



f series bearings



QS-9000



Engineered Materials Division



introducing Peer's F-Series self-lubricating bearings...

Peer's F-Series Self-Lubricated Bearings come in a variety of materials, each designed for different applications and degrees of lubrication.

FB Bearings are optimized for dry applications, meaning no lubrication of any kind is necessary. They are widely used in automotive and industrial linkages, pivots, and rotating and oscillating assemblies.

FR Bearings are optimized for semi-lubricated or fully lubricated environments such as hydraulic pumps and motors, compressors, and shock absorbers.

F-Series Bearings are also available in a variety of formats: FB and FR bearings are available as split bushings in metric sizes (page 8) and inch sizes (page 13). FB bearings are available in metric flanged bushings (page 10) and metric thrust washers (page 12). Inch sized flanged bushings and thrust washers, and special sizes in any format, can be made upon request.



features of FB & FR bearings

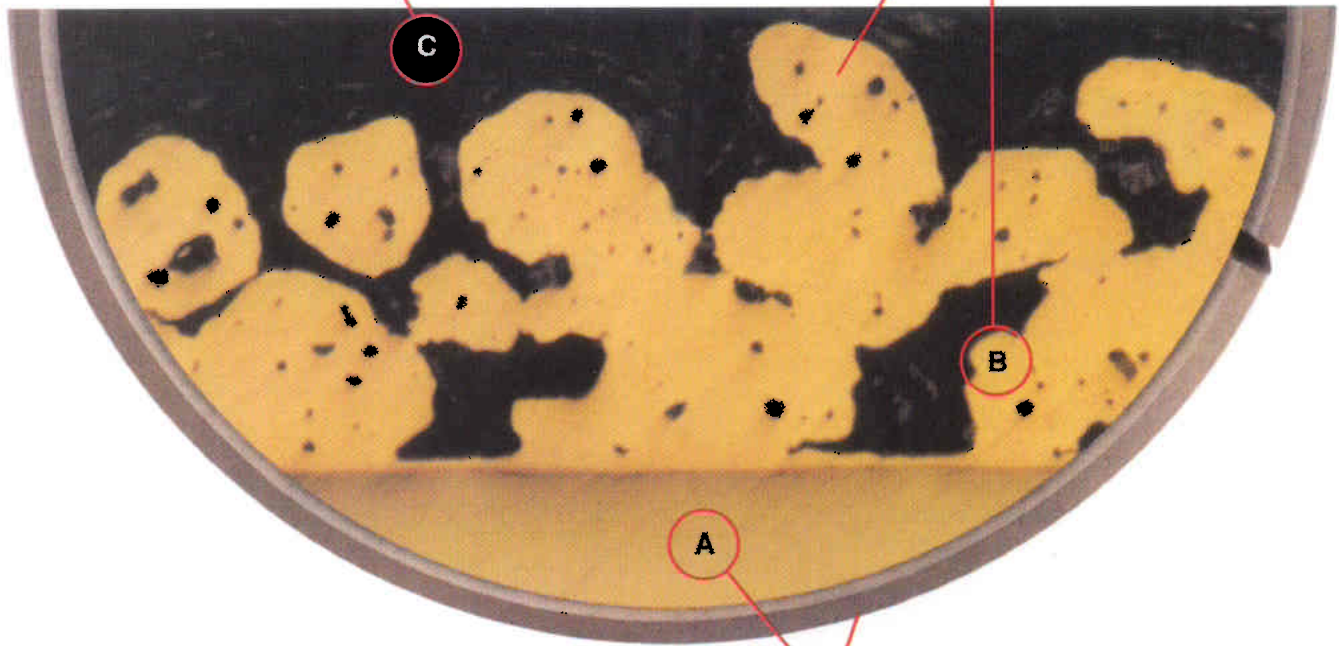
All F-Series Bearings start with a steel backing for high mechanical strength, dimensional rigidity, and heat dissipation (A). Next comes the strongest sintered bronze layer in the industry, key to bearing wear resistance (B). Finally, there is the resin layer itself, impregnated into the interstices in the sintered bronze (C). The resin layer provides the anti-friction properties.

C. Resin Layer

Changes in the composition of the resin layer provide for the different properties of the various F-Series Bearings. In most cases a PTFE-type resin is key, although it can be enhanced by stronger fluoropolymers and lead or tin-lead alloys. Carbon fibers can also be used for lead-free bearings. The sintered bronze/resin layer is generally 0.3mm (.012 inches) thick.

B. Sintered Bronze Layer

Similar bearings on the market employ a copper coating on the steel back to enhance the attachment of the bronze during sintering. While this makes for strong bond between those bronze particles that happen to be proximate to the steel, it does nothing to enhance the bonds among the upper-most bronze particles, which are not sintered to the steel but rather to other bronze particles. FB & FR bearings employ a state-of-the-art high temperature sintered technology that makes for a rock-solid bronze layer from the steel all the way to the surface.



A. Steel backing

Generally a 1010 mild carbon steel, although stainless is also available. For FB bearings that may be exposed to the elements, a tin flash is added for corrosion resistance. The thickness of the steel varies according to the size of the bearing.

FB & FR applications

FB Bearings: For Dry Applications

Material	Max PV	Temperature range	Friction coefficient	Max load at V-0	Uses
FB (resin: PTFE & lead oxide)	3,000 kgf/cm ² •m/min (140,000 psi•fpm) completely dry	-200°C~280°C (-328°F~536°F)	0.04~0.18	1,500 kgf/cm ² (21,335 psi)	The premium dry bearing for automotive and industrial uses: linkages, pivots, swivels, dry rotation and oscillation

Other variations: FB bearings can be made with a stainless rather than a mild carbon steel backing. A lead free version of FB is available that employs carbon fiber technology in the resin rather than lead oxide. In addition, research on FB-types with even greater PV capacities is ongoing, and we encourage you to contact our engineering or sales departments to learn of new products that may meet your needs.

FR Bearings: For Semi-lubricated to Fully Lubricated Applications

Material	Max PV	Temperature range	Friction coefficient	Max load at V-0	Uses
FR (resin: PTFE & FEP plus tin/lead)	5,000 kgf/cm ² •m/min (233,000 psi•fpm) semi-dry; many millions under hydrodynamic conditions	-50°C~280°C (-58°F~536°F)	0.01~0.05	1,400 kgf/cm ² (19,913 psi)	Gear pumps, vane pumps, piston pumps, compressors, shock absorbers, struts, forks

Other variations: FR bearings are also available in a lead free version (FR150X3), a super-low friction version (FR110), and a high cavitation resistant version (FR100). FR bushings can be made with grooves or holes to enhance oil flow. As with FB bearings, research on pushing the FR performance envelope is ongoing, and we encourage you to contact us for information regarding the latest technologies.

table of FB & FR bushings

Bushing ID	Recommended Dimensions		Bushing Length								Unit: mm
	Housing Dia.	Shaft Diameter	3	4	5	6	7	8	10	12	
3	5 $\begin{matrix} +0.012 \\ 0 \end{matrix}$	3 $\begin{matrix} -0.025 \\ -0.034 \end{matrix}$	BM0303XX	BM0304XX	BM0305XX	BM0306XX					
4	6 "	4 $\begin{matrix} -0.025 \\ -0.037 \end{matrix}$	BM0403XX	BM0404XX		BM0406XX		BM0408XX			
5	7 $\begin{matrix} +0.015 \\ 0 \end{matrix}$	5 "		BM0504XX	BM0505XX	BM0506XX		BM0508XX			
6	8 "	6 "			BM0605XX	BM0606XX	BM0607XX	BM0608XX	BM0610XX		
7	9 "	7 $\begin{matrix} -0.025 \\ -0.040 \end{matrix}$			BM0705XX		BM0707XX		BM0710XX	BM0712XX	
8	10 "	8 "			BM0805XX	BM0806XX	BM0807XX	BM0808XX	BM0810XX	BM0812XX	
9	11 $\begin{matrix} +0.018 \\ 0 \end{matrix}$	9 "							BM0910XX		
10	12 "	10 "				BM1006XX	BM1007XX	BM1008XX	BM1010XX	BM1012XX	
12	14 "	12 $\begin{matrix} -0.025 \\ -0.043 \end{matrix}$				BM1206XX		BM1208XX	BM1210XX	BM1212XX	
13	15 "	13 "						BM1308XX	BM1310XX		
14	16 "	14 "				BM1406XX			BM1410XX	BM1412XX	
15	17 "	15 "						BM1508XX	BM1510XX	BM1512XX	
16	18 "	16 "							BM1610XX	BM1612XX	
17	19 $\begin{matrix} +0.021 \\ 0 \end{matrix}$	17 "									
18	20 "	18 "							BM1810XX	BM1812XX	
19	22 "	19 $\begin{matrix} -0.025 \\ -0.046 \end{matrix}$							BM1910XX		
20	23 "	20 "							BM2010XX	BM2012XX	
22	25 "	22 "							BM2210XX	BM2212XX	
24	27 "	24 "									
25	28 "	25 "							BM2510XX	BM2512XX	
26	30 "	26 "									
28	32 $\begin{matrix} +0.025 \\ 0 \end{matrix}$	28 "								BM2812XX	
30	34 "	30 "							BM3010XX	BM3012XX	
31	35 "	31 $\begin{matrix} -0.025 \\ -0.050 \end{matrix}$									
32	36 "	32 "									
35	39 "	35 "								BM3512XX	
38	42 "	38 "									
40	44 "	40 "								BM4012XX	
45	50 "	45 "								BM4512XX	
50	55 $\begin{matrix} +0.030 \\ 0 \end{matrix}$	50 "								BM5012XX	
55	60 "	55 $\begin{matrix} -0.025 \\ -0.055 \end{matrix}$								BM5512XX	
60	65 "	60 "									
65	70 "	65 $\begin{matrix} +0.035 \\ +0.005 \end{matrix}$									
70	75 "	70 "									
75	80 "	75 "									
80	85 $\begin{matrix} +0.035 \\ 0 \end{matrix}$	80 "									
85	90 "	85 $\begin{matrix} +0.035 \\ 0 \end{matrix}$									
90	95 "	90 "									
100	105 "	100 "									
105	110 "	105 "									
110	115 "	110 "									
120	125 $\begin{matrix} +0.040 \\ 0 \end{matrix}$	120 "									
130	135 "	130 $\begin{matrix} +0.035 \\ -0.005 \end{matrix}$									
140	145 "	140 "									
150	155 "	150 "									
160	165 "	160 "									

Guide to part numbers:
 BM = metric bushing
 The first two or three numbers represent the ID, the last two or three represent the length. XX is replaced by FB or FR depending on the type of bearing material.

table of FB flanged bushings

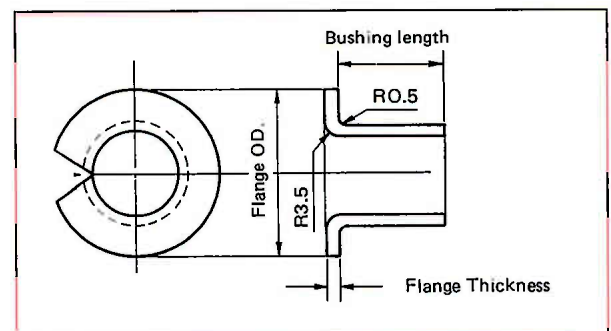
Bushing		Recommended Dimensions		Bushing Length				Unit: mm
ID	Flange OD	Housing Dia.	Shaft Diameter	3	4	5	6	
3	7	4.6 $\begin{smallmatrix} +0.012 \\ 0 \end{smallmatrix}$	3 $\begin{smallmatrix} -0.025 \\ -0.034 \end{smallmatrix}$	BM0303F7FB				
4	9	5.6 "	4 $\begin{smallmatrix} -0.025 \\ -0.037 \end{smallmatrix}$		BM0404F9FB			
5	10	7 $\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}$	5 "		BM0504F10FB	BM0505F10FB		
6	12	8 "	6 "			BM0605F12FB	BM0606F12FB	
7	13	9 "	7 $\begin{smallmatrix} -0.025 \\ -0.040 \end{smallmatrix}$			BM0705F13FB		
8	15	10 "	8 "				BM0806F15FB	
10	18	12 $\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	10 "				BM1006F18FB	
12	20	14 "	12 $\begin{smallmatrix} -0.025 \\ -0.043 \end{smallmatrix}$				BM1206F20FB	
14	22	16 "	14 "					
15	23	17 "	15 "					
16	24	18 "	16 "					
18	26	20 $\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	18 "					
20	31	23 "	20 $\begin{smallmatrix} -0.025 \\ -0.046 \end{smallmatrix}$					
22	33	25 "	22 "					
24	35	27 "	24 "					
25	36	28 "	25 "					
26	38	30 "	26 "					
28	40	32 $\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	28 "					
30	42	34 "	30 "					
31	45	35 "	31 $\begin{smallmatrix} -0.025 \\ -0.050 \end{smallmatrix}$					
32	46	36 "	32 "					
35	49	39 "	35 "					
38	52	42 "	38 "					
40	54	44 "	40 "					
45	60	50 "	45 "					
50	65	55 $\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	50 "					
55	70	60 "	55 $\begin{smallmatrix} -0.025 \\ -0.055 \end{smallmatrix}$					
60	75	65 "	60 "					

Guide to part numbers:
 BM = metric bushing
 The first two numbers represent the ID, the next two represent the length. "F" followed by one or two numbers gives the flange OD, and FB is the material designator.

Guide to flange thickness:
 ID Ø3 ~ Ø4: 0.8 +0/-0.15
 ID Ø5 ~ Ø18: 1.0 +0/-0.15
 ID Ø20 ~ Ø25: 1.5 +0/-0.15
 ID Ø26 ~ Ø40: 2.0 +0/-0.15
 ID Ø45 ~ Ø60: 2.5 +0/-0.15

Note: Flanged Bushings are available only in FB material.

Inch sizes and special sizes available on request.

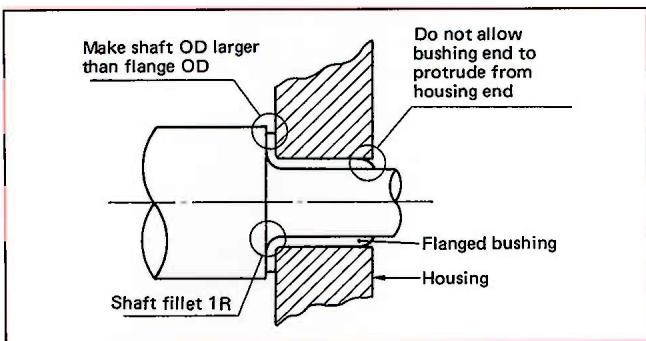


standard dimensions metric sizes

Length Tolerance 0 ~ -0.3

Unit: mm

7	8	10	12	15	20	25	30	40
BM0607F12FB								
BM0707F13FB								
	BM0808F15FB							
BM1007F18FB	BM1008F18FB	BM1010F18FB	BM1012F18FB	BM1015F18FB				
	BM1208F20FB	BM1210F20FB	BM1212F20FB	BM1215F20FB				
		BM1410F22FB	BM1412F22FB	BM1415F22FB				
		BM1510F23FB	BM1512F23FB	BM1515F23FB	BM1520F23FB			
				BM1615F24FB	BM1620F24FB			
		BM1810F26FB	BM1812F26FB	BM1815F26FB	BM1820F26FB			
		BM2010F31FB	BM2012F31FB	BM2015F31FB	BM2020F31FB	BM2025F31FB		
		BM2210F33FB	BM2212F33FB	BM2215F33FB	BM2220F33FB			
				BM2415F35FB	BM2420F35FB	BM2425F35FB		
		BM2510F36FB	BM2512F36FB	BM2515F36FB	BM2520F36FB	BM2525F36FB		
				BM2615F38FB	BM2620F38FB			
			BM2812F40FB	BM2815F40FB	BM2820F40FB			
			BM3012F42FB	BM3015F42FB	BM3020F42FB	BM3025F42FB	BM3030F42FB	
						BM3125F45FB		
					BM3220F46FB	BM3225F46FB	BM3230F46FB	
			BM3512F49FB		BM3520F49FB	BM3525F49FB	BM3530F49FB	BM3504F49FB
					BM3820F52FB			
			BM4012F54FB		BM4020F54FB	BM4025F54FB	BM4030F54FB	BM4040F54FB
					BM4520F60FB	BM4525F60FB	BM4530F60FB	BM4540F60FB
					BM5020F65FB		BM5030F65FB	BM5040F65FB
							BM5530F70FB	BM5540F70FB
							BM6030F75FB	BM6040F75FB



Flanged Bushing Installation & Usage

When pressfitting, the arbor diameter must be larger than the outside diameter of the flange. In use, the thrust side of the shaft must be larger than the outside diameter of the flange.

FB thrust washer

standard dimensions metric sizes

All dimensions in mm

Matching Bushing ID	Part No.	ID	OD	Thickness	Dowel Hole Dia.	Dowel Position	Housing Recess Depth
6	WM06FBA	8 ^{+0.25} ₀	16 ⁰ _{-0.25}	1.5 ^{-0.03} _{-0.08}	1.300 1.100	12±0.12	1.20 0.95
8	WM08FBA	10 "	18 "	"	"	14 "	"
10	WM10FBA	12 "	24 "	"	1.875 1.625	18 "	"
12	WM12FBA	14 "	26 "	"	2.375 2.125	20 "	"
14	WM14FBA	16 "	30 "	"	"	23 "	"
16	WM16FBA	18 "	32 "	"	"	25 "	"
18	WM18FBA	20 "	36 "	"	3.375 3.125	28 "	"
20	WM20FBA	22 "	38 "	"	"	30 "	"
22	WM22FBA	24 "	42 "	"	"	33 "	"
24	WM24FBA	26 "	44 "	"	"	35 "	"
25	WM25FBA	28 "	48 "	"	4.375 4.125	38 "	"
30	WM30FBA	32 "	54 "	"	"	43 "	"
35	WM35FBA	38 "	62 "	"	"	50 "	"
40	WM40FBA	42 "	66 "	"	"	54 "	"
45	WM45FBA	48 "	74 "	2.0 ^{-0.03} _{-0.08}	"	61 "	1.70 1.45
50	WM50FBA	52 "	78 "	"	"	65 "	"

Notes: Thrust washers are available only in FB material. Please contact your Peer sales representative regarding special sizes.

Thrust washers may be retained by using either the dowel or a suitable adhesive.

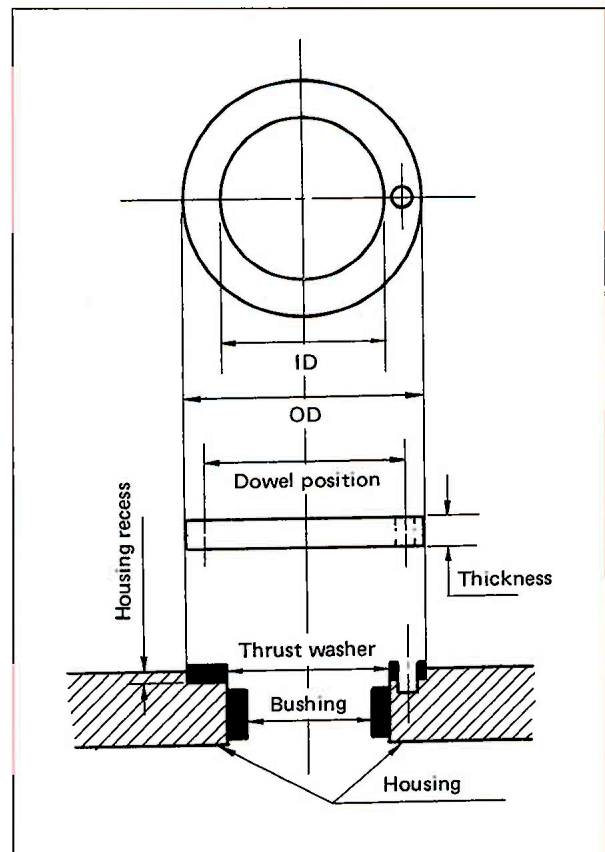


table of FB & FR bushings

standard dimensions inch sizes

Dimensions in Inches

Bushing ID	Recommended		Bushing Length and Part Number														
	Housing Bore	Shaft Dia															
1/8	.1873 .1878	.1243 .1236	1/8	02XX02	3/16	02XX03											
3/16	.2497 .2503	.1865 .1858	3/16	03XX03	1/4	03XX04	3/8	03XX06	Guide to part numbers: The first two numbers represent the ID in 1/16" increments. XX stands for either FB or FR bearing material The final two numbers stand for the bushing length in 1/16" increments.								
1/4	.3122 .3128	.2490 .2481	1/4	04XX04	3/8	04XX06											
5/16	.3747 .3753	.3115 .3106	3/8	05XX06	1/2	05XX08											
3/8	.4684 .4691	.3740 .3731	3/16	06XX03	1/4	06XX04	3/8	06XX06	1/2	06XX08	5/8	06XX10	3/4	06XX12			
7/16	.5309 .5316	.4365 .4355	1/2	07XX08	3/4	07XX12											
1/2	.5934 .5941	.4990 .4980	1/4	08XX04	3/8	08XX06	1/2	08XX08	5/8	08XX10	3/4	08XX12	7/8	08XX14			
9/16	.6559 .6566	.5615 .5605	3/8	09XX06	1/2	09XX08	5/8	09XX10	3/4	09XX12							
5/8	.7184 .7192	.6240 .6230	1/4	10XX04	1/2	10XX08	5/8	10XX10	3/4	10XX12	7/8	10XX14	1	10XX16			
11/16	.7809 .7817	.6865 .6855	7/8	11XX14													
3/4	.8747 .8755	.7491 .7479	1/4	12XX04	3/8	12XX06	1/2	12XX08	5/8	12XX10	3/4	12XX12	1	12XX16			
13/16	.9372 .9380	.8116 .8104	3/4	13XX12	1 1/8	13XX18											
7/8	.9997 1.0005	.8741 .8729	1/4	14XX04	3/8	14XX06	3/4	14XX12	1	14XX16	1 1/4	14XX20					
1	1.1247 1.1255	.9991 .9979	3/8	16XX06	1/2	16XX08	3/4	16XX12	1	16XX16	1 1/4	16XX20	1 1/2	16XX24			
1 1/8	1.2808 1.2818	1.1238 1.1226	3/8	18XX06	5/8	18XX10	3/4	18XX12	1	18XX16							
1 1/4	1.4058 1.4068	1.2488 1.2472	3/8	20XX06	3/4	20XX12	7/8	20XX14	1	20XX16	1 1/4	20XX20	1 3/4	20XX28			
1 3/8	1.5308 1.5318	1.3738 1.3722	3/4	22XX12	1	22XX16	1 1/2	22XX24	1 3/4	22XX28							
1 1/2	1.6558 1.6568	1.4988 1.4972	1/2	24XX08	1	24XX16	1 1/8	24XX18	1 1/4	24XX20	1 1/2	24XX24	2	24XX32			
1 5/8	1.7808 1.7818	1.6238 1.6222	1	26XX16	1 1/2	26XX24											
1 3/4	1.9371 1.9381	1.7487 1.7471	1	28XX16	1 1/2	28XX24	2	28XX32									
1 7/8	2.0621 2.0633	1.8737 1.8721	3/4	30XX12	1	30XX16	2 1/4	30XX36									
2	2.1871 2.1883	1.9987 1.9969	1/2	32XX08	1	32XX16	1 1/2	32XX24	1 3/4	32XX28	2	32XX32	2 1/2	32XX40			

LENGTH TOLERANCES

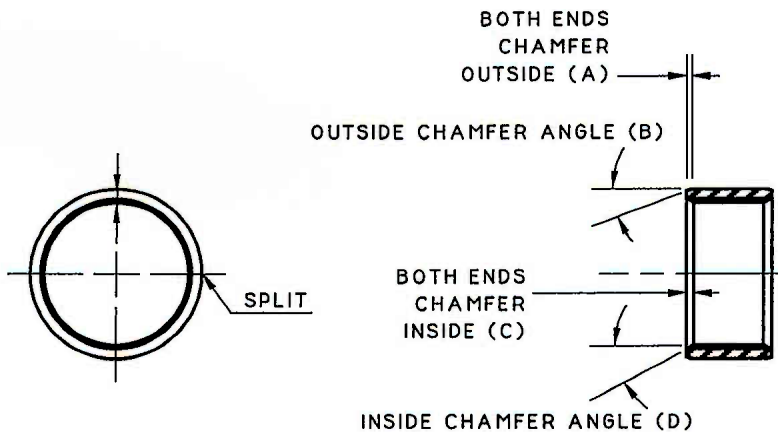
Up to and including 3/8 inch ID ±0.005 inch. Above 3/8 inch ID ±0.010 inch

1. Clearance information.
The recommended shaft and housing sizes given herein are based on a relatively rigid housing material. Under these conditions the resulting shaft/bearing clearance will be optimal. For thin-walled housings or non-rigid material, there may be housing expansion. Consult the Peer engineering department for details.
2. Do not bore or grind the inner or outer face of the bushing. The Peer FB/FR is a finished product requiring no further surface preparation. Boring the inner face will cause the removal of the resin-coated layer, reducing life. Grinding the outer face may allow rust to form and distort roundness.
3. Shafts used with the Peer FB/FR should be finished to $0.8 \mu\text{m AA}$ ($32 \mu\text{i AA}$) or better. Under severe conditions, shafts used with the FR should be finished to $0.4 \mu\text{m}$ ($16 \mu\text{i AA}$) or better.
4. The bushing is designed so that the split or mating gap will be eliminated upon insertion of the bushing into a housing. However, the split should be positioned away from the main load zone.
5. Fit the bushing slowly and concentrically into the housing using a press or vise. Bushing configurations are shown in Drawing 1, and the optimally-sized arbor for installation is shown in Drawing 2.
6. Because the OD of the bushing is greater than the housing ID, and because the FB/FR has a steel back of high mechanical strength, the FB/FR will never turn or spin out. Resin molded bushings, without a steel back, tend to deteriorate through creeping.
7. Fluid Compatibility
The Peer FB is optimized to run dry, without any lubrication. However, the FB will give excellent performance in a wide variety of lubricated environments. The FR is specifically designed to run in any kind of fluid environment, including all hydraulic oils and methanol. Oil grooves may be embossed into the bearing surface.
8. Because some FB/FR Bearings contain lead, it is important to wash hands thoroughly after handling, especially before eating or smoking.

Consult us for further information.



usage & installation notes



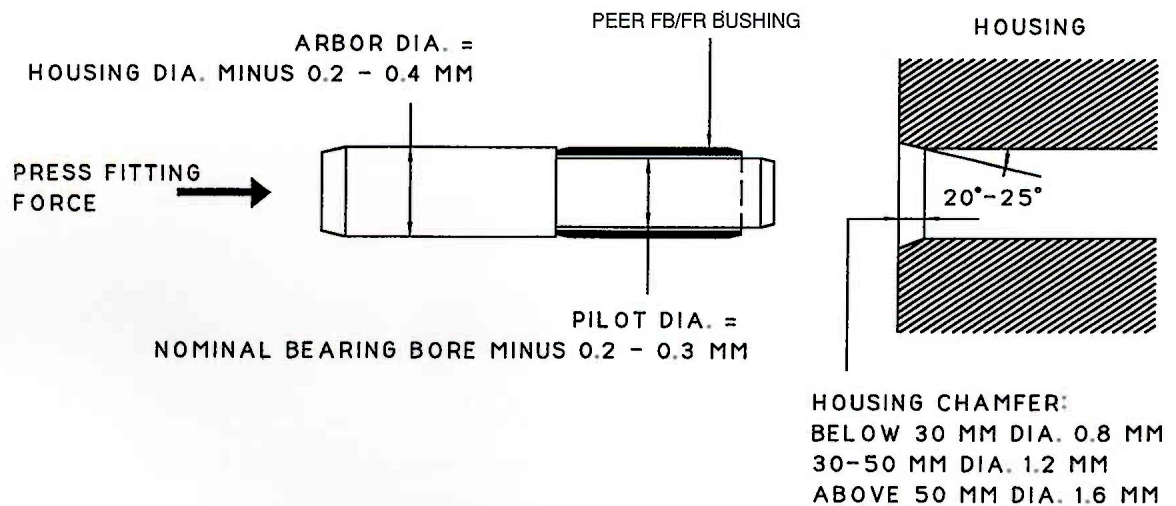
DIMENSIONS FOR STD METRIC BUSHING (IN MM)

BUSH ID	DIM A	DIM B	DIM B C	DIM D
Ø5-Ø19	0.4±0.2	20±5°	0.5±0.25	30±5°
Ø20-Ø40	0.75±0.3	20±5°	0.5±0.25	30±5°
Ø45 & UP	1.0±0.4	20±5°	0.5±0.25	30±5°

DIMENSIONS FOR STD INCH BUSHING (IN INCHES)

BUSH ID	DIM A	DIM B	DIM B C	DIM D
Ø1/8 Ø11/16	.016±.008	20±5°	.020±.010	30±5°
Ø3/4 & UP	.030±.008	20±5°	.020±.010	30±5°

DRAWING 1. CONFIGURATION OF STANDARD PEER FB/FR BUSHINGS



DRAWING 2. ARBOR DIAMETER AND HOUSING TOLERANCE WHEN PRESS-FITTING THE PEER FB/FR BUSHING



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