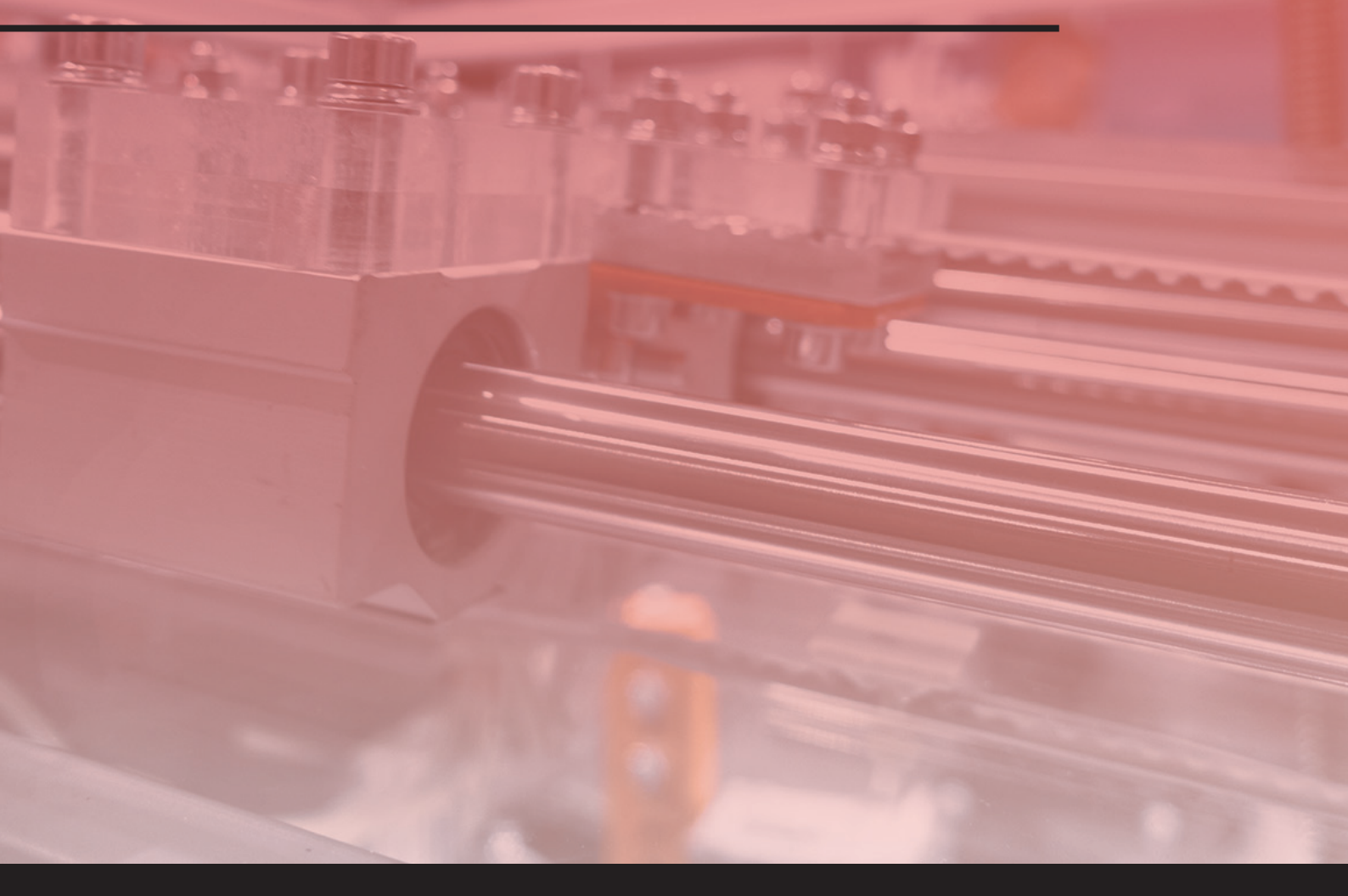


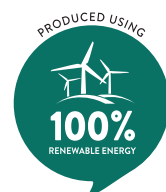
ROLLCO

**LINEAR
BALL BEARINGS
& STEEL SHAFTS**



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Product Overview

Shafts

Precision shafts are machine elements that in addition to high material quality, surface hardness, and surface quality are characterized by high precision in terms of dimension and shape.

This makes precision shafts extremely well-suited for applications like the following.

- Guide shaft in combination with linear bearings, cam and ball bearing rollers.
- Guide shaft for mounting by plain bearing.
- Stretch and straightening rolls.
- Shafts and axles in fixture construction and automation design.

Low-corrosion steels

Precision shafts from X46 or X90 are available for use in medical technology, the food industry, and other production lines.

Hard chrome plating

If high wear resistance and improved corrosion resistance compared to quenched and tempered steel are required, hard chrome plated precision shafts are perfect for the job.

Shaft types

Type	Series	Size range	Production length	Standard tolerance	Material	Coating
Precision shafts	W	5 - 80 mm	Up to 6000 mm (depending on size)	h6	Cf53 / 1.1213 / C53G 59 HRC min.	-
Precision shafts, chrome-plated	WV	10 - 40 mm	6000 mm	h7	Cf53 / 1.1213 / C53G 59 HRC min.	Chrome layer 800 HV min. ca. 10 µm
Precision shafts, stainless steel X90	WRA	8 - 50 mm	6000 mm	h6	X90CrMoV18 / 1.4112 54 HRC min.	-
Precision shafts, stainless steel X46	WRB	5 - 60 mm	Up to 6000 mm (depending on size)	h6	X46Cr13 / 1.4034 52 HRC min.	-
Predrilled precision shafts	WB	12 - 40 mm	6000 mm	h6	Cf53 / 1.1213 / C53G 59 HRC min.	-
Hollow shafts	WH	12 - 50 mm	6000 mm	h7	C60 / 1.1221 59 HRC min.	-

Ball bearings

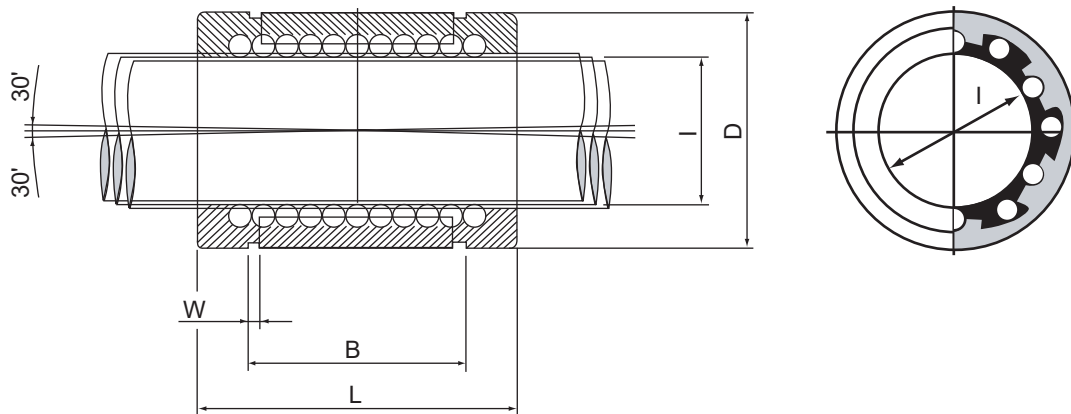
Rollco linear ball bearings are available in closed, open, compact or self-aligning versions with corresponding hardened shafts in many sizes. We also offer the option of stainless steel ball bushings.

In our workshop in Helsingborg we cut and machine according to customer requirements and therefore are able to offer quick deliveries with high flexibility.

Accessories include housings, shaft blocks, shaft supports etc.



Self-aligning Closed Type SBE

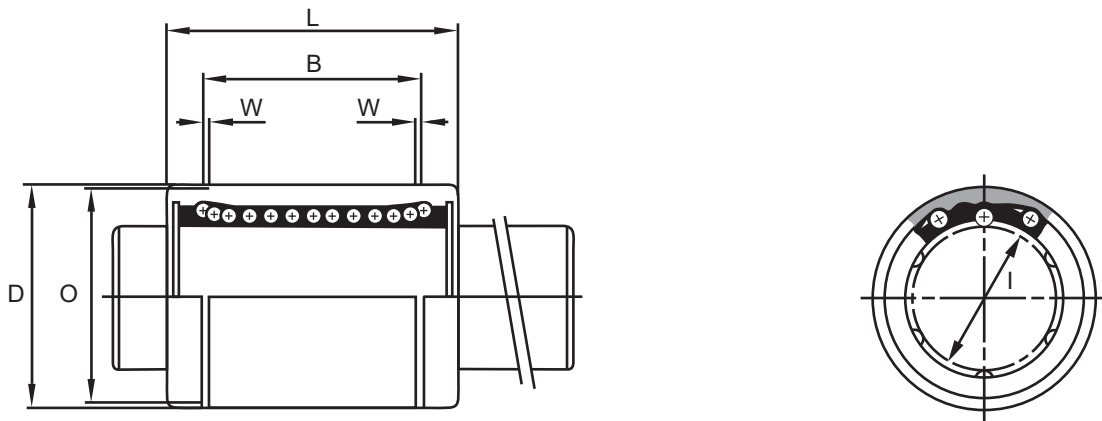


Designation	Number of ball rows	Inscribed circle diameter I	Outer diameter D	Length L	Outer locking groove B	W	Load capacity	
							Dynamic C(N)	Static C ₀ (N)
SBE16UU	5	16	26	36	24.6	1.3	1530	1280
SBE20UU	6	20	32	45	31.2	1.6	2630	1700
SBE25UU	6	25	40	58	43.7	1.85	3880	2810
SBE30UU	6	30	47	68	51.7	1.85	4810	2860
SBE40UU	6	40	62	80	60.3	2.15	6630	5840
SBE50UU	6	50	75	100	77.3	2.65	11690	8100

Dimensions in mm.

Other types available on request.

Closed Type LME



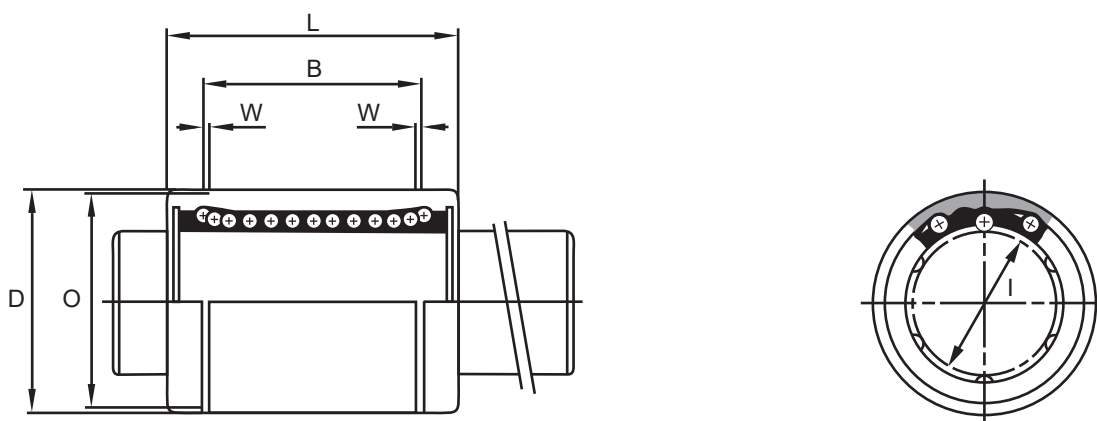
- Material: 100Cr6

Designation	Number of ball rows	Inscribed circle diameter I	Outer diameter D	Outer diameter tolerance	Length L	Outer locking groove B	Outer locking groove diameter O	W	Load capacity	
									Dynamic C(N)	Static C ₀ (N)
LME5UU	4	5	12	+0/-0,011	22	14.5	11.5	1.1	210	270
LME8UU	4	8	16	+0/-0,013	25	16.5	15.2	1.1	270	410
LME12UU	4	12	22	+0/-0,013	32	22.9	21	1.3	520	790
LME16UU	5	16	26	+0/-0,016	36	24.9	24.9	1.3	590	910
LME20UU	5	20	32	+0/-0,016	45	31.5	30.3	1.6	880	1400
LME25UU	6	25	40	+0/-0,016	58	44.1	37.5	1.85	1000	1600
LME30UU	6	30	47	+0/-0,016	68	52.1	44.5	1.85	1600	2800
LME40UU	6	40	62	+0/-0,019	80	60.6	59	2.15	2200	4000
LME50UU	6	50	75	+0/-0,019	100	77,6	72	2,65	3900	8100
LME60UU	6	60	90	+0/-0,022	125	101,7	86,5	3,15	4800	10200

Dimensions in mm.

Other types available on request.

Closed Type Stainless LMES



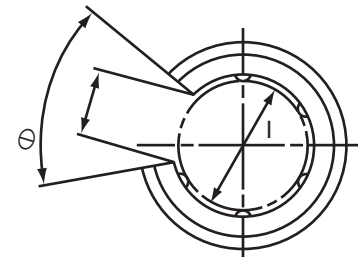
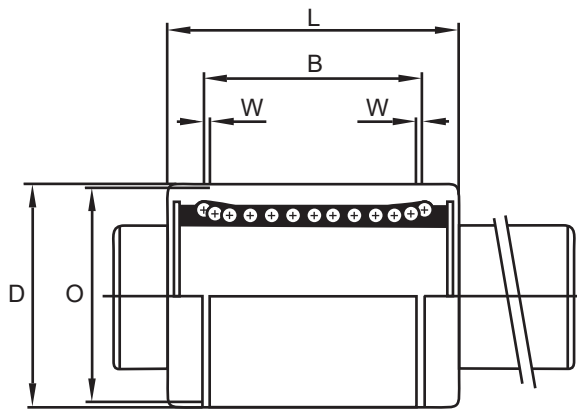
- Material: SUS440c

Designation	Number of ball rows	Inscribed circle diameter I	Outer diameter D	Outer diameter tolerance	Length L	Outer locking groove B	Outer locking groove diameter O	W	Load capacity	
									Dynamic C(N)	Static C ₀ (N)
LMES8UU	4	8	16	+0/-0,013	25	16,5	15,2	1,1	270	410
LMES12UU	4	12	22	+0/-0,013	32	22,9	21	1,3	520	790
LMES16UU	5	16	26	+0/-0,016	36	24,9	24,9	1,3	590	910
LMES20UU	5	20	32	+0/-0,016	45	31,5	30,3	1,6	880	1400
LMES25UU	6	25	40	+0/-0,016	58	44,1	37,5	1,85	1000	1600
LMES30UU	6	30	47	+0/-0,016	68	52,1	44,5	1,85	1600	2800
LMES40UU	6	40	62	+0/-0,019	80	60,6	59	2,15	2200	4000

Dimensions in mm.

Other types available on request.

Open Type LME...UUOP



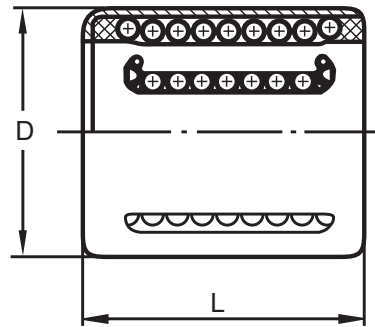
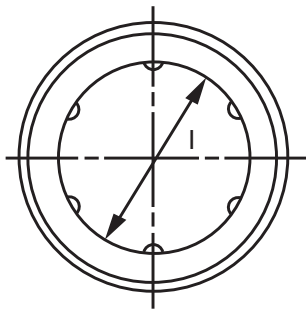
- Material: 100Cr6

Designation	Number of ball rows	Inscribed circle diameter I	Outer diameter D	Outer diameter tolerance	Length L	Outer locking groove B	Outer locking groove diameter O	W	θ	Load capacity	
										Dynamic C(N)	Static C ₀ (N)
LME12UUOP	3	12	22	+0/-0,013	32	22.9	21	1.3	78°	520	790
LME16UUOP	4	16	26	+0/-0,016	36	24.9	24.9	1.3	78°	590	910
LME20UUOP	4	20	32	+0/-0,016	45	31.5	30.3	1.6	60°	880	1400
LME25UUOP	5	25	40	+0/-0,016	58	44.1	37.5	1.85	60°	1000	1600
LME30UUOP	5	30	47	+0/-0,016	68	52.1	44.5	1.85	60°	1600	2800
LME40UUOP	5	40	62	+0/-0,019	80	60.6	59	2.15	60°	2200	4000
LME50UUOP	5	50	75	+0/-0,019	100	77.6	72	2.65	60°	3900	8100

Dimensions in mm.

Other types available on request.

Compact Type KH

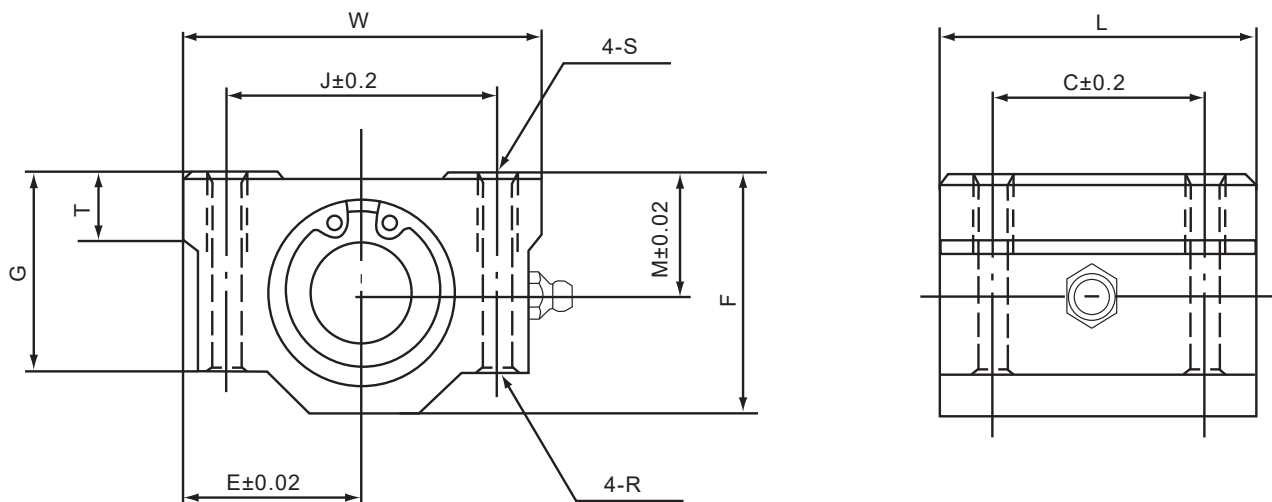


Designation	Inscribed circle diameter I	Outer diameter D	Length L	Load capacity		External seals
				Dynamic C(N)	Static C ₀ (N)	
KH0622PP	6	12	22	400	239	-
KH0824PP	8	15	24	435	280	-
KH1026PP	10	17	26	500	370	-
KH1228PP	12	19	28	620	510	G 12 x 19 x 3
KH1428PP	14	21	28	620	520	G 14 x 21 x 3
KH1630PP	16	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	-

Dimensions in mm.

Other types available on request.

Closed Unit Type KBA...UU



- Material: Aluminium 6063 + 100Cr6

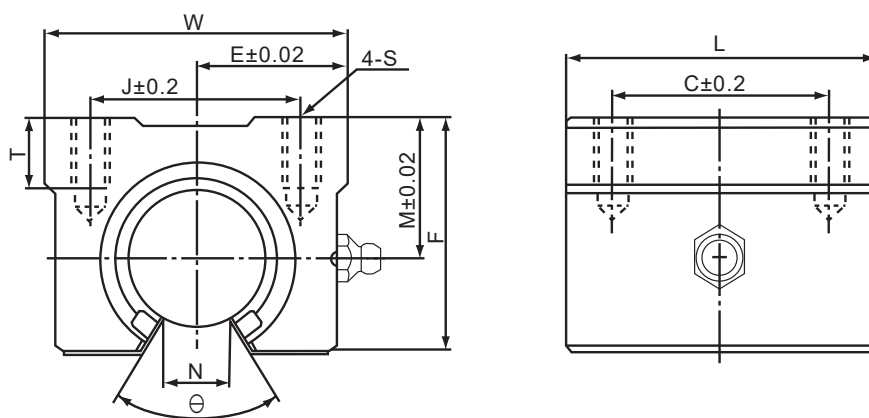
NOTE: Linear Units can also be supplied with self-aligning SBE-Bushing (KBE...UU) or stainless LMES-Bushing (KBS..UU).

Designation	Inscribed circle diameter	M	E	W	L	F	G	T	J	C	S	R	Load capacity	
													Dynamic C(N)	Static C ₀ (N)
KBA12UU	12	15	22	44	39	30	24.5	8	33	26	M5	4.3	520	740
KBA16UU	16	19	25	50	44	38.5	32.5	9	36	34	M5	4.3	590	910
KBA20UU	20	21	27	54	53	41	35	11	40	40	M6	5.2	880	1400
KBA25UU	25	26	38	76	67	51.5	42	12	54	50	M8	7	1000	1600
KBA30UU	30	30	39	78	76	59.5	49	15	58	58	M8	7	1600	2800
KBA40UU	40	40	51	102	90	78	62	20	80	60	M10	8.7	2200	4000
KBA50UU	50	52	61	122	110	102	80	25	100	80	M10	8.7	3900	8100

Dimensions in mm.

Other types available on request.

Open Unit Type KBA...UUOP



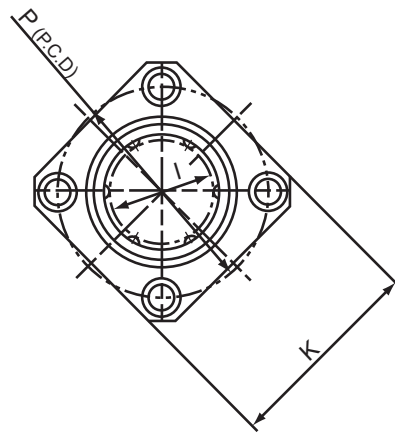
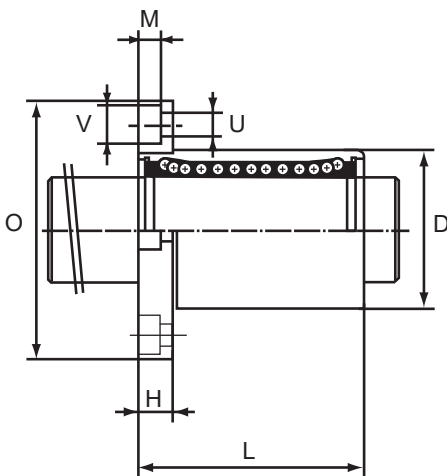
- Material: Aluminium 6063 + 100Cr6

Designation	Inscribed circle diameter	W	F	L	M	E	N	θ	J	C	S	T	Load capacity	
													Dynamic C(N)	Static C ₀ (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

Dimensions in mm.

Other types available on request.

Flange Unit Type LMEK...UU



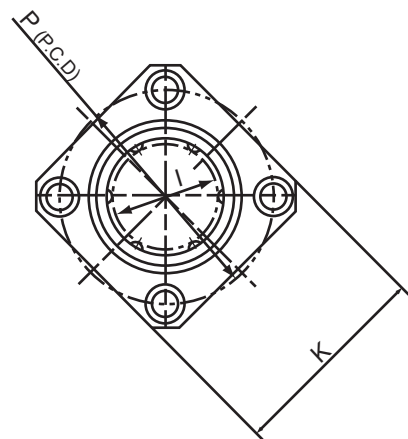
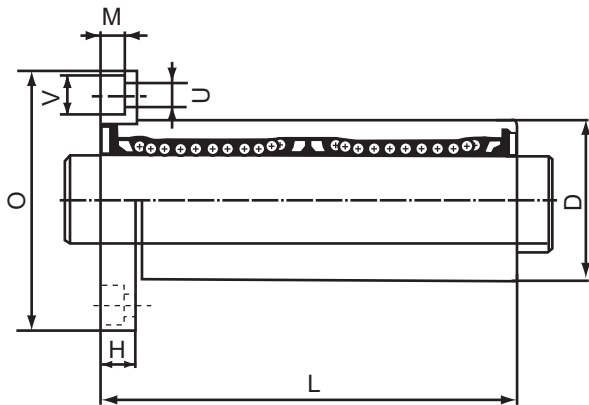
- Material: 100Cr6

Designation	No. of ball rows	d	D	Outer diameter (D) tolerance	L	O	K	H	P	U	V	M	Load capacity	
													Dynamic C(N)	Static C ₀ (N)
LMEK8UU	4	8	16	+0/-0.013	25	32	25	5	24	3,5	6	3,1	270	410
LMEK12UU	4	12	22	+0/-0,016	32	42	32	6	32	4,5	7,5	4,4	520	790
LMEK16UU	5	16	26	+0/-0,016	36	46	35	6	36	4,5	7,5	4,4	590	910
LMEK20UU	5	20	32	+0/-0,019	45	54	42	8	43	5,5	9	5,4	880	1400
LMEK25UU	6	25	40	+0/-0,019	58	62	50	8	51	5,5	9	5,4	1000	1600
LMEK30UU	6	30	47	+0/-0,019	68	76	60	10	62	6,6	11	6,5	1600	2800
LMEK40UU	6	40	62	+0/-0,022	80	98	75	13	80	9	14	8	2200	4100
LMEK50UU	6	50	75	+0/-0,022	100	112	88	13	94	9	14	8,1	3900	8100
LMEK60UU	6	60	90	+0/-0,025	125	134	106	18	112	11	17,5	10,8	4800	10000

Dimensions in mm.

Other types available on request.

Flange Unit Long Type LMEK...LUU



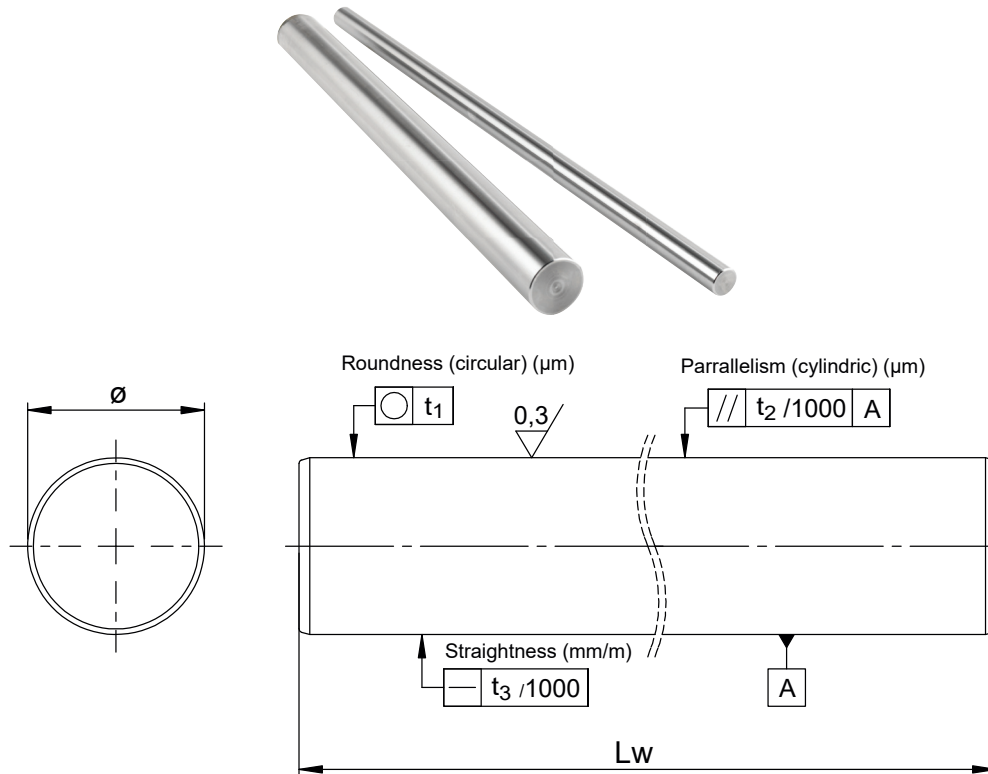
- Material: 100Cr6

Designation	No. of ball rows	d	D	Outer diameter (D) tolerance	L	O	K	H	P	U	V	M	Load capacity	
													Dynamic C(N)	Static C ₀ (N)
LMEK12LUU	4	12	22	+0/-0,016	61	42	32	6	32	4.5	8	4.4	657	1200
LMEK16LUU	5	16	26	+0/-0,016	68	46	35	6	36	4.5	8	4.4	1230	2350
LMEK20LUU	5	20	32	+0/-0,019	80	54	42	8	43	5.5	9.5	5.4	1400	2750
LMEK25LUU	6	25	40	+0/-0,019	112	62	50	8	51	5.5	9.5	5.4	1560	3140
LMEK30LUU	6	30	47	+0/-0,019	123	76	60	10	62	6.6	11	6.5	2490	5490
LMEK40LUU	6	40	62	+0/-0,022	152	98	75	13	80	9	14	8.6	3430	8040
LMEK50LUU	6	50	75	+0/-0,022	192	112	88	13	94	9	14	8,6	6200	16220
LMEK60LUU	6	60	90	+0/-0,025	209	134	106	18	112	11	17	11	7700	20400

Dimensions in mm.

Other types available on request.

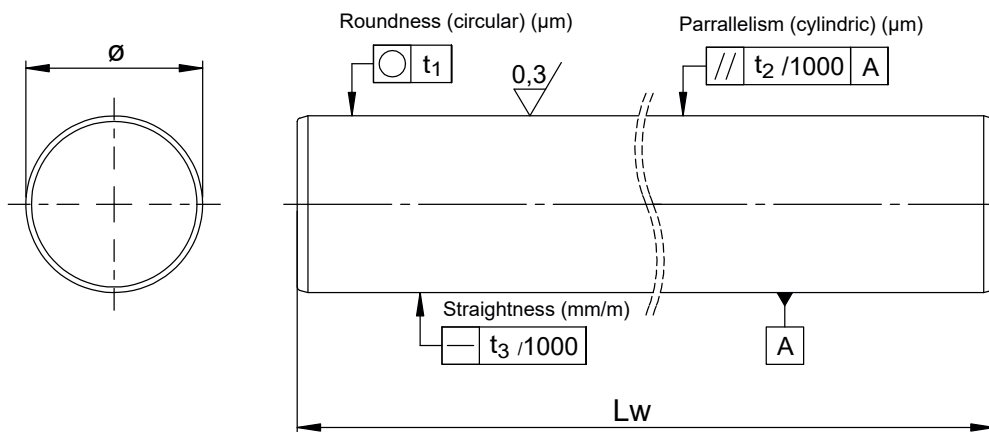
Hardened Precision Shafts W



- Material: Quenched and tempered steel Cf53 / 1.1213 / C53G
- Surface hardness: 59 HRC min.
- Other types available on request.

Designation	Max length L_w (mm)	Weight (kg/m)	Shaft diameter (mm)	Hardening depth (mm) ISO 18203	Roundness (circular) (μm)	Parallelism (cylindric) (μm)	Straightness (mm/m)
			h6 \varnothing		t1	t2	
W5	3000	0,15	5	0,4	4	5	0,3
W6	6000	0,22	6	0,4	4	5	0,3
W8	6000	0,39	8	0,4	4	6	0,3
W10	6000	0,62	10	0,4	4	6	0,3
W12	6000	0,89	12	0,6	5	8	0,3
W14	6000	1,21	14	0,6	5	8	0,3
W16	6000	1,58	16	0,6	5	8	0,2
W20	6000	2,47	20	0,9	6	9	0,2
W25	6000	3,85	25	0,9	6	9	0,2
W30	6000	5,55	30	0,9	6	9	0,2
W40	6000	9,86	40	1,5	7	11	0,2
W50	6000	15,41	50	1,5	7	11	0,2
W60	6000	22,20	60	2,2	8	13	0,2
W80	6000	39,46	80	3,2	8	13	0,2

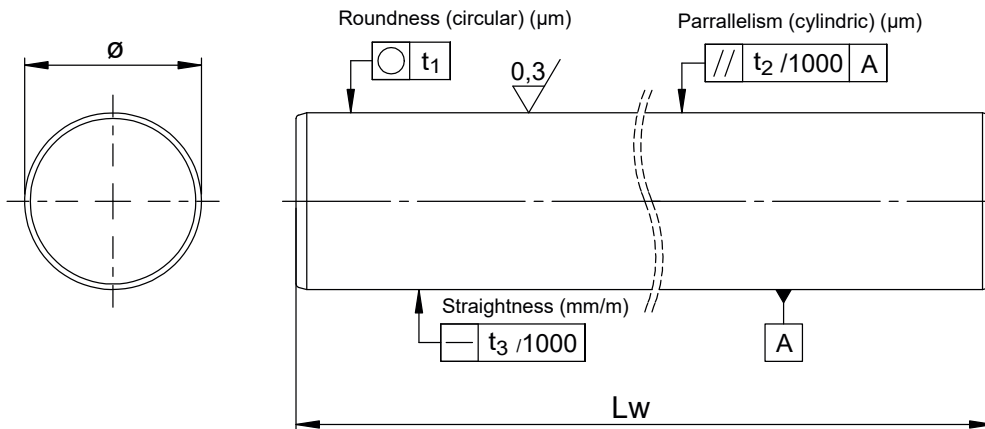
Hardened Precision Shafts WV, Chrome Plated



- Material: Quenched and tempered steel Cf53 / 1.1213 / C53G
- Surface hardness: 59 HRC min.
- Chrome layer, thickness ca. 10 μm . Layer hardness ≥ 800 HV. See page 28 for more information.
- Other types available on request.

Designation	Max length L_w (mm)	Weight (kg/m)	Shaft diameter (mm) $h7 \varnothing$	Hardening depth (mm) ISO 18203	Roundness (circular) (μm) t_1	Parallelism (cylindric) (μm) t_2	Straightness (mm/m) t_3
WV10	6000	0,62	10	0,4	6	9	0,3
WV12	6000	0,89	12	0,6	8	11	0,3
WV16	6000	1,58	16	0,6	8	11	0,2
WV20	6000	2,47	20	0,9	9	13	0,2
WV25	6000	3,85	25	0,9	9	13	0,2
WV30	6000	5,55	30	0,9	9	13	0,2
WV40	6000	9,86	40	1,5	11	16	0,2

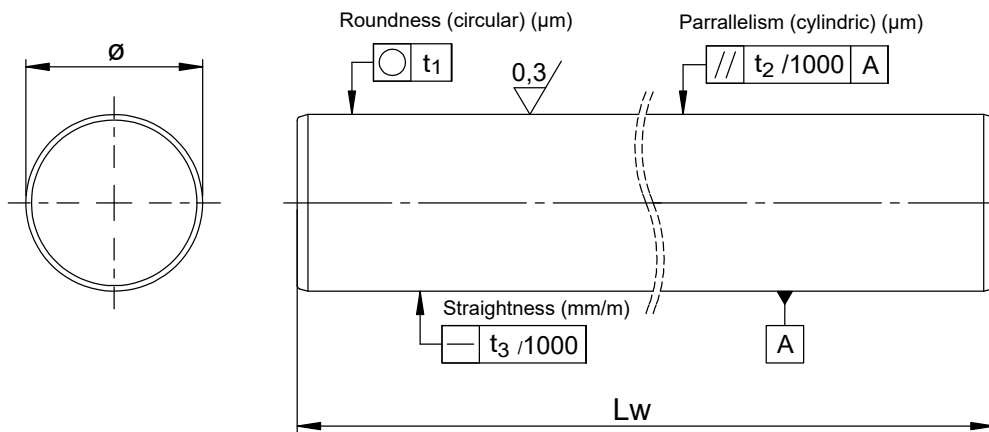
Hardened Precision Shafts WRB, Stainless Steel X46



- Material: X46Cr13 / 1.4034.
- Surface hardness: 52 HRC min.
- Reduction of load rating for linear ball bearing because of less hardness.
- Other types available on request.

Designation	Max length Lw (mm)	Weight (kg/m)	Shaft diameter (mm)	Hardening depth (mm) ISO 18203	Roundness (circular) (µm)	Parallelism (cylindric) (µm)	Straightness (mm/m)
			h6 Ø		t1	t2	
WRB5	3000	0,15	5	0,4	4	5	0,3
WRB6	6000	0,22	6	0,4	4	5	0,3
WRB8	6000	0,39	8	0,4	4	6	0,3
WRB10	6000	0,62	10	0,4	4	6	0,3
WRB12	6000	0,89	12	0,6	5	8	0,3
WRB14	6000	1,21	14	0,6	5	8	0,3
WRB16	6000	1,58	16	0,6	5	8	0,2
WRB20	6000	2,47	20	0,9	6	9	0,2
WRB25	6000	3,85	25	0,9	6	9	0,2
WRB30	6000	5,55	30	0,9	6	9	0,2
WRB40	6000	9,86	40	1,5	7	11	0,2
WRB50	6000	15,41	50	1,5	7	11	0,2
WRB60	6000	22,20	60	2,2	8	13	0,2

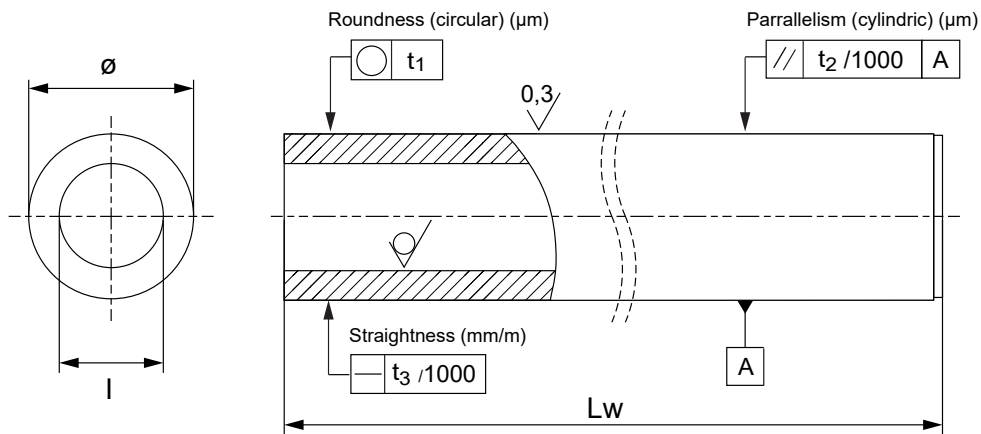
Hardened Precision Shafts WRA, Stainless Steel X90



- Material: X90CrMoV18 / 1.4112.
- Surface hardness: 54 HRC min.
- Reduction of load rating for linear ball bearing because of less hardness.
- Other types available on request.

Designation	Max length L_w (mm)	Weight (kg/m)	Shaft diameter (mm)	Hardening depth (mm)	Roundness (circular) (μm)	Parallelism (cylindric) (μm)	Straightness (mm/m)
			$h6 \varnothing$	ISO 18203	t_1	t_2	t_3
WRA8	6000	0,39	8	0,4	4	6	0.3
WRA10	6000	0,62	10	0,4	4	6	0.3
WRA12	6000	0,89	12	0,6	5	8	0.3
WRA14	6000	1,21	14	0,6	5	8	0.3
WRA16	6000	1,58	16	0,6	5	8	0.2
WRA20	6000	2,47	20	0,9	6	9	0.2
WRA25	6000	3,85	25	0,9	6	9	0.2
WRA30	6000	5,55	30	0,9	6	9	0.2
WRA40	6000	9,86	40	1,5	7	11	0.2
WRA50	6000	15,41	50	1,5	7	11	0.2

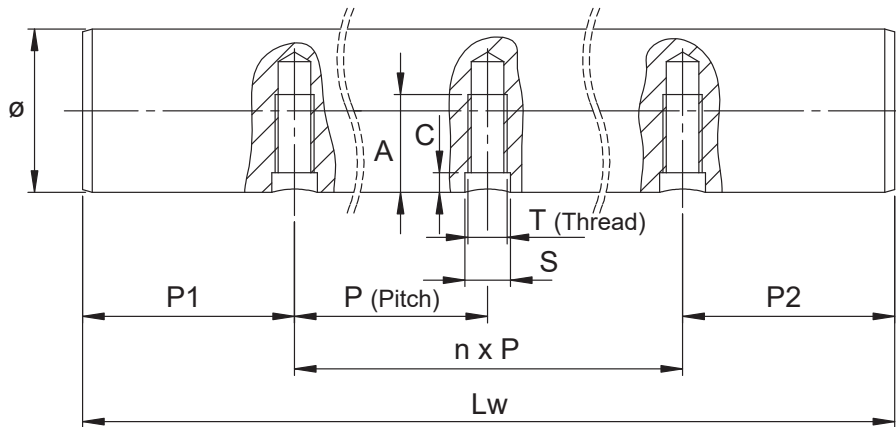
Hardened Precision Shafts WH, Hollow



- Material: Quenched and tempered steel C60 / 1.1221
- Surface hardness: 59 HRC min.
- Other types available on request.

Designation	Max length Lw (mm)	Weight (kg/m)	Shaft diameter (mm) h7 \varnothing	Inner diameter l	Hardening depth (mm) ISO 18203	Roundness (circular) (μm) t_1	Parallelism (cylindric) (μm) t_2	Straightness (mm/m) t_3
WH12	6000	0,79	12	4	0,6	8	8	0,3
WH16	6000	1,28	16	7	0,6	8	8	0,3
WH20	6000	1,25	20	14	0,9	9	9	0,3
WH25	6000	2,35	25	15,6	0,9	9	9	0,3
WH30	6000	3,50	30	18,3	0,9	9	9	0,3
WH40	6000	4,99	40	28	1,5	11	11	0,3
WH50	6000	9,91	50	29,7	1,5	11	11	0,2

Hardened Precision Shafts WB, Predrilled

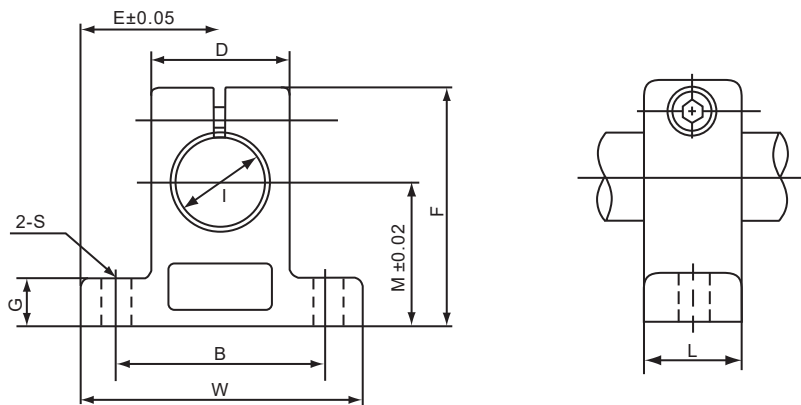


- Material: Quenched and tempered steel Cf53 / 1.1213 / C53G
- Surface hardness: 59 HRC min.
- Length tolerance: ± 3 mm, separating cut deburred
- Distance tolerance: $\pm 0,2$ mm, $P1 = P2$
- Positional tolerance of thread: $\varnothing (\pm 0,2$ mm).
- Other pitch available on request.

Designation	Max length Lw (mm)	Shaft diameter \varnothing	Pitch P	Thread T	Thread depth A	Thread dimension	
						C	S
WB12	6000	12	75	M4	7	2	5
WB16	6000	16	100	M5	9	2,5	6
WB20	6000	20	100	M6	11	3	7
WB25	6000	25	120	M8	15	3	9
WB30	6000	30	150	M10	17	3,5	11
WB40	6000	40	200	M10	19	4	11

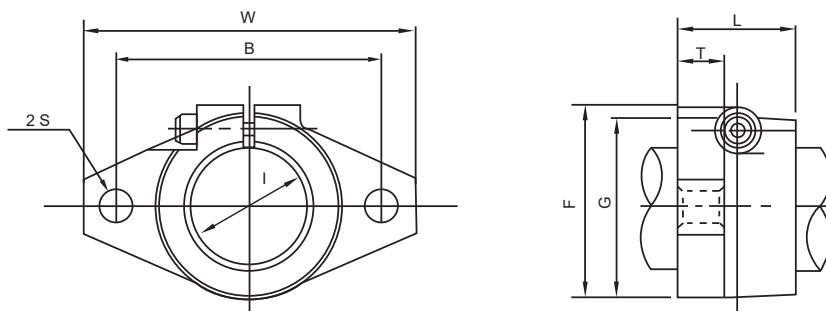
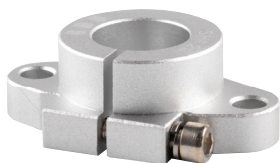
Other tolerances according to standard shaft W.

Shaft Block Type SK



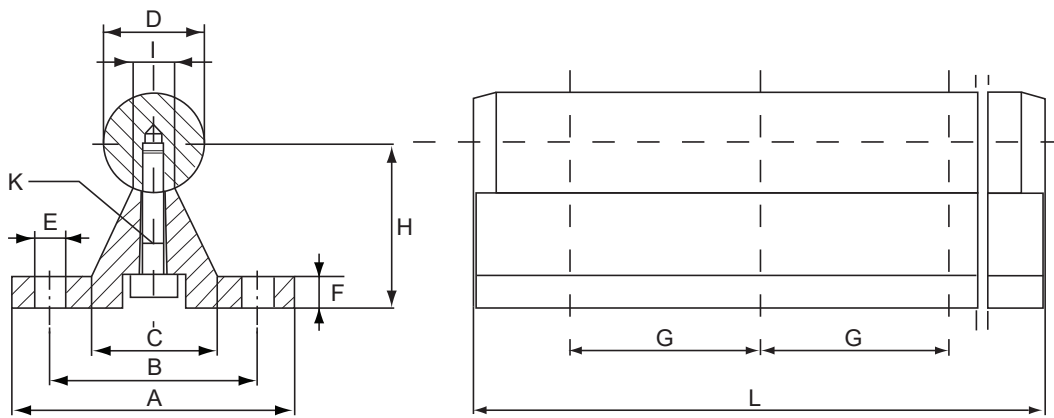
Designation	I	M	W	E	B	D	S	G	F	L	Weight (g)
SK12A	12	23	42	21	32	20	5.5	6	38	14	30
SK16A	16	27	48	24	38	25	5.5	8	44	16	40
SK20A	20	31	60	30	45	30	6.6	10	51	20	70
SK25A	25	35	70	35	56	38	6.6	12	60	24	130
SK30A	30	42	84	42	64	44	9	12	70	28	180
SK40A	40	60	114	57	90	60	11	15	96	36	420
SK50A	50	70	126	63	100	74	14	18	120	40	750

Shaft Block Type SHF



Designation	I	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

Shaft Support FTSN Flange Type



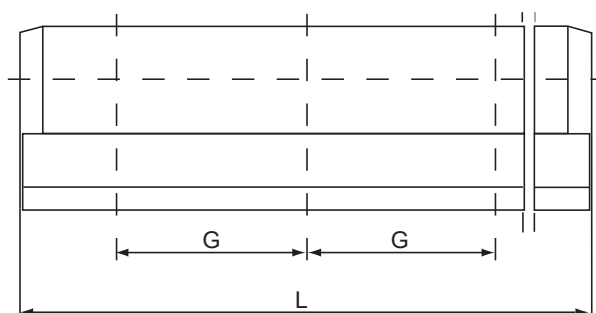
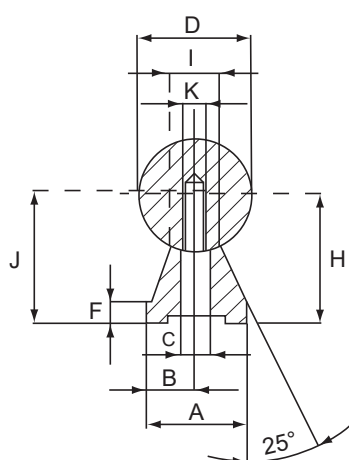
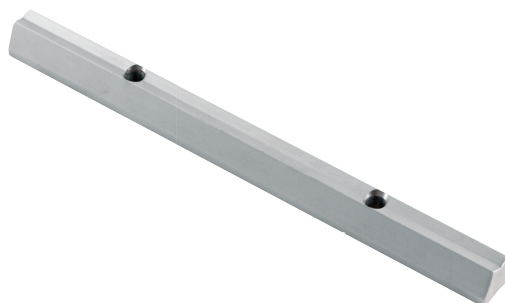
- Aluminium with mounting holes.
- Standard section length $L = 3700$ mm.
- Support rails can be supplied upon request, with or without mounting holes.
- Lengths other than standard ($L_{max} = 3700$ mm) are also available on request.

Notes: No anodizing in holes. The shaft is not included, please order separately.

Designation	D	Dimensions		Mounting dimensions						
		A	H	I	C	F	B	E	G	K
FTSN12G	12	40	22	5,4	15	5	29	4,5	75	M4x20
FTSN16G	16	45	26	7	19	5	33	5,5	100	M5x20
FTSN20G	20	52	32	8,1	23	6	37	6,6	100	M6x25
FTSN25G	25	57	36	10,3	26	6	42	6,6	120	M8x30
FTSN30G	30	69	42	11	29	7	51	9	150	M10x35
FTSN40G	40	73	50	15	36	8	55	9	200	M10x40

Dimensions in mm.

Shaft Support FTSU Low Type



- Aluminium with mounting holes.
- Standard section length $L = 4000$ mm.
- Support rails can be supplied upon request, with or without mounting holes.
- Lengths other than standard ($L_{max} = 4000$ mm) are also available on request.

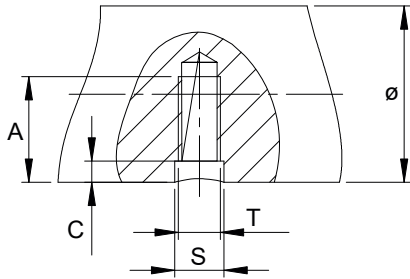
Note: No anodizing in holes. The shaft is not included, please order separately.

Designation	D	Dimensions		Mounting dimensions						
		A	H	B	I	F	K	C	J	G
FTSU16G	16	14	18	7	7	3	M5	5.5	19	100
FTSU20G	20	17	22	8.5	8.1	3	M6	6.6	23	100
FTSU25G	25	21	26	10.5	10.3	3	M8	9	28.5	120
FTSU30G	30	23	30	11.5	11	3	M10	11	32	150
FTSU40G	40	30	39	15	15	4	M10	13.5	39.5	200

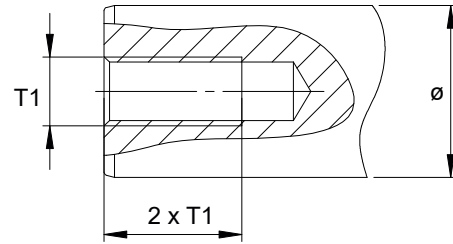
Dimensions in mm.

Standard axial and radial threads

If precision shaft are to be combined with shaft support, radial holes are needed. Radial holes are drilled in the precision shaft after hardening and grinding. Thread size and depth depend on the diameter of the shaft.



Radial thread (RT)



Axial thread (AT)

Radial Thread

Type	T	S	C	A (min)
RT W12 - W15	M4	5	2	7
RT W16 - W20	M5	6	2,5	9
RT W20 - W25	M6	7	3	11
RT W25 - W30	M8	9	3	15
RT W30 - W40	M10	11	4	19
RT W40 - W50	M12	13	4	21
RT W50 - W60	M14	15	4	25

Axial Thread

Type	T1	2 x T1
AT W8 - W10	M3	6
AT W10 - W12	M4	8
AT W12 - W14	M5	10
AT W14 - W20	M6	12
AT W15 - W25	M8	16
AT W18 - W40	M10	20
AT W24 - W50	M12	24
AT W30 - W80	M16	32
AT W50 - W80	M20	40
AT W60 - W80	M24	48

Dimensions in mm.

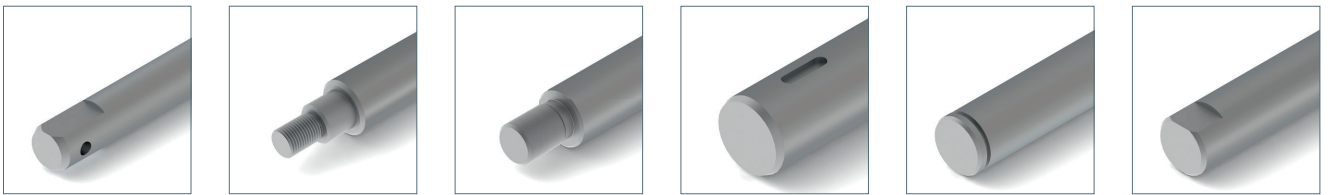
Separating cut

The precision shaft is cut to length and the faces are deburred using a manual chamfer. No other processing is done. The separating cut is standard.

Special processing

If necessary, special processing can be carried out according to the needs of the customer. A great variety of shapes and combinations is possible. A few processing options are listed below.

- Journal
- Feather key groove
- Flattening or flutes
- Clearance groove
- Crosswise groove
- Axial / radial threads (metric / imperial)
- External threads (metric / imperial)



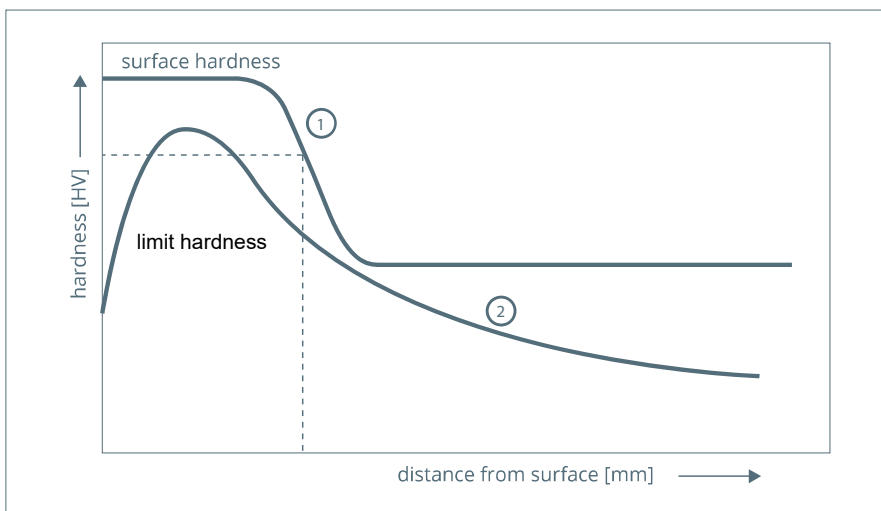
Special processing

Steel Shafts

Surface hardening depth

For rolling bearings like linear ball bearings to work reliably with precision steel shafts, the Hertzian contact stress must be considered during design of the surface hardening depth (SHD):

- The surface hardening depth is the depth of the hardened zone in which 80% of the surface hardness is present as a limit hardness.
- Under the surface of a track with a ball carrying force Q_c , there is a three-axis stress.
- The maximum stress occurs at a certain distance from the surface of the track.
- The hardness characteristic (1) must run into the core area of the material in such a way that the rigidity derived from the hardness is higher than the comparison stress curve (2) of the three-axis stress at all points.
- For other special processing contact Rollco.



Shaft \varnothing	Surface hardening depth (SHD)
$\varnothing \leq 10$	0,4 min. (fully hardened possible)
$10 < \varnothing \leq 18$	0,6 min.
$18 < \varnothing \leq 30$	0,9 min.
$30 < \varnothing \leq 50$	1,5 min.
$50 < \varnothing \leq 80$	2,2 min.
$80 < \varnothing \leq 100$	3,2 min.

Dimensions in mm.

Lower track hardness

If corrosion-resistant precision shafts stated below are used for a rolling bearing, the dynamic and static load ratings C and C_o are reduced due to the lower track hardness of the shafts.

- X46 Cr13 / 1.4034
- X90 CrMoV18 / 1.4112

$$C_H = f_H \cdot C$$

$$C_{oH} = f_{H0} \cdot C_o$$

C_{oH}, C_H [N]

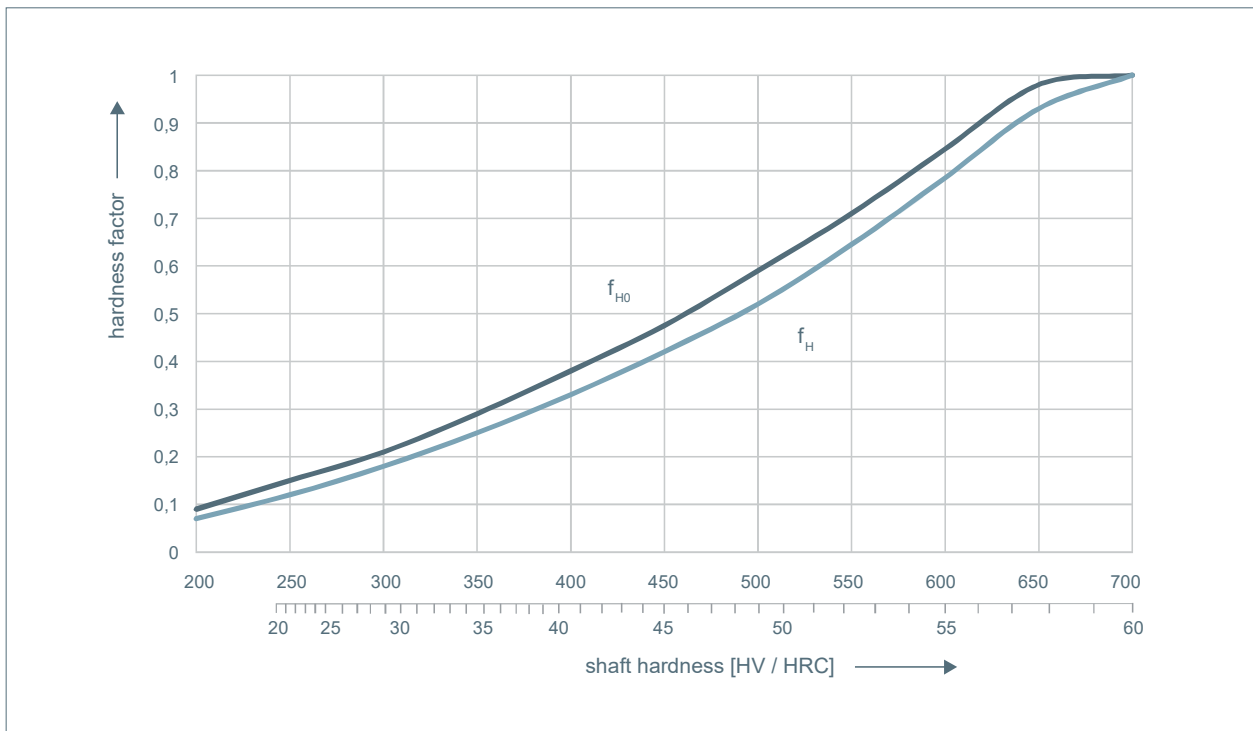
effective static and dynamic load with lower hardness

f_{H0}, f_H [-]

static and dynamic hardness factor

C_o, C [N]

static and dynamic load of linear bearing



Static and dynamic hardness factors for lower hardness of shaft

Note

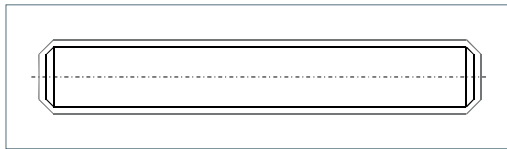
- Surface hardening only limits the corrosion resistance of X46 and X90 precision shafts on the faces.
- To avoid deposits of more base metals on the surface of corrosion-resistance precision shafts, machining should be carried out using solid carbide or ceramic tools. This allows surface corrosion (rust bloom) to be avoided.

Chrome plated coating

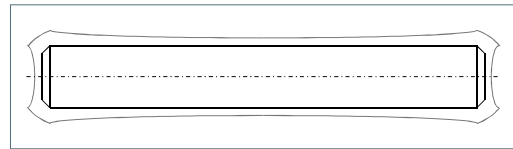
The chrome layer is galvanically applied to precision shafts at a temperature between 50 °C and 60 °C, do that no structural changes occur.

The chrome plating process takes place as a continuous process in a chrome plating system. This has the following advantages over conventional frame chrome plating:

- The continuous process provides an even coating of chrome, without flow density dependent differences in coating thickness (“bone effect”).
- Chrome coating over the entire length of the shaft without uncoated areas or contact points for up to 6 meters.
- High processing capability.
- Environmentally friendly, since the continuous chrome plating system is a closed system.



Continuous process



Conventional process

Properties of the coating

- High wear resistance.
- In roller bearing applications, prevention of formation of false brinelling under vibration while stationary.
- Low coefficient of friction.
- Additional wear protection for roller bearings subject to mixed friction.
- Anti-stick effect due to low adhesion effect.
- Good corrosion resistance to outer diameter.

Application

Since chrome layer does not contain Cr(VI), this coating is suitable for use in the food industry, medical technology, etc.

Product id	Layer thickness	Layer hardness	Number of layer	Corrosion protection	Wear protection	Max. single length	Cr(VI) free
WV	ca. 10 µm	800HV - 1100HV	1	Good, can be improved by belt polishing	Mixed friction	L > 6000 mm upon request	Yes

Linear Ball Bearings

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

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.

$$f_s = \frac{C_0}{P_0}$$

- f_s = static safety factor
- P₀ = static equivalent load (N)
- C₀ = 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

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-LMEK-KH bushings

Housing material	Housing tolerance
Steel/cast iron	H7
Aluminium/alloy	H7

Friction

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°C.

Type of bearing	Operating temperature
KH	-20 to + 100°C
LME/LMES/SBE	-20 to + 100°C

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 C₀

The static load rating C₀ 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_c = Contact coefficient

f_w = 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_h = rated life (hours)

L_s = stroke length (m)

L = rated life (km)

n₁ = operating frequency (stroke/min)

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