

# LINEAR BALL BEARINGS & HARDENED STEEL SHAFTS



**ROLLCO**

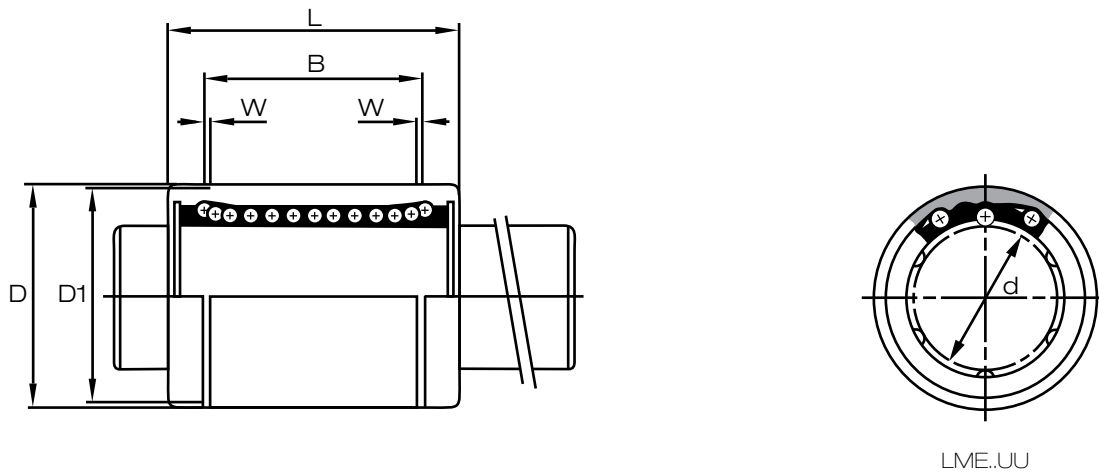
SPECIALIZED  
ON LINEAR MOTION



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## Closed Design/5-60 mm



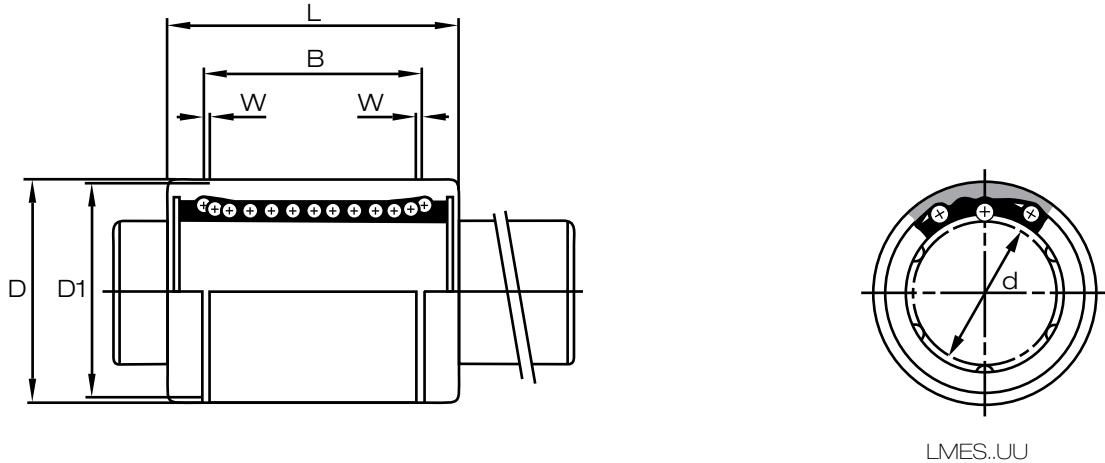
LME.UU

Dimensions: mm

Type	Number of ball rows	Inscribed circle diameter	Outer diameter	Length	Outer locking groove	Outer locking groove diameter	Load capacity		
							Dynamic C(N)	Static Co(N)	
		d	D	L	B	D1	W		
LME5UU	4	5	12	22	14.5	11.5	1.1	210	270
LME8UU	4	8	16	25	16.5	15.2	1.1	270	410
LME12UU	4	12	22	32	22.9	21	1.3	520	790
LME16UU	5	16	26	36	24.9	24.9	1.3	590	910
LME20UU	5	20	32	45	31.5	30.3	1.6	880	1400
LME25UU	6	25	40	58	44.1	37.5	1.85	1000	1600
LME30UU	6	30	47	68	52.1	44.5	1.85	1600	2800
LME40UU	6	40	62	80	60.6	59	2.15	2200	4000
LME50UU	6	50	75	100	77.6	72	2.65	3900	8100
LME60UU	6	60	90	125	101.7	86.5	3.15	4800	10200

Other types on request

## Closed Design/8-40 mm

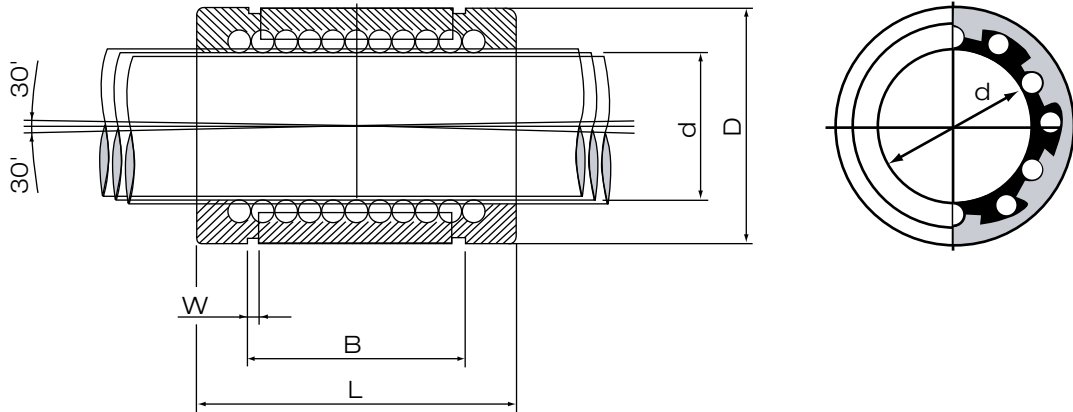


Dimensions: mm

Type	Number of ball rows	Inscribed circle diameter	Outer diameter	Length	Outer locking groove	Outer locking groove diameter	Load capacity		
							Dynamic C(N)	Static Co(N)	
		d	D	L	B	D1	W		
LMES8UU	4	8	16	25	16,5	15,2	1,1	270	410
LMES12UU	4	12	22	32	22.9	21	1.3	520	790
LMES16UU	5	16	26	36	24.9	24.9	1.3	590	910
LMES20UU	5	20	32	45	31.5	30.3	1.6	880	1400
LMES25UU	6	25	40	58	44.1	37.5	1.85	1000	1600
LMES30UU	6	30	47	68	52.1	44.5	1.85	1600	2800
LMES40UU	6	40	62	80	60.6	59	2.15	2200	4000

**Other types on request**

## Self-aligning Closed Design/12-50 mm

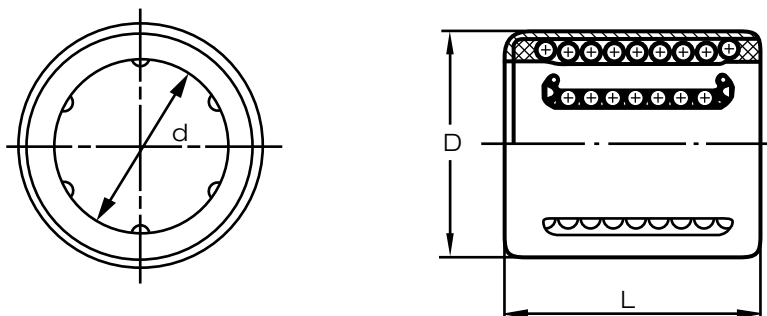


Dimensions: mm

Type	Number of ball rows	Inscribed circle diameter	Outer diameter	Length	Outer locking groove	Load capacity		
						D	L	B
SBE12UU	5	12	22	32	22.7	1.3	1260	1120
SBE16UU	5	16	26	36	24.6	1.3	1530	1280
SBE20UU	6	20	32	45	31.2	1.6	2630	1700
SBE25UU	6	25	40	58	43.7	1.85	3880	2810
SBE30UU	6	30	47	68	51.7	1.85	4810	2860
SBE40UU	6	40	62	80	60.3	2.15	6630	5840
SBE50UU	6	50	75	100	77.3	2.65	11690	8100

Other types on request

## Compact Type/6-50 mm

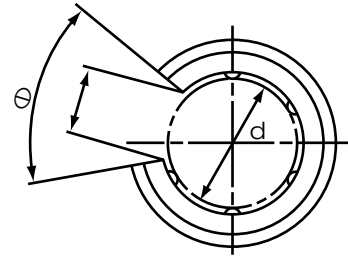
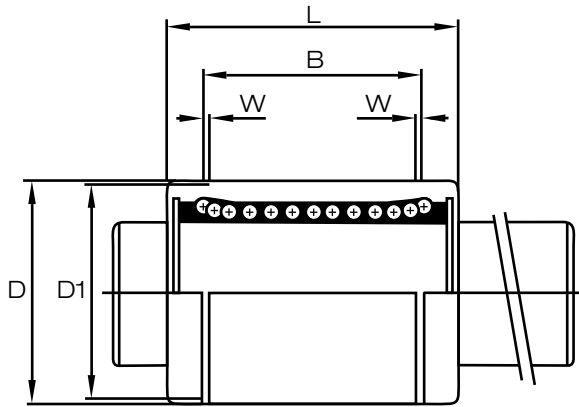


Dimensions: mm

Type	Inscribed circle diameter	Outer diameter	Length	Load capacity		External seals
				Dynamic C(N)	Static Co(N)	
	d	D	L			
KH0622PP	6	12	22	400	239	-
KH0824PP	8	15	24	435	280	-
KH1026PP	10	17	26	500	370	-
KH1228PP	12	19	28	620	510	G 12 x 19 x 3
KH1428PP	14	21	28	620	520	G 14 x 21 x 3
KH1630PP	16	24	30	800	620	G 16 x 24 x 3
KH2030PP	20	28	30	950	790	G 20 x 28 x 4
KH2540PP	25	35	40	1990	1670	G 25 x 35 x 4
KH3050PP	30	40	50	2800	2700	G 30 x 40 x 4
KH4060PP	40	52	60	4400	4450	G 40 x 52 x 5
KH5070PP	50	62	70	5500	6300	-

**Other types on request**

# Open Design/12-50 mm



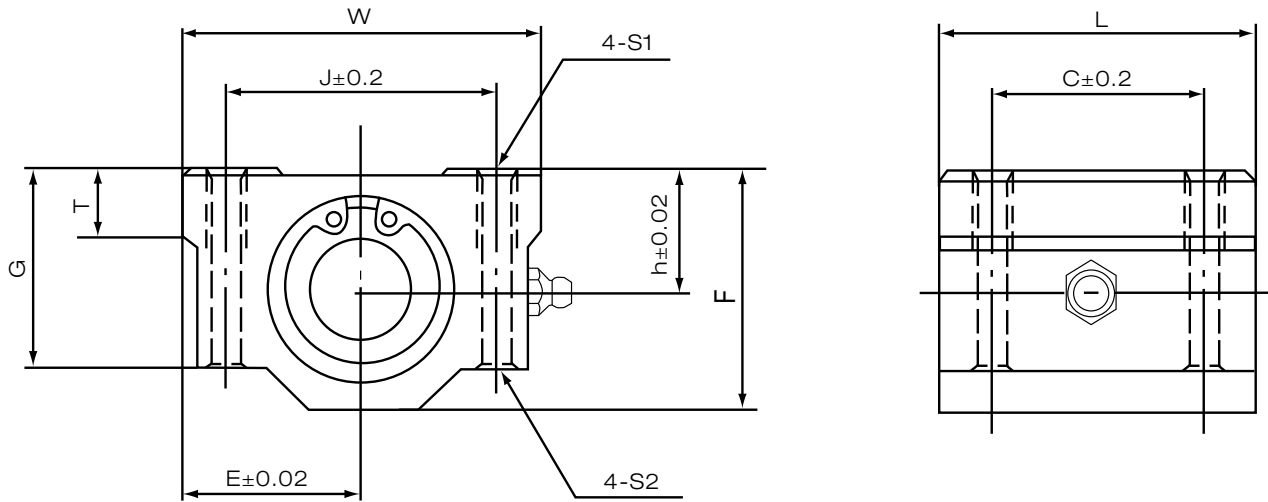
LME...UUOP

Dimensions: mm

Type	Number of ball rows	Inscribed circle diameter	Outer diameter	Length	Outer locking groove	Outer locking groove diameter				Load capacity	
							d	D	L	B	D1
LME12UUOP	3	12	22	32	22.9	21	1.3	78°	520	790	
LME16UUOP	4	16	26	36	24.9	24.9	1.3	78°	590	910	
LME20UUOP	4	20	32	45	31.5	30.3	1.6	60°	880	1400	
LME25UUOP	5	25	40	58	44.1	37.5	1.85	60°	1000	1600	
LME30UUOP	5	30	47	68	52.1	44.5	1.85	60°	1600	2800	
LME40UUOP	5	40	62	80	60.6	59	2.15	60°	2200	4000	
LME50UUOP	5	50	75	100	77.6	72	2.65	60°	3900	8100	

Other types on request

## Type KBA...UU/12-50 mm



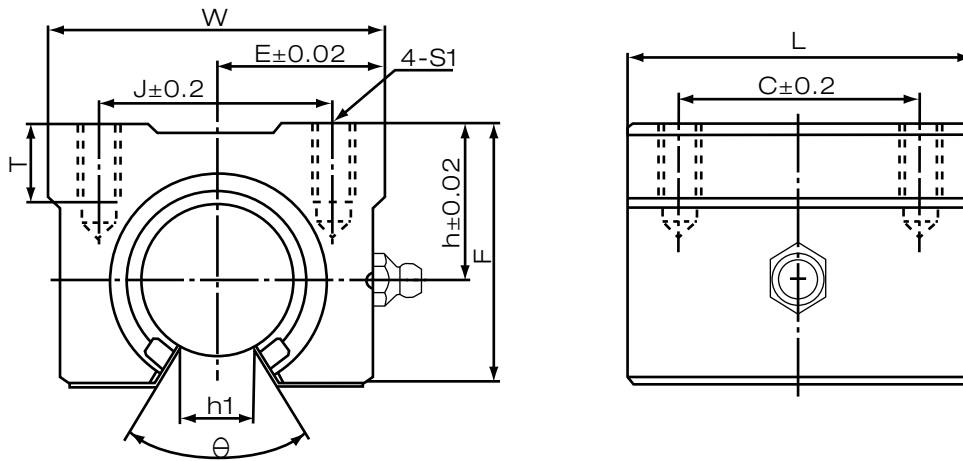
**NOTE:** Linear Units can also be supplied with selfaligning SBE-Bushing (KBE...UU) or stainless LMES-Bushing (KBS..UU)

Dimensions: mm

Type	Inscribed circle diameter												Weight (g)	Load capacity	
		h	E	W	L	F	G	T	J	C	S1	S2		Dynamic C(N)	Static Co(N)
KBA12UU	12	15	22	44	39	30	24.5	8	33	26	M5	4.3	120	520	740
KBA16UU	16	19	25	50	44	38.5	32.5	9	36	34	M5	4.3	200	590	910
KBA20UU	20	21	27	54	53	41	35	11	40	40	M6	5.2	270	880	1400
KBA25UU	25	26	38	76	67	51.5	42	12	54	50	M8	7	600	1000	1600
KBA30UU	30	30	39	78	76	59.5	49	15	58	58	M8	7	776	1600	2800
KBA40UU	40	40	51	102	90	78	62	20	80	60	M10	8.7	1590	2200	4000
KBA50UU	50	52	61	122	110	102	94	25	100	80	M10	8.7	3340	3900	8100

Other types on request

# Open Type KBA...UUOP/16-40 mm

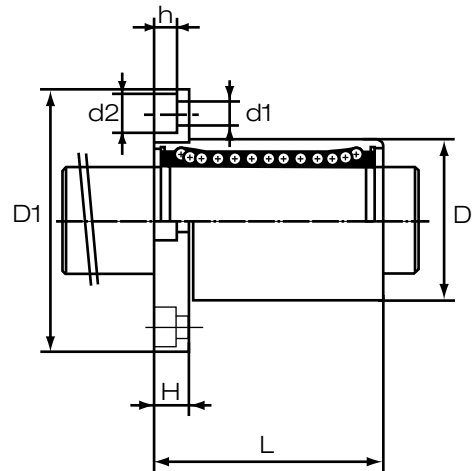
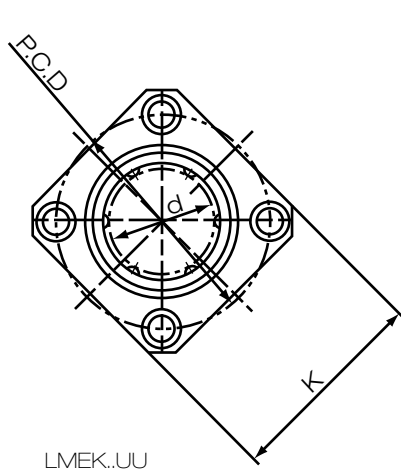


Dimensions: mm

Type	Inscribed circle diameter												Load capacity	
		W	F	L	h	E	h1	θ	J	C	S1	T	Dynamic C(N)	Static Co(N)
KBA16UUOP	16	45	33	45	20	22.5	10	80	32	30	M5	12	590	910
KBA20UUOP	20	48	39	50	23	24	10	60	35	35	M6	12	880	1400
KBA25UUOP	25	60	47	65	27	30	11.5	60	40	40	M6	12	1000	1600
KBA30UUOP	30	70	56	70	33	35	14	60	50	50	M8	18	1600	2800
KBA40UUOP	40	90	72	90	42	45	19	60	65	65	M10	20	2200	4100

Other types on request

## Type LMEK..UU/8-60 mm

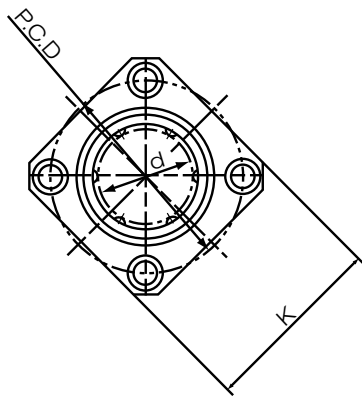


Dimensions: mm

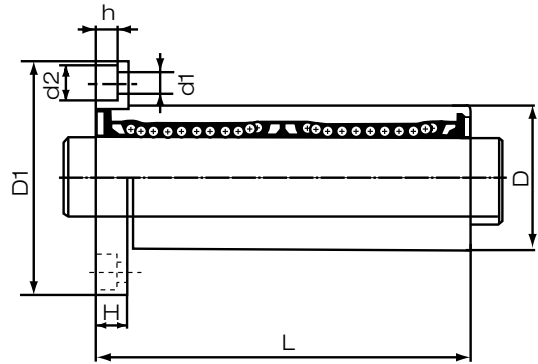
Type	No. of ball rows											Load capacity			
		d	D	L	D1	K	H	P.C.D	d1	x	d2	x	h	Dynamic C(N)	Static Co(N)
LMEK8UU	4	8	16	25	32	25	5	24	3,5	x	6	x	3,1	270	410
LMEK12UU	4	12	22	32	42	32	6	32	4,5	x	8	x	4,4	520	790
LMEK16UU	5	16	26	36	46	35	6	36	4,5	x	8	x	4,4	590	910
LMEK20UU	5	20	32	45	54	42	8	43	5,5	x	9,5	x	5,4	880	1400
LMEK25UU	6	25	40	58	62	50	8	51	5,5	x	9,5	x	5,4	1000	1600
LMEK30UU	6	30	47	68	76	60	10	62	6,6	x	11	x	6,5	1600	2800
LMEK40UU	6	40	62	80	98	75	13	80	9	x	14	x	8,6	2200	4100
LMEK50UU	6	50	75	100	112	88	13	94	9	x	14	x	8,1	3900	8100
LMEK60UU	6	60	90	125	134	106	18	112	11	x	17,5	x	10,8	4800	10000

Other types on request

# Type LMEK...LUU/12-60 mm



LMEK.LUU

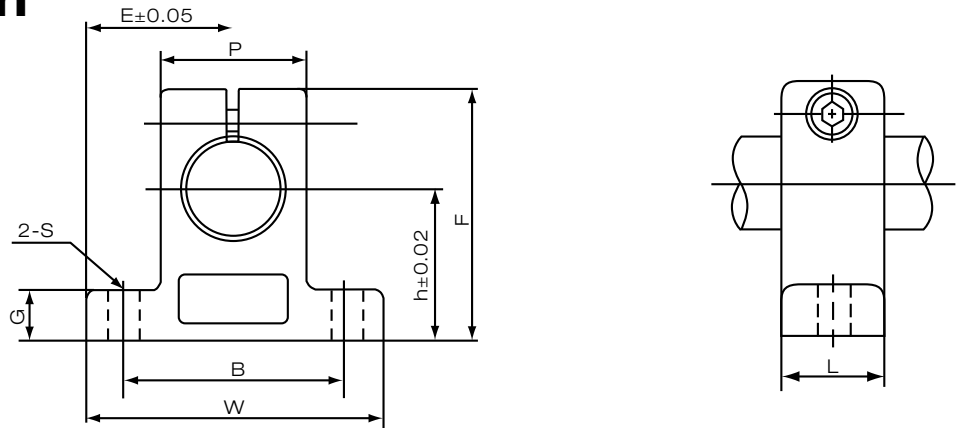


Dimensions: mm

Type	No. of ball rows								Load capacity		
		d	D	L	D1	K	H	P.C.D	d1 x d2 x h	Dynamic C(N)	Static Co(N)
LMEK12LUU	4	12	22	61	42	32	6	32	4.5 x 8 x 4.4	657	1200
LMEK16LUU	5	16	26	70	46	35	6	36	4.5 x 8 x 4.4	1230	2350
LMEK20LUU	5	20	32	80	54	42	8	43	5.5 x 9.5 x 5.4	1400	2750
LMEK25LUU	6	25	40	112	62	50	8	51	5.5 x 9.5 x 5.4	1560	3140
LMEK30LUU	6	30	47	123	76	60	10	62	6.6 x 11 x 6.5	2490	5490
LMEK40LUU	6	40	62	152	98	75	13	80	9 x 14 x 8.6	3430	8040
LMEK50LUU	6	50	75	192	112	88	13	94	9 X 14 X 8,6	6200	16220
LMEK60LUU	6	60	90	209	134	106	18	112	11 X 17 X 11	7700	20400

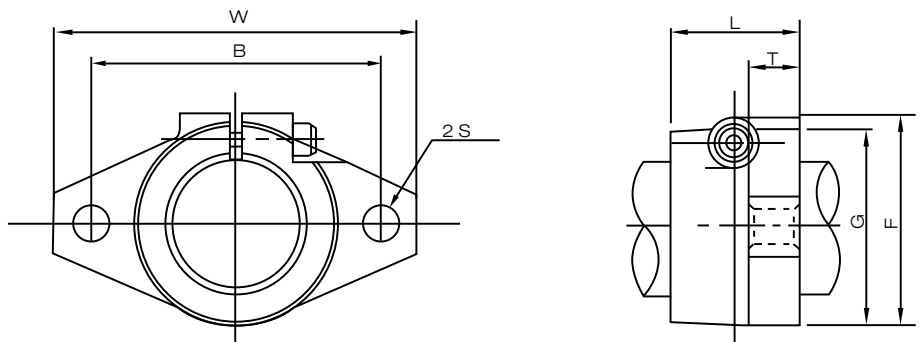
Other types on request

## SK 12-50 mm



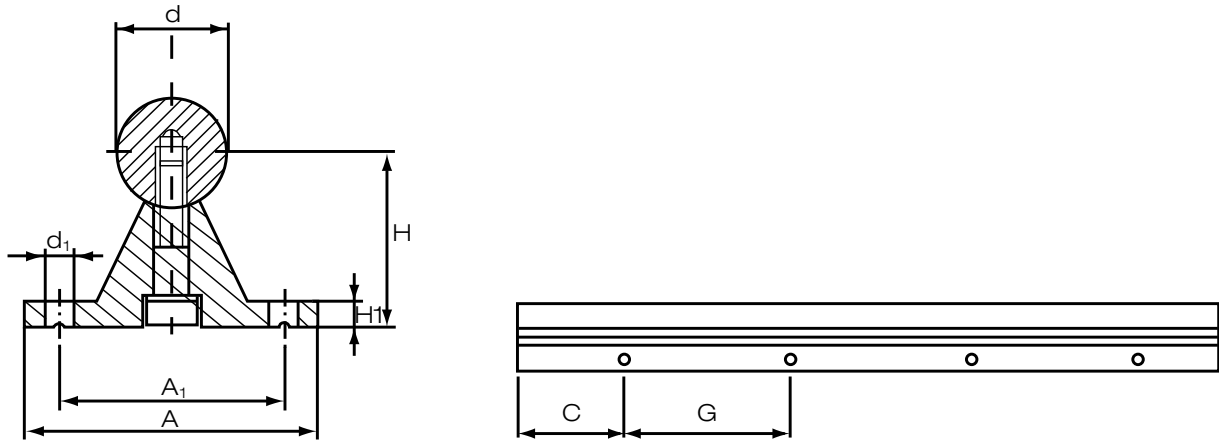
Type	Circle diameter	h	W	E	B	P	S	G	F	L	Weight (g)
SK12 A	12	23	42	21	32	20	5.5	6	38	14	30
SK16 A	16	27	48	24	38	25	5.5	8	44	16	40
SK20 A	20	31	60	30	45	30	6.6	10	51	20	70
SK25 A	25	35	70	35	56	38	6.6	12	60	24	130
SK30 A	30	42	84	42	64	44	9	12	70	28	180
SK40 A	40	60	114	57	90	60	11	15	96	36	420
SK50 A	50	70	126	63	100	74	14	18	120	40	750

## SHF 12-40 mm



Type	Circle diameter	W	L	T	F	G	B	S	Weight (g)
SHF12	12	47	13	7	28	25	36	5,5	20
SHF16	16	50	16	8	31	28	40	5.5	27
SHF20	20	60	20	8	37	34	48	7	40
SHF25	25	70	25	10	42	40	56	7	60
SHF30	30	80	30	12	50	46	64	9	110
SHF40	40	102	40	16	67	56	80	12	510

## Type SSU/12-50 mm



Dimensions: mm

Type	d	A	H	A <sub>1</sub>	C	G	d <sub>1</sub>	H <sub>1</sub>
SSU12W	12	40	22	29	37.5	75	4,5	5
SSU16W	16	45	26	33	50	100	5,5	5
SSU20W	20	52	32	37	50	100	6,6	6
SSU25W	25	57	36	42	60	120	6,6	6
SSU30W	30	69	42	51	75	150	9,0	7
SSU40W	40	73	50	55	100	200	9,0	9
SSU50W	50	84	60	63	100	200	11,0	9

Example:

SSU16 W = Standard hardened shaft + shaft support

SSU16 WW = Chromium plated hardened shaft + shaft support

SSU16 WRB = Stainless steel hardened shaft + shaft support

Length of support according to customer application.

Ordering ex: SSU16 WRB-1600 shaft stainless steel mounted at shaft support total length 1600 m/m.

**Other types on request**

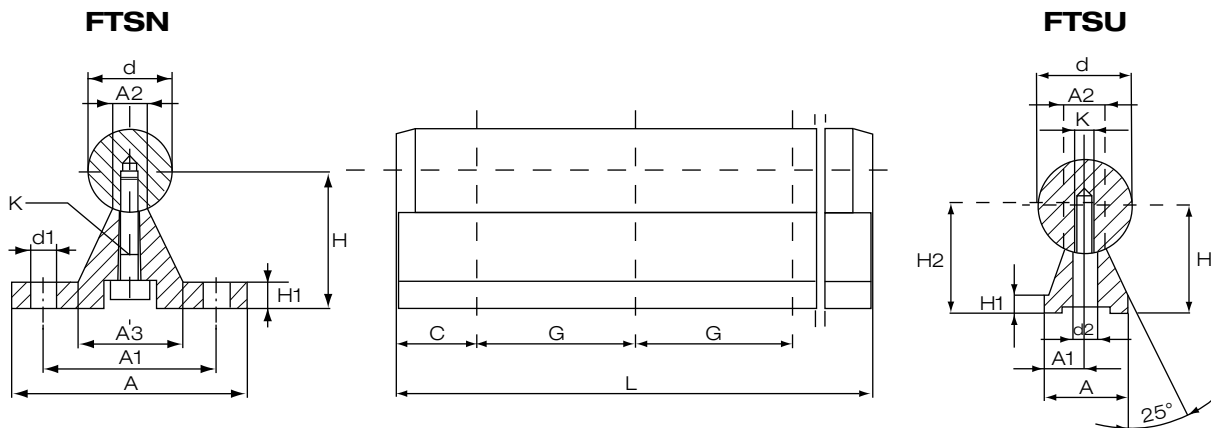
## FTSN Flange Type

Dimensions: mm

Type	Dimensions mm		Mounting dimensions mm								
	d	A	H	A2	A3	H1	A1	d1	C	G	K
FTSN12G	12	40	22	5,4	15	5	29	4,5	37,5	75	M4x20
FTSN16G	16	45	26	7	19	5	33	5.5	50	100	M5x20
FTSN20G	20	52	32	8.1	23	6	37	6.6	50	100	M6x25
FTSN25G	25	57	36	10.3	26	6	42	6.6	60	120	M8x30
FTSN30G	30	69	42	11	29	7	51	9	75	150	M10x35
FTSN40G	40	73	50	15	36	8	55	9	100	200	M10x40
FTSN50G	50	84	60	19	40	9	63	11	100	200	M12x45

Standard section length **L=6000 mm**

Support rails can be supplied, upon request, with or without mounting holes and in length different than standad ( $L_{max}=6000$  mm)



## FTSU Low Type

Dimensions: mm

Type	Dimensions mm		Mounting dimensions mm								
	d	A	H	A1	A2	H1	K	d2	H2	C	G
FTSU16G	16	14	18	7	7	3	M5	5.5	19	37.5	100
FTSU20G	20	17	22	8.5	8.1	3	M6	6.6	23	37.5	100
FTSU25G	25	21	26	10.5	10.3	3	M8	9	28.5	37.5	120
FTSU30G	30	23	30	11.5	11	3	M10	11	32	50	150
FTSU40G	40	30	39	15	15	4	M12	13.5	39.5	50	200

Standard section length **L=6000 mm**

Support rails can be supplied, upon request, with or without mounting holes and in length different than standad ( $L_{max}=6000$  mm)

# Lifetime Calculation

## Dynamic load rating C

The dynamic load rating C is a load of constant magnitude under which 90% of a statistically significant number of apparently identical bearings would reach a theoretical life of 50 km without the apparent appearance of metal fatigue.

## Static load rating Co

The static load rating Co is defined as the load that would cause a permanent deformation equal to 1/10.000 of the ball diameter at the most stressed contact point.

## Life of a linear ball bearing

Repeated stresses onto the contact surfaces could lead to material fatigue, This will lead to the appearance of surface pitting. The life of the unit is defined as the duration before the appearance of pitting.

## Rated life (L)

The rated life L is the total traveled distance which 90% of a statistically significant number of apparently identical bearings would reach under the same operating conditions without the apparent appearance of metal fatigue.

$$L = (C/P)^3 \cdot 50 \quad (1)$$

**L** = rated life (km)

**C** = dynamic load ratings (N)

**P** = equivalent dynamic load (N)

When a system is subjected to a load equal to the dynamic load rating C the resulting life equal the rated life (50 km). The theoretical life of a linear bearing is affected by the load and by the operating conditions (temperature, vibration, shock, load distribution, etc.) In such cases the theoretical life is calculated with the help of equation 2.

$$L = (f_c \cdot C / f_w \cdot P)^3 \cdot 50 \quad (2)$$

**L** = rated life (km)

**C** = dynamic load ratings (N)

**P** = equivalent dynamic load (N)

**f<sub>c</sub>** = Contact coefficient

**f<sub>w</sub>** = Load factor

The following equation (3) allows the conversion of the rated life in hours.

$$L_h = L \cdot 10^3 / (2 \cdot L_s \cdot n_1 \cdot 60) \quad (3)$$

**L<sub>h</sub>** = rated life (hours)

**L<sub>s</sub>** = stroke length (m)

**L** = rated life (km)

**n<sub>1</sub>** = operating frequency (stroke/min)

## Mounting Tolerances

The table below shows the tolerances to be used for a proper bearing installation. They insure a precise and smooth motion.

### Recommended mounting tolerances for SBE-LME-LMES-KH bushings.

Housing Material

	Housing tolerance
Steel/cast iron	H7
Aluminum/alloy	H7

## Lifetime Calculation

### Contact factor ( $f_c$ )

Load biasing, attributed to mounting errors and multiple bearing assemblies can be accounted for by using the coefficient in table.

Number of bearings for shaft	Contact factor
1	1.00
2	0,81
3	0,72
4	0,66
5	0,61

### Load factor ( $f_w$ )

The loads acting on the linear units include payload, inertial effects during acceleration and deceleration as well as moment loads. All of these factors are difficult to assess and are further complicated by the potential presence of shocks and vibrations. A more practical solution involves the use of the coefficients in table.

Operating conditions	$f_w$
Low speed operations (< 15 m/min) without shockloads	1 - 1,5
Medium speed operations (60 m/min) without shockloads	1,5 - 2
High speed operations (> 60 m/min) without shockloads	2 - 3,5

# Lifetime Calculation

## Static safety factor

For applications with a high requirement for accuracy and smooth running, the static safety factor  $f_s$  should be higher than the values shown in table to prevent permanent deformation at the contact points.

$$f_s = \frac{C_o}{P_o}$$

$f_s$  = static safety factor

$P_o$  = static equivalent load (N)

$C_o$  = static load rating (N)

Operating conditions	$f_s$
Shafts subjected to small deflections and low shocks	1 ÷ 2
Elastic deflection can cross load the units	2 ÷ 4
System subjected to shock & vibration	3 ÷ 5

The magnitude of the friction force is affected by several factors. The type of bearing, the operating conditions, the type and quantity of the lubricant, the presence or lack of seals all impact the overall frictional behaviour. Standard seals can add between 2 and 5 N to the overall friction force.

The magnitude of the coefficient of friction depends upon the operating conditions such as load, moments and/or preload. Table below shows the dynamic coefficient of friction for each type of bearing under normal operating condition ( $P/C = 0.2$ ) and proper assembly.

Type of bearing	Friction coefficient
KH	0.004 to 0.006
LME/SBE	0.002 to 0.003

## Operating temperature

The operating temperature ranges of the various bearings are shown in table below. Should the operating temperature exceed the limits shown in the table, please contact Rollco. Stainless steel units, without seals, can operate between -20/+120 deg. C.

Bearing type	Operating temperature
HK	-20 to + 120°C
LME/LMES/SBE	-20 to + 110°C

## Technical Section

The following tables give a complete information of materials used for the production of Precision Shafts and their chemical-physical characteristics.

### Used Material Typology

W	WRB	WV
A) Ck55 (1.1203) B) Cf53 (1.1213)	X46Cr13 (1.4034)	A) Ck55 (1.1203) B) Cf53 (1.1213)

### Tensile Strength [N/mm2]

W	WRB	WV
550-750	650-800	**

### Materials chemical composition [%]

W	WRB	WV
A) C 0.57-0.65 Si 0.15-0.35 Mn 0.6-0.9	C 0.42-0.5 Si 0.7-1.00 Mn 0.7-1.0	A) C 0.57-0.65 Si 0.15-0.35 Mn 0.6-0.9 Cr 12.5-14.5
B) C 0.50-0.57 Si 0.15-0.35 Mn 0.4-0.7		B) C 0.50-0.57 Si 0.15-0.35 Mn 0.4-0.7

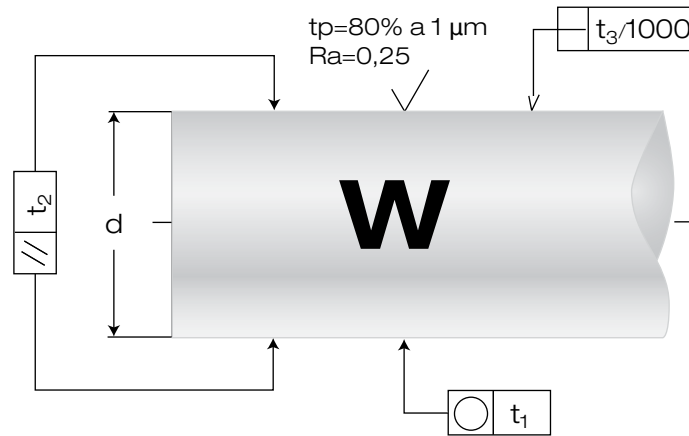
### Surface hardness

W	WRB	WV
62±2 HRc	55±2 HRc	800-1100 HV (Cromo)

### Applications

W	WRB	WV
The most commonly used.	Material used for its resistance corrosion.	Characteristics similar to W type, but particularly resistant to atmospheric agents corrosion thanks to a chrome coating.

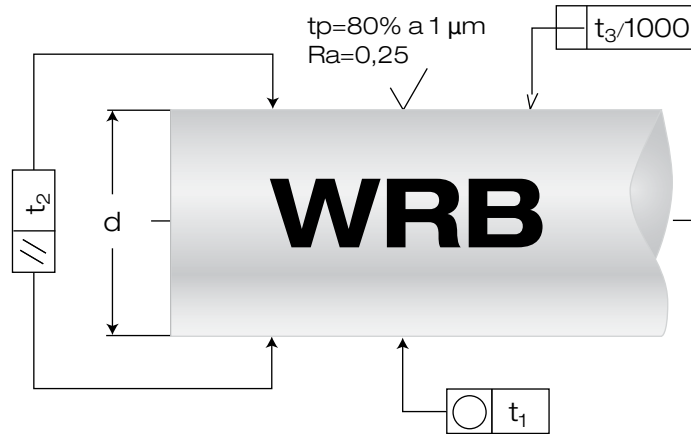
# Hardened and Ground



Model-number	Weight per meter	Shaft Diameter d	Hardening depth Rht (max) DIN6773	Standard tolerance ISO h6	Roundness (circular) t1	Parallelism (cylindric) t2	Straightness t3
	kg	mm	mm	μm	μm	μm	μm
W 5	0.15	5	0.8	0 - 8	4	6	300
W 6	0.22	6	0.8	0 - 8	4	6	300
W 8	0.39	8	1.0	0 - 9	4	6	300
W 10	0.61	10	1.0	0 - 9	4	6	300
W 12	0.89	12	1.3	0 - 11	5	8	200
W 14	1.21	14	1.3	0 - 11	5	8	200
W 16	1.57	16	1.6	0 - 11	5	8	200
W 20	2.45	20	1.6	0 - 13	6	9	100
W 25	3.83	25	1.8	0 - 13	6	9	100
W 30	5.51	30	2.0	0 - 13	6	9	100
W 40	9.80	40	2.5	0 - 16	7	11	100
W 50	15.3	50	3.0	0 - 16	7	11	100
W 60	22.1	60	3.0	0 - 19	8	13	100
W 80	39.2	80	3.0	0 - 19	8	13	100

Other types on request

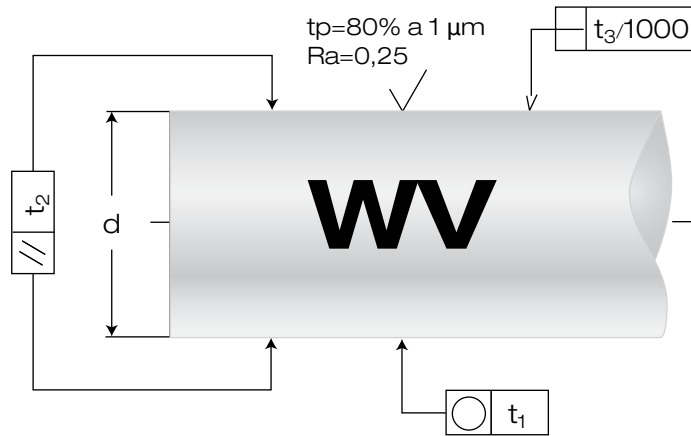
## Hardened and Ground Stainless Steel



Model number	Weight per meter	Shaft Diameter $d$	Hardening depth Rht (max) DIN6773	Standard tolerance ISO h6	Roundness (circular) $t_1$	Parallelism (cylindric) $t_2$	Straightness $t_3$
	kg	mm	mm	$\mu m$	$\mu m$	$\mu m$	$\mu m$
WRB 5	0.15	5	0.7	0 - 8	4	5	300
WRB 6	0.22	6	0.7	0 - 8	4	6	300
WRB 8	0.40	8	0.9	0 - 9	4	6	300
WRB 10	0.62	10	1.1	0 - 9	4	6	300
WRB 12	0.89	12	1.3	0 - 11	5	8	200
WRB 14	1.21	14	1.5	0 - 11	5	8	200
WRB 16	1.58	16	1.6	0 - 11	5	8	200
WRB 20	2.47	20	1.8	0 - 13	6	9	100
WRB 25	3.85	25	2.0	0 - 13	6	9	100
WRB 30	5.55	30	2.4	0 - 13	6	9	100
WRB 40	9.87	40	2.6	0 - 16	7	11	100
WRB 50	15.41	50	2.9	0 - 16	7	11	100
WRB 60	22.2	60	3.0	0 - 19	8	13	100

Other types on request

## Hardened and Ground/Chromium Plated



Model number	Weight per meter	Shaft Diameter	Hardening depth	Standard tolerance	Roundness (circular)	Parallelism (cylindric)	Straightness
		$d$	Rht (max) DIN6773	ISO h6	$t_1$	$t_2$	$t_3$
	kg	mm	mm	$\mu\text{m}$	$\mu\text{m}$	$\mu\text{m}$	$\mu\text{m}$
WV 10	0.62	10	1.0	0 - 15	6	10	300
WV 12	0.89	12	1.3	0 - 18	8	12	200
WV 16	1.58	16	1.6	0 - 18	8	12	200
WV 20	2.47	20	1.6	0 - 21	9	12	100
WV 24	3.55	24	1.8	0 - 21	9	12	100
WV 25	3.85	25	1.8	0 - 21	9	12	100
WV 30	5.55	30	2.0	0 - 21	9	12	100
WV 40	9.87	40	2.5	0 - 25	11	15	100

Other types on request

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