounting of SC, SCW, SCV type from the top and the bottom side with mounting bolt are both available, and it gives you minimum mounting time.

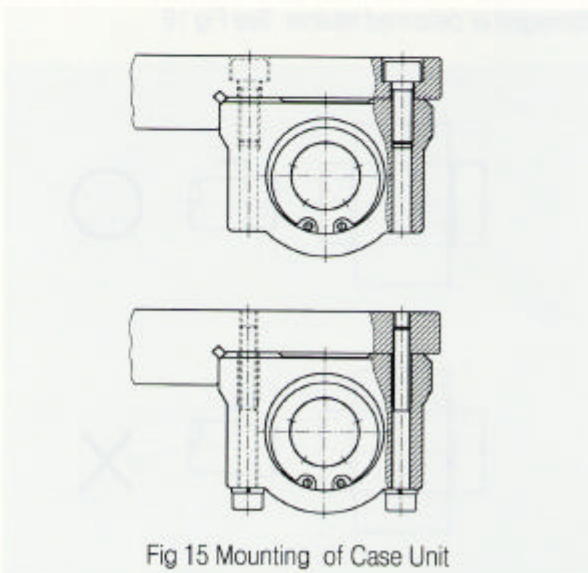


Fig 15 Mounting of Case Unit

Application Tips

Mounting of Linear Bushing

For mounting of a standard type SAMICK Linear Bushing into the Housing, a jig should be used to avoid direct hitting on the outer sleeve or seal during mounting. See Fig 15

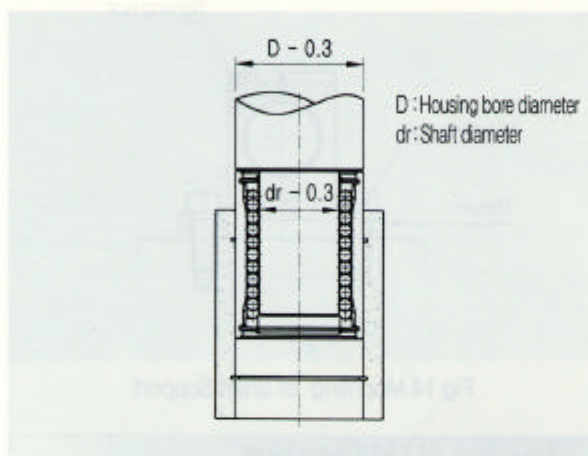


Fig 15 Mounting into housing

Insertion of Shaft

Care must be taken to align the bushing and the shaft when inserting a shaft into a Linear Bushing. If the shaft is inserted with slanted, balls may depart from the damaged or deformed retainer. See Fig 16

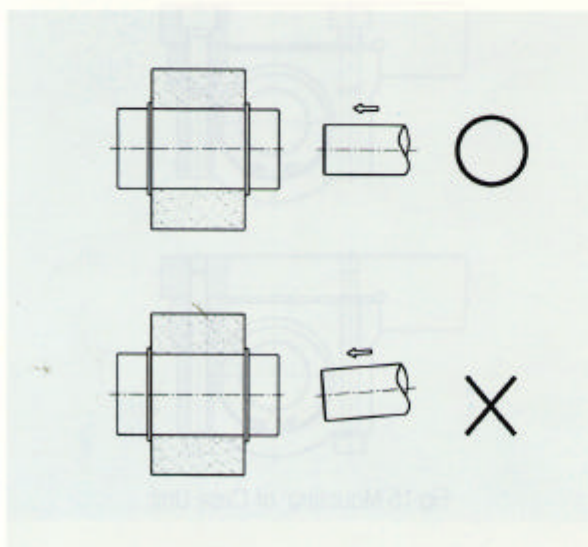


Fig 16 Insertion of shaft into Linear Bushing

When Moment loads applied

External loads should be distributed uniformly on a Linear Bushing. When moment loads are applied, two or more Linear Bushing should be used in one LM shaft, and the distance between two Linear Bushing should be as long as possible. Calculate the equivalent load when the moment loads are applied and choose the proper Linear Bushing. See page 22.

Avoid the Rotational Motion

SAMICK Linear Bushing is not suitable for rotational motion. See Fig 18

If the Linear Bushing is exposed to rotational motion, it may lead to unexpected accidents.

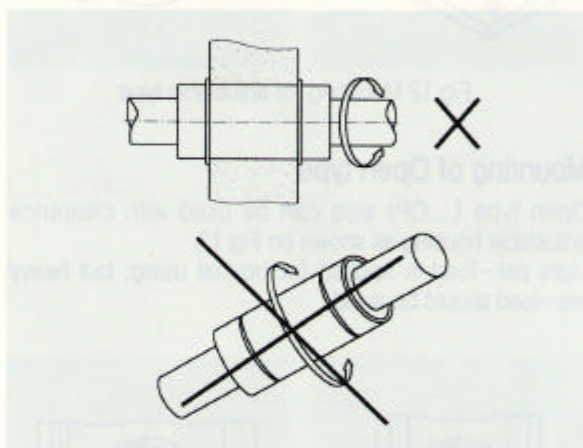


Fig 18

Mounting of open type Linear Bushing with three ball rows

Please mount the open type Linear Bushing with three ball circuit as same as Fig 19 for considering of load distribution.

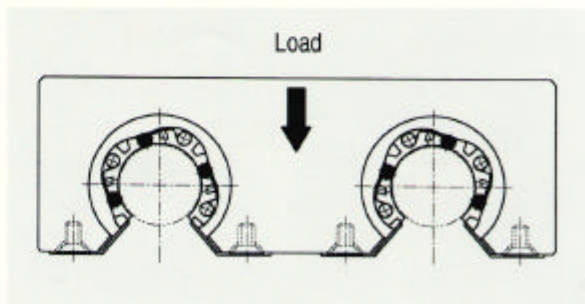


Fig 19

Linear Bushing LM Series



SAMICK LINEAR BUSHING SYSTEM

LINEAR BUSHING



LAUBM1

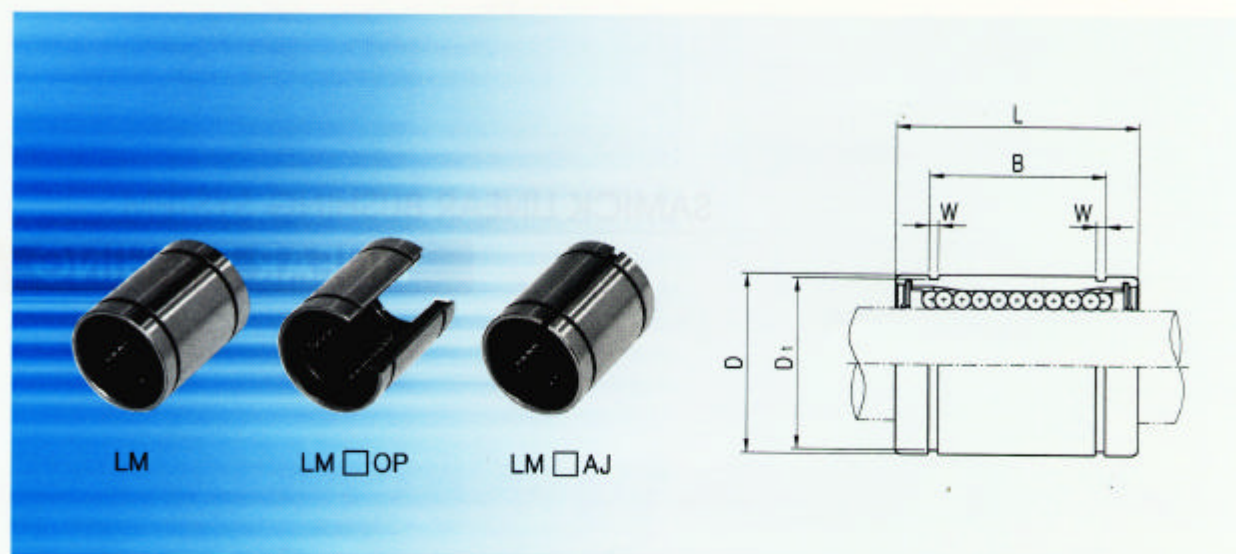
LAUBM2

Series	Model	Length (mm)	Width (mm)	Height (mm)	Weight (kg)	Material	Notes
0	LAUBM1	100	10	10	0.01	Aluminum	
	LAUBM2	150	15	15	0.02	Aluminum	
	LAUBM3	200	20	20	0.03	Aluminum	
	LAUBM4	250	25	25	0.04	Aluminum	
	LAUBM5	300	30	30	0.05	Aluminum	
	LAUBM6	350	35	35	0.06	Aluminum	
0	LAUBM7	400	40	40	0.07	Aluminum	
	LAUBM8	450	45	45	0.08	Aluminum	
	LAUBM9	500	50	50	0.09	Aluminum	
	LAUBM10	550	55	55	0.10	Aluminum	
	LAUBM11	600	60	60	0.11	Aluminum	
	LAUBM12	650	65	65	0.12	Aluminum	
0	LAUBM13	700	70	70	0.13	Aluminum	
	LAUBM14	750	75	75	0.14	Aluminum	
	LAUBM15	800	80	80	0.15	Aluminum	
	LAUBM16	850	85	85	0.16	Aluminum	
	LAUBM17	900	90	90	0.17	Aluminum	
	LAUBM18	950	95	95	0.18	Aluminum	
0	LAUBM19	1000	100	100	0.19	Aluminum	
	LAUBM20	1050	105	105	0.20	Aluminum	
	LAUBM21	1100	110	110	0.21	Aluminum	
	LAUBM22	1150	115	115	0.22	Aluminum	
	LAUBM23	1200	120	120	0.23	Aluminum	
	LAUBM24	1250	125	125	0.24	Aluminum	
0	LAUBM25	1300	130	130	0.25	Aluminum	
	LAUBM26	1350	135	135	0.26	Aluminum	
	LAUBM27	1400	140	140	0.27	Aluminum	
	LAUBM28	1450	145	145	0.28	Aluminum	
	LAUBM29	1500	150	150	0.29	Aluminum	
	LAUBM30	1550	155	155	0.30	Aluminum	

LAUBM1

LAUBM1

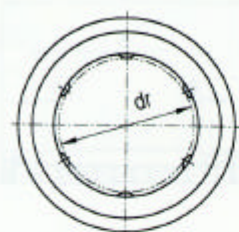
Linear Bushing LM Series



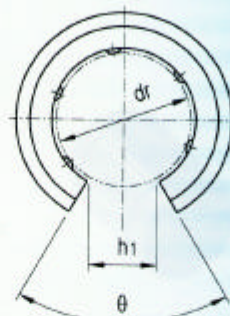
LM Series						Basic Load Ratings		Working Bore Diameter	
Standard type		Open type		Adjustable type		Dynamic C (N)	Static C ₀ (N)		
Part number	No. of Ball circuit	Part number	No. of Ball circuit	Part number	No. of Ball circuit			dr (mm)	Tol. (μm)
LM6UU	4	—	—	LM6UUAJ	4	200	260	6	0 -9
LM8SUU	4	—	—	LM8SUUAJ	4	170	220	8	
LM8UU	4	—	—	LM8UUAJ	4	260	400	8	
LM10UU	4	—	—	LM10UUAJ	4	370	540	10	
LM12UU	4	LM12UUOP	3	LM12UUAJ	4	410	590	12	
LM13UU	4	LM13UUOP	3	LM13UUAJ	4	500	770	13	
LM16UU	5	LM16UUOP	4	LM16UUAJ	5	770	1170	16	0 -10
LM20UU	5	LM20UUOP	4	LM20UUAJ	5	860	1370	20	
LM25UU	6	LM25UUOP	5	LM25UUAJ	6	980	1560	25	
LM30UU	6	LM30UUOP	5	LM30UUAJ	6	1560	2740	30	
LM35UU	6	LM35UUOP	5	LM35UUAJ	6	1660	3130	35	0 -12
LM40UU	6	LM40UUOP	5	LM40UUAJ	6	2150	4010	40	
LM50UU	6	LM50UUOP	5	LM50UUAJ	6	3820	7930	50	
LM60UU	6	LM60UUOP	5	LM60UUAJ	6	4700	9990	60	0 -15

note) Plating and RAYDENT treatments are available

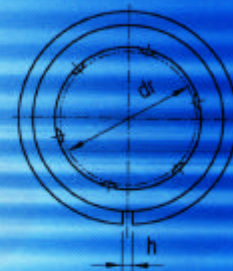
1N≒0.102kgf



LM



LM □ OP

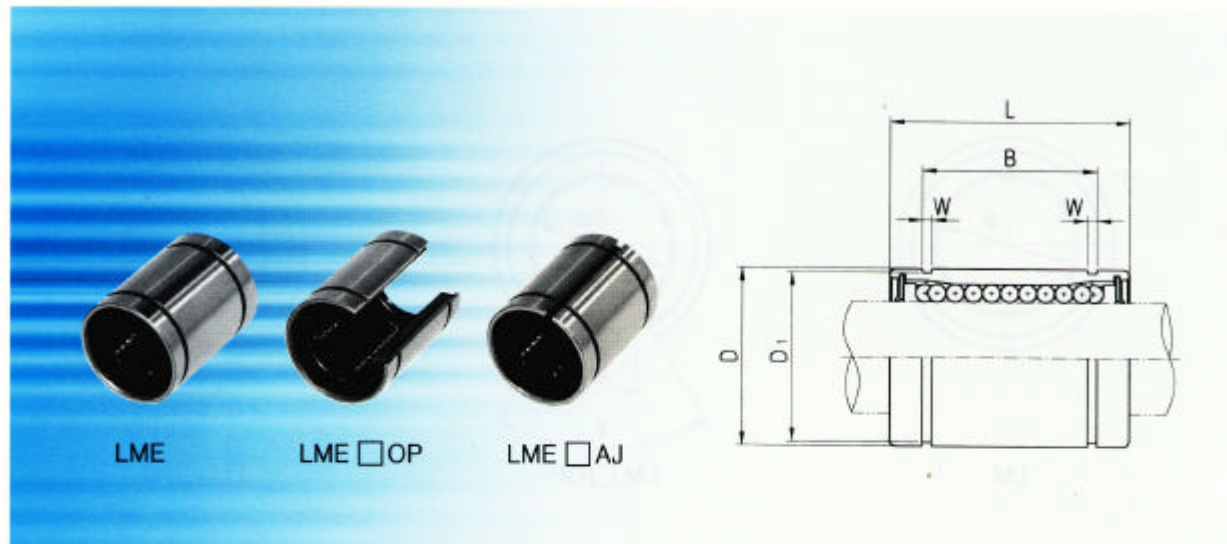


LM □ AJ

Dimensions(mm)											Wgt. (gr)	Allowable Diametral Clearance (μm)	Part Number
D (mm)	Tol. (μm)	L (mm)	Tol. (mm)	B (mm)	Tol. (mm)	W	D ₁	h	h ₁	θ (°)			
12	0 -11	19	0 -0.2	13.5	0 -0.2	1.1	11.5	1	—	—	8	-5	LM6UU
15		17		11.5		1.1	14.3	1	—	—	11	-5	LM8SUU
15		24		17.5		1.1	14.3	1	—	—	16	-5	LM8UU
19	0 -13	29	0 -0.2	22	0 -0.2	1.3	18	1	—	—	30	-5	LM10UU
21		30		23		1.3	20	1.5	8	80°	31.5	-5	LM12UU
23		32		23		1.3	22	1.5	9	80°	43	-7	LM13UU
28	0 -16	37	0 -0.3	26.5	0 -0.3	1.6	27	1.5	11	80°	69	-7	LM16UU
32		42		30.5		1.6	30.5	1.5	11	60°	87	-9	LM20UU
40		59		41		1.85	38	2	12	50°	220	-9	LM25UU
45	0 -19	64	0 -0.3	44.5	0 -0.3	1.85	43	2.5	15	50°	250	-9	LM30UU
52		70		49.5		2.1	49	2.5	17	50°	390	-13	LM35UU
60		80		60.5		2.1	57	3	20	50°	585	-13	LM40UU
80	0 -22	100	0 -0.3	74	0 -0.3	2.6	76.5	3	25	50°	1580	-13	LM50UU
90		110		85		3.15	86.5	3	30	50°	2000	-16	LM60UU

* : the value of Standard type

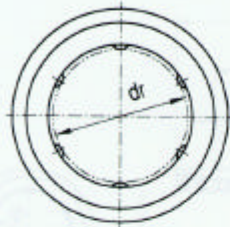
Linear Bushing LME Series



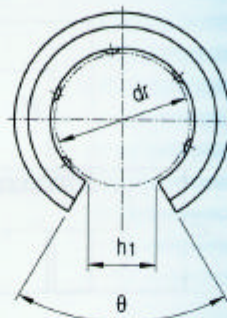
LME Series						Basic Load Ratings		Working Bore Diameter	
Standard type		Open type		Adjustable type		Dynamic C (N)	Static Co (N)		
Part number	No. of Ball circuit	Part number	No. of Ball circuit	Part number	No. of Ball circuit				
LME5UU	4	—	—	LME5UUAJ	4	200	260	5	+8 0
LME8UU	4	—	—	LME8UUAJ	4	260	400	8	
LME12UU	4	LME12UUOP	3	LME12UUAJ	4	500	770	12	
LME16UU	5	LME16UUOP	4	LME16UUAJ	5	570	890	16	+9 -1
LME20UU	5	LME20UUOP	4	LME20UUAJ	5	860	1370	20	
LME25UU	6	LME25UUOP	5	LME25UUAJ	6	980	1560	25	+11 -1
LME30UU	6	LME30UUOP	5	LME30UUAJ	6	1560	2740	30	
LME40UU	6	LME40UUOP	5	LME40UUAJ	6	2150	4010	40	+13 -2
LME50UU	6	LME50UUOP	5	LME50UUAJ	6	3820	7930	50	
LME60UU	6	LME60UUOP	5	LME60UUAJ	6	4700	9990	60	

note) Plating and RAYDENT treatments are available

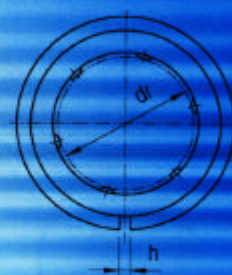
1N≒0.102kgf



LME



LME □ OP

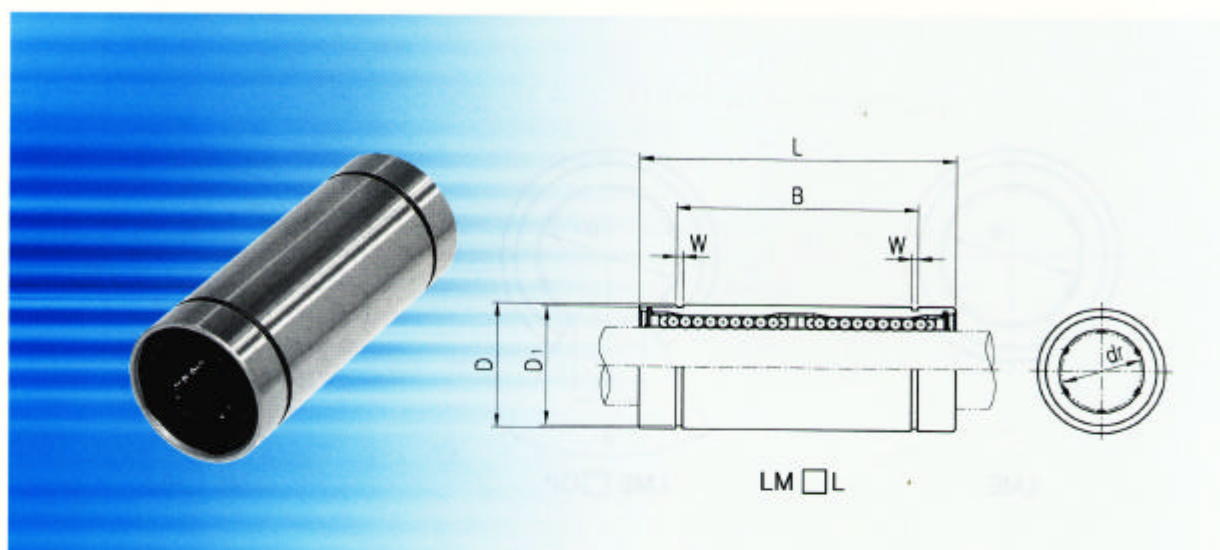


LME □ AJ

Dimensions(mm)											Wgt.* (gr)	Allowable Diametral Clearance (μm)	Part Number
D (mm)	Tol. (μm)	L (mm)	Tol. (mm)	B (mm)	Tol. (mm)	W	D ₁	h	h ₁	θ (°)			
12	0	22		14.5		1.1	11.5	1	—	—	12	-5	LME5UU
16	-8	25		16.5		1.1	15.2	1	—	—	20	-5	LME8UU
22	0	32	0 -0.2	22.9	0 -0.2	1.3	21	1.5	7.5	78°	41	-7	LME12UU
26	-9	36		24.9		1.3	24.9	1.5	10	78°	57	-7	LME16UU
32		45		31.5		1.6	30.3	2	10	60°	91	-9	LME20UU
40	0 -11	58		44.1		1.85	37.5	2	12.5	60°	215	-9	LME25UU
47		68	0	52.1	0	1.85	44.5	2	12.5	50°	325	-9	LME30UU
62	0	80	-0.3	60.6	-0.3	2.15	59	3	16.8	50°	705	-13	LME40UU
75	-13	100		77.6		2.65	72	3	21	50°	1130	-13	LME50UU
90	0 -15	125	0 -0.4	101.7	0 -0.4	3.15	86.5	3	27.2	54°	2220	-16	LME60UU

* : the value of Standard type

Linear Bushing LM□L Series

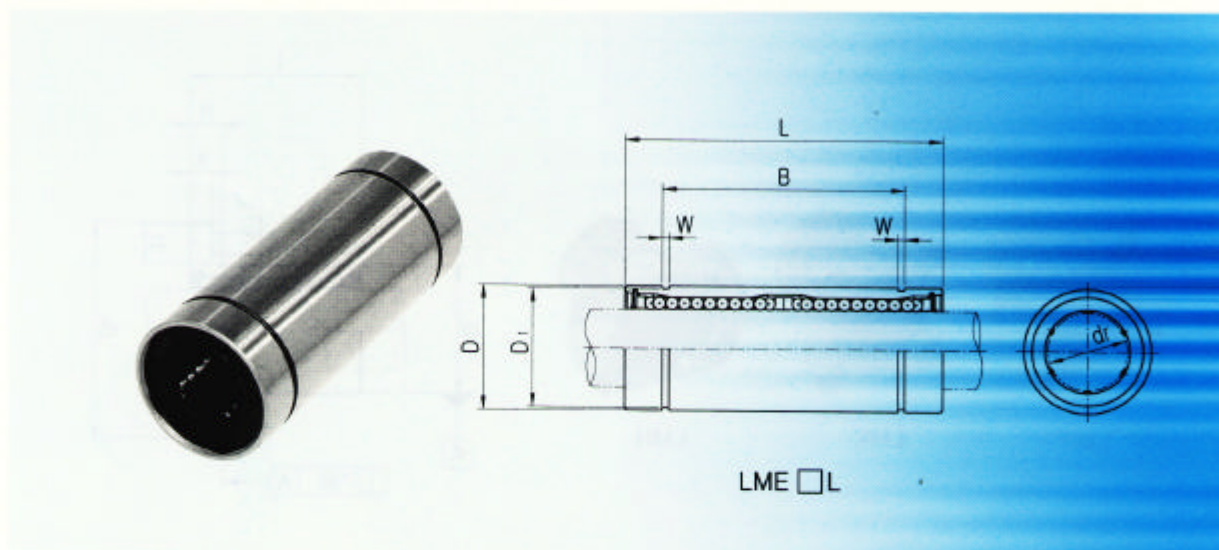


LM□L Series		Working Bore Diameter dr (mm) Tol. (μm)		Dimensions(mm)								Wgt. (g)	Basic Load Ratings	
Part number	No. of Ball circuit			D (mm)	Tol. (μm)	L (mm)	Tol. (mm)	B (mm)	Tol. (mm)	W	D1		Dynamic C (N)	Static Co (N)
LM6LUU	4	6	0 -10	12	0	35	0 -0.3	27	0 -0.3	1.1	11.5	16	320	520
LM8LUU	4	8		15	-13	45		35		1.1	14.3	31	430	780
LM10LUU	4	10		19	0 -16	55		44		1.3	18	62	580	1100
LM12LUU	4	12		21		57		46		1.3	20	80	650	1200
LM13LUU	4	13		23		61		46		1.3	22	90	810	1570
LM16LUU	5	16	0 -12	28	0 -19	70	0 -0.4	53	0 -0.4	1.6	27	145	1230	2350
LM20LUU	5	20		32		80		61		1.6	30.5	180	1400	2750
LM25LUU	6	25		40		112		82		1.85	38	440	1560	3140
LM30LUU	6	30		45		123		89		1.85	43	580	2490	5490
LM35LUU	6	35		52	0 -22	135		99		2.1	49	795	2650	6470
LM40LUU	6	40	0 -15	60		154		121	0 -0.4	2.1	57	1170	3430	8040
LM50LUU	6	50		80		192		148		2.6	76.5	3100	6080	15900
LM60LUU	6	60		90	0 -25	211		170		3.15	86.5	3500	7650	20000

note) Plating and RAYDENT treatments are available

1N≒0.102kgf

Linear Bushing LME□L Series

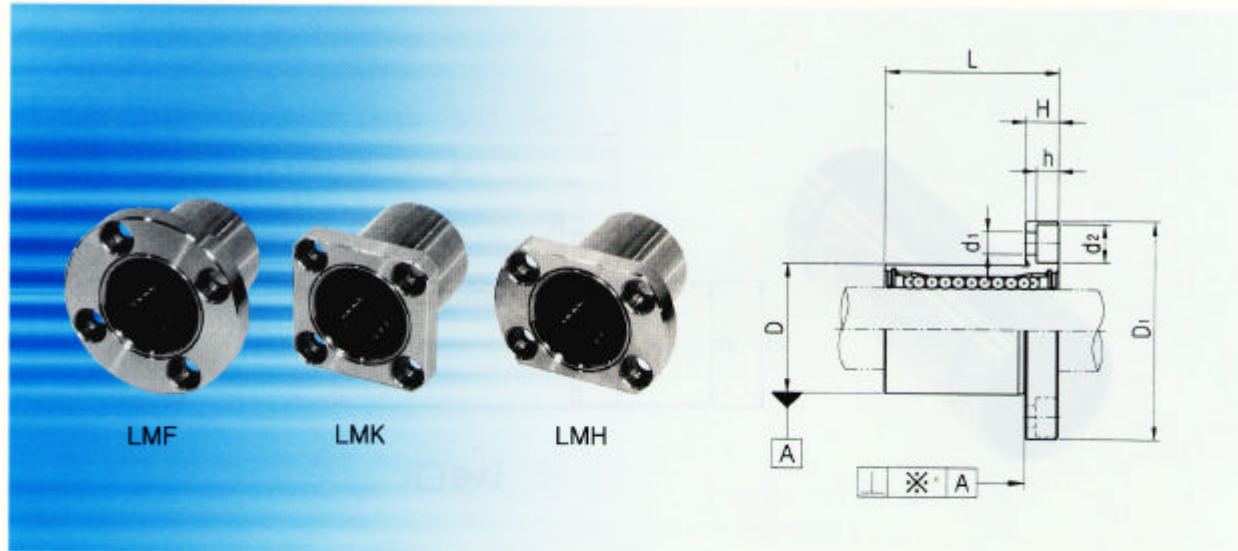


LME□L Series		Working Bore Diameter dr Tol. (mm) (μm)		Dimensions(mm)								Wgt. (gr)	Basic Load Ratings	
Part number	No. of Ball circuit			D Tol. (mm) (μm)		L Tol. (mm) (mm)		B Tol. (mm) (mm)		W	D ₁		Dynamic C (N)	Static C ₀ (N)
LME8LUU	4	8	+9	16	0 / -9	45	0	33	0	1.1	15.2	31	430	780
LME12LUU	4	12	-1	22	0	57		45.8		1.3	21	80	650	1200
LME16LUU	5	16	+11	26	-11	70		49.8		1.3	24.9	145	1230	2350
LME20LUU	5	20	-1	32	0	80		61		1.6	30.3	180	1400	2750
LME25LUU	6	25	+13	40		-13	112	82	1.85	38	440	1560	3140	
LME30LUU	6	30	-2	47		0	123	104.2	1.85	44.5	580	2490	5490	
LME40LUU	6	40	+16 -4	62			0	154	121.2	2.15	59	1170	3430	8040
LME50LUU	6	50		-15	192		155.2	2.65	72	3100	6080	15900		
LME60LUU	6	60		0 -20	211		170	3.15	86.5	3500	7650	20000		

note) Plating and RAYDENT treatments are available

1N ≈ 0.102kgf

Linear Bushing LMF/K/H Series

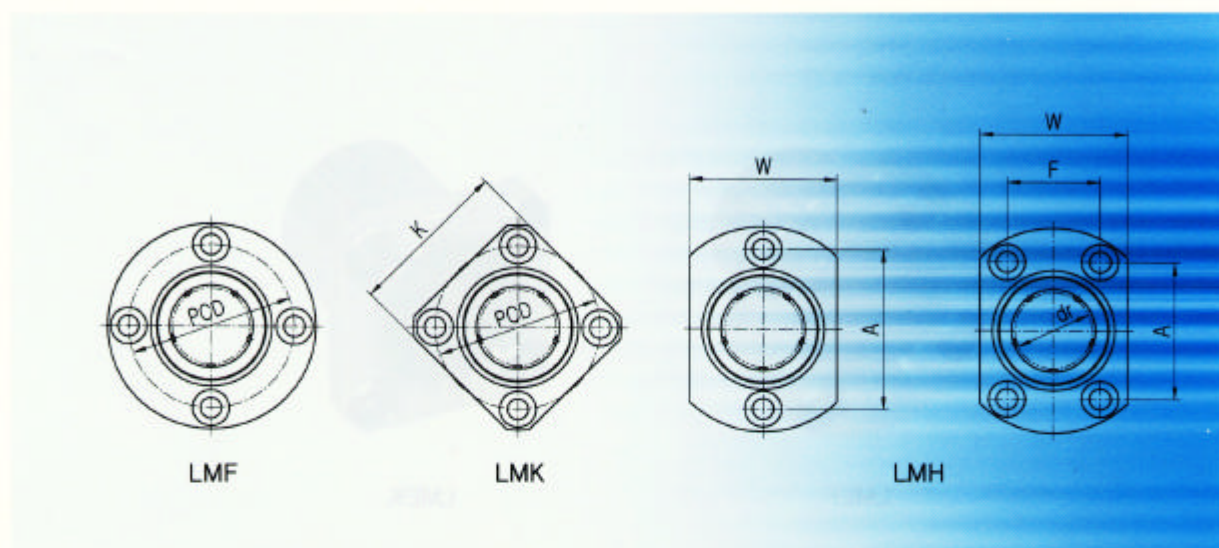


Part number			No. of Ball circuit	Wgt.* (g)	Allowable Diametral Clearance (μm)	Basic Load Ratings		Working Bore Diameter	
Circular type	Square type	Oval type				Dynamic C (N)	Static C_0 (N)	d_r (mm)	Tol. (μm)
LMF6UU	LMK6UU	LMH6UU	4	26.5	-5	200	260	6	0 -9
LMF8SUU	LMK8SUU	-	4	34	-5	170	220	8	
LMF8UU	LMK8UU	LMH8UU	4	40	-5	260	400	8	
LMF10UU	LMK10UU	LMH10UU	4	78	-5	370	540	10	
LMF12UU	LMK12UU	LMH12UU	4	76	-5	410	590	12	
LMF13UU	LMK13UU	LMH13UU	4	94	-7	500	770	13	
LMF16UU	LMK16UU	LMH16UU	5	134	-7	770	1170	16	0 -10
LMF20UU	LMK20UU	LMH20UU	5	180	-9	860	1370	20	
LMF25UU	LMK25UU	LMH25UU	6	340	-9	980	1560	25	
LMF30UU	LMK30UU	LMH30UU	6	460	-9	1560	2740	30	
LMF35UU	LMK35UU	-	6	795	-13	1660	3130	35	0 -12
LMF40UU	LMK40UU	-	6	1054	-13	2150	4010	40	
LMF50UU	LMK50UU	-	6	2200	-13	3820	7930	50	
LMF60UU	LMK60UU	-	6	2960	-16	4700	9990	60	0 -15

note) Plating and RAYDENT treatments are available

1N $\approx$ 0.102kgf

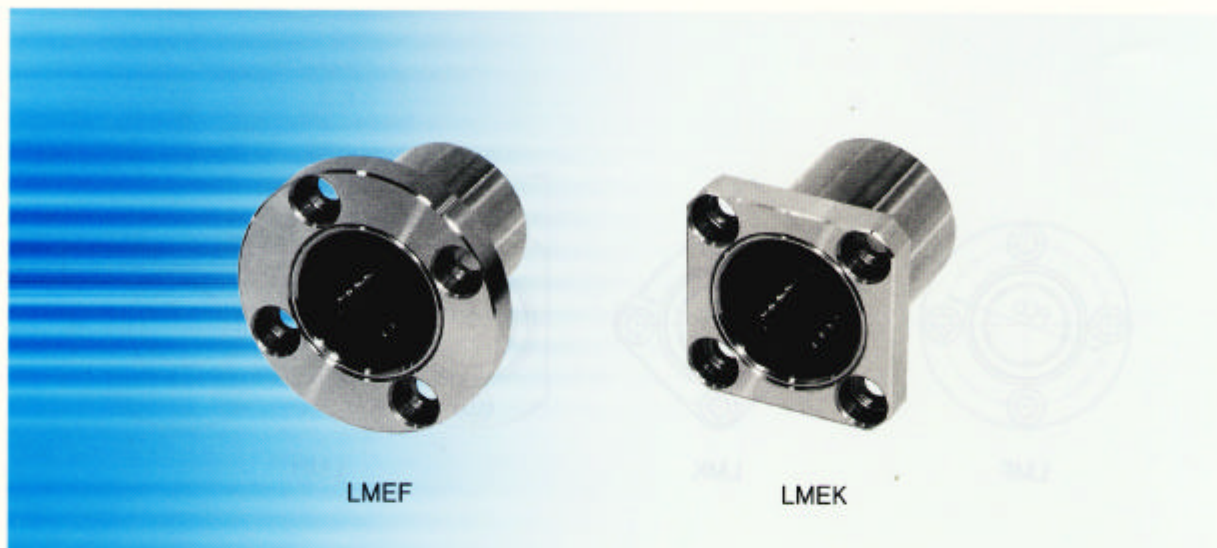
Linear Bushing LMF/K Series



Dimensions(mm)														Part number
D		L		D ₁		H	PCD	K	W	A	F	Squar- eness * (μm)	d ₁ ×d ₂ ×h	
(mm)	Tol. (μm)	(mm)	Tol. (mm)	(mm)	Tol. (mm)									
12	0 -11	19	0 -0.2	28	0 -0.2	5	20	22	18	20	—	12	3.4×6.5×3.3	LMF/K/H 6UU
15		17		32		5	24	25	—	—	—	12	3.4×6.5×3.3	LMF/K 8SUU
15		24		32		5	24	25	21	24	—	12	3.4×6.5×3.3	LMF/K/H 8UU
19	0 -13	29	0 -0.2	40	0 -0.2	6	29	30	25	29	—	12	4.5×8×4.4	LMF/K/H 10UU
21		30		42		6	32	32	27	32	—	12	4.5×8×4.4	LMF/K/H 12UU
23		32		43		6	33	34	29	33	—	12	4.5×8×4.4	LMF/K/H 13UU
28	0 -16	37	0 -0.3	48	0 -0.3	6	38	37	34	31	22	12	4.5×8×4.4	LMF/K/H 16UU
32		42		54		8	43	42	38	36	24	15	5.5×9.5×5.4	LMF/K/H 20UU
40		59		62		8	51	50	46	40	32	15	5.5×9.5×5.4	LMF/K/H 25UU
45	0 -19	64	0 -0.3	74	0 -0.3	10	60	58	51	49	35	15	6.6×11×6.5	LMF/K/H 30UU
52		70		82		10	67	64	—	—	—	20	6.6×11×6.5	LMF/K 35UU
60		80		96		13	78	75	—	—	—	20	9×14×8.6	LMF/K 40UU
80	0 -22	100	0 -0.3	116	0 -0.3	13	98	92	—	—	—	20	9×14×8.6	LMF/K 50UU
90		110		134		18	112	106	—	—	—	25	11×17.5×10.8	LMF/K 60UU

* : the value of Circular type

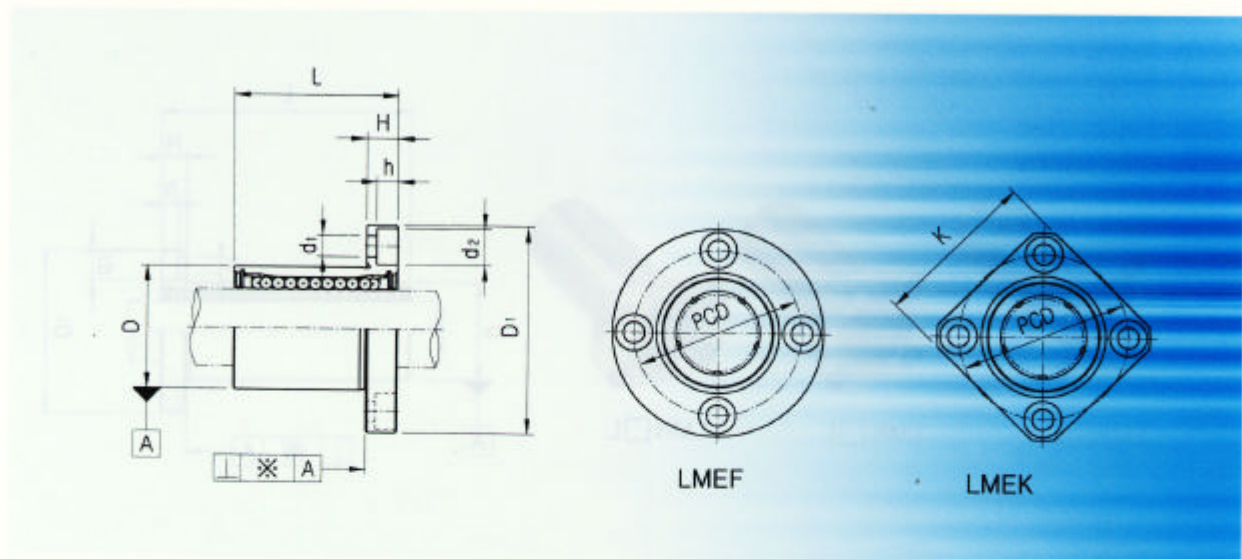
Linear Bushing LMEF/K Series



Part number		No. of Ball circuit	Wgt. * (g)	Allowable Diametral Clearance (μm)	Basic Load Ratings		Working Bore Diameter	
Circular type	Square type				Dynamic C (N)	Static Co (N)	dr (mm)	Tol. (μm)
LMEF8UU	LMEK8UU	4	44	-5	260	400	8	+8
LMEF12UU	LMEK12UU	4	86	-5	500	770	12	0
LMEF16UU	LMEK16UU	5	120	-7	570	890	16	+9
LMEF20UU	LMEK20UU	5	184	-9	860	1370	20	-1
LMEF25UU	LMEK25UU	6	335	-9	980	1560	25	+11
LMEF30UU	LMEK30UU	6	545	-9	1560	2740	30	-1
LMEF40UU	LMEK40UU	6	1185	-13	2150	4010	40	+13 -2
LMEF50UU	LMEK50UU	6	1730	-13	3820	7930	50	
LMEF60UU	LMEK60UU	6	3180	-16	4700	9990	60	

note) Plating and RAYDENT treatments are available

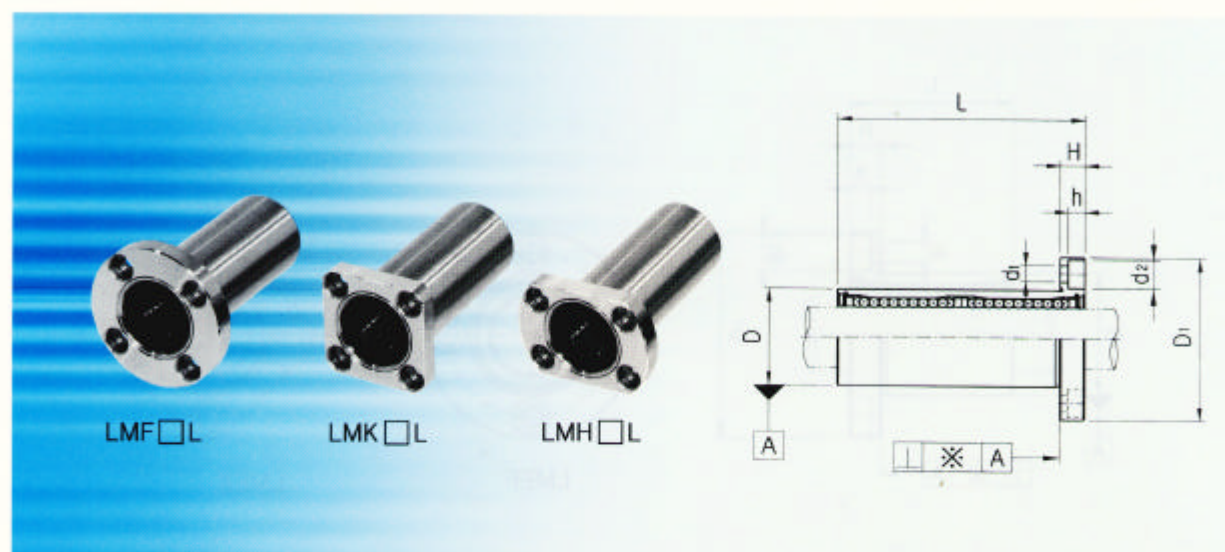
1N ≒ 0.102kgf



Dimensions(mm)											Part number
D (mm)	Tol. (μ m)	L (mm)	Tol. (mm)	D ₁ (mm)	Tol. (mm)	H	PCD	K	Squar- eness * (μ m)	d ₁ ×d ₂ ×h	
16	0 / -8	25	0	32	-0.2	5	24	25	12	3.4×6.5×3.3	LMEF/K 8UU
22	0	32		42		6	32	32	12	4.5×8×4.4	LMEF/K 12UU
26	-9	36		46		6	36	35	12	4.5×8×4.4	LMEF/K 16UU
32	0	45	0	54	-0.2	8	43	42	15	5.5×9.5×5.4	LMEF/K 20UU
40		58		62		8	51	50	15	5.5×9.5×5.4	LMEF/K 25UU
47		68		76		10	62	60	15	6.6×11×6.5	LMEF/K 30UU
62	0	80	-0.3	98	0	13	80	75	20	9×14×8.6	LMEF/K 40UU
75	-13	100		112		13	94	88	20	9×14×8.6	LMEF/K 50UU
90	0 / -15	125		134		18	112	106	25	11×17.5×10.8	LMEF/K 60UU

* : the value of Circular type

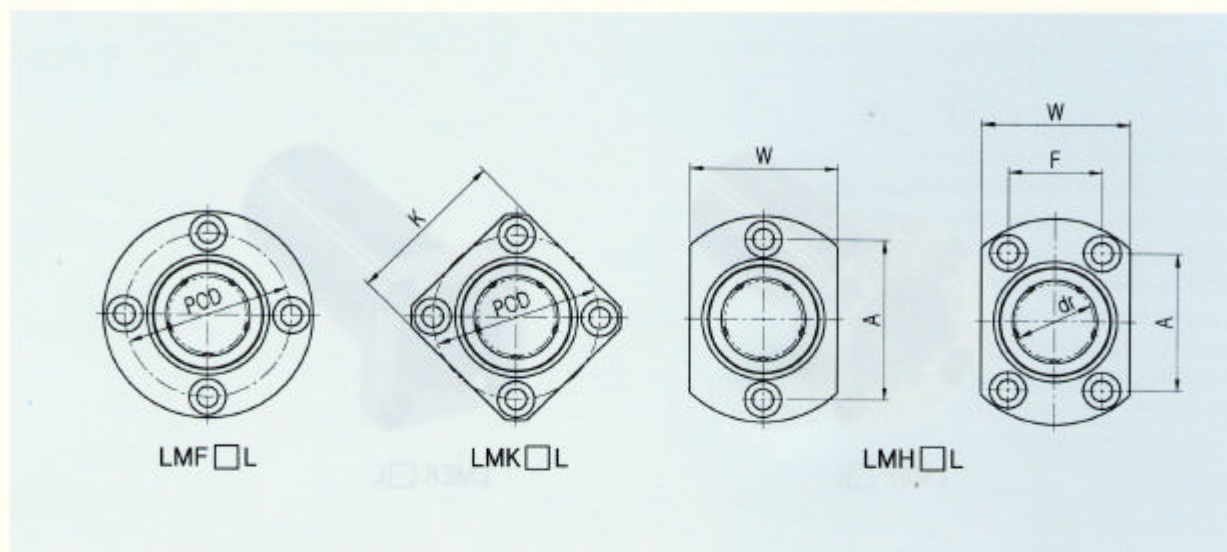
Linear Bushing LMF/K/H□L Series



Part number			No. of Ball circuit	Wgt. (g)	Allowable Diametral Clearance (μm)	Basic Load Ratings		Working Bore Diameter	
Circular type	Square type	Oval type				Dynamic C (N)	Static C ₀ (N)	dr (mm)	Tol. (μm)
LMF6LUU	LMK6LUU	LMH6LUU	4	31	-5	320	520	6	0 -10
LMF8LUU	LMK8LUU	LMH8LUU	4	53	-5	430	780	8	
LMF10LUU	LMK10LUU	LMH10LUU	4	105	-5	580	1100	10	
LMF12LUU	LMK12LUU	LMH12LUU	4	100	-5	650	1200	12	
LMF13LUU	LMK13LUU	LMH13LUU	4	130	-7	810	1570	13	
LMF16LUU	LMK16LUU	LMH16LUU	5	187	-7	1230	2350	16	0 -12
LMF20LUU	LMK20LUU	LMH20LUU	5	260	-9	1400	2750	20	
LMF25LUU	LMK25LUU	LMH25LUU	6	515	-9	1560	3140	25	
LMF30LUU	LMK30LUU	LMH30LUU	6	655	-9	2490	5490	30	0 -15
LMF35LUU	LMK35LUU	-	6	970	-13	2650	6470	35	
LMF40LUU	LMK40LUU	-	6	1560	-13	3430	8040	40	
LMF50LUU	LMK50LUU	-	6	3500	-13	6080	15900	50	0 -20
LMF60LUU	LMK60LUU	-	6	4500	-16	7650	20000	60	

note) Plating and RAYDENT treatments are available

1N $\approx$ 0.102kgf



Dimensions(mm)														Part number
D		L		D ₁		H	PCD	K	W	A	F	Squar eness * (μm)	d ₁ ×d ₂ ×h	
(mm)	Tol. (μm)	(mm)	Tol. (mm)	(mm)	Tol. (mm)									
12	0	35	0 -0.3	28	0 -0.2	5	20	22	18	20	-	15	3.4×6.5×3.3	LMF/K/H 6LUU
15	-13	45		32		5	24	25	21	24	-	15	3.4×6.5×3.3	LMF/K/H 8LUU
19	0 -16	55		40		6	29	30	25	29	-	15	4.5×8×4.4	LMF/K/H 10LUU
21		57		42		6	32	32	27	32	-	15	4.5×8×4.4	LMF/K/H 12LUU
23		61		43		6	33	34	29	33	-	15	4.5×8×4.4	LMF/K/H 13LUU
28		70		48		6	38	37	34	31	22	15	4.5×8×4.4	LMF/K/H 16LUU
32	0 -19	80	54	8	43	42	38	36	24	20	5.5×9.5×5.4	LMF/K/H 20LUU		
40		112	62	8	51	50	46	40	32	20	5.5×9.5×5.4	LMF/K/H 25LUU		
45		123	74	10	60	58	51	49	35	20	6.6×11×6.5	LMF/K/H 30LUU		
52		135	82	10	67	64	-	-	-	25	6.6×11×6.5	LMF/K 35LUU		
60	0 -22	154	0 -0.4	96	0 -0.3	13	78	75	-	-	-	25	9×14×8.6	LMF/K 40LUU
80		192		116		13	98	92	-	-	-	25	9×14×8.6	LMF/K 50LUU
90	0 -25	211		134		18	112	106	-	-	-	25	11×17.5×10.8	LMF/K 60LUU

* : the value of Circular type

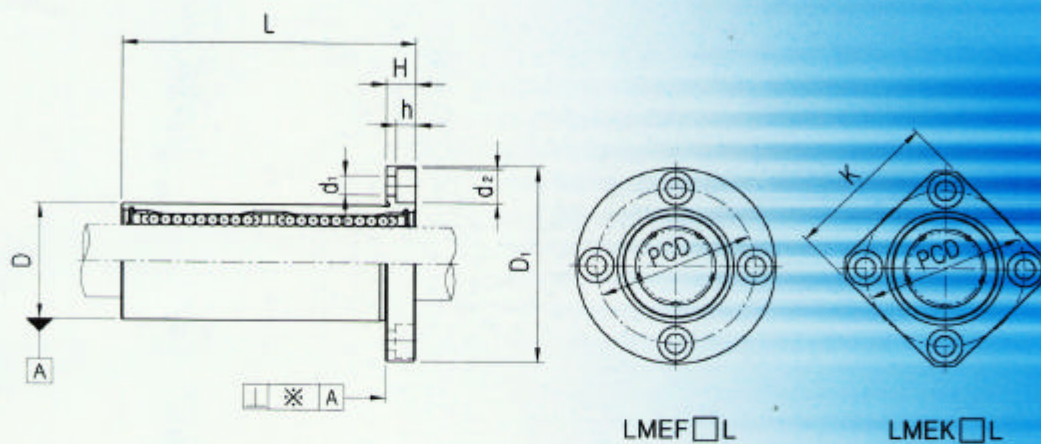
Linear Bushing LMEF/K□L Series



Part number		No. of Ball circuit	Wgt. * (g)	Allowable Diametral Clearance (μm)	Basic Load Ratings		Working Bore Diameter	
Circular type	Square type				Dynamic C (N)	Static Co (N)	dr (mm)	Tol. (μm)
LMEF8LUU	LMEK8LUU	4	53	-5	430	780	8	+9
LMEF12LUU	LMEK12LUU	4	100	-5	650	1200	12	-1
LMEF16LUU	LMEK16LUU	5	187	-7	1230	2350	16	+11
LMEF20LUU	LMEK20LUU	5	260	-9	1400	2750	20	-1
LMEF25LUU	LMEK25LUU	6	515	-9	1560	3140	25	+13
LMEF30LUU	LMEK30LUU	6	655	-9	2490	5490	30	-2
LMEF40LUU	LMEK40LUU	6	1560	-13	3430	8040	40	+16
LMEF50LUU	LMEK50LUU	6	3500	-13	6080	15900	50	-4
LMEF60LUU	LMEK60LUU	6	4500	-16	7650	20000	60	

note) Plating and RAYDENT treatments are available

1N ≈ 0.102kgf



Dimensions(mm)											Part number
D (mm)	Tol. (μ m)	L (mm)	Tol. (mm)	D ₁ (mm)	Tol. (mm)	H	PCD	K	Squar eness * (μ m)	d ₁ ×d ₂ ×h	
16	0 / -9	45	0 -0.3	32	0 -0.2	5	24	25	15	3.4×6.5×3.3	LMEF/K 8LUU
22	0	57		42		6	32	32	15	4.5×8×4.4	LMEF/K 12LUU
26	-11	70		46		6	36	35	15	4.5×8×4.4	LMEF/K 16LUU
32	0	80		54		8	43	42	17	5.5×9.5×5.4	LMEF/K 20LUU
40	-13	112	0 -0.4	62	0 -0.3	8	51	50	17	5.5×9.5×5.4	LMEF/K 25LUU
47	0	123		76		10	62	60	17	6.6×11×6.5	LMEF/K 30LUU
62	-15	154		98		13	80	75	20	9×14×8.6	LMEF/K 40LUU
75	0	192		112		13	94	88	20	9×14×8.6	LMEF/K 50LUU
90	-20	211		134		18	112	106	25	11×17.5×10.8	LMEF/K 60LUU

* : the value of Circular type