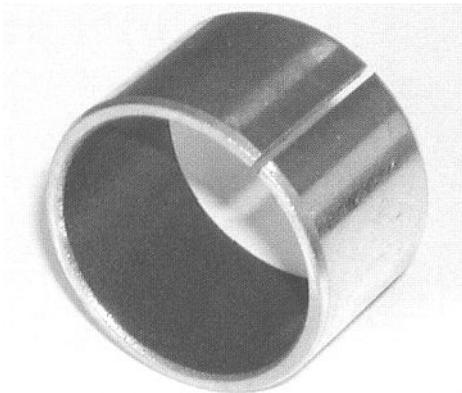


BK-1 self-lubricating bushes

Technical data

BK-1 BUSHES

BK-1 self-lubricating bushes are used as dry bearings. They are made up of a self-lubricating layer over a metallic backing, and vertically cut.

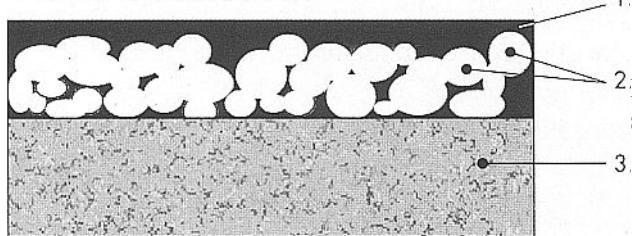


CHARACTERISTICS

- good low-friction performance of self-lubricating PTFE layer;
- suitable for dry running and excellent resistance to dust and dirt;
- minimum static and dynamic friction with no stick-slip effect;
- suitable for rotating and oscillating motions even at low speed;
- low coefficient of friction, very low wear and long life;
- high load capacity and shock resistance;
- operating temperature from -195°C to +280°C;
- high resistance to chemical compounds.

STRUCTURE

The material used corresponds to DIN 1494 and it is made up of three different layers:



Picture 1: structure of a BK-1 bushing

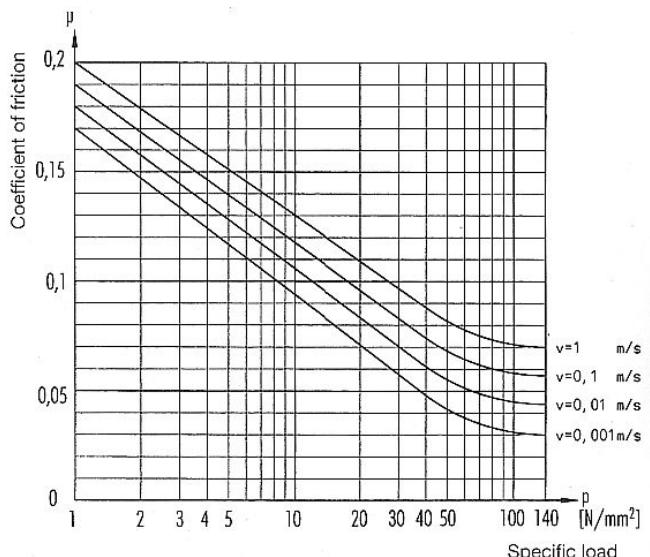
1. a layer of polytetrafluoroethylene (PTFE) and lead, from 0,01 to 0,03 mm thick;
2. a layer of porous sintered bronze, from 0,25 to 0,30 mm thick;
3. a steel backing, from 0,7 to 2,2 mm thick and a tin covering of 5 µm;

TECHNICAL DATA

Permissible specific load p	static	250
	With $v \leq 0,01 \text{ m/s}$	140
	dynamic	56
Max sliding speed v		2
Operating temperature range t		From -195 to +280
Wear coefficient μ		From 0,03 to 0,2
Coefficient of heat deformation α	Steel backing	$12 \cdot 10^{-6}$
	Bronze backing	$17 \cdot 10^{-6}$
Coefficient of heat conductivity λ	Steel backing	> 40
	Bronze outside	> 70
p in N/mm^2	μ coeff.	
v in m/s	α in $1/\text{K}$	
t in $^\circ\text{C}$	λ in $\text{W}/(\text{m}\cdot\text{K})$	

COEFFICIENT OF FRICTION

The coefficient of friction varies according to specific load p and sliding speed v. Picture 2 shows that the friction coefficient decreases when load is high and speed is slow. Temperatures over 25°C can have a negative influence on the friction coefficient.



Picture 2: relation between the coefficient of friction, specific load and sliding speed

AS MODULATOR

BK-1 self-lubricating bushes

Technical data

RUNNING-IN PHASE

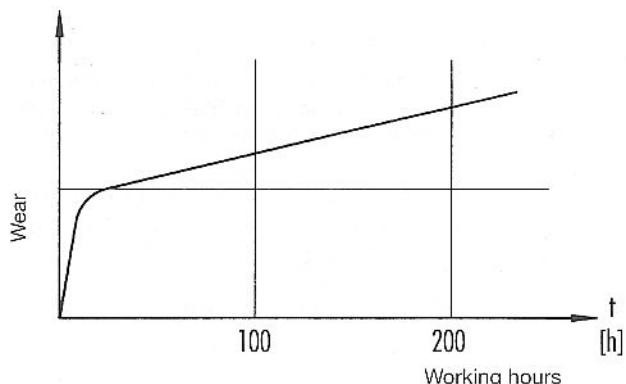
During the first few hours after fitting, the bushing and the moving surface have to mate. The surface of the bushing is coated with a thin film of PTFE, this compensates for any irregularities on the mating surface.

A sliding surface with a low friction coefficient and low wear is formed.

In picture 3 it is possible to see the wear pattern in relation to the working life.

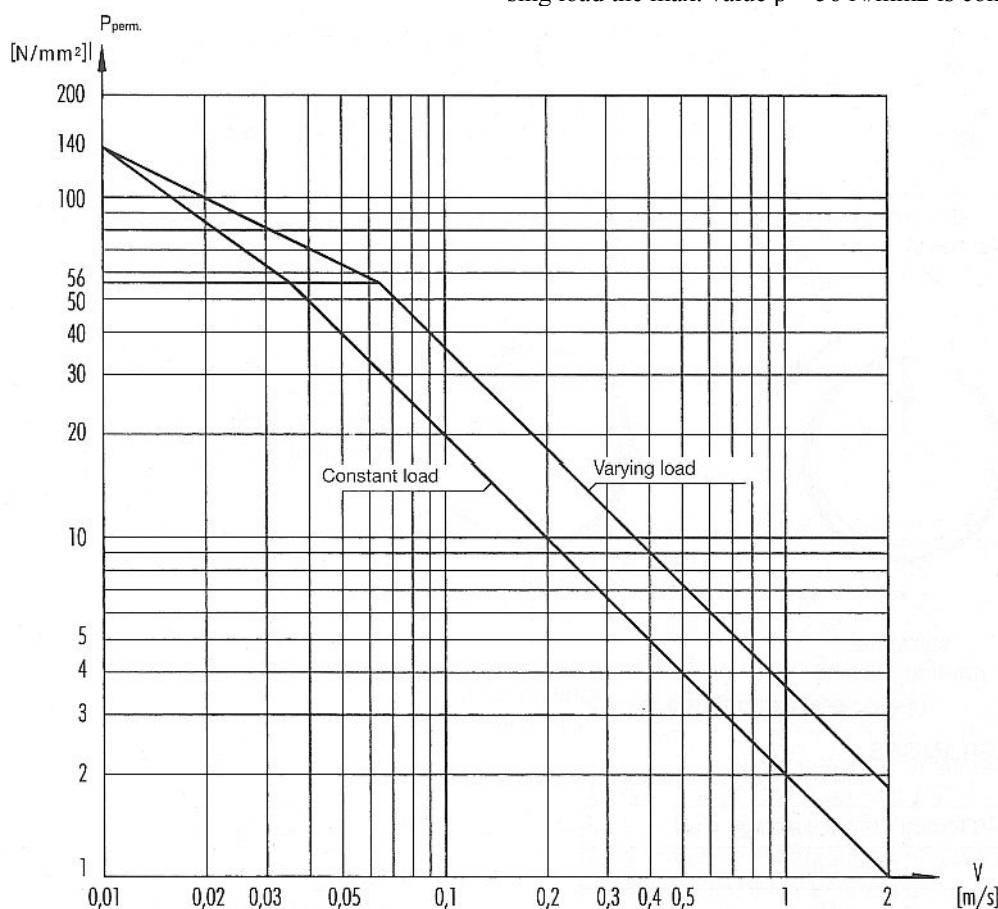
PERMISSIBLE LOAD ON BUSHING

Max. permissible load p [N/mm²] and bushing speed v [m/s] are correlated. The result of $p \cdot v$ is the pv value which is the most important parameter for a bushing.



Picture 3: behaviour in initial phases

Picture 4 indicates max values for constant load and varying load. For bushing speed values up to $v < 0,01$ m/s and constant loads, the possible specific load $p = 140$ N/mm² is considered. For a dynamic and increasing load the max. value $p = 56$ N/mm² is considered.



Picture 4: permissible load on a BK-1 bushing related to speed

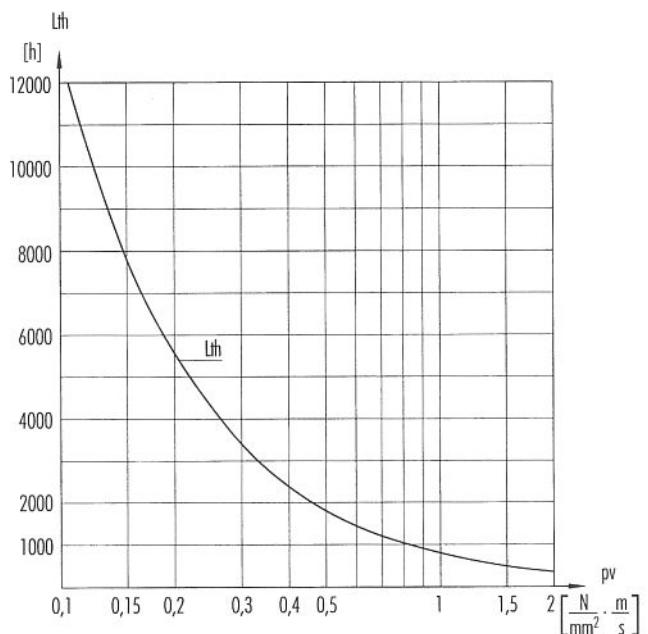
BK-1 self-lubricating bushes

Technical data

LIFE

The life of a BK-1 bushing is determined by the $p v$ value. The basic theoretical run shown in picture 5 is to be considered for a dry rotation with the radial load on the inner diameter of the bushing. By means of some correction factors on the specific load, speed and temperature, it is possible to calculate the life foreseen by basic values of picture 5:

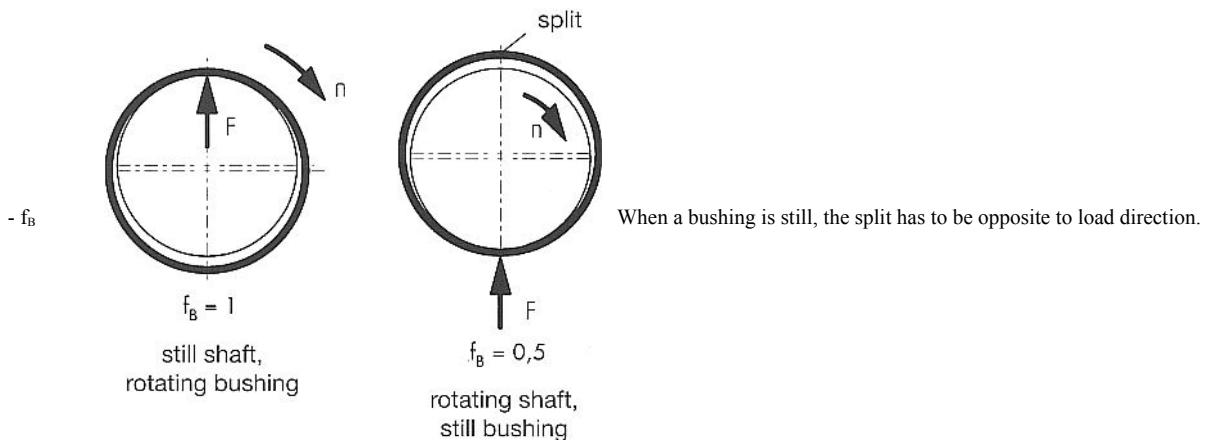
$$L_h = L_{th} \cdot f_p \cdot f_v \cdot f_t \cdot f_B [h]$$



Picture 5: basic life

CORRECTION FACTORS

- f_p	specific bushing load correction factor	$p [N/mm^2]$	≤ 5	≤ 10	≤ 20	≤ 30	≤ 45	≤ 56
	bushing speed correction factor	$v [m/s]$	$\leq 0,7$	≤ 1	$\leq 1,25$	$\leq 1,5$	$\leq 1,75$	≤ 2
- f_v	bushing temperature correction factor	$t [^\circ C]$	25°	$\leq 50^\circ$	$\leq 100^\circ$	$\leq 150^\circ$		
- f_t	bushing temperature correction factor	f_t	1	0,75	0,5	0,3		



MOUNTING TOLERANCES

- Shaft	Shaft - Ø (mm)	Tolerance
	≤ 5	h6
	≤ 80	f7
	> 80	h8

More specific details for assembling are to be found on page 6

- Housing	Housing - Ø (mm)	Tolerance
	$\leq 5,5$	H6
	$> 5,5$	H7

BK-1 self-lubricating bushes

Technical data

EXAMPLES FOR CALCULATION

The bushing to be mounted on the driving shaft of a harvester should have an estimated life of 500 hours

Following parameters have to be considered:

1. Max. radial load $F = 750 \text{ N}$
2. Shaft rotating speed $n = 250 \text{ min}^{-1}$
3. Shaft diameter $d = 30 \text{ mm}$
4. Max. operating temperature $t = 40^\circ\text{C}$

STEPS FOR CALCULATION	RESULTS
1st step How to calculate bushing speed	$v = 0,4 \text{ m/s}$
$V = \frac{d * \pi * n}{60} = \frac{0,03m * \pi * 250}{60} = 0,4 \text{ m/s}$	
2nd step How to determine permissible specific load	$p_{perm} = 5 \text{ N/mm}^2$
As shown by picture 4 (page 3) if $v = 0,4 \text{ m/s}$ a specific load of 5 N/mm^2 for continuous work is permissible	
3rd step How to determine theoretical life	
For $I = 20 \text{ mm}$ of chosen width, the following specific load is determined	
$p = \frac{F}{d * I} = \frac{750 \text{ N}}{30 \text{ mm} * 20 \text{ mm}} = 1.25 \text{ N/mm}^2$	
$\Rightarrow p v \text{ value: } p v = 1,25 \text{ N/mm}^2 * 0,4 \text{ m/s}$ $= 0,5 \text{ N/mm}^2 * \text{m/s}$	$p v = 0,5 \text{ N/mm}^2 * \text{m/s}$
The curve of life according to picture 5 shows a basic value of $L_{th} = 1850 \text{ h}$	$L_{th} = 1850 \text{ h}$
4th step Nominal life	
Nominal life will be: $L_h = L_{th} * f_p * f_v * f_t * f_b = 1850 * 1 * 1 * 0,75 * 0,5 = 694 \text{ h}$	Correction factors (see pag. 4) $f_p: f_p = 1 \quad \text{specific load on bushing} \leq 5 \text{ N/mm}^2$ $f_v: f_v = 1 \quad \text{bushing speed } 0,7 \text{ m/s}$ $f_t: f_t = 0,75 \quad \text{operating temperature } 40^\circ\text{C}$ $f_b: f_b = 0,5 \quad \text{punctiform load of a still bushing}$ Lh = 694 h Type of bushing selected: BK-1 3020

BK-1 self-lubricating bushes

Technical data

ASSEMBLY

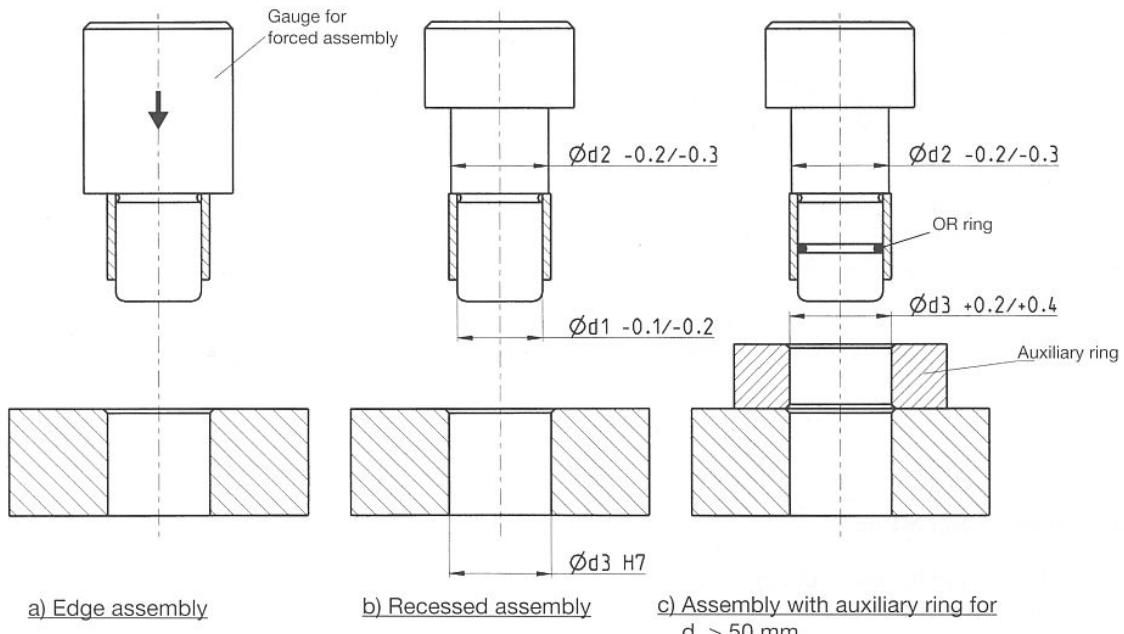
Before assembling a BK-1 bushing, the first thing to check is that the mating surface is clean and without burrs so as to avoid damaging the lining of the bush and causing initial wear.

A plug gauge is used to assemble the bushes using force as indicated in picture 6. If a small quantity of oil or grease is applied to the inner or outer surfaces of

bushes, assembly is made easier.

For bushings with a diameter over 50 mm, an auxiliary mounting ring is recommended, in order to prevent inclination of the bushing itself.

By means of an OR ring mounted on the gauge, it is possible to keep even bushes with a larger diameter more tightly.



Picture 6: assembly

SPECIAL EXECUTIONS

Our range of standard bushes may not meet every requirement.

More and more customers are seeking new solutions to various applications outside of normal parameters.

Over the last few years we have developed a large range of solutions for specific problems. Our technical staff is at your disposal for any requirements you may have.



BK-1 self-lubricating bushes

Technical data

TOLERANCES

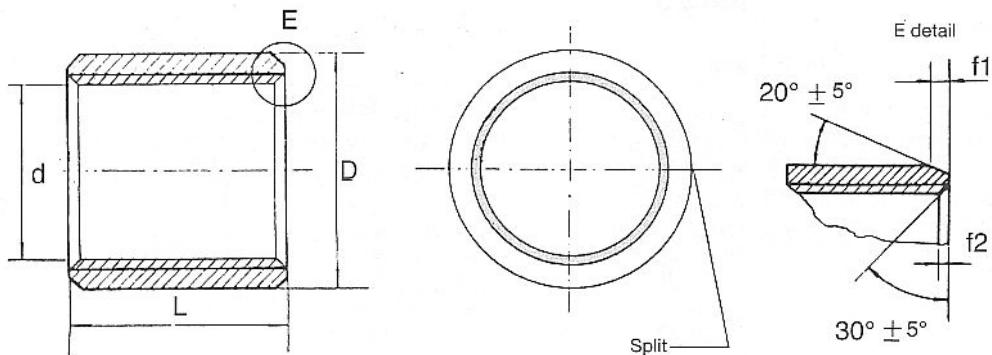
Thickness

BK-1,BK-1F			mm
Hole	Thickness	Tolerance	
<4	0.75	0 -0.025	
5~19	1	0 -0.03	
20~27	1.5	0 -0.03	
28~44	2	0 -0.04	
45~79	2.5	0 -0.045	
80~119	2.5	-0.010 -0.060	
120~300	2.5	0.035 -0.085	

Outer diameter	mm
Outer diameter	Tolerance
≤ 1	+0.055 +0.025
10~18	+0.065 +0.030
18~30	+0.075 +0.035
30~40	+0.085 +0.045
40~50	+0.085 +0.045
50~80	+0.100 +0.055
80~105	+0.120 +0.070
105~180	+0.170 +0.100
180~250	+0.210 +0.130
250~305	+0.260 +0.170

Split	mm
Inner diameter	Split
2~9	0.1~0.4
10~17	0.2~0.8
18~25	0.3~1.0
26~40	0.4~2.0
45~60	1~2
65~100	2~5
105~135	3~6
140~300	5~9

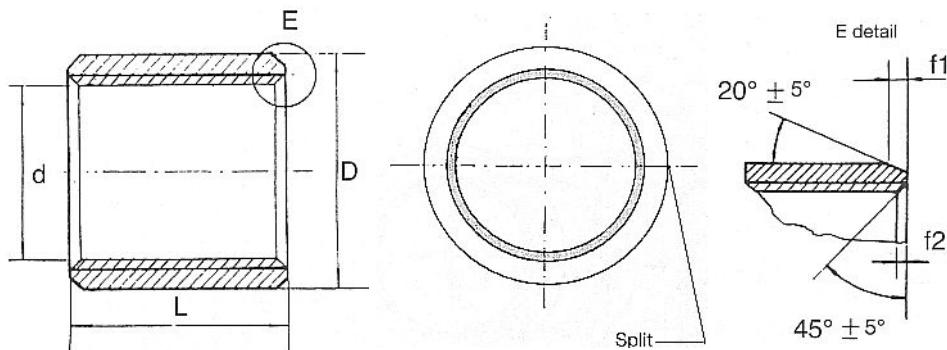
Bk-1 self-lubricating bushes



Material specifications according to DIN 1494

d	D	Shaft diameter	Housing diameter	Thickness		f1	f2	0 L-0.4 < Ø28 0 L-0.3, >Ø30 0 L-0.4												
				min	max			3	4	5	6	7	8	10	12	15	20	25	30	40
3	4.5	3 ^{-0.010} _{-0.022}	4.5 ^{+0.012} ₀	0.725	0.750	0.4	0.3	0303	0304	0305	0306									
4	5.5	4 ^{-0.010} _{-0.022}	5.5 ^{+0.012} ₀	0.725	0.750	0.4	0.3		0404	0405	0406	0407	0408	0410						
5	7	5 ^{-0.010} _{-0.022}	7 ^{+0.015} ₀	0.970	1.000	0.5	0.3		0504	0505	0506	0507	0508	0510						
6	8	6 ^{-0.013} _{-0.028}	8 ^{+0.015} ₀	0.970	1.000	0.5	0.3		0604	0605	0606	0607	0608	0610						
8	10	8 ^{-0.013} _{-0.028}	10 ^{+0.015} ₀	0.970	1.000	0.5	0.3		0805	0806	0807	0808	0810	0812	0815					
10	12	10 ^{-0.016} _{-0.034}	12 ^{+0.018} ₀	0.970	1.000	0.5	0.3			1006	1007	1008	1010	1012	1015	1020				
12	14	12 ^{-0.016} _{-0.034}	14 ^{+0.018} ₀	0.970	1.000	0.5	0.3			1206		1208	1210	1212	1215	1220	1225			
13	15	13 ^{-0.016} _{-0.034}	15 ^{+0.018} ₀	0.970	1.000	0.5	0.3					1308	1310		1315	1320				
14	16	14 ^{-0.016} _{-0.034}	16 ^{+0.018} ₀	0.970	1.000	0.5	0.3		1405				1410	1412	1415	1420	1425			
15	17	15 ^{-0.016} _{-0.034}	17 ^{+0.018} ₀	0.970	1.000	0.5	0.3					1508	1510	1512	1515	1520	1525			
16	18	16 ^{-0.016} _{-0.034}	18 ^{+0.018} ₀	0.970	1.000	0.5	0.3		1605				1610	1612	1615	1620	1625			
17	19	17 ^{-0.016} _{-0.034}	19 ^{+0.018} ₀	0.970	1.000	0.5	0.3					1710	1712	1715	1720					
18	20	18 ^{-0.020} _{-0.041}	20 ^{+0.021} ₀	0.970	1.000	0.5	0.3					1808	1810	1812	1815	1820	1825			
20	23	20 ^{-0.020} _{-0.041}	23 ^{+0.021} ₀	1.470	1.500	0.8	0.4		2005				2010	2012	2015	2020	2025	2030		
22	25	22 ^{-0.020} _{-0.041}	25 ^{+0.021} ₀	1.470	1.500	0.8	0.4					2210	2212	2215	2220	2225	2230			
24	27	24 ^{-0.020} _{-0.041}	27 ^{+0.021} ₀	1.470	1.500	0.8	0.4						2415	2420	2425	2430				
25	28	25 ^{-0.020} _{-0.041}	28 ^{+0.021} ₀	1.470	1.500	0.8	0.4		2505				2510	2512	2515	2520	2525	2530	2540	2550
28	32	28 ^{-0.020} _{-0.041}	32 ^{+0.025} ₀	1.960	2.000	1.0	0.5						2812	2815	2820	2825	2830	2840		
30	34	30 ^{-0.025} _{-0.050}	34 ^{+0.025} ₀	1.960	2.000	1.0	0.5					3010	3012	3015	3020	3025	3030	3040		
32	36	32 ^{-0.025} _{-0.050}	36 ^{+0.025} ₀	1.960	2.000	1.0	0.5					3208		3220		3230	3240			
35	39	35 ^{-0.025} _{-0.050}	39 ^{+0.025} ₀	1.960	2.000	1.0	0.5						3512	3515	3520	3525	3530	3540	3550	
38	42	38 ^{-0.025} _{-0.050}	42 ^{+0.025} ₀	1.960	2.000	1.0	0.5						3815	3820	3825	3830	3840			
40	44	40 ^{-0.025} _{-0.050}	44 ^{+0.025} ₀	1.960	2.000	1.0	0.5						4012	4015	4020	4025	4030	4040	4050	

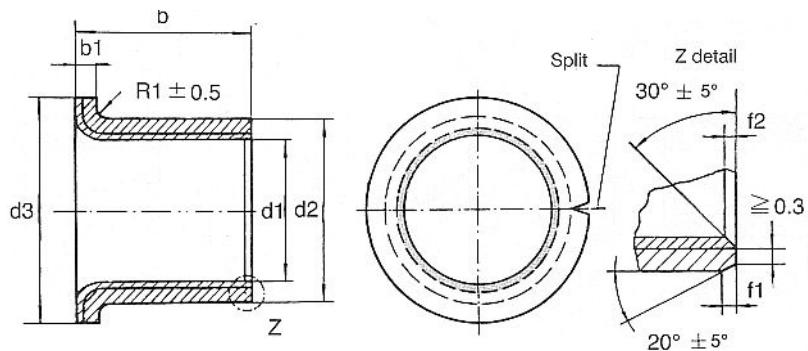
BK-1 self-lubricating bushes



d	D	Shaft diameter	Housing diameter	Thickness		f ₁	f ₂	0 L-0.4									
				min	max			20	25	30	40	50	60	70	80	90	100
45	50	45 ^{-0.025} _{-0.050}	50 ^{+0.025} ₀	2.455	2.500	1.2	0.6	4520	4525	4530	4540	4550					
50	55	50 ^{-0.030} _{-0.060}	55 ^{+0.030} ₀	2.455	2.500	1.2	0.6	5020	5025	5030	5040	5050	5060				
55	60	55 ^{-0.030} _{-0.060}	60 ^{+0.030} ₀	2.455	2.500	1.2	0.6	5520	5525	5530	5540	5550	5560				
60	65	60 ^{-0.030} _{-0.060}	65 ^{+0.030} ₀	2.455	2.500	1.2	0.6			6030	6040	6050	6060	6070			
65	70	65 ^{-0.030} _{-0.060}	70 ^{+0.030} ₀	2.455	2.500	1.2	0.6			6530	6540	6550	6560	6570			
70	75	70 ^{-0.030} _{-0.060}	75 ^{+0.030} ₀	2.455	2.500	1.2	0.6			7030	7040	7050	7060	7070	7080		
75	80	75 ^{-0.030} _{-0.060}	80 ^{+0.030} ₀	2.455	2.500	1.2	0.6			7530	7540	7550	7560	7570	7580		
80	85	80 ⁰ _{-0.035}	85 ^{+0.035} ₀	2.440	2.490	1.4	0.7			8040	8050	8060	8070	8080		80100	
85	90	85 ⁰ _{-0.035}	90 ^{+0.035} ₀	2.440	2.490	1.4	0.7			8530	8540	8550	8560		8580		85100
90	95	90 ⁰ _{-0.035}	95 ^{+0.035} ₀	2.440	2.490	1.4	0.7			9040	9050	9060		9080	9090	90100	
95	100	95 ⁰ _{-0.035}	100 ^{+0.035} ₀	2.440	2.490	1.4	0.7	9520				9550	9560		9580		95100
100	105	100 ⁰ _{-0.035}	105 ^{+0.035} ₀	2.440	2.490	1.4	0.7					10050	10060	10070	10080		100115
105	110	105 ⁰ _{-0.035}	110 ^{+0.035} ₀	2.440	2.490	1.4	0.7					10560		10580			105115
110	115	110 ⁰ _{-0.035}	115 ^{+0.035} ₀	2.440	2.490	1.4	0.7					11050	11060		11080		110115
120	125	120 ⁰ _{-0.040}	125 ^{+0.035} ₀	2.415	2.465	1.6	0.8					12050	12060	12070	12080		120100
125	130	125 ⁰ _{-0.040}	130 ^{+0.040} ₀	2.415	2.465	1.6	0.8					12560				125100	125115
130	135	130 ⁰ _{-0.040}	135 ^{+0.040} ₀	2.415	2.465	1.6	0.8					13050	13060		13080		130100
140	145	140 ⁰ _{-0.040}	145 ^{+0.040} ₀	2.415	2.465	1.6	0.8					14050	14060		14080		140100
150	155	150 ⁰ _{-0.040}	155 ^{+0.040} ₀	2.415	2.465	1.6	0.8					15050	15060		15080		150100
160	165	160 ⁰ _{-0.040}	165 ^{+0.040} ₀	2.415	2.465	1.6	0.8					16060		16080		160100	160115
180	185	180 ⁰ _{-0.046}	185 ^{+0.046} ₀	2.415	2.465	1.6	0.8							18080		180100	
190	195	190 ⁰ _{-0.046}	195 ^{+0.046} ₀	2.415	2.465	1.6	0.8							19080		190100	
200	205	200 ⁰ _{-0.046}	205 ^{+0.046} ₀	2.415	2.465	1.6	0.8					20060		20080		200100	
220	225	220 ⁰ _{-0.046}	225 ^{+0.046} ₀	2.415	2.465	1.6	0.8							22080		220100	
250	255	250 ⁰ _{-0.052}	255 ^{+0.052} ₀	2.415	2.465	1.6	0.8							25080		250100	
260	265	260 ⁰ _{-0.052}	265 ^{+0.052} ₀	2.415	2.465	1.6	0.8							26080		260100	
280	285	280 ⁰ _{-0.052}	285 ^{+0.052} ₀	2.415	2.465	1.6	0.8							28080		280100	
300	305	300 ⁰ _{-0.052}	305 ^{+0.052} ₀	2.415	2.465	1.6	0.8							30080		300100	

Other dimensions on request

BK-1 self-lubricating flanged bushes



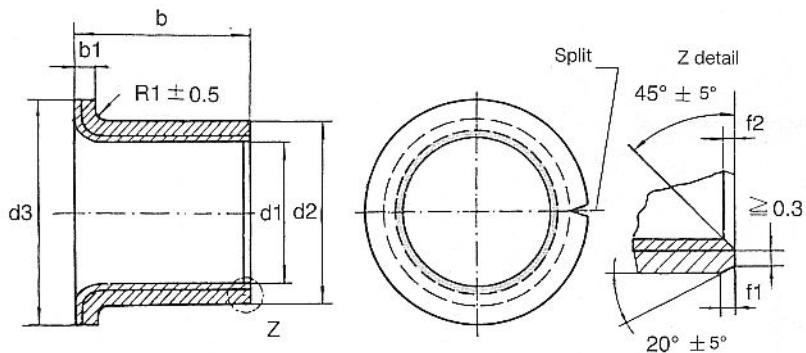
Shaft diameter	Reference	Dimensions mm						
		d1	d2	d3 ±0.5	b ±0.25	b1 -0.2	f1	f2
3	BK-1 0304F	3	4.5	7	4	0.75	0.5	0.3
	BK-1 0404F	4	5.5	9	4			
	BK-1 0405F	4	5.5	9	5			
	BK-1 0406F	4	5.5	9	6			
	BK-1 0407F	4	5.5	9	7			
	BK-1 0408F	4	5.5	9	8			
5	BK-1 0504F	5	7	10	4	1	0.5	0.4
	BK-1 0505F	5	7	10	5			
	BK-1 0506F	5	7	10	6			
	BK-1 0507F	5	7	10	7			
	BK-1 0508F	5	7	10	8			
6	BK-1 0604F	6	8	12	4	1.5	0.8	0.4
	BK-1 0607F	6	8	12	7			
8	BK-1 08055F	8	10	15	5.5			
	BK-1 08075F	8	10	15	7.5			
10	BK-1 1007F	10	12	18	7	2	1.0	0.5
	BK-1 1009F	10	12	18	9			
	BK-1 1012E	10	12	18	12			
	BK-1 1017F	10	12	18	17			
12	BK-1 1207F	12	14	20	7	1	0.5	0.4
	BK-1 1209F	12	14	20	8			
	BK-1 1212F	12	14	20	12			
	BK-1 1217F	12	14	20	17			
14	BK-1 1412F	14	16	22	12	1	0.8	0.4
	BK-1 1417F	14	16	22	17			
15	BK-1 1509F	15	17	23	9			
	BK-1 1512F	15	17	23	12			
	BK-1 1517F	15	17	23	17			
16	BK-1 1612F	16	18	24	12			
	BK-1 1617F	16	18	24	17			
18	BK-1 1812F	18	20	26	12	1.5	1.0	0.5
	BK-1 1817F	18	20	26	17			
	BK-1 1822F	18	20	26	22			
20	BK-1 20115F	20	23	30	11.5			
	BK-1 20135F	20	23	30	13.5			
	BK-1 20165F	20	23	30	16.5			
	BK-1 20215F	20	23	30	21.5			
22	BK-1 2215F	22	25	32	15	2	2.0	1.0
	BK-1 2220F	22	25	32	20			
25	BK-1 25115F	25	28	35	11.5			
	BK-1 25165F	25	28	35	16.5			
	BK-1 25215F	25	28	35	21.5			
30	BK-1 3016F	30	34	42	16	2	2.0	1.0
	BK-1 3026F	30	34	42	26			
35	BK-1 3516F	35	39	47	16			
	BK-1 3526F	35	39	47	26			
40	BK-1 4016F	40	44	53	16			
	BK-1 4026F	40	44	53	26			
	BK-1 4040F	40	44	53	40			

Shaft tolerance f7 up to $\varnothing \leq 55$ - h8 over $\varnothing > 55$

Housing tolerance: H7

AS MODULATOR

BK-1 self-lubricating flanged bushes

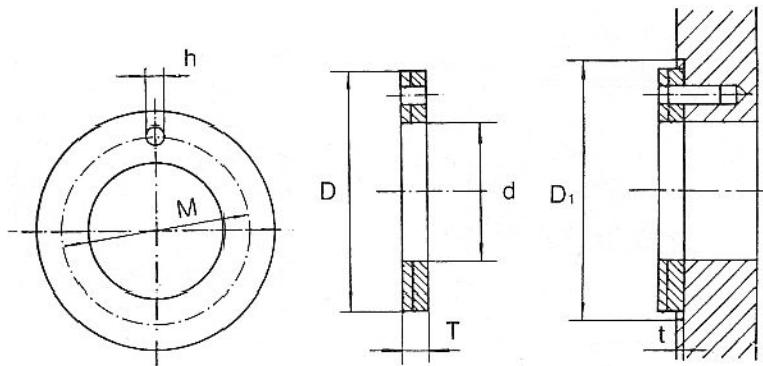


Shaft diameter	Reference	Dimensions mm					
		d_1	d_2	$d_3 \pm 0.5$	$b \pm 0.25$	$b_1 -0.2$	f_t
45	BK-1 4520F	45	50	60	20	1.2	0.6
	BK-1 4525F	45	50	60	25		
	BK-1 4530F	45	50	60	30		
	BK-1 4540F	45	50	60	40		
50	BK-1 5020F	50	55	65	20	2.5	1.4
	BK-1 5030F	50	55	65	30		
	BK-1 5040F	50	55	65	40		
55	BK-1 5530F	55	60	70	30	2.5	0.7
	BK-1 5540F	55	60	70	40		
60	BK-1 6030F	60	65	75	30		
	BK-1 6040F	60	65	75	40		
65	BK-1 6530F	65	70	80	30		
	BK-1 6540F	65	70	80	40		
70	BK-1 7030F	70	75	85	30		
	BK-1 7040F	70	75	85	40		
75	BK-1 7530F	75	80	90	30		
	BK-1 7540F	75	80	90	40		
80	BK-1 8030F	80	85	95	30		
	BK-1 8040F	80	85	95	40		
85	BK-1 8530F	85	90	100	30		
	BK-1 8540F	85	90	100	40		
90	BK-1 9030F	90	95	105	30		
	BK-1 9040F	90	95	105	40		
95	BK-1 9530F	95	100	110	30		
	BK-1 9540F	95	100	110	40		

Shaft tolerance f7 up to $\varnothing \leq 55$ - h8 over $\varnothing > 55$

Housing tolerance: H7

BK-1 self-lubricating washers



Reference	Shaft diameter	Dimensions				Mounting dimensions		
		d +0.25	D -0.25	T -0.05	M ±0.12	h +0.4 +0.1	t ±0.2	D ₁ +0.12
BK-1 10SF	8	10	20	1.5	15	1.5	1	20
BK-1 12SF	10	12	24	1.5	18	1.5	1	24
BK-114SF	12	14	26	1.5	20	2	1	26
BK-1 16SF	14	16	30	1.5	23	2	1	30
BK-1 18SF	16	18	32	1.5	25	2	1	32
BK-1 20SF	18	20	36	1.5	28	3	1	36
BK-1 22SF	20	22	38	1.5	30	3	1	38
BK-1 24SF	22	24	42	1.5	33	3	1	42
BK-1 26SF	24	26	44	1.5	35	3	1	44
BK-1 28SF	25	28	48	1.5	38	4	1	48
BK-1 32SF	30	32	54	1.5	43	4	1	54
BK-1 38SF	35	38	62	1.5	50	4	1	62
BK-1 42SF	40	42	66	1.5	54	4	1	66
BK-1 48SF	45	48	74	2	61	4	1.5	74
BK-1 52SF	50	52	78	2	65	4	1.5	78
BK-1 62SF	60	62	90	2	76	4	1.5	90

BK-1 plates

Type	Length ±1	Width ±1	Thickness -0.05
BK-1	500	125	1.0
BK-1	500	125	1.5
BK-1	500	150	2.0
BK-1	500	150	2.5

AS MODULATOR

BK-2 self-lubricating bushes Technical data

BK-2 BUSHES

BK-2 bushes are particularly suitable for low maintenance applications thanks to their long lubricating intervals. Their structure is composed of a self-lubricating layer over a metallic backing, and vertically cut.

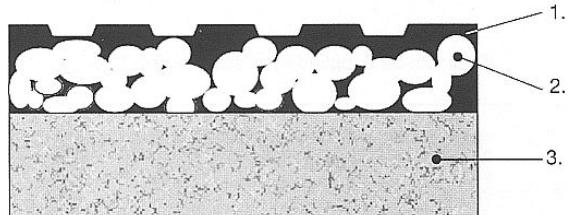


CHARACTERISTICS

good sliding characteristics and low wear on the lubricated surface
suitable for rotating and oscillating motions
marginal maintenance thanks to long lubricating intervals
very low sensibility to load on chamfers
water-repellent (no moisture expansion)
good damping capacity
suitable also for shock loads

STRUCTURE

The material used corresponds to DIN 1494 and is made up of three different layers.
Indentations on the sliding surface retain grease for a better and longer-lasting lubrication.



Picture 7: structure of a BK-2 bushing

Layer of modified acetal co-polymer (POM), from 0,3 to 0,5 mm thick;
Layer of spherical bronze particles from 0.2 to 3,3 mm thick;
Steel backing, 0,4 ÷ 2,2 mm thick with a superficial copper protection, 0,008 mm thick.

TECHNICAL DATA

Possible specific load p	static	250
	with v very low	140
	Rotating or oscillating	70
Max sliding speed v	Greased	2,5
	Oiled	5
Operating temperature range t		from -40 to +90
	Greased	from 0,15 to 0,25
	Oiled	from 0,02 to 0,1
Coefficient of heat deformation α	Steel backing	$12 * 10^{-6}$
Coefficient of heat conductivity λ	Steel backing	> 40

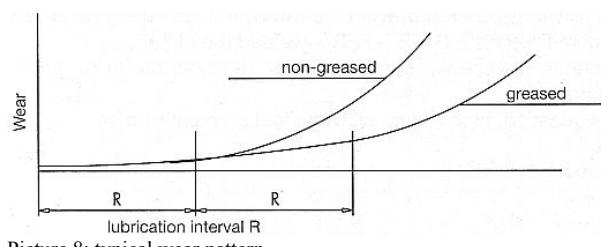
p in [N/mm²] μ coeff.
v in [m/s] α in [1/K]
t in [°C] λ in [W/(m · K)]

LUBRICATION

When a BK-2 bushing is assembled for the first time, an initial lubrication with grease is necessary. In most case this initial lubrication is enough for the whole operating life of the bushing itself. But regular relubricating can increase the operating life. BK-2 bushes are normally produced with a lubricating hole. A lithium soap base grease is recommended for lubrication. MoS₂ or graphite base greases are not suitable.

LIFE

Wear of a BK-2 bushing depends on the lubricating conditions. Picture 8 shows a very low wear pattern until the end of lubrication "R", when the initial lubrication is almost exhausted. After that, wear increases considerably. With a new lubrication, the bushing continues to work with low wear.

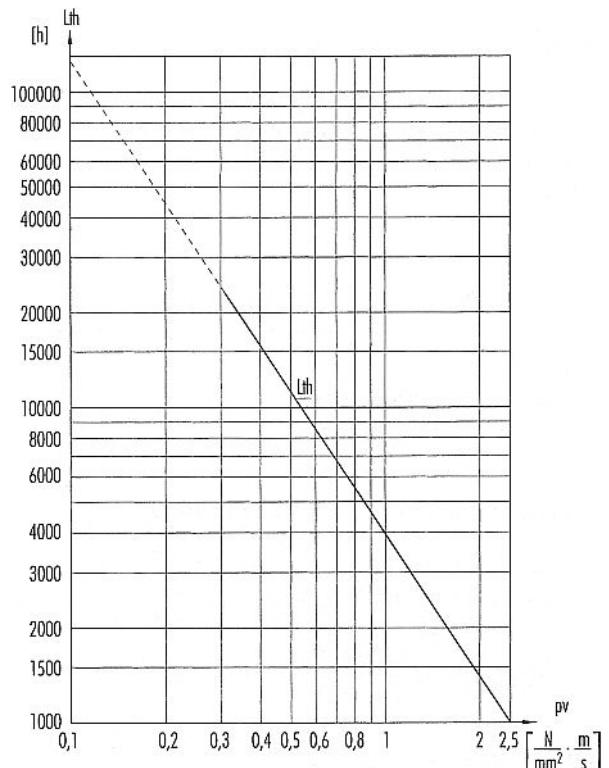


BK-2 self-lubricating bushes Technical data

In picture 9 a theoretical correlation between life and pv value is shown. Light loads and low speeds applied to bushes give unreal life values (dotted section of L_{th} line) and are therefore to be considered as indicative values only.

The foreseen life is determined by different mounting conditions and taking various correction factors into consideration.

$$L_h = L_{th} \cdot f_p \cdot f_v \cdot f_t \cdot f_r \cdot f_b [h]$$

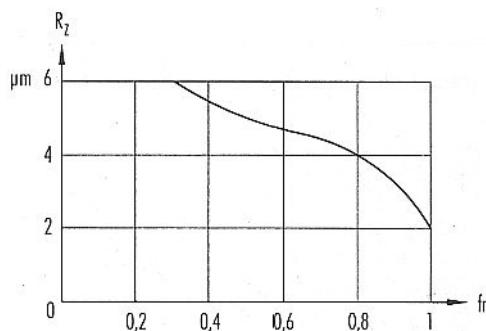


Picture 9: theoretical life of a BK-2 bushing in relation to pv values.

CORRECTION FACTORS

- f_p	specific bushing load correction factor	p [N/mm ²] f_p	≤ 5 1	≤ 10 0,85	≤ 20 0,7	≤ 30 0,6	≤ 40 0,45	≤ 50 0,35	≤ 60 0,25	≤ 70 0,15
- f_v	bushing speed correction factor	v [m/s] f_v	$\leq 0,4$ 1	≤ 1 0,95	$\leq 1,5$ 0,8	≤ 2 0,65	$\leq 2,5$ 0,45	≤ 3 0,2		
- f_t	bushing temperature correction factor	t [°C] f_t	$\leq 35^\circ$ 1	$\leq 50^\circ$ 0,95	$\leq 60^\circ$ 0,85	$\leq 70^\circ$ 0,75	$\leq 80^\circ$ 0,4	$\leq 90^\circ$ 0,3	$\leq 100^\circ$ 0,25	$\leq 110^\circ$ 0,2

- f_r correction factor f_r see figure 10
- f_b correction factor f_b see page 4



Picture 10: roughness influence on shaft surface

MOUNTING TOLERANCE

- Shaft	Shaft - Ø (mm)	Tolerance
	≥ 8	h8
- Housing	Housing - Ø (mm)	Tolerance
	≥ 10	H7

More specific details for assembling are to be found on page 17

BK-2 self-lubricating bushes

Technical data

EXAMPLES FOR CALCULATION

We have to assemble a BK-2 bushing on a lift with an X mechanism. The rising speed of the platform is very slow and therefore bushing speed is v axis.

The shaft has a diameter of 40 mm. We have mainly a punctiform load condition. Max load for that bushing is 15000 N. The bushing should last for 1000 hours.

STEPS FOR CALCULATION	RESULTS
1st step How to calculate bushing speed	$v \leq 0,01$
2nd step How to determine permissible specific load	bushing selected: BK-2 4020
We calculate a specific load for the width of smaller size of bushing BK-2 4020:	$P_{res.} = 18,75 \text{ N/mm}^2$
3rd step How to calculate pv value	$pv = 0,1875 \text{ N/mm}^2 \cdot \text{m/s}$
4th step How to determine theoretical life	$L_{th} \approx 50000 \text{ h}$
According to picture 9 a theoretical life of $L_{th} \approx 50000 \text{ h}$ is possible	Correction factors (see page 15)
5th step Nominal life	$f_p: f_p = 0,7 \text{ specific load } 20 \text{ N/mm}^2$ $f_v: f_v = 1 \text{ bushing speed } 0,01 \text{ m/s}$ $f_t: f_t = 1 \text{ operating temperature } 35^\circ\text{C}$ $f_B: f_B = 0,5 \text{ bushing rotation } 35^\circ$ $f_r: f_r = 0,3 \text{ for Fit } 6 \text{ (for example)}$
$L_h = L_{th} * f_p * f_v * f_t * f_r * f_B [h] = L_{th} = 50000 * 0,7 * 1 * 1 * 0,5 * 0,3 = 5250 \text{ h}$	$L_h = 5250 \text{ h}$
Through a different calculation, we can determine the permissible load for a life of $L_h = 1000 \text{ h}$	L_{th} run as indicated in picture 9 shows a pv value of about 0,55
$L_h = L_{th} * 0,7 \cdot 1 \cdot 0,5 \cdot 0,3$	When $v = 0,01 \text{ m/s}$, $p = 55 \text{ N/mm}^2$
Therefore the theoretical life is	Therefore the resulting load is
$L_{th} = \frac{1000}{0,105} = 9523 \text{ h}$	$F = p * d * l = 55 \text{ N/mm}^2 * 40 \text{ mm} * 20 \text{ mm}$ $= 44000 \text{ N} > 15000 \text{ N}$

BK-2 self-lubricating bushes

Technical data

TOLERANCES

Thickness	mm	
BK-2		
Hole	Thickness	Tolerances
10-19	1	-0.02 -0.045
20-27	1.5	-0.025 -0.055
28-44	2	-0.03 -0.065
45-79	2.5	-0.04 -0.085
80-100	2.5	-0.05 -0.115
101-300	2.5	-0.05 -0.115

Split	mm
Inner diameter	Split
2~9	0.5~1.5
10~17	0.5~1.5
18~25	0.5~1.5
26~40	0.4~2.0
45~60	1~3
65~100	2~5
105~135	3~6
140~300	5~9

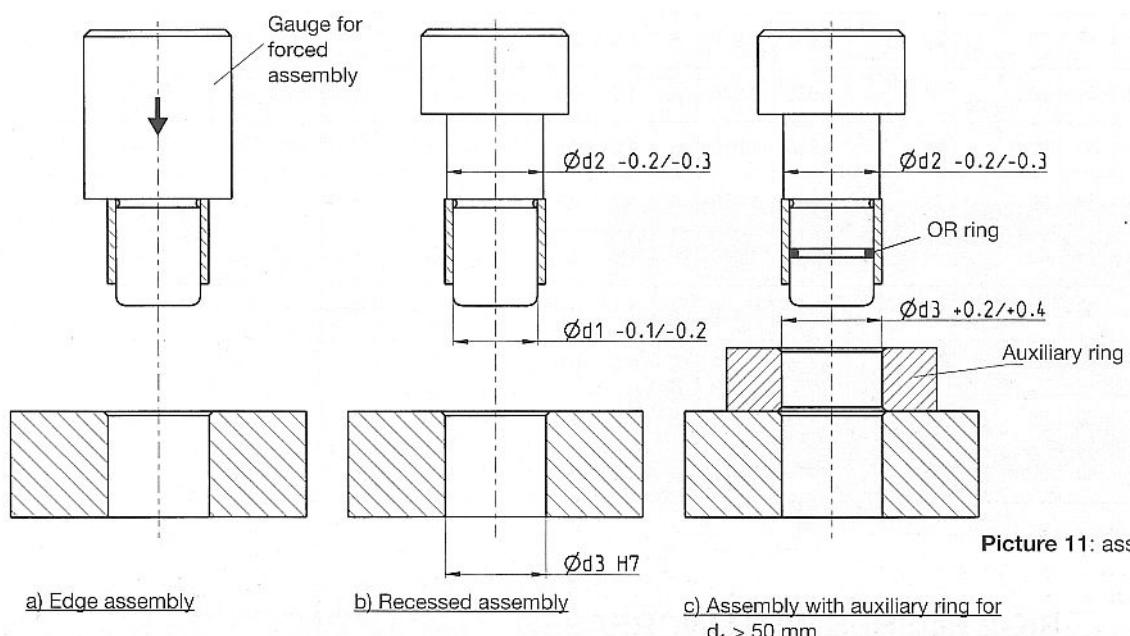
Outer diameter	mm
Outer diameter	Tolerances
≤ 10	+0.055 +0.025
10~18	+0.065 +0.030
18~30	+0.075 +0.035
30~40	+0.085 +0.045
40~50	+0.085 +0.045
50~80	+0.100 +0.055
80~105	+0.120 +0.070
105~180	+0.170 +0.100
180~250	+0.210 +0.130
250~305	+0.260 +0.170

ASSEMBLY

Before assembling a BK-2 bushing, the first thing to check is that the mating surface is clean and without burrs so as to avoid damaging the lining of the bush and causing initial wear. A plug gauge is used to assemble the bushes using force as indicated in picture 11. If a small quantity of oil or grease is applied to the inner or outer surfaces of

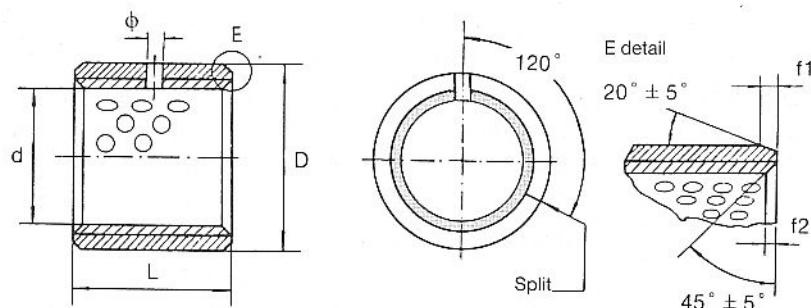
bushes, assembly is made easier.

For bushes with a diameter over 50 mm, an auxiliary mounting ring is recommended, in order to prevent inclination of the bushing itself. By means of an OR ring mounted on the gauge, it is possible to keep even bushes with a larger diameter more tightly.



Picture 11: assembly

BK-2 self-lubricating bushes



Material specifications according to DIN 1494

d	D	Shaft diameter	Housing diameter	Thickness		φ	f1	f2	L-0.4									
				min	max				10	12	15	20	25	30	35	40	45	
8	10	8 ⁰ _{-0.022}	10 ^{+0.018} ₀	0.955	0.980	4	0.5	0.3	0810									
10	12	10 ⁰ _{-0.022}	12 ^{+0.018} ₀	0.955	0.980	4	0.5	0.3	1010		1015	1020						
12	14	12 ⁰ _{-0.027}	14 ^{+0.018} ₀	0.955	0.980	4	0.5	0.3	1210	1212	1215	1220						
14	16	14 ⁰ _{-0.027}	16 ^{+0.018} ₀	0.955	0.980	4	0.5	0.3			1415	1420	1425					
15	17	15 ⁰ _{-0.027}	17 ^{+0.018} ₀	0.955	0.980	4	0.5	0.3			1515	1520	1525					
16	18	16 ⁰ _{-0.027}	18 ^{+0.018} ₀	0.955	0.980	4	0.5	0.3			1615	1620	1625					
18	20	18 ⁰ _{-0.027}	20 ^{+0.021} ₀	0.955	0.980	4	0.5	0.3			1815	1820	1825					
20	23	20 ⁰ _{-0.033}	23 ^{+0.021} ₀	1.445	1.475	4	0.8	0.4			2015	2020	2025	2030				
22	25	22 ⁰ _{-0.033}	25 ^{+0.021} ₀	1.445	1.475	6	0.8	0.4			2215	2220	2225					
24	27	24 ⁰ _{-0.033}	27 ^{+0.021} ₀	1.445	1.475	6	0.8	0.4			2415	2420	2425	2430				
25	28	25 ⁰ _{-0.033}	28 ^{+0.021} ₀	1.445	1.475	6	0.8	0.4			2515	2520	2525	2530				
28	32	28 ⁰ _{-0.033}	32 ^{+0.025} ₀	1.935	1.970	6	1.0	0.5			2820		2830					
30	34	30 ⁰ _{-0.033}	34 ^{+0.025} ₀	1.935	1.970	6	1.0	0.5			3020	3025	3030		3040			
32	36	32 ⁰ _{-0.039}	36 ^{+0.025} ₀	1.935	1.970	6	1.0	0.5					3225	3230		3240		
35	39	35 ⁰ _{-0.039}	39 ^{+0.025} ₀	1.935	1.970	6	1.0	0.5			3520		3530		3540		3550	
40	44	40 ⁰ _{-0.039}	44 ^{+0.025} ₀	1.935	1.970	8	1.0	0.5			4020		4030	3535	4040		4050	
45	50	45 ⁰ _{-0.039}	50 ^{+0.025} ₀	2.415	2.460	8	1.2	0.6			4520		4530		4540	4545	4550	
50	55	50 ⁰ _{-0.046}	55 ^{+0.030} ₀	2.415	2.460	8	1.2	0.6					5030		5040	5050	5055	5060
55	60	55 ⁰ _{-0.046}	60 ^{+0.030} ₀	2.415	2.460	8	1.2	0.6					5530		5540	5550		
60	65	60 ⁰ _{-0.046}	65 ^{+0.030} ₀	2.415	2.460	8	1.2	0.6					6030		6040	6050		

BK-2 BUSHES WITH INCREASED LOAD CAPACITY ON REQUEST

BK-2 self-lubricating bushes

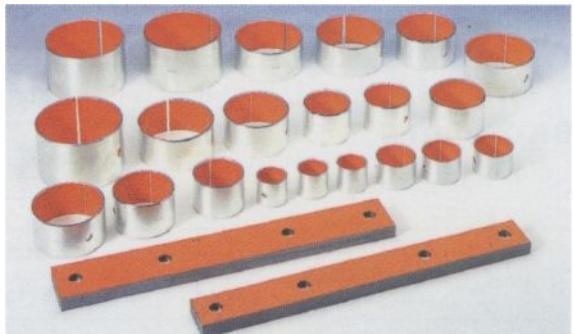
d	D	Shaft diameter		Housing diameter	Thickness		ϕ	f1	f2	0 L -0.4											
		min	max		40	45				80	90	95	100	110	120						
65	70	65 0 -0.046	70 0 +0.030	70	2.415	2.460	8	1.2	0.6	6540		650	6560								
70	75	70 0 -0.046	75 0 +0.030	75	2.415	2.460	8	1.2	0.6	7040		7050		7070	7080						
75	80	75 0 -0.046	80 0 +0.030	80	2.415	2.460	9.5	1.2	0.6	7540		7560		7580							
80	85	80 0 -0.046	85 0 +0.035	85	2.385	2.450	9.5	1.4	0.7	8040		8060		8080							
85	90	85 0 -0.054	90 0 +0.035	90	2.385	2.450	9.5	1.4	0.7	8540		8560		8580							
90	95	90 0 -0.054	95 0 +0.035	95	2.385	2.450	9.5	1.4	0.7	9040		9060		9080	9090						
100	105	100 0 -0.054	105 0 +0.035	105	2.385	2.450	9.5	1.4	0.7			10050			10080		10095				
105	110	105 0 -0.054	110 0 +0.035	110	2.385	2.450	9.5	1.4	0.7			10560		10580	10595		105110				
110	115	110 0 -0.054	115 0 +0.035	115	2.385	2.450	9.5	1.4	0.7			11060		11080	11095		110110				
120	125	120 0 -0.054	125 0 +0.035	125	2.385	2.450	9.5	1.6	0.8			12060		12080			120110				
125	130	125 0 -0.063	130 0 +0.040	130	2.385	2.450	9.5	1.6	0.8			12560					125110				
130	135	130 0 -0.063	135 0 +0.040	135	2.385	2.450	9.5	1.6	0.8			13050	13060		13080		130100				
140	145	140 0 -0.063	145 0 +0.040	145	2.385	2.450	9.5	1.6	0.8			14050	14060		14080		140100				
150	155	150 0 -0.063	155 0 +0.040	155	2.385	2.450	9.5	1.6	0.8			15050	15060		15080		150100				
160	165	160 0 -0.063	165 0 +0.040	165	2.385	2.450	11	1.6	0.8			16050	16060		16080		160100				
170	175	170 0 -0.063	175 0 +0.040	175	2.385	2.450	11	1.6	0.8			17050		17080		170100					
180	185	180 0 -0.072	185 0 +0.040	185	2.385	2.450	11	1.6	0.8			18050	18060		18080		180100				
190	195	190 0 -0.072	195 0 +0.046	195	2.385	2.450	11	1.6	0.8			19050	19060		19080		190100	190120			
200	205	200 0 -0.072	205 0 +0.046	205	2.385	2.450	11	1.6	0.8			20050	20060		20080		200100	200120			
220	225	220 0 -0.072	225 0 +0.046	225	2.385	2.450	12	1.6	0.8			22050	22060		22080		220100	220120			
240	245	240 0 -0.072	245 0 +0.046	245	2.385	2.450	12	1.6	0.8			24050	24060		24080		240100	240120			
250	255	250 0 -0.081	255 0 +0.052	255	2.385	2.450	12	1.6	0.8			25050	25060		25080		250100	250120			
260	265	260 0 -0.081	265 0 +0.052	265	2.385	2.450	12	1.6	0.8			26050	26060		26080		260100	260120			
280	285	280 0 -0.081	285 0 +0.052	285	2.385	2.450	12	1.6	0.8			28050	28060		28080		280100	280120			
300	305	300 0 -0.081	305 0 +0.052	305	2.385	2.450	12	1.6	0.8			30050	30060		30080		300100	300120			

BK-2..SX series Bushes

Cylindrical bushes made of a metal-plastic alloy (steel backing + sintered bronze + POM material).

Suitable for sliding movements with or without grease. Excellent against wear of uneven surface in oscillating movements.

Load	110 N/mm ²
Max. temp.	+ 130° C
Min. temp.	- 60° C
Max. speed	5 m/s
Coefficient of friction	0.03 - 0.20
Limit pv (dry)	3.2 N/mm ² * m/s 25 N/mm ² * m/s



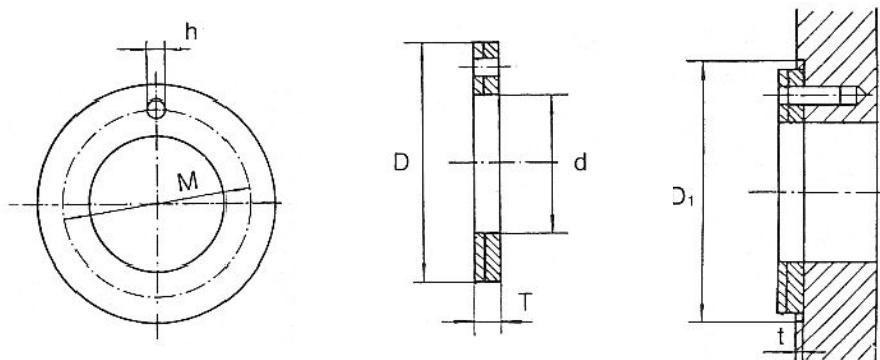
BK-2..S series Bushes

Cylindrical bushes made of a metal-plastic alloy (steel backing + sintered bronze + POM material) with oil indents Characteristics and technical data as BK-2 SX series.

They can be supplied in all sizes as BK-2 series

AS MODULATOR

BK-2 self-lubricating washers



Reference	Shaft diameter	Dimensions				Mounting dimensions		
		d +0.25	D -0.25	T -0.05	M ±0.12	h +0.4 +0.1	t ±0.2	Di +0.12
BK-2 10SF	8	10	20	1.5	15	1.5	1	20
BK-2 12SF	10	12	24	1.5	18	1.5	1	24
BK-2 14SF	12	14	26	1.5	20	2	1	26
BK-2 16SF	14	16	30	1.5	23	2	1	30
BK-2 18SF	16	18	32	1.5	25	2	1	32
BK-2 20SF	18	20	36	1.5	28	3	1	36
BK-2 22SF	20	22	38	1.5	30	3	1	38
BK-2 24SF	22	24	42	1.5	33	3	1	42
BK-2 26SF	24	26	44	1.5	35	3	1	44
BK-2 28SF	25	28	48	1.5	38	4	1	48
BK-2 32SF	30	32	54	1.5	43	4	1	54
BK-2 38SF	35	38	62	1.5	50	4	1	62
BK-2 42SF	40	42	66	1.5	54	4	1	66
BK-2 48SF	45	48	74	2	61	4	1.5	74
BK-2 52SF	50	52	78	2	65	4	1.5	78
BK-2 62SF	60	62	90	2	76	4	1.5	90

BK-2 plates	Type	Length ±1	Width ±1	Thickness -0.05
	BK-2	500	125	1.0
		500	125	1.5
		500	150	2.0
		500	150	2.5

BK090 and BK080 machined bronze bushes

Technical data

BK090 and BK080 bushes can be supplied with plain inner surface or with diamond indentations for grease depots; instead of indentations bushes can also have holes which can increase lubrication retaining capacity and re-lubricating intervals. These bushes have a high sliding capacity, good wear and corrosion resistance and therefore can guarantee a longer working life. Split can be straight or interlocked on request.

Material specifications according to DIN 17662 for BK090 and according to DIN 4382 for BK080

Chemical composition

Type	Cu%	Sn%	P%	Pb%	Zn%
BK080	89.5	4	/	2.5	4
BK090	91.68	8.3	0.02	/	/

Mechanical properties

Type	Tensile stress capacity N/mm ²	Yield point load N/mm ²	Elongation %	Brinell hardness HB
BK080	420	230	50	120
BK090	460	260	60	110

Physical properties

Type	Density g/m ³	Linear expansion coefficient 20-300°C 10-6/°C	Thermal conductivity up to 20°C W/m • K	Electrical conductivity up to 20°C m/ohm • mm ²	Modulus elasticity kN/mm ²
BK080	8.8	20.2	70	7.8	108
BK090	8.9	18.3	58	6.6	117

Load capacity

Type	Oscillating motion at low speed v<0.01 m/s	Rotating motion v ≤ 2m/s
BK080	90-110 N/mm ²	30-35 N/mm ²
BK090	100-120 N/mm ²	35-40 N/mm ²

BK090 and BK080 machined bronze bushes

Technical data

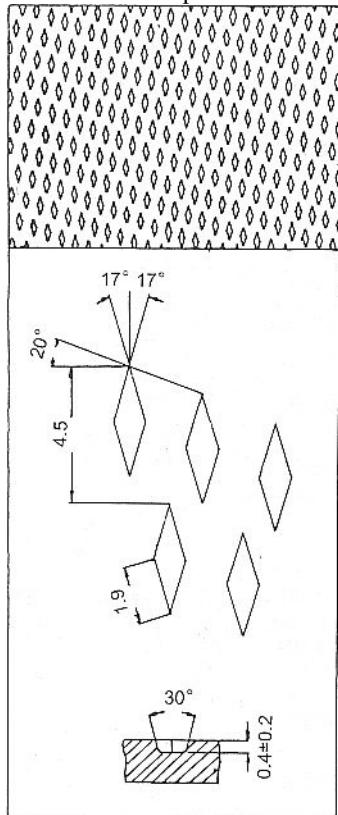
Nominal sizes	10 18	18 30	30 50	50 80	80 120	120 180	180 250	250 300
Outer diameter tolerances	+0.065 +0.030	+0.075 +0.035	+0.085 +0.045	+0.100 +0.055	+0.120 +0.070	+0.170 +0.100	+0.210 +0.130	+0.260 +0.170
Inner diameter (whrhen tolerances (w bushing is mounted)	+0.043 0	+0.052 0	+0.062 0	+0.074 0	+0.087 0	+0.10 0	+0.115 0	+0.130 0

TOLERANCES

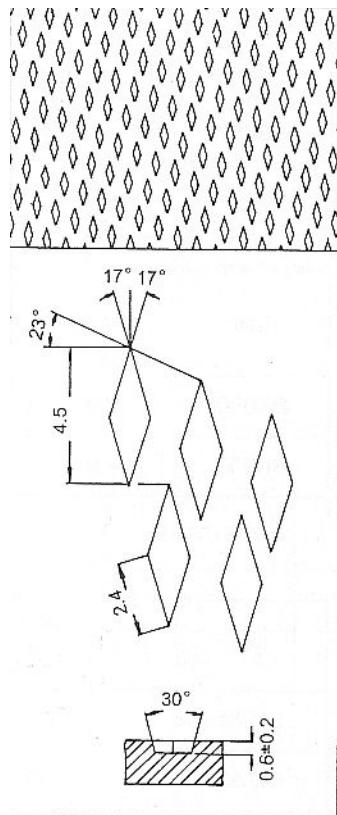
Inner diameter	Split mm
2-19	0.3-1.0
10-17	0.3-1.0
18-25	0.3-1.0
26-40	0.4-2.0
45-60	1-3
65-100	2-5
105-135	3-6
140-300	5-9

POCKET TYPES ACCORDING TO DIN 1494

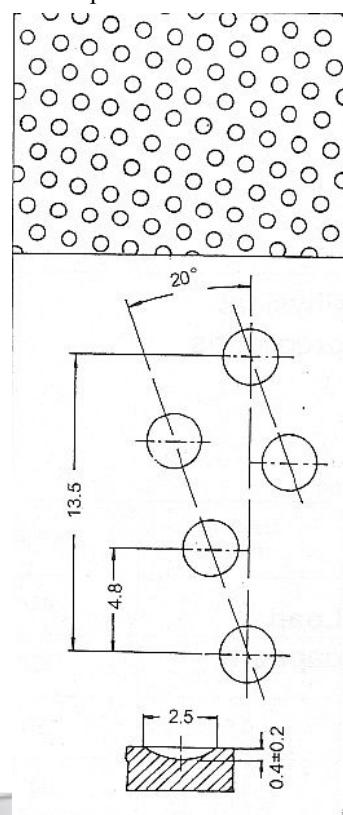
Inner diameter up to 22 mm



Inner diameter over 22 mm



Round pockets



BK090 and BK080 machined bronze bushes

Technical data

BK090 MACHINED BRONZE BUSHES

The main feature of this type of bushes is the machined bronze layer with diamond lubrication indentations on the sliding surface, as shown in picture 12. Bushes are bent from plates with a high-quality surface and are provided with a straight cut, which is closed when bushes are assembled.

The thickness of the material and bushing bores are according to DIN 1494.

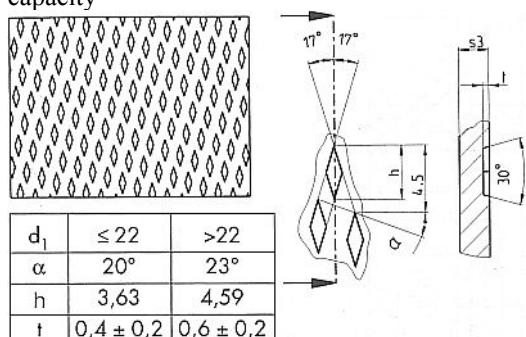


CHARACTERISTICS

- good sliding characteristics
- low maintenance thanks to long re-lubrication intervals
- high wear resistance
- good corrosion resistance
- compact and cost effective
- fully recyclable
- suitable for oscillating motions and shock-resistant

STRUCTURE

Diamond indentations to improve lubrication retaining capacity



Picture 12: diamond indentations

TECHNICAL DATA

Permissible specific load p	Static	120
	with $v \leq 0,01$ m/s	100
	Rotating dynamic	40
Max sliding speed v		2
Resistance to tensile stress R_m		450
Yield point $R_{p0,2}$		250
Elongation A		55
Brinell hardness		HB 108
E-module E		115
Possible operating temperature t		From -40 to +150
Coefficient of heat conductivity λ		60
Coefficient of heat deformation α		$18,2 \cdot 10^{-6}$
Density ρ		8,9
Wear coefficient μ	Grased	From 0,05 to 0,14

p in [N/mm²] λ in [W/(m*K)]
 v in [m/s] α in [1/K]
 R_m in [N/mm²] ρ in [g/cm³]
 $R_{p0,2}$ in [N/mm²] μ coeff.
 A in [%] t in [°C]
 E in [kN/mm²]

LUBRICATION

When assembled for the first time, BK090 bushes require grease lubrication (initial lubrication). A lithium soap base grease is recommended for lubrication. MoS₂ or graphite base greases are not suitable.

MOUNTING TOLERANCES

Differently from sintered bronze bushes in oil, machined bronze bushes require a clearance >0,1 mm. Consequently shaft tolerances range from e7 to f7 with a recommended roughness of Ra = 0,3 + 0,8. The mating surface should be hardened and ground with hardness >45 HRC.

ASSEMBLY

For assembling, please refer to instructions in picture 15 on page 26. When the bushing stands still, the split must be opposite to load direction.

BK090 and BK080 machined bronze bushes

Technical data

LIFE

Machined bronze bushes can have a very long life under some conditions. The precision of dimensions, quality and hardness of mating surface, the parallelism between bushing and shaft (which cannot exceed the maximum inclination of $0,15^\circ$), grease characteristics and quantity inside indentations are determinant factors for bushing life.

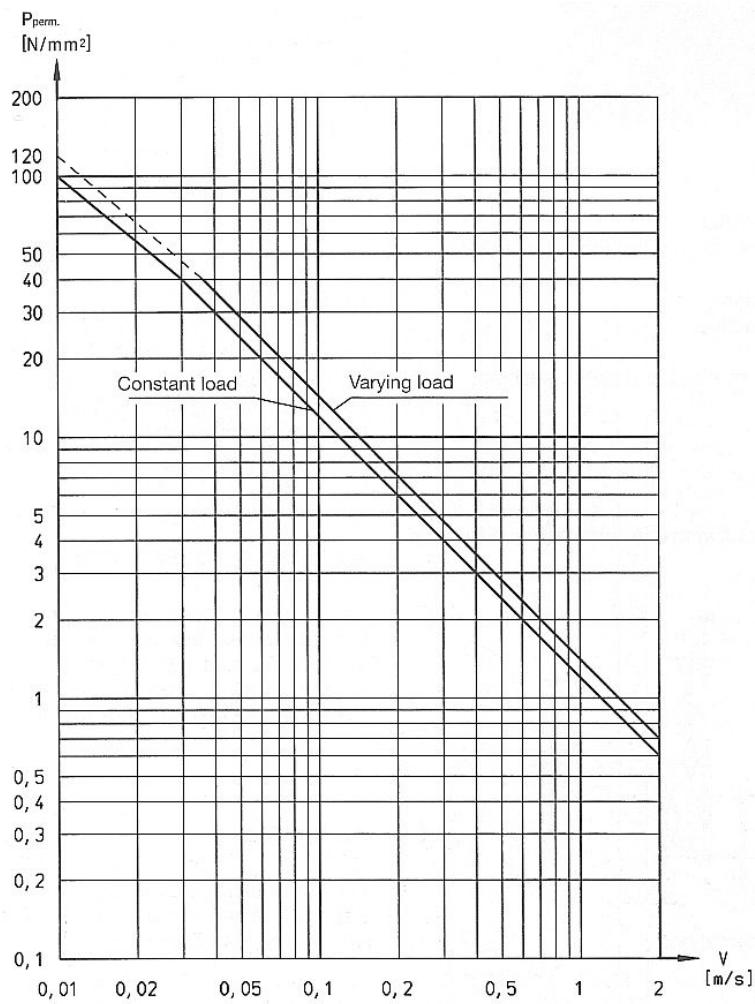
HOW TO DETERMINE DIMENSIONS

In order to determine dimensions of a machined bronze bushing, the product between the specific load of a bushing p and the sliding speed v is extremely important.

For thin bushes, functional characteristics (shaft guidance, operating quietness, damping, and so on) and consequently also normal life, are restricted by wear condition. The permissible wear limit is expressed in relation to the thickness of material s_3

The limit value is below $0,15 \cdot s_3$ [mm]. In specific cases, the maximum limit depends on the bushing characteristics.

The pv limit values as shown in picture 13 show evidence of differences between constant and variable static and dynamic loads under working conditions.



Picture 13: permissible pv limit values for greased BK090 and BK080 bushes

BK090 and BK080 machined bronze bushes

Technical data

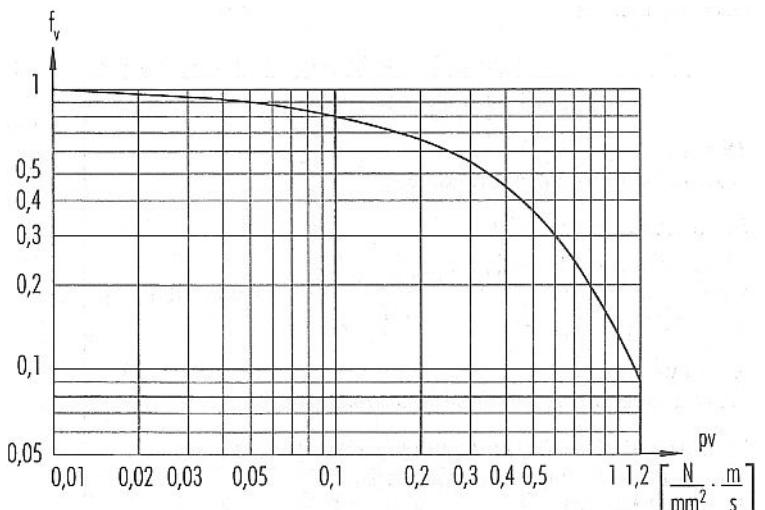
HOW TO CALCULATE LIFE

With the help of following correction factors, we can calculate a nominal life, expressed in hours, of a machined bronze bushing:

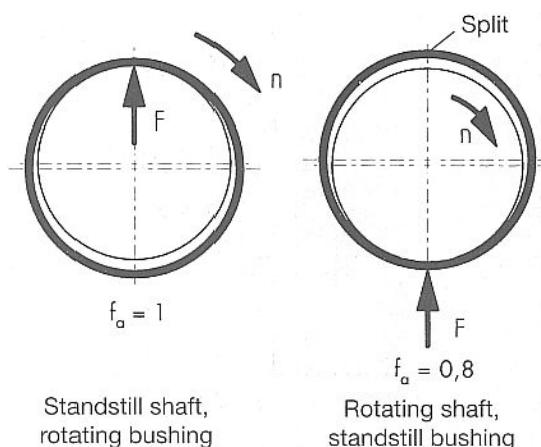
$$L_h = 5,3 \cdot 10^6 \cdot \frac{1}{d_1 \cdot n} \cdot 0,15 s_3 \cdot f_v \cdot f_a \cdot f_o \quad [\text{h}]$$

And consequently:

- $5,3 \cdot 10^6$: calculating factor
- d_1 shaft diameter in mm
- n rotating speed in 1/min
- s_3 thickness in mm
- $0,15 \cdot s_3$: Permissible wear limit
- f_v : Wear factor dependant on $p v$ value (see picture 14). This factor has been empirically determined.
- f_a load factor



Picture 14: wear factor f_v dependant on $p v$ value



When the bushing stands still, the split must be opposite to load direction

- f_e : factor of the type of load
 $f_e = 1$ for constant loads
 $f_e = 0,7$ for dynamic loads, variable values and directions

The resulting nominal life obtained by the above indicated process is approximate. But machined bronze bushes have a longer life than the one resulting from calculations. Up to 100°C, temperature does not have a great influence on performances; over 100° C each single case has to be carefully considered.

BK090 and BK080 machined bronze bushes

Technical data

EXAMPLE FOR CALCULATION

A chain load pinion on a lift truck for standing shelving has to bear a load of 300 kgs. The rotation of the wheel is $n = 35 \text{ min}^{-1}$. Shaft diameter is $d_s = 32 \text{ mm}$. Which size of BK090 do we have to choose and how long is the hypothetical life?

STEPS FOR CALCULATION

1st step

How to calculate bushing speed

Speed is determined by

$$v = \frac{d^1 * \pi * n}{60} [\text{m/s}] = \frac{0,32 \text{ m} * \pi * 35 \text{ min}^{-1}}{60} = 0,06 \text{ m/s}$$

2nd step

How to determine admissible specific load

For a speed of $v = 0,06 \text{ m/s}$, the possible specific load is as indicated in picture 13, pages 24

$$P_{\text{perm}} = 20 \text{ N/mm}^2$$

3rd step

How to choose bushing length

We chose the shortest standard length $l = 20 \text{ mm}$

4th step

How to calculate resultant load of bushing

$$p = \frac{F}{d_1 * l} = \frac{3000 \text{ N}}{32 \text{ mm} * 20 \text{ mm}} = 4,7 \text{ N/mm}^2$$

5th step

How to calculate PV value

$$p * v = 4,7 \text{ N/mm}^2 * 0,06 \text{ m/s} = 0,282 \text{ N/mm}^2 * \text{m/s}$$

6th step

Nominal life

$$L_h = 5,3 * 10^{6*} \frac{1}{d_1 * n} * 0,15 s_3 f_v * f_a * f_e [\text{h}]$$

$$L_h = 5,3 * 10^{6*} \frac{1}{32 \text{ mm} * 35 \text{ min}^{-1}} * 0,15 * 2 * 0,56 * 1 * 1 = 795 \text{ h}$$

Correction factors

Wear limit: $0,15 * s_3 = 0,15 * 2 = 0,3 \text{ mm}$

$$f_v: f_v = 0,56$$

$$f_a: f_a = 1$$

$$f_e: f_e = 1$$

$$L_h = 795 \text{ h}$$

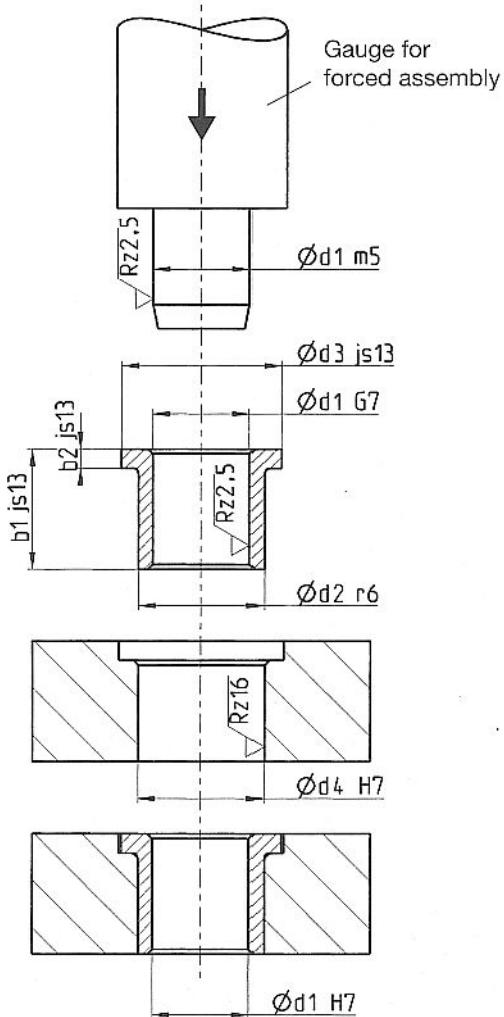
Type of bushing chosen: **BK090 3220**

MOUNTING TOLERANCES

The precision of a machined bronze bushing as indicated in picture 15 determines also clearance. For a long-term working life a minimum clearance from 0,05 to 0,15% of d_1 is necessary and, for small diameters, a thin layer of grease of at least 5 pm. An excessive clearance can cause a high noise level. Best conditions to obtain a low noise level are a low clearance and low roughness of shaft surface.

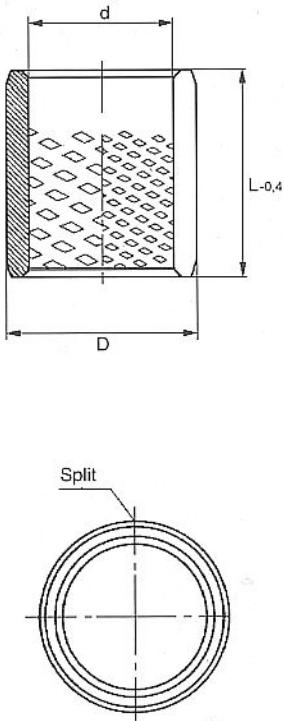
ASSEMBLY

Machined bronze bushes have to be assembled into their housing with a plug gauge, as shown in picture 15 by means of a rocker arm or a hydraulic press. While assembling, it is necessary to avoid any damaging of the inner surface of bushes. After fitting, the G7 bore tolerance has an H7 range of tolerance.



Picture 15: example of assembly of a sintered bushing and a machined bronze bushing

BK090 and BK080 machined bronze bushes



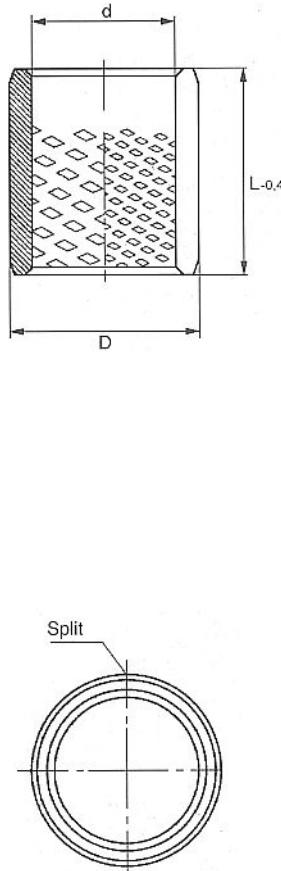
* As per DIN 1494 we can also supply the following inner and outer diameters

Inner diameter	Outer diameter
18	20
20	22
22	24
28	32

On request

Reference	d x D x L (mm)	Reference	d x D x L (mm)
BK090 1010	10 x 12 x 10	BK090 3040	30 x 34 x 40
BK090 1015	10 x 12 x 15	BK090 3215	32 x 36 x 15
BK090 1210	12 x 14 x 10	BK090 3220	32 x 36 x 20
BK090 1215	12 x 14 x 15	BK090 3225	32 x 36 x 25
BK090 1220	12 x 14 x 20	BK090 3230	32 x 36 x 30
BK090 1410	14 x 16 x 10	BK090 3240	32 x 36 x 40
BK090 1415	14 x 16 x 15	BK090 3515	35 x 39 x 15
BK090 1420	14 x 16 x 20	BK090 3520	35 x 39 x 20
BK090 1425	14 x 16 x 25	BK090 3525	35 x 39 x 25
BK090 1510	15 x 17 x 10	BK090 3530	35 x 39 x 30
BK090 1515	15 x 17 x 15	BK090 3535	35 x 39 x 35
BK090 1520	15 x 17 x 20	BK090 3540	35 x 39 x 40
BK090 1525	15 x 17 x 25	BK090 3550	35 x 39 x 50
BK090 1610	16 x 18 x 10	BK090 4020	40 x 44 x 20
BK090 1615	16 x 18 x 15	BK090 4025	40 x 44 x 25
BK090 1620	16 x 18 x 20	BK090 4030	40 x 44 x 30
BK090 1625	16 x 18 x 25	BK090 4040	40 x 44 x 40
BK090 1810*	18 x 21 x 10	BK090 4050	40 x 44 x 50
BK090 1815*	18 x 21 x 15	BK090 4060	40 x 44 x 60
BK090 1820*	18 x 21 x 20	BK090 4520	45 x 50 x 20
BK090 1825*	18 x 21 x 25	BK090 4525	45 x 50 x 25
BK090 2010*	20 x 23 x 10	BK090 4530	45 x 50 x 30
BK090 2015*	20 x 23 x 15	BK090 4540	45 x 50 x 40
BK090 2020*	20 x 23 x 20	BK090 4550	45 x 50 x 50
BK090 2025*	20 x 23 x 25	BK090 4560	45 x 50 x 60
BK090 2030*	20 x 23 x 30	BK090 5025	50 x 55 x 25
BK090 2215*	22 x 25 x 15	BK090 5030	50 x 55 x 30
BK090 2220*	22 x 25 x 20	BK090 5040	50 x 55 x 40
BK090 2225*	22 x 25 x 25	BK090 5050	50 x 55 x 50
BK090 2230*	22 x 25 x 30	BK090 5060	50 x 55 x 60
BK090 2240*	22 x 25 x 40	BK090 5520	55 x 60 x 20
BK090 2430	24 x 27 x 30	BK090 5525	55 x 60 x 25
BK090 2515	25 x 28 x 15	BK090 5530	55 x 60 x 30
BK090 2520	25 x 28 x 20	BK090 5540	55 x 60 x 40
BK090 2525	25 x 28 x 25	BK090 5550	55 x 60 x 50
BK090 2530	25 x 28 x 30	BK090 5560	55 x 60 x 60
BK090 2815*	28 x 31 x 15	BK090 6025	60 x 65 x 25
BK090 2820*	28 x 31 x 20	BK090 6030	60 x 65 x 30
BK090 2825*	28 x 31 x 25	BK090 6035	60 x 65 x 35
BK090 2830*	28 x 31 x 30	BK090 6040	60 x 65 x 40
BK090 3015	30 x 34 x 15	BK090 6050	60 x 65 x 50
BK090 3020	30 x 34 x 20	BK090 6060	60 x 65 x 60
BK090 3025	30 x 34 x 25	BK090 6080	60 x 65 x 80
BK090 3030	30 x 34 x 30	BK090 6090	60 x 65 x 90

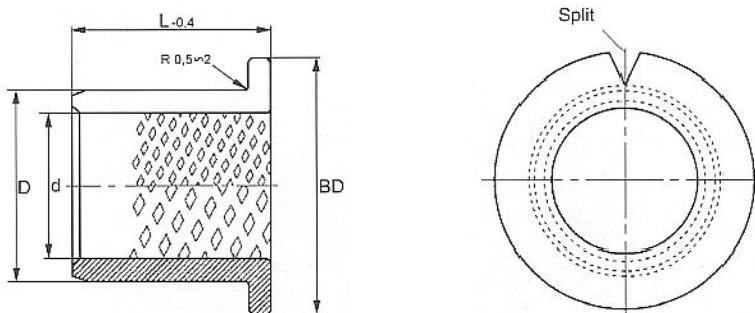
BK090 and BK080 machined bronze bushes



Reference	d x D x L (mm)
BK090 6530	65 x 70 x 30
BK090 6540	65 x 70 x 40
BK090 6550	65 x 70 x 50
BK090 6560	65 x 70 x 60
BK090 6580	65 x 70 x 80
BK090 7040	70 x 75 x 40
BK090 7050	70 x 75 x 50
BK090 7060	70 x 75 x 60
BK090 7070	70 x 75 x 70
BK090 7080	70 x 75 x 80
BK090 7090	70 x 75 x 90
BK090 7530	75 x 80 x 30
BK090 7540	75 x 80 x 40
BK090 7560	75 x 80 x 60
BK090 7580	75 x 80 x 80
BK090 8030	80 x 85 x 30
BK090 8040	80 x 85 x 40
BK090 8060	80 x 85 x 60
BK090 8080	80 x 85 x 80
BK090 8530	85 x 90 x 30
BK090 8540	85 x 90 x 40
BK090 8560	85 x 90 x 60
BK090 8580	85 x 90 x 80
BK090 9040	90 x 95 x 40
BK090 9060	90 x 95 x 60
BK090 9080	90 x 95 x 80
BK090 9090	90 x 95 x 90
BK090 10050	100 x 105 x 50
BK090 10060	100 x 105 x 60
BK090 10095	100 x 105 x 95
BK090 10560	105 x 110 x 60
BK090 105100	105 x 110 x 100
BK090 11060	110 x 115 x 60
BK090 110100	110 x 115 x 100
BK090 11560	115 x 120 x 60
BK090 115100	115 x 120 x 100
BK090 12060	120 x 125 x 60
BK090 120100	120 x 125 x 100
BK090 12560	125 x 130 x 60
BK090 125100	125 x 130 x 100
BK090 13060	130 x 135 x 60
BK090 130100	130 x 135 x 100

Reference	d x D x L (mm)
BK090 13560	135 x 140 x 60
BK090 135100	135 x 140 x 100
BK090 14060	140 x 145 x 60
BK090 140100	140 x 145 x 100
BK090 14560	145 x 150 x 60
BK090 145100	145 x 150 x 100
BK090 15060	150 x 155 x 60
BK090 150100	150 x 155 x 100
BK090 15560	155 x 160 x 60
BK090 155100	155 x 160 x 100
BK090 16060	160 x 165 x 60
BK090 160100	160 x 165 x 100
BK090 16560	165 x 170 x 60
BK090 165100	165 x 170 x 100
BK090 17060	170 x 175 x 60
BK090 170100	170 x 175 x 100
BK090 17560	175 x 180 x 60
BK090 175100	175 x 180 x 100
BK090 18060	180 x 185 x 60
BK090 180100	180 x 185 x 100
BK090 18560	185 x 190 x 60
BK090 185100	185 x 190 x 100
BK090 19060	190 x 195 x 60
BK090 190100	190 x 195 x 100
BK090 19560	195 x 200 x 60
BK090 195100	195 x 200 x 100
BK090 20060	200 x 205 x 60
BK090 200100	200 x 205 x 100
BK090 21560	215 x 220 x 60
BK090 215100	215 x 220 x 100
BK090 22560	225 x 230 x 60
BK090 225100	225 x 230 x 100
BK090 23560	235 x 240 x 60
BK090 235100	235 x 240 x 100
BK090 24560	245 x 250 x 60
BK090 245100	245 x 250 x 100
BK090 27560	275 x 280 x 60
BK090 275100	275 x 280 x 100
BK090 28560	285 x 290 x 60
BK090 285100	285 x 290 x 100
BK090 30060	300 x 305 x 60
BK090 300100	300 x 305 x 100

BK090 and BK080 machined bronze flanged bushes



Reference	d x D x BD x L (mm)
BKF090 2515	25 x28 / 35 x15
BKF090 2525	25 x 28 / 35 x 25
BKF090 3020	30 x 34 / 45 x 20
BKF090 3030	30 x34 / 45 x30
BKF090 3520	35 x 39 / 50 x 20
BKF090 3535	35 x 39 / 50 x 35
BKF090 4025	40 x 44 / 55 x 25
BKF090 4040	40 x 44 / 55 x 40
BKF090 4530	45 x 50 / 60 x 30
BKF090 4545	45 x 50 / 60 x 45
BKF090 4550	45 x 50 / 60 x 50
BKF090 5030	50 x 55 / 65 x 30
BKF090 5050	50 x 55 / 65 x 50
BKF090 5530	55 x 60 / 70 x 30
BKF090 5550	55 x 60 / 70 x 50
BKF090 6030	60 x 65 / 75 x 30
BKF090 6035	60 x 65 / 75 x 35
BKF090 6060	60 x 65 / 75 x 60
BKF090 6530	65 x 70 / 80 x 30
BKF090 6560	65 x 70 / 80 x 60
BKF090 7040	70 x 75 / 85 x 40
BKF090 7070	70 x 75 / 85 x 70
BKF090 7540	75 x 80 / 90 x 40
BKF090 7570	75 x 80 / 90 x 70
BKF090 8040	80 x 85/100x40
BKF090 8080	80 x 85 /100x80
BKF090 9050	90 x 95/110x50
BKF090 9090	90 x 95 /110x90
BKF090 10050	100x105/120x50
BKF090 10090	100x105/120x90

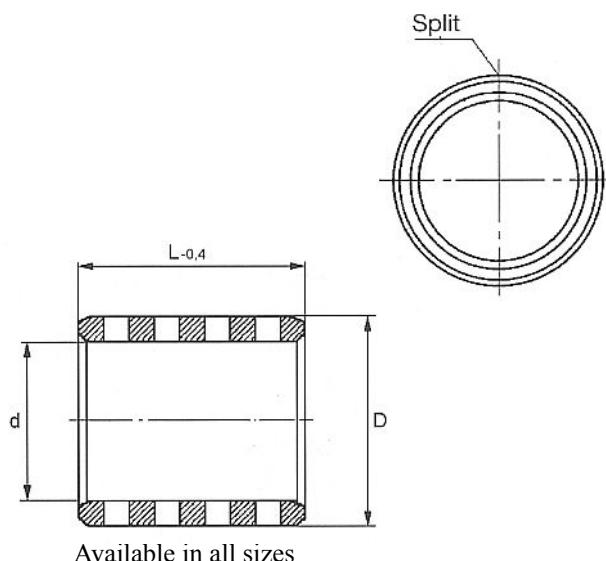
Reference	d x D x BD x L (mm)
BKF090 11050	110x115/130x50
BKF090 11090	110x115/130x90
BKF090 12050	120x125/140x50
BKF090 12090	120x125/140x90
BKF090 13060	130x135/155x60
BKF090 13090	130x135/155x90
BKF090 14060	140x145/165x60
BKF090 14090	140x145/165x90
BKF090 15060	150x155/180x60
BKF090 15090	150x155/180x90
BKF090 16060	160x165/190x60
BKF090 16090	160x165/190x90
BKF090 17060	170x175/200x60
BKF090 17090	170x175/200x90
BKF090 18060	180x185/215x60
BKF090 18090	180x185/215x90
BKF090 19060	190x195/225x60
BKF090 19090	190x195/225x90
BKF090 20060	200x205/235x60
BKF090 20090	200x205/235x90
BKF090 22560	225x230/260x60
BKF090 22590	225x230/260x90
BKF090 25060	250x255/290x60
BKF090 25090	250x255/290x90
BKF090 26560	265x270/305x60
BKF090 26590	265x270/305x90
BKF090 28560	285x290/325x60
BKF090 28590	285x290/325x90
BKF090 30060	300x305/340x60
BKF090 30090	300x305/340x90

BK090 L and BK090 LDD drilled bronze bushes

BK090...L – drilled



(For dimensions and materials, see tables for BK090)

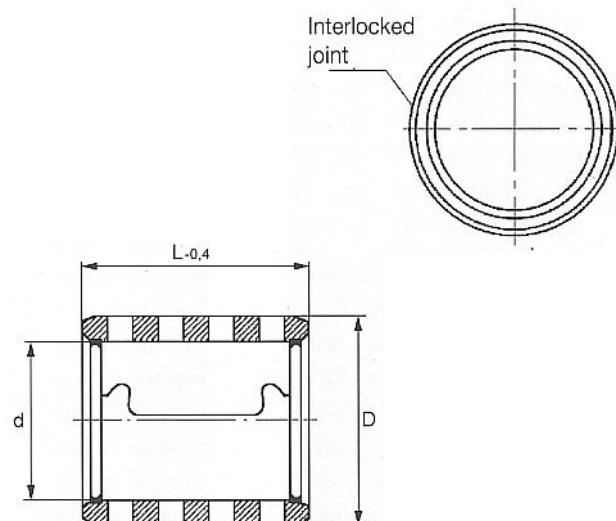


Available in all sizes

BK090...LDD - drilled and with seals



(For dimensions and materials, see tables for BK090)



Available in all sizes