Linear bearings and units

with SKF factory pre-lubrication

Precision shafts

SKF precision shafts can be supplied either as solid or hollow shafts. Solid shafts are available in all dimensions required to fit SKF linear ball bearings; hollow shafts have a minimum outer diameter of 16 mm. They are induction hardened and ground (see table on next page). SKF shafts have exceptionally high dimensional stability and are designed for long service life.

The shaft ends of normal shaft production may deviate in hardness and dimension accuracy. For special applications, solid shafts of stainless steel or hard chromium plated shafts with a chromium coating of approximately 10 µm thickness can be supplied. Note that the surface of a stainless steel shaft is not as hard as the surface of a shaft made of high-grade steel. The case depth may also be greater than indicated in the table and this may have an influence on the machinability of the shafts. Because of the benefits they offer, SKF precision shafts are not only used together with SKF linear ball bearings for linear guides, but are also used for other applications like axles or column sleeves.

Materials

SKF precision shafts are made from non-alloyed high-grade steels Cf53 (Material No.1.1213), Ck53 (Material No.1.1210), C60 (Material No.1.0601) and 100Cr6 (Material No.1.3505). The surface hardness is between 60 and 64 HRC. Solid stainless steel shafts are made from X90CrMoV18 (Material No.1.4112) or X46Cr13 (Material No.1.4034). In this case the surface hardness lies between 52 and 56 HRC. Shafts made from other materials can be supplied to special order.

Surface finish

All SKF precision steel shafts have a surface roughness of max. R_a 0,3 µm.

Case hardening of SKF shafts

Shaft diameter over	incl	Hardness depth min
mm		mm
—	10	0,5
10	18	0,8
18	30	1,2
30	50	1,5
50	80	2,2
80	100	3,0

Tolerances

SKF precision steel shafts are machined to h6 or h7 tolerances. The accuracy of dimensions and form of these shafts can be found in the table on page 56. There may be slight deviations from the values provided in the tables for sections of the shaft that have been annealed. SKF precision steel shafts with diameters machined to tolerance h9 can be supplied to special order. Shafts cut to special lengths have a length tolerance to ISO 2768 medium class. The relevant values are provided in the adjacent table.

Shafts with radial holes

For linear guides requiring support, shafts with threaded radial holes are needed. These can be supplied by SKF. The radial holes may be either positioned to fit SKF shaft supports or as specified on the customer's drawings. However, SKF recommends using the guideline values provided in the adjacent table for thread size and depth. SKF shafts with radial holes are not annealed at the drilling position; the thread is cut in the case hardened and ground shaft to avoid any changes in hardness or dimensional accuracy.

Composite shafts

Composite shafts can be supplied to customer drawings, either with screwed joints or with "plug and socket" joints, depending on the application. Accurately centred trunnions and sockets provide smooth transitions at the butt joint. To enable correct assembly, the relative positions of the shaft sections and shaft ends are marked. Composite shafts should be fastened to a support at the butt joints, particularly when "plug and socket" joints are used. When drilling radial holes for the supports, drill as close as possible to the joint.

Note: the length of the shaft and the positioning of the supports should be determined so that any bending of the shaft will not cause a gap to form at the joint.

Length tolerances for shafts to ISO 2768 medium class

Nominal length over	incl	Deviation
mm		mm
—	120	± 0,3
120	400	± 0,5
400	1 000	± 0,8
1 000	2 000	± 1,2
2 000	4 000	± 2
4 000	8 000	± 3

Corrosion protection, packing

SKF precision steel shafts are treated with a rust inhibiting preservative that must be removed before the shafts are installed. Depending on size and quantity, they are supplied in cardboard or wooden boxes that offer maximum protection during transport.

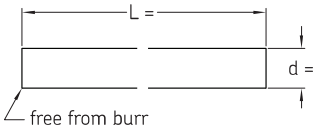
Standard length of the shafts[1]

SKF precision steel shafts are available in following length

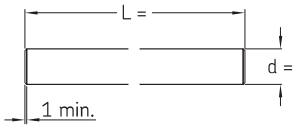
Shaft diameter	Maximal length[2]				
	LJM[3]	LJMH[3]	LJMS[3]	LJMR[3]	LJT[3]
mm	mm				
3[4]				200	
4[4]				200	
5	3 900	2 000	1 000	3 800	
6	3 900	3 900	3 900	3 800	
8	3 900	3 900	3 900	3 800	
10	6 200	6 200	3 900	3 800	
12	6 200	6 200	4 900	6 200	6 000
14	6 200	6 200	4 900	6 200	
16	6 200	6 200	4 900	6 200	6 000
20	6 200	6 200	4 900	6 200	6 000
25	6 200	6 200	4 900	6 200	6 000
30	6 200	6 200	4 900	6 200	6 000
40	6 200	6 200	4 900	6 200	6 000
50	6 200	6 200	4 900	6 200	6 000
60	6 200	6 200	4 900	6 200	6 000
80	6 200	6 200			6 000

[1] Different diameters and length on request
[2] length tolerance ±10 % (based on maximum shaft length)
[3] for details see page 56/57
[4] only available as ESSC 2 see page 54

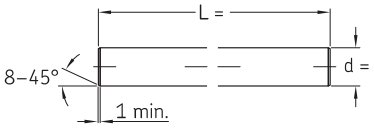
Shafting standard – ESSC



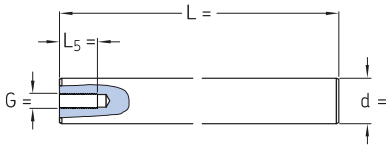
ESSC 1
cut with no chamfer only deburr
- length tolerance according to ISO 2768 medium class (see page 53)



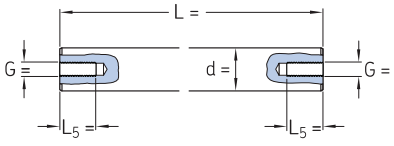
ESSC 2
cut with chamfer
- length tolerance as ESSC 1



ESSC 3
cut with machined 25° chamfer and 90° front surfaces for limited length tolerance or chamfer according to customer specification
- length tolerance +/- 0,1 mm up to 3 000 mm total length



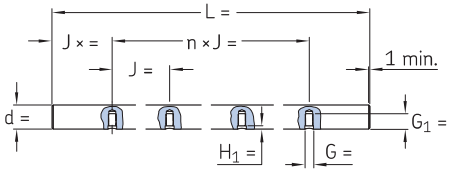
ESSC 4
cut with machined 25° chamfer, 90° front surfaces and one axial hole
- length tolerance as ESSC 3



ESSC 5
as ESSC 4 with two axial holes

Dimensions of front side thread (ESSC 4 & ESSC 5)

Ø (d)	Thread (G)	Depth (L5)
5	-	-
8	M4	10
10	M4	10
12	M5	12,5
14	M5	12,5
16	M6	15
20	M8	20
25	M10	25
30	M10	25
40	M12	30
50	M16	40
60	M20	50
80	M24	60



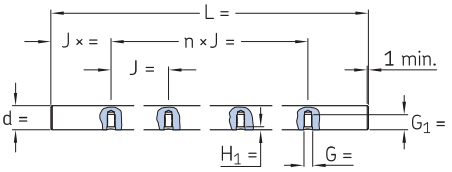
ESSC 6

cut and chamfer as ESSC 2

- with radial holes for LRCB (see page 47)
- first radial hole with Jx = J/2
- H1 according to hardness depth

Dimensions of radial thread

Ø	Thread	G	G1	J	Jx
5	-	-	-	-	-
8	-	-	-	-	-
12	M4	5	8	75	37,5
16	M5	6	9,5	100	50
20	M6	7	13	100	50
25	M8	9	14	120	60
30	M10	11	18	150	75
40	M10	11	20	200	100
50	M12	13	23	200	100
60	M14	15	28	300	150
80	M16	16	33	300	150

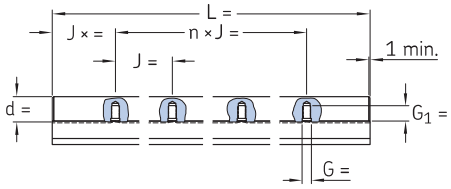


ESSC 7

as ESSC 6

- radial holes with J and Jx according to customer specification

Ø	Thread	G	G1	J	Jx
5	-	-	-	-	-
8	-	-	-	-	-
12	M4	5	8	-	
16	M5	6	9,5	-	-
20	M6	7	13	-	-
25	M8	9	14	-	-
30	M10	11	18	-	-
40	M10	11	20	-	-
50	M12	13	23	-	-
60	M14	15	28	-	-
80	M16	16	33	-	-

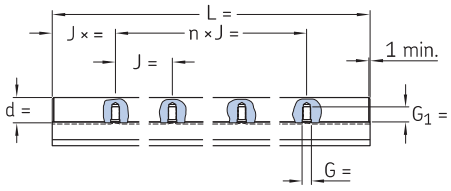


ESSC 8

cut and chamfer as ESSC 2

- Shaft is mounted on LRCB (see page 47)
- first radial hole with Jx = J/2
- H1 according to hardness depth

Ø	Thread	G	G1	J	Jx
5	-	-	-	-	-
8	-	-	-	-	-
12	M4	5	8	75	37,5
16	M5	6	9,5	100	50
20	M6	7	13	100	50
25	M8	9	14	120	60
30	M10	11	18	150	75
40	M10	11	20	200	100
50	M12	13	23	200	100
60	M14	15	28	300	150
80	M16	16	33	300	150



ESSC 9

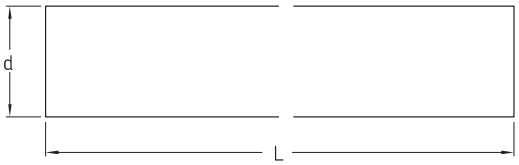
as ESSC 8

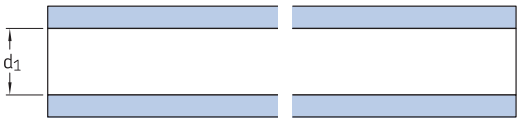
- Shaft is mounted on LRCC (see page 47)
- radial holes with J and Jx according to customer specification

Ø	Thread	G	G1	J	Jx
5	-	-	-	-	-
8	-	-	-	-	-
12	M4	5	8	-	-
16	M5	6	9,5	-	-
20	M6	7	13	-	-
25	M8	9	14	-	-
30	M10	11	18	-	-
40	M10	11	20	-	-
50	M12	13	23	-	-
60	M14	15	28	-	-
80	M16	16	33	-	-

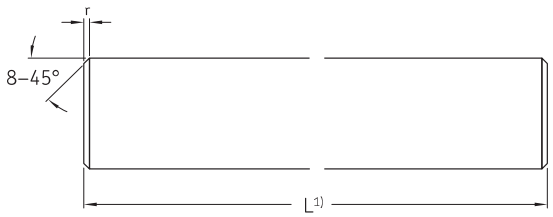
ESSC 10, shaft according to customer specification / drawings

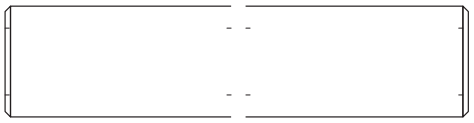
Precision shafts





Standard designs for fixed lenght without chamfer





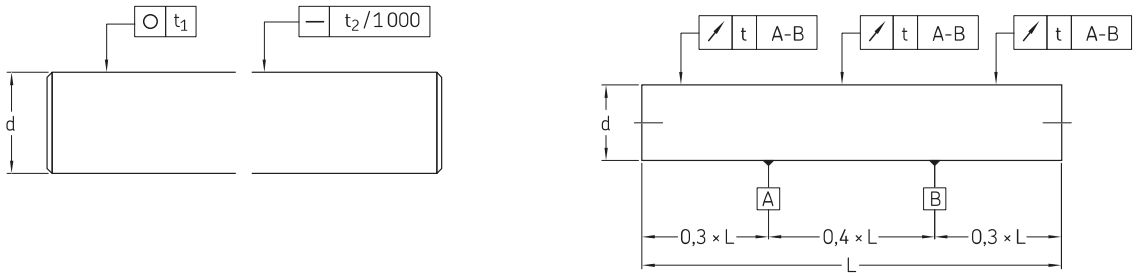
Standard designs for fixed lenght with chamfer

Dimension			Mass		Moment of inertia		Cross sectional area		Designations				
			Solid shaft	Hollow shaft	Solid shaft	Hollow shaft	Solid shaft	Hollow shaft	Solid shafts of precision steel	Solid shafts of stainless steel		Solid shafts with high grade steel hard chromium	Hollow shaft high grade steel plated
d	d_1	r_{min}							Cf53/Ck53	X90CrMoV18	X46Cr13	Cf53/Ck53	C60/100Cr6
mm			kg/m		cm^4		mm^2						
3	—	0,4	0,06	—	0,0004	—	7,1	—		LJMR 3			
4	—	0,4	0,1	—	0,0013	—	12,6	—		LJMR 4			
5	—	0,8	0,15	—	0,0031	—	19,6	—	LJM 5	LJMR 5	LJMS 5	LJMH 5	
6		0,8	0,22	—	0,0064	—	28,3	—	LJM 6	LJMR 6	LJMS 6	LJMH 6	
8	—	0,8	0,39	—	0,020	—	50,3	—	LJM 8	LJMR 8	LJMS 8	LJMH 8	
10	—	0,8	0,62	—	0,049	—	78,5	—	LJM 10	LJMR 10	LJMS 10	LJMH 10	
12	4	1	0,89	0,79	0,102	—	113	—	LJM 12	LJMR 12	LJMS 12	LJMH 12	LJT 12
14	—	1	1,21	—	0,189	—	154	—	LJM 14	LJMR 14	LJMS 14	LJMH 14	
16	7	1	1,58	1,28	0,322	0,310	201	163	LJM 16	LJMR 16	LJMS 16	LJMH 16	LJT 16
20	14	1,5	2,47	1,25	0,785	0,597	314	160	LJM 20	LJMR 20	LJMS 20	LJMH 20	LJT 20
25	16	1,5	3,86	2,35	1,92	1,64	491	305	LJM 25	LJMR 25	LJMS 25	LJMH 25	LJT 25
30	18	1,5	5,55	3,5	3,98	3,46	707	453	LJM 30	LJMR 30	LJMS 30	LJMH 30	LJT 30
40	28	2	9,86	4,99	12,6	9,96	1 260	685	LJM 40	LJMR 40	LJMS 40	LJMH 40	LJT 40
50	30	2	15,4	9,91	30,7	27,7	1 960	1 350	LJM 50	LJMR 50	LJMS 50	LJMH 50	LJT 50
60	36	2,5	22,2	14,2	63,6	57,1	2 830	1 920	LJM 60	LJMR 60	LJMS 60	LJMH 60	LJT 60
80	57	2,5	39,5	19,43	201	153	5 030	2 565	LJM 80			LJMH 80	LJT 80

Attention:
d_1 can deviate from the value quoted. Please enquire if necessary.
Different shaft diameters and types on request.
The static load capacity has to be decreased by 8 % and the dynamic load capacity by 18 % when using the non corrosion types (HV6) in conjunction with precision steel shafts made of stainless steel.

[1] **Shafts cut to special length with chamfered ends.** The length tolerance of these shafts corresponds to LJM 20x1500 ESSC2 medium class. The designation for a shaft with 20 mm diameter cut to a length of 1,5 m is, for example, LJM 20x1500 ESSC2.

Precision shafts of high-grade steel

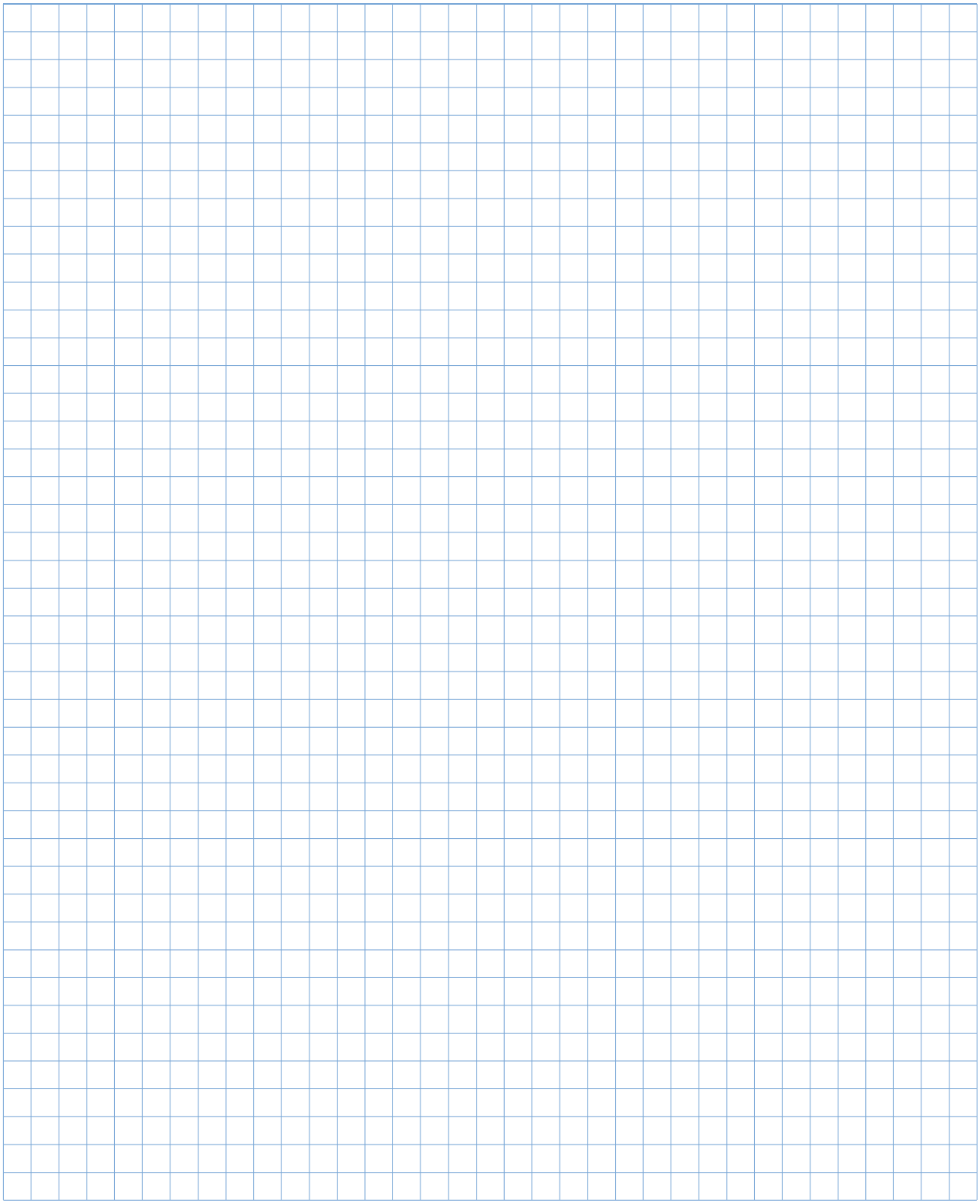


Measuring principle of straightness

Shaft	Accuracy of dimension and form							
Nominal diameter	Shafts to tolerance h6				Shafts to tolerance h7			
	Diameter deviation		Round-ness	Straight-ness[1]	Diameter deviation		Round-ness	Straight ness[1]
d	high	low	t_1	t_2	high	low	t_1	t_2
mm	µm							
3	0	-6	3	150	0	-10	4	150
4	0	-8	4	150	0	-12	5	150
5	0	-8	4	150	0	-12	5	150
6	0	-8	4	150	0	-12	5	150
8	0	-9	4	120	0	-15	6	120
10	0	-9	5	120	0	-15	7	120
12	0	-11	5	100	0	-18	8	100
14	0	-11	5	100	0	-18	8	100
16	0	-11	5	100	0	-18	8	100
20	0	-13	6	100	0	-21	9	100
25	0	-13	6	100	0	-21	9	100
30	0	-13	6	100	0	-21	9	100
40	0	-16	7	100	0	-25	11	100
50	0	-16	7	100	0	-25	11	100
60	0	-19	8	100	0	-30	13	100
80	0	-19	8	100	0	-30	13	100

[1] Shafts with higher precision on request.

Notes



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