

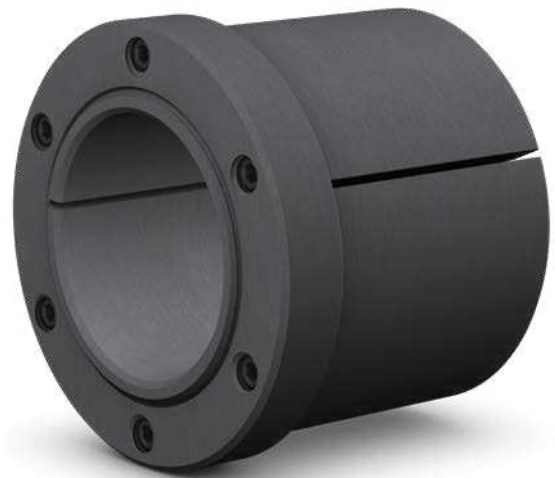
The SKF SH bushing

Easy mount keyless mechanical friction joint



Are you considering the facts?

SH Bushings are designed to mount components to a shaft. Sounds simple, right? However, if you are using traditional connections, such as keys and keyways, which have been around for quite some time, or keyed tapered bushings, which are especially popular around the globe, you could be using something that is surprisingly ineffective.



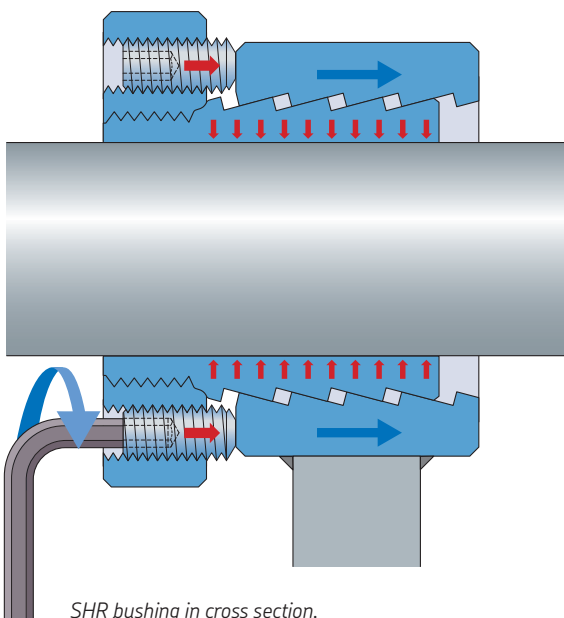
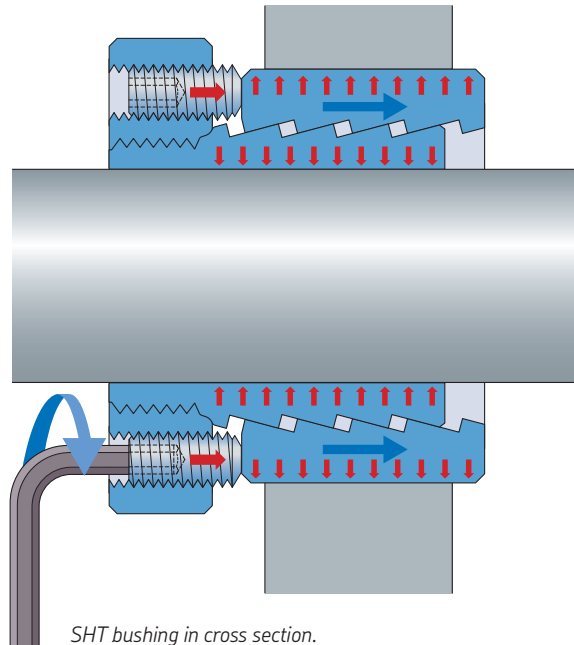
When keyways are cut into components and shafts, they reduce the cross section and strength of the machined parts. As a result, any shafts, gears or pulleys containing a keyway must be oversized to compensate for the reduced cross section. Keys and keyways require a clearance fit on several planes. The combined effect of these clearances is backlash, which in some cases can enlarge the keyways, while promoting fatigue failures and fretting corrosion. So, with the facts in front of you, what are your options? ...

SHT or SHR?

You can choose between SHT and SHR to get the mounting system that fits your application.



SHT, delivered with a slotted outer sleeve, locks your application with pressure and friction. You only need a cylindrical bore in the hub.



SHR, delivered with a non-slotted outer sleeve, can be used principally if you want to weld something onto the SH bushing, e.g. a lever.

Why choose the SH bushing?

Dispense with key joints to keep shaft diameters smaller

The drawbacks of key joints are well known. Not only is there a risk of increasing slack and fretting corrosion, the stress concentration also reduces shaft strength. Shaft diameters have had to be increased to compensate. Because the SH bushing is a mechanical friction joint, there is no need to machine keyways and axially secure the joint, saving you time and resources.

No slip issues

The SH bushing is designed for heavy loads, regarding both torque and axial forces. It transmits high torque and still allows for large tolerance spectra both on the shaft and on the hub. The SH bushing needs h11-k6 on the shaft and H7-H11 in the hub.

For details see → **table 3** and **4**.

The hub is already there

Hub/shaft assemblies often need some form of intermediate hub. Either as an integral part of the hub proper or welded into it. The SH bushing is made of weldable steel. With an unslotted outer component (SHR), it can be welded directly into the hub bore. It acts as an intermediate hub and saves time and material.

No need to remove old keyways

The quickest method of repairing a key joint is to replace it completely with an SH bushing. All you need do is remove any fretting corrosion, otherwise the shaft can be left as it is. The hub bore should be turned to the outside diameter of the SH bushing. The result: a joint with improved performance, free from stress concentrations, which is also simpler to mount and dismount.

Temperature-resistant

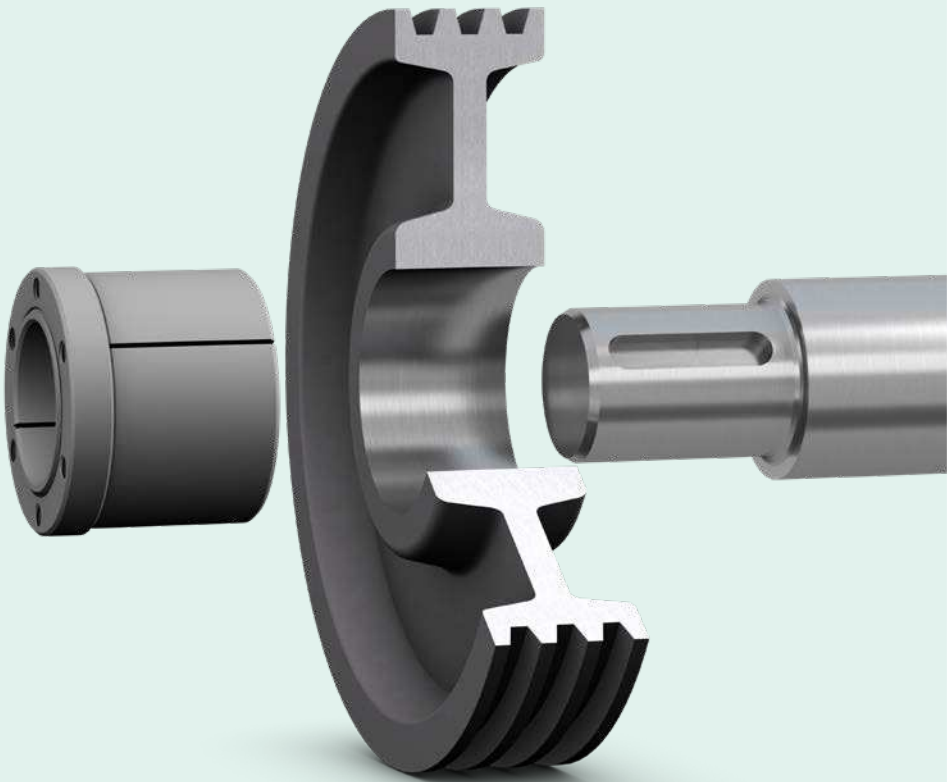
The SH bushing is entirely mechanical. There is no hydraulic media to cause volume change because of temperature. So, it can be used anywhere – in the cold or in the heat.

No risk of distortion

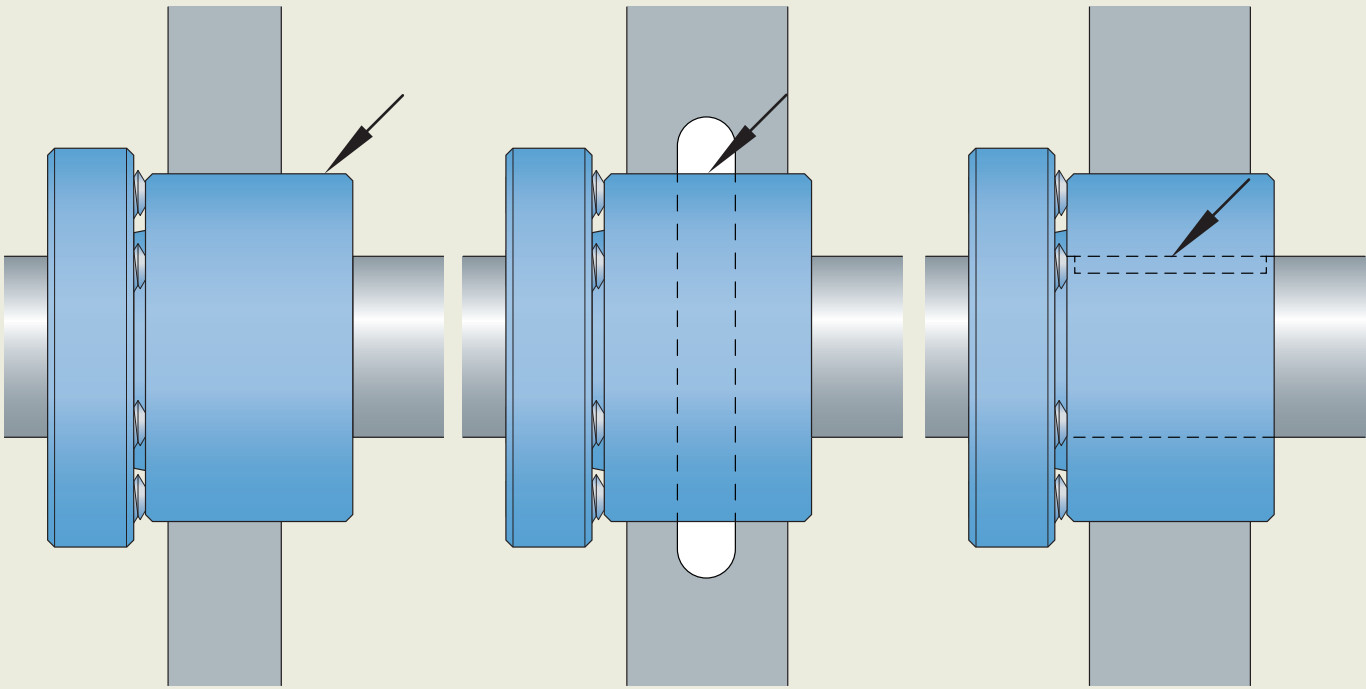
As expansion in the SH bushing is produced mechanically, it will always be equal over the entire surface. The bushing can never buckle. Even where there are depressions in the hub or the shaft, or where the bushing is longer than the width of the hub, it will still produce a joint that is quick and easy to dismount.

FORGET
KEYWAYS

MAINTAIN JOINT STRENGTH
WITH FRICTION

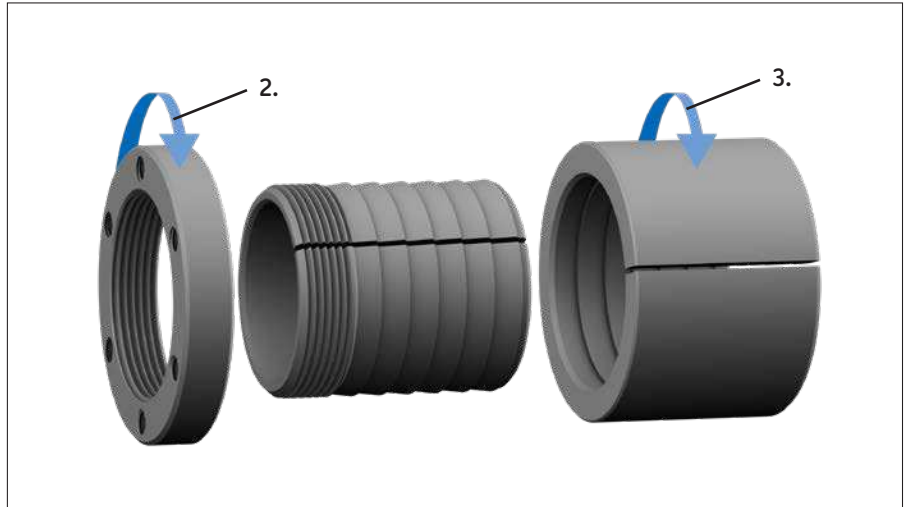
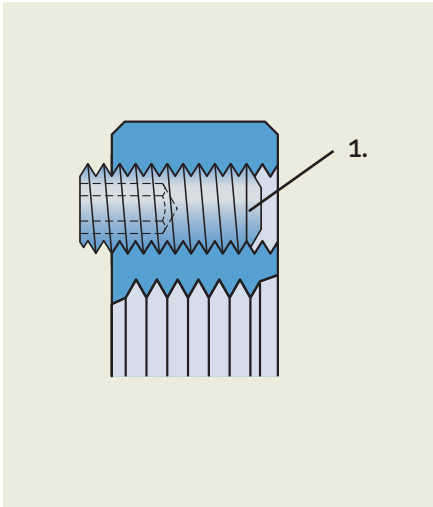


No need to remove old keyways



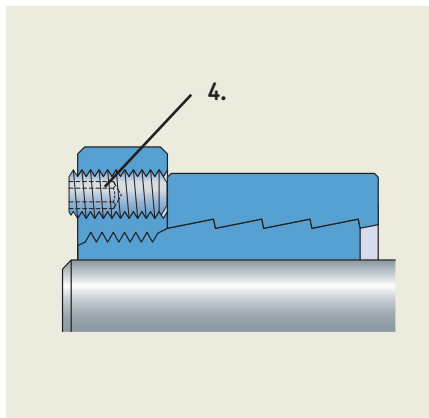
No risk of distortion

Mounting is rapid and simple



Mounting

- 1 Check to see that the locking screws do not protrude from the rear of the nut.
- 2 Tighten the nut on to the inner sleeve as far as it will go.
- 3 Thread the outer sleeve on to the inner until it abuts the nut. Note that the outer sleeve has a lefthand thread.
- 4 Insert the locking screws until they loosely abut the outer sleeve.
- 5 Insert the shaft and mount the hub.
- 6 Tighten the locking screws alternately. Check that they are properly tightened by turning all screws twice more. (Where maximum torque transmission must be guaranteed, a torque wrench is recommended.)



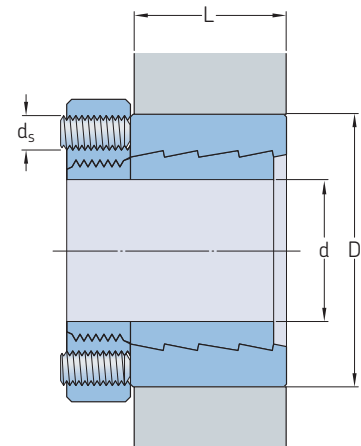
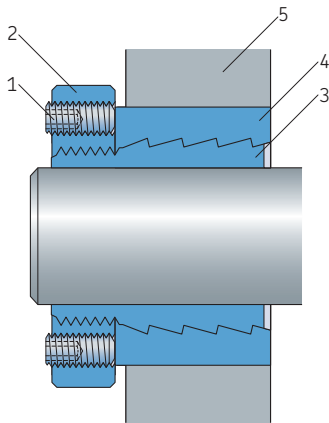
Dismounting

- 1 Loosen the locking screws so that they are not in contact with the bushing.
- 2 Slightly loosen the nut.
- 3 Apply light blows to the nut or the outer sleeve, so that the tapered section of the thread releases its grip.

Table 1

SHT (SHR)	d mm	D mm	L mm	M1 Nm
15	15	42	27	8
16	16	42	27	8
17	17	42	27	8
18	18	42	27	8
19	19	42	27	8
20	20	42	27	8
22	22	42	27	8
24	24	46	27	8
25	25	46	27	8
28	28	55	32	18
30	30	55	32	18
32	32	60	37	18
35	35	60	37	18
38	38	67	45	18
40	40	67	45	18
42	42	67	45	18
45	45	70	50	18
48	48	77	55	18
50	50	77	55	18
55	55	85	60	18
60	60	92	65	34
65	65	100	70	34
70	70	105	75	34
75	75	110	85	34
80	80	120	90	60
85	85	125	95	60
90	90	135	100	60
95	95	140	105	60
100	100	140	110	60
110	110	155	120	60
120	120	165	130	60
130	130	175	140	60
140	140	185	155	60
150	150	205	150	140
160	160	215	160	140

To be observed during mounting



Mounting procedure – to be strictly adhered to as follows:

Leave approximately 1 mm between the nut and the hub

- 1 Locking screw
- 2 Nut
- 3 Inner sleeve
- 4 Outer sleeve
- 5 Hub

During mounting the outer sleeve (4) and the hub (5) move from the nut in axial direction. After mounting the hub must not touch the shoulder on the shaft. Therefore, it is important to leave a space between the hub and the shoulder.

When mounting the SH-bushing, the outer sleeve is normally moved in an axial direction from the nut. If the outer sleeve cannot be moved in this direction the inner sleeve will slide on the shaft in the direction of the nut. The friction losses that occur result in a lower transmitted torque. The transmitted torque when the SH bushing is mounted in this way will be decreased according to the following:

$$M_v \text{ obtained} = 0.7 \times M_v \text{ catalogue}$$

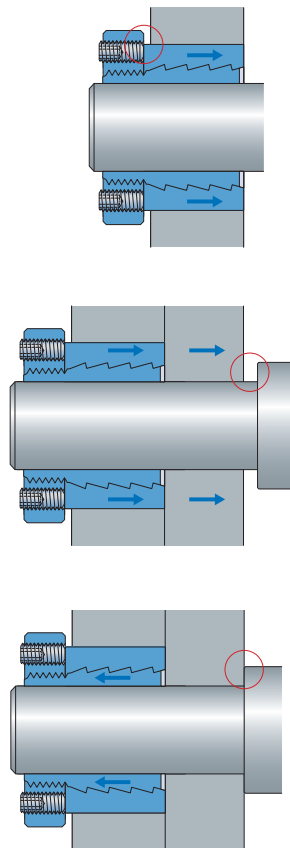


Table 2

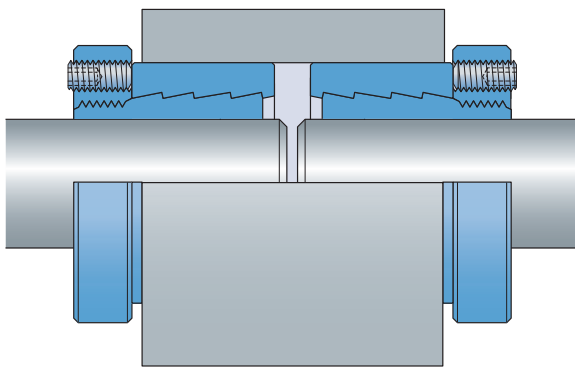
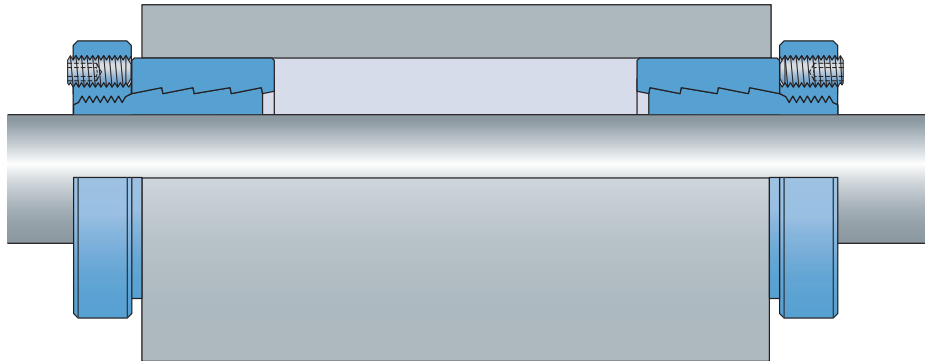
SHT (SHR)	d	D	L	d _s	M1
	inch	inch	mm	mm	Lb/Ft
5/8	5/8	1 13/16	27	M 6	5.9
3/4	3/4	1 13/16	27	M 6	5.9
7/8	7/8	1 13/16	27	M 6	5.9
15/16	15/16	1 15/16	27	M 6	5.9
1	1	1 15/16	27	M 6	5.9
1 1/8	1 1/8	2 5/16	32	M 8	13.28
1 3/16	1 3/16	2 5/16	32	M 8	13.28
1 1/4	1 1/4	2 7/16	37	M 8	13.28
1 5/16	1 5/16	2 7/16	37	M 8	13.28
1 3/8	1 3/8	2 7/16	37	M 8	13.28
1 7/16	1 7/16	2 13/16	45	M 8	13.28
1 1/2	1 1/2	2 13/16	45	M 8	13.28
1 5/8	1 5/8	2 13/16	45	M 8	13.28
1 3/4	1 3/4	2 15/16	50	M 8	13.28
1 7/8	1 7/8	3 3/16	55	M 8	13.28
1 15/16	1 15/16	3 3/16	55	M 8	13.28
2	2	3 3/16	55	M 8	13.28
2 1/8	2 1/8	3 7/16	60	M 8	13.28
2 3/16	2 3/16	3 7/16	60	M 8	13.28
2 3/8	2 3/8	4 1/16	70	M 10	25.08
2 7/16	2 7/16	4 1/16	70	M 10	25.08
2 1/2	2 1/2	4 1/16	70	M 10	25.08
2 3/4	2 3/4	4 3/16	70	M 10	25.08
2 15/16	2 15/16	4 7/16	75	M 10	25.08
3	3	4 13/16	75	M 12	44.25
3 3/16	3 3/16	4 13/16	75	M 12	44.25
3 3/8	3 3/8	5 1/16	75	M 12	44.25
3 7/16	3 7/16	5 7/16	80	M 12	44.25
3 1/2	3 1/2	5 7/16	80	M 12	44.25
3 15/16	3 15/16	5 11/16	80	M 12	44.25
4	4	6 3/16	80	M 12	44.25
4 7/16	4 7/16	6 9/16	90	M 12	44.25
4 1/2	4 1/2	6 9/16	90	M 12	44.25
4 15/16	4 15/16	6 15/16	95	M 12	44.25
5	5	6 15/16	95	M 12	44.25
5 1/2	5 1/2	7 5/16	100	M 12	44.25
6	6	8 5/16	105	M 16	103.25

Examples of special applications

Double mounting

For double mounting the first mounted SH bushing is transmitting 100% of M_v and the second one 70% of M_v .

The total transmitted torque for this application will be $1.7 \times M_v$ of a single SH bushing.



Coupling of shafts

If the shafts can move axially during the mounting operation, the transmitted torque will be 100% of one SH bushing. If the shaft mounted last cannot move axially during the mounting operation the transmitted torque will be 70% of one SH bushing.

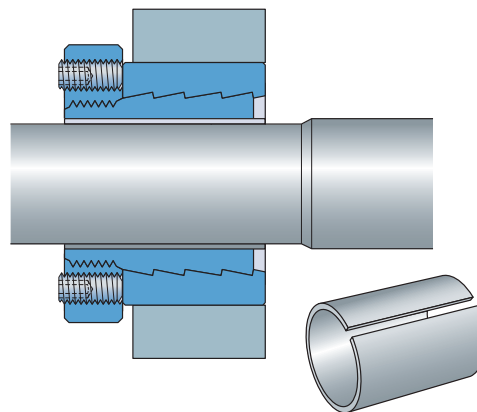
Modification/Repair

(Using slotted intermediate sleeve)

For repairs when the shaft has been damaged it might be necessary to machine the shaft to suit dimension d_i .

A slotted intermediate sleeve is manufactured to dimensions d_i and d and an SH bushing is fitted over the sleeve. The transmitted torque for the modified joint will be:

$$M_v = \frac{M_v \text{ catalogue} \cdot d_i}{d}$$



Shafts

Roundness.

s
e
SH

within this specified tolerances. The same tolerances are also valid for the hub.

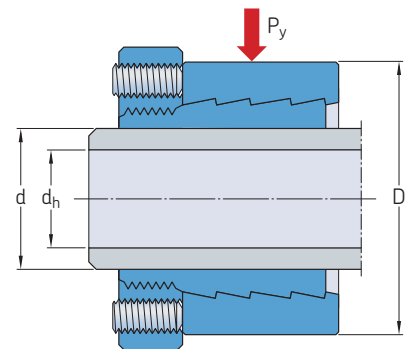
Surface roughness. The surface roughness of the shaft should be max. $3.2 R_a$.

Hollow shafts, calculation. The maximum allowable inside diameter for a hollow shaft application can be obtained as follows.

$$\text{Equation: } d_{h_{\max}} = d \cdot \sqrt{\frac{R_p 0.2 - \frac{P_y \cdot D}{d} \cdot 2}{R_p 0.2}}$$

- $R_p 0.2$ (N/mm² alt. psi) = yield limit of the shaft material.
- P_y (N/mm² alt. psi) = surface pressure against hub.
- D (mm alt. inch) = enter diameter of the outer sleeve.
- d (mm alt. inch) = bore diameter of the inner sleeve.

See catalogue → **table 5** or **8**.



Details of tolerances for mating parts

SH bushing

d × D	Shaft(d) h11 to k6		Hub (D) h7 to h11		Shaft(d) h11 to k6		Hub (D) h7 to h11	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
	mm				inch			
15 × 42	15.012	14.890	42.160	42.000	0.5910	0.5862	1.6598	1.6535
16 × 42	16.012	15.890	42.160	42.000	0.6304	0.6256	1.6598	1.6535
17 × 42	17.012	16.890	42.160	42.000	0.6698	0.6650	1.6598	1.6535
18 × 42	18.012	17.890	42.160	42.000	0.7091	0.7043	1.6598	1.6535
19 × 42	19.015	18.870	42.160	42.000	0.7486	0.7429	1.6598	1.6535
20 × 42	20.015	19.870	42.160	42.000	0.7880	0.7823	1.6598	1.6535
22 × 42	22.015	21.870	42.160	42.000	0.8667	0.8610	1.6598	1.6535
24 × 46	24.015	23.870	46.160	46.000	0.9455	0.9398	1.8173	1.8110
25 × 46	25.015	24.870	46.160	46.000	0.9848	0.9791	1.8173	1.8110
28 × 55	28.015	27.870	55.190	55.000	1.1030	1.0972	2.1728	2.1654
30 × 55	30.015	29.870	55.190	55.000	1.1817	1.1760	2.1728	2.1654
32 × 60	32.018	31.840	60.190	60.000	1.2606	1.2535	2.3697	2.3622
35 × 60	35.018	34.840	60.190	60.000	1.3787	1.3717	2.3697	2.3622
38 × 67	38.018	37.840	67.190	67.000	1.4968	1.4898	2.6453	2.6378
40 × 67	40.018	39.840	67.190	67.000	1.5755	1.5685	2.6453	2.6378
42 × 67	42.018	41.840	67.190	67.000	1.6543	1.6472	2.6453	2.6378
45 × 70	45.018	44.840	70.190	70.000	1.7724	1.7654	2.7634	2.7559
48 × 77	48.018	47.840	77.190	77.000	1.8905	1.8835	3.0390	3.0315
50 × 77	50.018	49.840	77.190	77.000	1.9692	1.9622	3.0390	3.0315
55 × 85	55.021	54.810	85.220	85.000	2.1662	2.1579	3.3551	3.3465
60 × 92	60.021	59.810	92.220	92.000	2.3630	2.3547	3.6307	3.6220
65 × 100	65.021	64.810	100.220	100.000	2.5599	2.5516	3.9457	3.9370
70 × 105	70.021	69.810	105.220	105.000	2.7567	2.7484	4.1425	4.1339
75 × 110	75.021	74.810	110.220	110.000	2.9536	2.9453	4.3394	4.3307
80 × 120	80.021	79.810	120.220	120.000	3.1504	3.1421	4.7331	4.7244
85 × 125	85.025	84.780	125.250	125.000	3.3474	3.3378	4.9311	4.9213
90 × 135	90.025	89.780	135.250	135.000	3.5443	3.5346	5.3248	5.3150
95 × 140	95.025	94.780	140.250	140.000	3.7411	3.7315	5.5217	5.5118
100 × 140	100.025	99.780	140.250	140.000	3.9380	3.9283	5.5217	5.5118
110 × 155	110.025	109.780	155.250	155.000	4.3317	4.3220	6.1122	6.1024
120 × 165	120.025	119.780	165.250	165.000	4.7254	4.7157	6.5059	6.4961
130 × 175	130.028	129.750	175.250	175.000	5.1192	5.1038	6.8996	6.8898
140 × 185	140.028	139.750	185.290	185.000	5.5129	5.5020	7.2949	7.2935
150 × 205	150.028	149.750	205.290	205.000	5.9066	5.8957	8.0823	8.0709
160 × 215	160.028	159.750	215.290	215.000	6.3003	6.2894	8.4760	8.4646

SH bushing

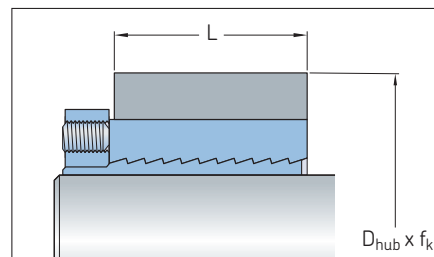
d × D	Shaft(d) h11 to k6		Hub (D) h7 to h11		Shaft(d) h11 to k6		Hub (D) h7 to h11	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
	inch				mm			
5/8 × 1 13/16	0.6255	0.6207	1.8188	1.8125	15.8870	15.7650	46.1975	46.0375
3/4 × 1 13/16	0.7506	0.7449	1.8188	1.8125	19.0650	18.9200	46.1975	46.0375
7/8 × 1 13/16	0.8756	0.8699	1.8188	1.8125	22.2400	22.0950	46.1975	46.0375
15/16 × 1 15/16	0.9381	0.9324	1.9438	1.9375	23.8275	23.6825	49.3725	49.2125
1 × 1 15/16	1.0006	0.9949	1.9438	1.9375	25.4150	25.2700	49.3725	49.2125
1 1/8 × 2 5/16	1.1256	1.1199	2.3200	2.3125	28.5900	28.4450	58.9275	58.7375
1 3/16 × 2 5/16	1.1882	1.1812	2.3200	2.3125	30.1805	30.0025	58.9275	58.7375
1 1/4 × 2 7/16	1.2507	1.2437	2.4450	2.4375	31.7680	31.5900	62.1025	61.9125
1 5/16 × 2 7/16	1.3132	1.3062	2.4450	2.4375	33.3555	33.1775	62.1025	61.9125
1 3/8 × 2 7/16	1.3757	1.3687	2.4450	2.4375	34.9430	34.7650	62.1025	61.9125
1 7/16 × 2 13/16	1.4382	1.4312	2.8200	2.8125	36.5305	36.3525	71.6275	71.4375
1 1/2 × 2 13/16	1.5007	1.4937	2.8200	2.8125	38.1180	37.9400	71.6275	71.4375
1 5/8 × 2 13/16	1.6257	1.6187	2.8200	2.8125	41.2930	41.1150	71.6275	71.4375
1 3/4 × 2 15/16	1.7507	1.7437	2.9450	2.9375	44.4680	44.2900	74.8025	74.6125
1 7/8 × 3 3/16	1.8757	1.8687	3.1962	3.1875	47.6430	47.4650	81.1825	80.9625
1 15/16 × 3 3/16	1.9382	1.9312	3.1962	3.1875	49.2305	49.0525	81.1825	80.9625
2 × 3 3/16	2.0008	1.9925	3.1962	3.1875	50.8210	50.6100	81.1825	80.9625
2 1/8 × 3 7/16	2.1258	2.1215	3.4462	3.4375	53.9960	53.8850	87.5325	87.3125
2 3/16 × 3 7/16	2.1883	2.1800	3.4462	3.4375	55.5835	55.3725	87.5325	87.3125
2 3/8 × 4 1/16	2.3758	2.3675	4.0712	4.0625	60.3460	60.1350	103.4075	103.1875
2 7/16 × 4 1/16	2.4383	2.4300	4.0712	4.0625	61.9335	61.7225	103.4075	103.1875
2 1/2 × 4 1/16	2.5008	2.4927	4.0712	4.0625	63.5210	63.3100	103.4075	103.1875
2 3/4 × 4 3/16	2.7508	2.7425	4.1962	4.1875	69.8710	69.6600	106.5825	106.3625
2 15/16 × 4 7/16	2.9383	2.9300	4.4462	4.4375	74.6335	74.4225	112.9325	112.7125
3 × 4 13/16	3.0008	2.9925	4.8223	4.8125	76.2210	76.0100	122.4875	122.2375
3 3/16 × 4 13/16	3.1885	3.1788	4.8223	4.8125	80.9875	80.7425	122.4875	122.2375
3 3/8 × 5 1/16	3.3760	3.3663	5.0723	5.0625	85.7500	85.5050	128.8375	128.5875
3 7/16 × 5 7/16	3.4385	3.4288	5.4473	5.4375	87.3375	87.0925	138.3625	138.1125
3 1/2 × 5 7/16	3.5010	3.4913	5.4473	5.4375	88.9250	88.6800	138.3625	138.1125
3 15/16 × 5 11/16	3.9385	3.9288	5.6973	5.6875	100.0375	99.7925	144.7125	144.4625
4 × 6 3/16	4.0010	3.9913	6.1973	6.1875	101.6250	101.3800	157.4125	157.1625
4 7/16 × 6 9/16	4.4385	4.4288	6.5723	6.5625	112.7375	112.4925	166.9375	166.6875
4 1/2 × 6 9/16	4.5010	4.4913	6.5723	6.5625	114.3250	114.0800	166.9375	166.6875
4 15/16 × 6 15/16	4.9386	4.9277	6.9473	6.9375	125.4405	125.1625	176.4625	176.2125
5 × 6 15/16	5.0011	4.9902	6.9473	6.9375	127.0280	126.7500	176.4625	176.2125
5 1/2 × 7 5/16	5.5011	5.4902	7.3239	7.3125	139.7280	139.4500	186.0275	185.7375
6 × 8 5/16	6.0011	5.9902	8.3239	8.3125	152.4280	152.1500	211.4275	211.1375

Technical data

The bushings are available with either slotted (SHT) or non-slotted (SHR) outer components. Designation example: Bushing with slotted outer components for 20 mm shaft = SHT20.

Metric sizes

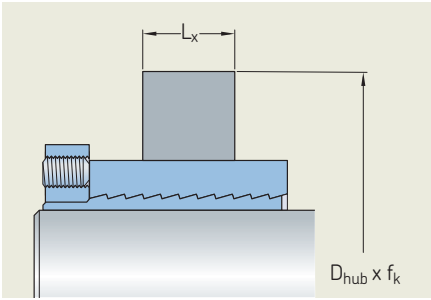
The table below gives the required minimum hub diameter (D_{hub}) for various materials when the SH bushing is completely covered by the hub.



SH bushing

Designation	Dimensions d × D	Surface pressure against hub P _y	Required minimum hub diameter D_{hub} (mm)						
			Yield limit R _p 0.2						
			80	120	200	250	300	400	500
	mm	N/mm ²	N/mm ²						
SHT 15	15 × 42	42	77	61	52	50	49	47	46
SHT 16	16 × 42	42	77	61	52	50	49	47	46
SHT 17	17 × 42	42	77	61	52	50	49	47	46
SHT 18	18 × 42	42	77	61	52	50	49	47	46
SHT 19	19 × 42	42	77	61	52	50	49	47	46
SHT 20	20 × 42	42	77	61	52	50	49	47	46
SHT 22	22 × 42	42	77	61	52	50	49	47	46
SHT 24	24 × 46	58	118	79	62	59	56	53	52
SHT 25	25 × 46	58	118	79	62	59	56	53	52
SHT 28	28 × 55	66	185	103	78	72	69	65	63
SHT 30	30 × 55	66	185	103	78	72	69	65	63
SHT 32	32 × 60	60	164	105	82	77	74	70	68
SHT 35	35 × 60	61	169	106	83	77	74	70	68
SHT 38	38 × 67	54	155	110	89	84	81	77	75
SHT 40	40 × 67	54	155	110	89	84	81	77	75
SHT 42	42 × 67	54	155	110	89	84	81	77	75
SHT 45	45 × 70	53	159	114	92	87	84	80	78
SHT 48	48 × 77	50	164	121	100	95	91	88	85
SHT 50	50 × 77	50	164	121	100	95	91	88	85
SHT 55	55 × 85	48	173	131	109	103	100	96	94
SHT 60	60 × 92	33	143	122	109	105	103	100	98
SHT 65	65 × 100	37	168	139	121	117	114	110	108
SHT 70	70 × 105	41	189	152	130	125	121	117	114
SHT 75	75 × 110	35	176	149	131	127	124	120	118
SHT 80	80 × 120	39	208	170	147	141	137	133	130
SHT 85	85 × 125	44	236	185	157	150	145	140	137
SHT 90	90 × 135	46	265	204	172	163	158	152	148
SHT 95	95 × 140	42	255	204	174	166	162	156	153
SHT 100	100 × 140	40	246	200	172	165	161	155	152
SHT 110	110 × 155	37	254	213	187	181	176	171	167
SHT 120	120 × 165	37	271	226	199	192	188	182	178
SHT 130	130 × 175	36	282	240	211	204	197	193	188
SHT 140	140 × 185	34	294	247	221	213	208	201	199
SHT 150	150 × 205	34	326	274	244	236	231	223	221
SHT 160	160 × 215	35	342	291	256	247	242	234	232

Diagram 1



If the width of the hub is smaller than L , the hub diameter must be multiplied by the factor f_k obtained from the adjacent diagram.

Example:

SH bushing SHT 40

Hub material yield limit $R_{p0.2} = 200 \text{ N/mm}^2$

Hub width $L_x = 31.5$

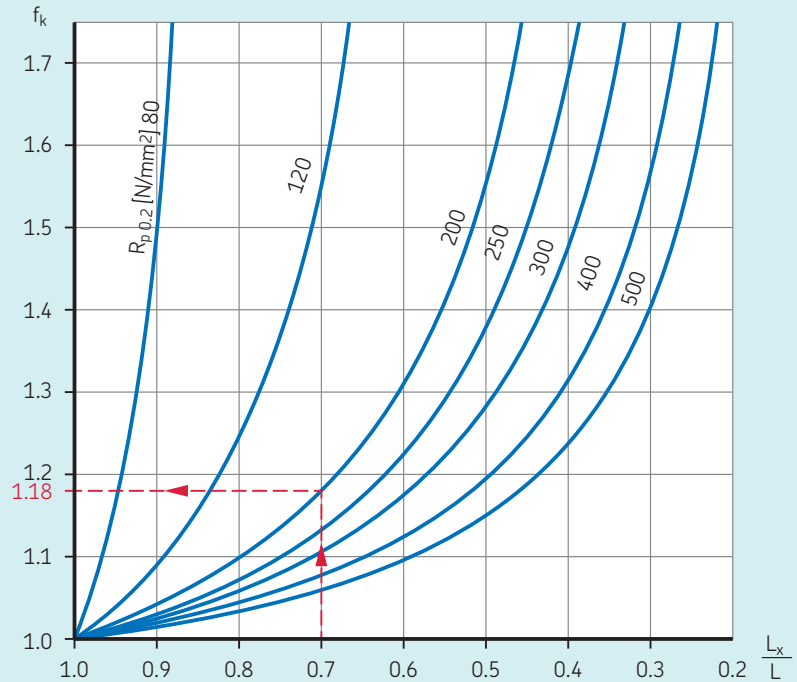
The required minimum hub diameter is obtained as follows:

$$\frac{L_x}{L} = \frac{31.5}{45} = 0.7$$

From the diagram, $f_k = 1.18$

Minimum hub diameter =
 $D_{\text{hub}} \times f_k = 89 \times 1.18 = 105 \text{ mm}$

Yield limit $R_{p0.2}$ (N/mm²)



If the joint is simultaneously subjected to a torque and an axial force, the resultant torque is obtained using the equation.

$$M_{vR} = \sqrt{M_v^2 + \left(P_{ax} \times \frac{d}{2000} \right)^2}$$

where

M_{vR} = maximum resultant torque [Nm]

M_v = torque acting on bushing [Nm]

P_{ax} = axial force acting on bushing [N]

d = shaft diameter [mm]

Example:

Bushing SHT 50 is subject to an axial force of 20 000 N and simultaneously to a torque of 500 Nm. The machine factor f_d is estimated as being 1.5.

$$M_{vR} = \sqrt{500^2 + \left(\frac{20\,000 \times 50}{2\,000} \right)^2} = 707 \text{ Nm}$$

According to → **table 7**, the maximum torque for SHT 50 is 1.625 Nm.

The permissible torque is then

$$\frac{1.625}{1.5} = 1.083 \text{ Nm}$$

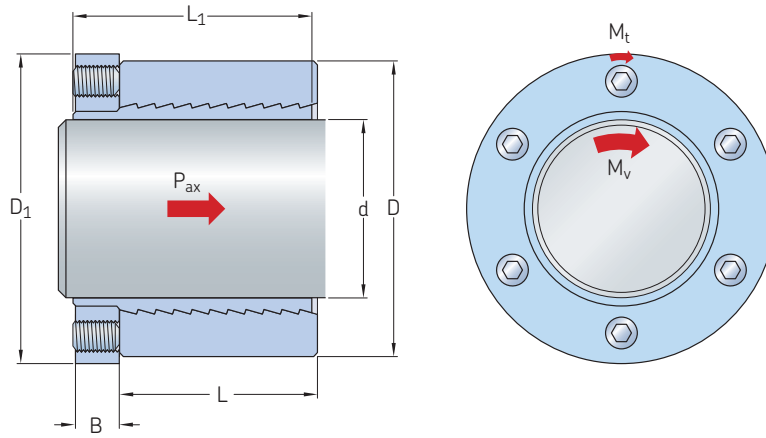
Load transmission

The maximum static slip torque and axial slip force are given in → **table 7**. Under dynamic load, the transmission ability is obtained by dividing by the machine factor f_d . See → **table 6**.

Table 6

Machine factor f_d for different load conditions

Power source	Type of load on driven machine		
	Group 1 Even loads	Group 2 Moderate shock loads	Group 3 Moderate shock loads
Electric motors, turbines	1.0 – 1.25	1.25 – 1.5	1.5 – 1.75
Multi-cylinder piston engines	1.25 – 1.5	1.5 – 1.75	1.75 – 2.00
Single cylinder piston engines	1.75 – 2.00	2.00 – 2.25	2.25 – 3.00
	Electric generators Centrifugal pumps Fans Light conveyors Turbo-compressors Agitators	Piston compressors Small piston pumps Machine tools Packaging machines Woodworking machines (joinery equipment)	Eccentric presses and punching machines Drawbanks Planing machines for metals Large piston compressors Pneumatic tools frequently activated



Dimensions and product range

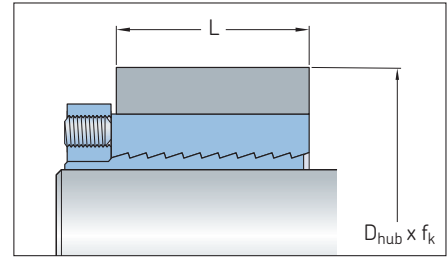
Dimensions						Locking screws		Tightening torque	Maximum torque	Maximum axial load	Designations	
d	D	D ₁	L	L ₁	B	No.	Size	M _t	M _v	P _{ax}	SHT slotted	SHR non-slotted
mm						–	mm	Nm	Nm	kN	–	–
15	42	49	27	36	9.5	4	M6 × 12	8	135	18	SHT 15	SHR 15
16	42	49	27	36	9.5	4	M6 × 12	8	140	18	SHT 16	SHR 16
17	42	49	27	36	9.5	4	M6 × 12	8	150	18	SHT 17	SHR 17
18	42	49	27	36	9.5	4	M6 × 12	8	160	18	SHT 18	SHR 18
19 ¹⁾	42	49	27	36	9.5	4	M6 × 12	8	170	18	SHT 19	SHR 19
20	42	49	27	36	9.5	4	M6 × 12	8	180	18	SHT 20	SHR 20
22	42	49	27	36	9.5	4	M6 × 12	8	200	18	SHT 22	SHR 22
24	46	53	27	37	10.5	6	M6 × 12	8	325	27	SHT 24	SHR 24
25	46	53	27	37	10.5	6	M6 × 12	8	340	27	SHT 25	SHR 25
28	55	63	32	44	12.5	4	M8 × 16	18	490	35	SHT 28	SHR 28
30	55	63	32	44	12.5	4	M8 × 16	18	525	35	SHT 30	SHR 30
32	60	67	37	49	12.5	5	M8 × 16	18	650	41	SHT 32	SHR 32
35	60	67	37	49	12.5	5	M8 × 16	18	720	41	SHT 35	SHR 35
38	67	75	45	57	12.5	6	M8 × 16	16	950	50	SHT 38	SHR 38
40	67	75	45	57	12.5	6	M8 × 16	18	1 000	50	SHT 40	SHR 40
42	67	75	45	57	12.5	6	M8 × 16	18	1 050	50	SHT 42	SHR 42
45	70	77	50	63	13.5	7	M8 × 16	18	1 280	57	SHT 45	SHR 45
48	77	83	55	68.8	14	8	M8 × 16	18	1 560	65	SHT 48	SHR 48
50	77	83	55	68.5	14	8	M8 × 16	18	1 625	65	SHT 50	SHR 50
55	85	90	60	73.5	14	9	M8 × 16	18	2 040	75	SHT 55	SHR 55
60	92	98	65	79.5	15	6	M10 × 16	34	2 250	75	SHT 60	SHR 60
65	100	105	70	87	17	8	M10 × 20	34	3 250	100	SHT 65	SHR 65
70	105	110	75	92.5	17.5	10	M10 × 20	34	4 400	125	SHT 70	SHR 70
75	110	115	85	102	17	10	M10 × 20	34	4 750	125	SHT 75	SHR 75
80	120	126	90	111	21	8	M12 × 25	60	6 000	150	SHT 80	SHR 80
85	125	133	95	116.5	21.5	10	M12 × 25	60	8 000	186	SHT 85	SHR 85
90	135	141	100	123.5	23.5	12	M12 × 25	60	10 000	224	SHT 90	SHR 90
95	140	148	105	127.5	22.5	12	M12 × 25	60	10 600	224	SHT 95	SHR 95
100	140	148	110	132.5	22.5	12	M12 × 25	60	11 200	224	SHT 100	SHR 100
110	155	161	120	143	23	14	M12 × 25	60	13 400	244	SHT 110	SHR 110
120	165	171	130	155	25	16	M12 × 25	60	16 700	279	SHT 120	SHR 120
130	175	181	140	166	26	18	M12 × 25	60	20 400	314	SHT 130	SHR 130
140	185	191	155	181	26	20	M12 × 25	60	24 400	349	SHT 140	SHR 140
150	205	213	150	176.5	26.5	12	M16 × 30	140	28 000	373	SHT 150	SHR 150
160	215	223	160	189	29	14	M16 × 30	140	34 800	435	SHT 160	SHR 160

¹⁾ Also available with d = 3/4"

The bushings are available with either slotted (SHT) or non-slotted (SHR) outer components.
Designation example: Bushing with slotted outer components for shaft 1.3/16 inch= SHT1.3/16

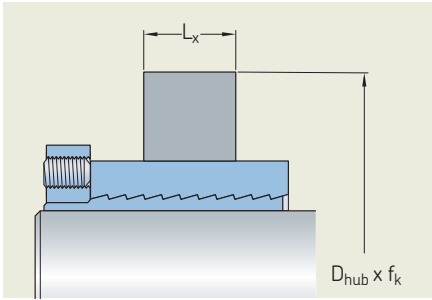
Inch sizes

The table below gives the minimum required hub diameter (D_{hub}) for various materials when the SH bushing is completely covered by the hub.



SH bushing

Designation	Dimensions d × D	Surface pressure against hub P _y	Required minimum hub diameter D_{hub} (inch)						
			Yield limit R _p 0.2						
			12 000	18 000	29 000	37 000	44 000	58 000	73 000
	Inch	Psi	Psi						
SHT 5/8	5/8 × 1 13/16	6 930	3.622	2.795	2.323	2.205	2.165	2.047	2.008
SHT 3/4	3/4 × 1 13/16	6 930	3.622	2.795	2.323	2.205	2.165	2.047	2.008
SHT 7/8	7/8 × 1 13/16	6 930	3.622	2.795	2.323	2.205	2.165	2.047	2.008
SHT 1 15/16	1 15/16 × 2 15/16	9 730	6.575	3.661	2.756	2.559	2.441	2.323	2.244
SHT 1	1 × 1 15/16	9 730	6.575	3.661	2.756	2.559	2.441	2.323	2.244
SHT 1 1/8	1 1/8 × 2 5/16	7 300	4.882	3.661	3.031	2.874	2.756	2.638	2.598
SHT 1 3/16	1 3/16 × 2 5/16	7 300	4.882	3.661	3.031	2.874	2.756	2.638	2.598
SHT 1 1/4	1 1/4 × 2 7/16	7 350	5.276	3.898	3.228	3.071	2.953	2.835	2.756
SHT 1 5/16	1 5/16 × 2 7/16	7 350	5.276	3.898	3.228	3.071	2.953	2.835	2.756
SHT 1 3/8	1 3/8 × 2 7/16	7 350	5.276	3.898	3.228	3.071	2.953	2.835	2.756
SHT 1 7/16	1 7/16 × 2 13/16	6 370	5.236	4.134	3.543	3.366	3.268	3.150	3.110
SHT 1 1/2	1 1/2 × 2 13/16	6 370	5.236	4.134	3.543	3.366	3.268	3.150	3.110
SHT 1 5/8	1 5/8 × 2 13/16	6 370	5.236	4.134	3.543	3.366	3.268	3.150	3.110
SHT 1 3/4	1 3/4 × 2 15/16	6 530	5.669	4.409	3.740	3.543	3.465	3.307	3.228
SHT 1 7/8	1 7/8 × 3 3/16	6 110	5.827	4.606	3.976	3.800	3.701	3.543	3.504
SHT 1 15/16	1 15/16 × 3 3/16	6 110	5.827	4.606	3.976	3.800	3.701	3.543	3.504
SHT 2	2 × 3 3/16	6 110	5.827	4.606	3.976	3.800	3.701	3.543	3.504
SHT 2 1/8	2 1/8 × 3 7/16	5 830	5.984	4.882	4.252	4.055	3.937	3.819	3.740
SHT 2 3/16	2 3/16 × 3 7/16	5 830	5.984	4.882	4.252	4.055	3.937	3.819	3.740
SHT 2 3/8	2 3/8 × 4 1/16	6 480	7.717	6.063	5.157	4.921	4.764	4.606	4.488
SHT 2 7/16	2 7/16 × 4 1/16	6 480	7.717	6.063	5.157	4.921	4.764	4.606	4.488
SHT 2 1/2	2 1/2 × 4 1/16	6 480	7.717	6.063	5.157	4.921	4.764	4.606	4.488
SHT 2 3/4	2 3/4 × 4 3/16	7 900	9.646	6.850	5.551	5.236	5.039	4.803	4.685
SHT 2 15/16	2 15/16 × 4 7/16	6 960	8.899	6.811	5.669	5.394	5.236	5.039	4.921
SHT 3	3 × 4 13/16	6 610	9.213	7.205	6.102	5.827	5.630	5.433	5.276
SHT 3 3/16	3 3/16 × 4 13/16	6 610	9.213	7.205	6.102	5.827	5.630	5.433	5.276
SHT 3 3/8	3 3/8 × 5 1/16	7 850	11.535	8.268	6.693	6.339	6.102	5.827	5.669
SHT 3 7/16	3 7/16 × 5 7/16	8 210	13.150	9.094	7.283	6.850	6.614	6.299	6.102
SHT 3 1/2	3 1/2 × 5 7/16	8 210	13.150	9.094	7.283	6.850	6.614	6.299	6.102
SHT 3 15/16	3 15/16 × 5 11/16	7 860	12.992	9.291	7.520	7.126	6.850	6.535	6.378
SHT 4	4 × 6 3/16	7 880	14.173	10.079	8.189	7.717	7.441	7.126	6.929
SHT 4 7/16	4 7/16 × 6 9/16	7 530	14.252	10.433	8.583	8.110	7.835	7.480	7.283
SHT 4 1/2	4 1/2 × 6 9/16	7 530	14.252	10.433	8.583	8.110	7.835	7.480	7.283
SHT 4 15/16	4 15/16 × 6 15/16	7 590	15.197	11.102	9.094	8.583	8.307	7.913	7.717
SHT 5	5 × 6 15/16	7 590	15.197	11.102	9.094	8.583	8.307	7.913	7.717
SHT 5 1/2	5 1/2 × 7 5/16	7 590	16.024	11.693	9.606	9.094	8.740	8.386	8.150
SHT 6	6 × 8 5/16	6 800	16.299	12.598	10.591	10.079	9.764	9.370	9.134



If the width of the hub is smaller than L . The hub diameter must be multiplied by the factor f_k obtained from the adjacent diagram.

Example:

SH bushing SHT 1.1/2

Hub material yield limit $R_{p0.2} = 29\,000$ psi

Hub width $L_x = 31.5$

The required minimum hub diameter is obtained as follows:

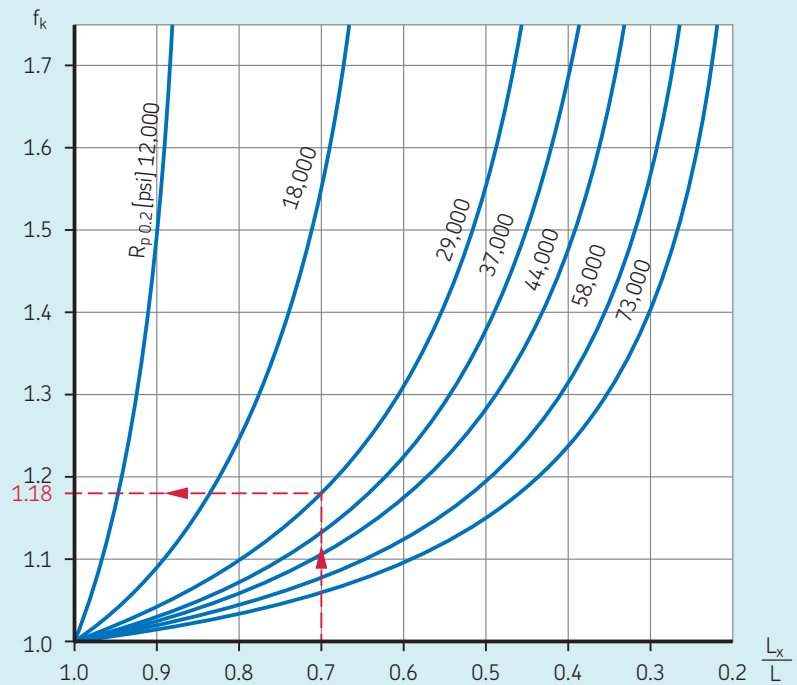
$$\frac{L_x}{L} = \frac{31.5}{45} = 0.7$$

From the diagram, $f_k = 1.18$

Minimum hub diameter =

$$D_{\text{hub}} \times f_k = 3.543 \times f_k = 3.543 \times 1.18 = 4.18 \text{ inch}$$

Yield limit $R_{p0.2}$ (N/mm²)



If the joint is simultaneously subjected to a torque and an axial force, the resultant torque is obtained using the equation.

$$M_{vR} = \sqrt{M_v^2 + \left(P_{ax} \times \frac{d}{24}\right)^2}$$

where

M_{vR} = maximum resultant torque [lb/ft]

M_v = torque acting on bushing [lb/ft]

P_{ax} = axial force acting on bushing [lb]

d = shaft diameter 1 15/16 [inch]

Example:

Bushing SHT 1,15/16 is subject to an axial force of 4 000 lb and simultaneously to a torque of 300 lb/ft. The machine factor f_d is estimated as being 1.5.

$$M_{vR} = \sqrt{300^2 + \left(\frac{4\,000 \times 1 \frac{15}{16}}{24}\right)^2} = 441 \text{ lb/ft}$$

According to → **table 10**, the maximum torque for SHT 1.15/16 is 1.210 lb/ft.

The permissible torque is then

$$\frac{1.210}{1.5} = 807 \text{ lb/ft}$$

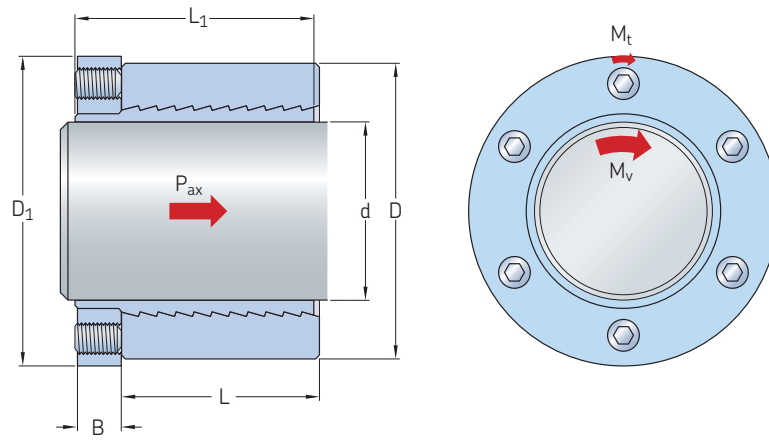
Load transmission

The maximum static slip torque and axial slip force are given in → **table 10**. Under dynamic load, the transmission ability is obtained by dividing by the machine factor f_d . See → **table 9**.

Table 9

Machine factor f_d for different load conditions

Power source	Type of load on driven machine		
	Group 1 Even loads	Group 2 Moderate shock loads	Group 3 Moderate shock loads
Electric motors, turbines	1.0 – 1.25	1.25 – 1.5	1.5 – 1.75
Multi-cylinder piston engines	1.25 – 1.5	1.5 – 1.75	1.75 – 2.00
Single cylinder piston engines	1.75 – 2.00	2.00 – 2.25	2.25 – 3.00
	Electric generators Centrifugal pumps Fans Light conveyors Turbo-compressors Agitators	Piston compressors Small piston pumps Machine tools Packaging machines Woodworking machines (joinery equipment)	Eccentric presses and punching machines Drawbanks Planing machines for metals Large piston compressors Pneumatic tools frequently activated



Dimensions and product range

Dimensions					Locking screws		Tightening torque	Maximum torque	Maximum axial load	Designations		
d	D	D ₁	L	L ₁	B	No.	Size	M _t	M _v	P _{ax}	SHT slotted	SHR non-slotted
						–	mm	lb/ft	lb/ft	lb	inch	inch
5/8	1 13/16	49	27	36,5	9,5	4	M6 x 12	5,9	105	4 040	5/8	5/8
3/4	1 13/16	49	27	36,5	9,5	4	M6 x 12	5,9	126	4 040	3/4	3/4
7/8	1 13/16	49	27	36,5	9,5	4	M6 x 12	5,9	147	4 040	7/8	7/8
15/16	1 15/16	53	27	37,5	10,5	6	M6 x 12	5,9	236	6 060	15/16	15/16
1	1 15/16	53	27	37,5	10,5	6	M6 x 12	5,9	252	6 060	1	1
1 1/8	2 5/16	63	32	44,5	12,5	4	M8 x 16	13,28	350	7 490	1 1/8	1 1/8
1 3/16	2 5/16	63	32	44,5	12,5	4	M8 x 16	13,28	370	7 490	1 3/16	1 3/16
1 1/4	2 7/16	67	37	49,5	12,5	5	M8 x 16	13,28	487	9 350	1 1/4	1 1/4
1 5/16	2 7/16	67	37	49,5	12,5	5	M8 x 16	13,28	511	9 360	1 5/16	1 5/16
1 3/8	2 7/16	67	37	49,5	12,5	5	M8 x 16	13,28	536	9 360	1 3/8	1 3/8
1 7/16	2 13/16	75	45	57,5	12,5	6	M8 x 16	13,28	673	11 230	1 7/16	1 7/16
1 1/2	2 13/16	75	45	57,5	12,5	6	M8 x 16	13,28	701	11 230	1 1/2	1 1/2
1 5/8	2 13/16	75	45	57,5	12,5	6	M8 x 16	13,28	760	11 230	1 5/8	1 5/8
1 3/4	2 15/16	77	50	63,5	13,5	7	M8 x 16	13,28	955	13 100	1 3/4	1 3/4
1 7/8	3 3/16	83	55	69,0	14,0	8	M8 x 16	13,28	1 170	14 970	1 7/8	1 7/8
1 15/16	3 3/16	83	55	69,0	14,0	8	M8 x 16	13,28	1 210	14 970	1 15/16	1 15/16
2	3 3/16	83	55	69,0	14,0	8	M8 x 16	13,28	1 250	14 970	2	2
2 1/8	3 7/16	90	60	74,0	14,0	9	M8 x 16	13,28	1 490	16 850	2 1/8	2 1/8
2 3/16	3 7/16	90	60	74,0	14,0	9	M8 x 16	13,28	1 530	16 850	2 3/16	2 3/16
2 3/8	4 1/16	105	70	87,0	17,0	8	M10 x 20	25,08	2 235	22 590	2 3/8	2 3/8
2 7/16	4 1/16	105	70	87,0	17,0	8	M10 x 20	25,08	2 290	22 590	2 7/16	2 7/16
2 1/2	4 1/16	105	70	87,0	17,0	8	M10 x 20	25,08	2 350	22 590	2 1/2	2 1/2
2 3/4	4 3/16	110	70	87,5	17,5	10	M10 x 20	25,08	3 235	28 240	2 3/4	2 3/4
2 15/16	4 7/16	115	75	92,0	17,0	10	M10 x 20	25,08	3 455	28 240	2 15/16	2 15/16
3	4 13/16	126	75	96,0	21,0	8	M12 x 25	44,25	4 190	33 550	3	3
3 3/16	4 13/16	126	75	96,0	21,0	8	M12 x 25	44,25	4 450	33 550	3 3/16	3 3/16
3 3/8	5 1/16	133	75	96,5	21,5	10	M12 x 25	44,25	5 900	41 940	3 3/8	3 3/8
3 7/16	5 7/16	141	80	103,5	23,5	12	M12 x 30	44,25	7 210	50 300	3 7/16	3 7/16
3 1/2	5 7/16	141	80	103,5	23,5	12	M12 x 30	44,25	7 340	50 300	3 1/2	3 1/2
3 15/16	5 11/16	148	80	102,5	22,5	12	M12 x 30	44,25	8 250	50 300	3 15/16	3 15/16
4	6 3/16	161	80	103,0	23,0	14	M12 x 30	44,25	9 150	54 710	4	4
4 7/16	6 9/16	171	90	115,0	25,0	16	M12 x 30	44,25	11 600	62 750	4 7/16	4 7/16
4 1/2	6 9/16	171	90	115,0	25,0	16	M12 x 30	44,25	11 760	62 750	4 1/2	4 1/2
4 15/16	6 15/16	181	95	121,0	26,0	18	M12 x 30	44,25	14 500	70 600	4 15/16	4 15/16
5	6 15/16	181	95	121,0	26,0	18	M12 x 30	44,25	14 700	70 600	5	5
5 1/2	7 5/16	191	100	126,0	26,0	20	M12 x 30	44,25	18 000	78 400	5 1/2	5 1/2
6	8 5/16	218	105	131,0	26,0	12	M16 x 30	103,25	21 000	83 900	6	6

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