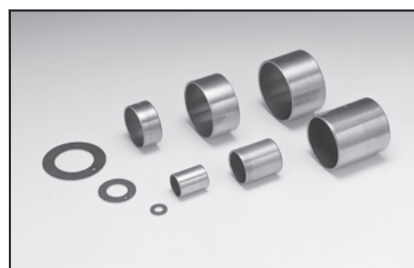


Multi-layer Bearings

Oiles Drymet ST	P.141
Oiles Drymet LF	P.151
Oiles LF Guides	P.164
Oiles Techmet B	P.166
Oiles Techmet E	P.169
Oiles Toughmet	P.170
Oiles Toughmet D	P.173
Oiles Hiplast N/E	P.179

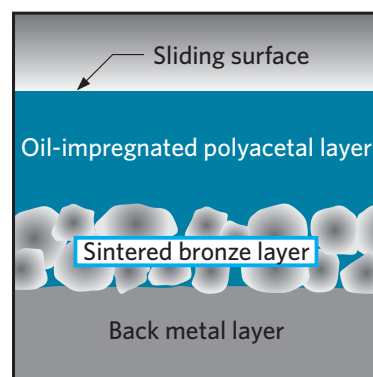


Oiles Drymet ST Oil-impregnated polyacetal multi-layer bearings with back metals



Feature

- Serviceable without the need for lubrication and demonstrates low coefficient of friction and superior load performance.
- Demonstrates superior wear resistance in applications where oil film is seldom produced such as reciprocating motions, oscillation, frequent starts and stops, etc.
- Thin bearing allows compact design.
- Superior dimensional stability, mechanical strength, and thermal conductivity.
- The standard products and plate material of various sizes are available.



Image

Service range

Lubrication condition	Dry
Service temperature range °C	−40~+120
Allowable max. pressure P N/mm ² [kgf/cm ²]	24.5 (137) {250 (1,400)}
Allowable max. velocity V m/s [m/min]	1.15 {69}
Allowable max. PV value N/mm ² · m/s [kgf/cm ² · m/min]	3.25 {1,990}

The values in parentheses are static bearing pressures, which are the bearing pressures in applications with no motion or very small motion (≤ 0.0017 m/s [0.1 m/min]).

Mechanical properties

Tensile strength	JIS Z 2241	N/mm ² [kgf/cm ²]	380 {3,875}
Elongation	JIS Z 2241	%	27
Hardness	JIS Z 2244	HV	107

※The values shown above are typical values, not the standard values.

※The values shown above are values of back metal.

Lathe turning

	carbide tool (JIS)	
	Cutting tool	
Condition	Relief angle	5~10°
	Rake angle	10~20°
	Nose radius (mm)	0.10~0.20
	Speed (m/min)	60~200
Condition	Cut depth (mm)	0.05~0.10
	Feed (mm/rev)	0.05~0.20

Attention should be paid to dimensional variances due to thermal expansion, chucking, and bend of the material.

Machining accuracy (bushing)

I.D.	O.D.	Length
class 7 (Note)	—	class 8 to 9

(Note) Accuracy after press fitting.

Classes here are in JIS standard.

This product demonstrates satisfactory performance at the slide surface roughness of Rz6.3 to 12.5 μ m.

Dimensions may change due to thermal expansion, chucking pressure, moisture absorption deformation, etc. High accuracy is ensured if the product is installed on the housing and then ground.

Test data

Journal rotation test

<Testing conditions>

Bearing dimension : $\phi 40 \times \phi 44 \times l 30$

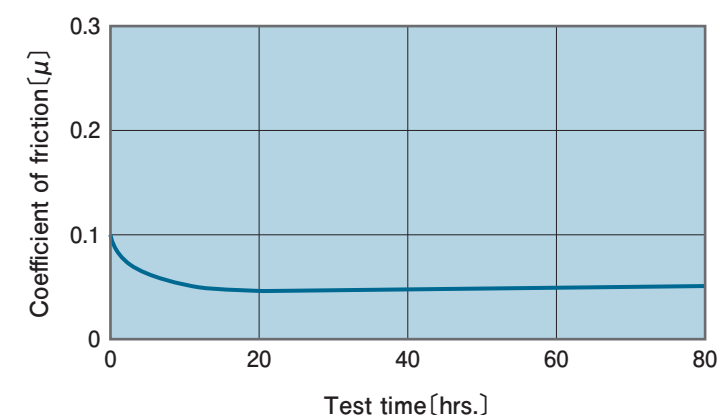
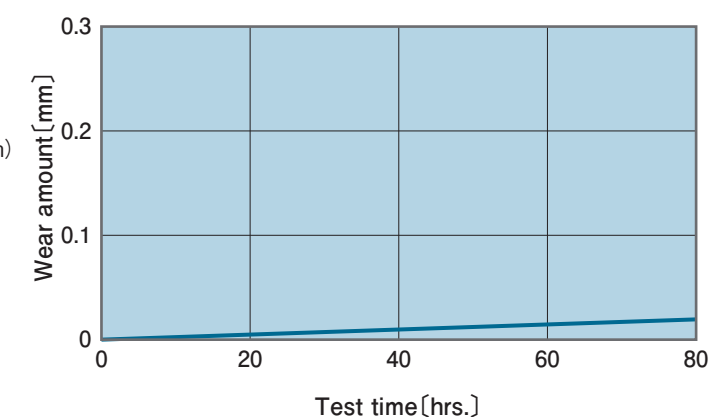
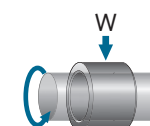
Mating material : S45C (surface roughness Rz0.6 μ m)

Pressure : 10.3N/mm² {105.0kgf/cm²}

Velocity : 0.922m/s {55.3m/min}

Test time : 80hrs.

Lubrication : grease is applied at assembly



Journal oscillation test

<Testing conditions>

Bearing dimension :

$\phi 40 \times \phi 44 \times l 30$ (Oiles Drymet ST)

$\phi 40 \times \phi 50 \times l 30$ (Oil impregnated sintered bronze bearing)

Mating material : S45C (surface roughness Rz1.5 μ m)

Pressure : 19.6N/mm² {200.0kgf/cm²}

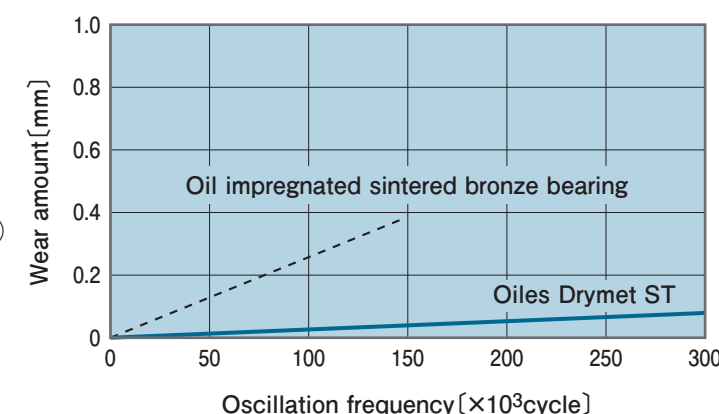
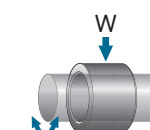
Velocity : 0.023m/s {1.40m/min}

Oscillating cycle : 100cpm

Oscillating angle : 20°

Oscillating frequency : 300,000cycle

Lubrication : grease is applied at assembly



Press-fitting (Rolled bushing)

Press-fitting jig

Generally, as shown in the figure 1, a mandrel is used for the press-fitting. However use of a guide ring facilitates easier press-fitting. Use of a guide ring prevents damage of a bushing at the time of press-fitting. The dimension of a guide ring should be calculated from the table below.

Inner diameter of the guide ring should be the size so that the bushing can be inserted by hands. Length of the guide ring should be more than one-third of the bushing, or if possible, it should be the same length as the bushing.

The dimension of mandrel should be calculated from table below.

Dimension of bushing	Dimension of mandrel
I.D. D ₀	d ₀ =D ₀ -(0.05 to 0.10)
O.D. D ₁	d ₁ =D ₁ -(0.20 to 0.30)
Length L	ℓ ≥ L

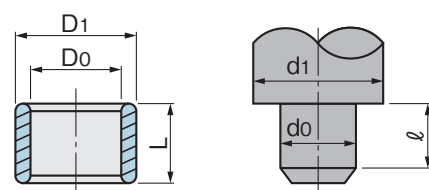


Figure 2

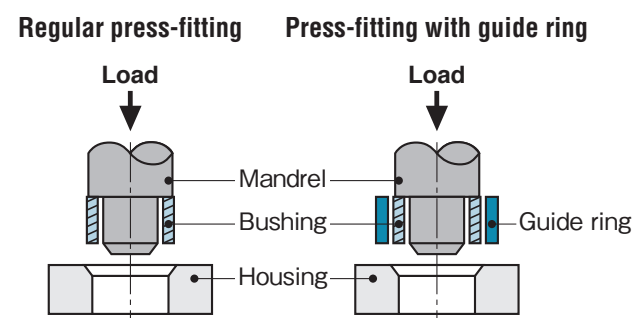


Figure 1

The dimension of guide ring should be calculated from table below.

Dimension of bushing	Guide ring I.D.	Guide ring O.D.
Up to φ40	D ₁ +(0.1 to 0.3)	
φ42 to φ60	D ₁ +(0.2 to 0.5)	D ₁ +(10 to 15)
Over φ65	D ₁ +(0.5 to 1.0)	

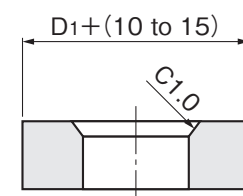


Figure 3

Inner diameter of the guide ring should be the size that bushing can be inserted by hands. The length of the guide ring should be more than one-third of the bushing, or if possible, it should be the same length as the bushing.

Housing chamfer

For the housing chamfer, either a round chamfer or a tapered chamfer is recommended. In case of a C-surface chamfer, (more than C1.0) make sure there is no burr. Smoother press-fitting is possible by applying small amount of grease or lubricant.

Press-fit force

Press-fit smoothly with hydraulic (pressure), pneumatic pressure, or a vice. Avoid press-fit by use of impact such as use of a hammer. It might induce damage of the bushing, or change the size of the inner diameter after press-fit.

Press-fit force is obtained by below formula.

$$F = (0.9 \text{ to } 1.2) \times 10^4 \cdot \frac{t \cdot L \cdot S}{D_1} \text{ [kg]}$$

t : thickness of the steel backing
L : length of the bushing
S : average interference
D₁ : O.D. of bushing

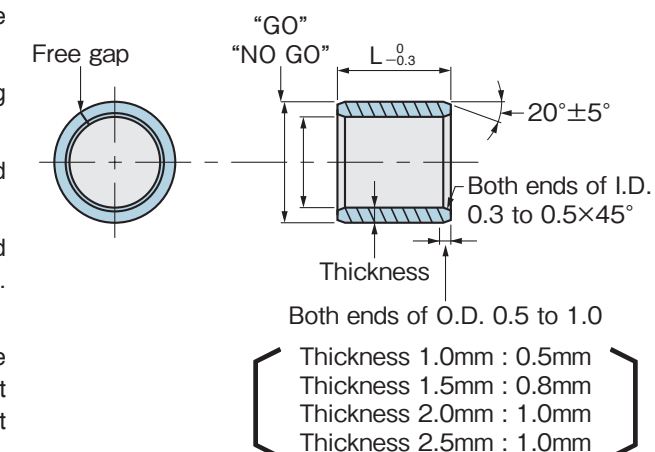
I.D. of bushing	t
Up to φ18	0.5
φ19 to φ25	0.95
φ26 to φ40	1.38
φ42 and over φ42	1.88

Unit : mm

Dimensional inspection and chamfering of Oiles Drymet ST

Oiles Drymet ST is dimensionally inspected before shipping as indicated below:

1. The O.D. is checked by "GO" and "NO GO" ring gauges.
2. The I.D. mounted in the "GO" ring gauge is checked by plug gauges.
3. The "GO" ring gauge stands for the upper limit and the "NO GO" ring gauge the lower limit of the O.D. tolerance.
4. Chamfering: Both ends of the I.D. and O.D. are chamfered as shown in the right diagram except those with the ID of 9mm or less which are not chamfered.

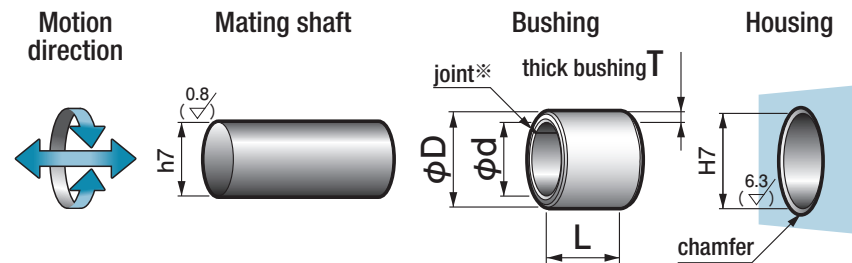


70B Oiles Drymet ST Bushings (I.D. $\phi 5 \sim \phi 30$)

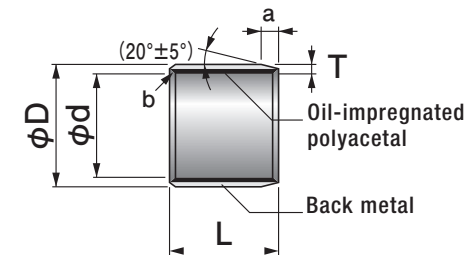


Specify Part No. by required I.D. and length.
(e.g.) I.D. is 15mm and length is 10mm.

70B - 1510
Part No.



※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.



a: O.D. chamfering for the bushing I.D. of $\phi 10$ or more

T	1.0	1.5	2.0
a	0.5	0.8	1.0

(mm)

b: I.D. chamfering for the bushing I.D. of $\phi 10$ or more

T	1.0	1.5	2.0
b	C0.3	C0.5	C0.5

(mm)

※Chamfering of inner or outer diameters less than $\phi 10$ mm is done only to remove burrs.

Shaft		Housing		I.D.		O.D.		Wall thickness		Length L Tolerance -0.3					
Size	h7 Tolerance	Size	H7 Tolerance	ϕd	ϕD	Tolerance	T	Tolerance		4	5	6	7	8	10
5	$0 \begin{smallmatrix} -0.012 \end{smallmatrix}$	7	$+0.015 \begin{smallmatrix} 0 \end{smallmatrix}$	5	7	$+0.055 \begin{smallmatrix} +0.025 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$		0504	0505	0506		0508	
6	$0 \begin{smallmatrix} -0.012 \end{smallmatrix}$	8	$+0.015 \begin{smallmatrix} 0 \end{smallmatrix}$	6	8	$+0.055 \begin{smallmatrix} +0.025 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$			0605	0606	0607	0608	0610
7	$0 \begin{smallmatrix} -0.015 \end{smallmatrix}$	9	$+0.015 \begin{smallmatrix} 0 \end{smallmatrix}$	7	9	$+0.055 \begin{smallmatrix} +0.025 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$			0705		0707		0710
8	$0 \begin{smallmatrix} -0.015 \end{smallmatrix}$	10	$+0.015 \begin{smallmatrix} 0 \end{smallmatrix}$	8	10	$+0.055 \begin{smallmatrix} +0.025 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$				0806		0808	0810
9	$0 \begin{smallmatrix} -0.015 \end{smallmatrix}$	11	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	9	11	$+0.060 \begin{smallmatrix} +0.030 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$							0910
10	$0 \begin{smallmatrix} -0.015 \end{smallmatrix}$	12	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	10	12	$+0.060 \begin{smallmatrix} +0.030 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$				1006	1007	1008	1010
12	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	14	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	12	14	$+0.060 \begin{smallmatrix} +0.030 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$				1206		1208	1210
13	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	15	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	13	15	$+0.060 \begin{smallmatrix} +0.030 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$							
14	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	16	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	14	16	$+0.065 \begin{smallmatrix} +0.035 \end{smallmatrix}$	1.0	$-0.030 \begin{smallmatrix} -0.075 \end{smallmatrix}$							1410
15	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	17	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	15	17	$+0.065 \begin{smallmatrix} +0.035 \end{smallmatrix}$	1.0	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							1510
16	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	18	$+0.018 \begin{smallmatrix} 0 \end{smallmatrix}$	16	18	$+0.070 \begin{smallmatrix} +0.035 \end{smallmatrix}$	1.0	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							1610
17	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	19	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	17	19	$+0.070 \begin{smallmatrix} +0.035 \end{smallmatrix}$	1.0	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							
18	$0 \begin{smallmatrix} -0.018 \end{smallmatrix}$	20	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	18	20	$+0.075 \begin{smallmatrix} +0.040 \end{smallmatrix}$	1.0	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							1810
19	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	22	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	19	22	$+0.075 \begin{smallmatrix} +0.040 \end{smallmatrix}$	1.5	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							
20	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	23	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	20	23	$+0.080 \begin{smallmatrix} +0.045 \end{smallmatrix}$	1.5	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							2010
22	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	25	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	22	25	$+0.080 \begin{smallmatrix} +0.045 \end{smallmatrix}$	1.5	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							2210
24	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	27	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	24	27	$+0.080 \begin{smallmatrix} +0.045 \end{smallmatrix}$	1.5	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							
25	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	28	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	25	28	$+0.085 \begin{smallmatrix} +0.050 \end{smallmatrix}$	1.5	$-0.035 \begin{smallmatrix} -0.085 \end{smallmatrix}$							2510
26	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	30	$+0.021 \begin{smallmatrix} 0 \end{smallmatrix}$	26	30	$+0.080 \begin{smallmatrix} +0.050 \end{smallmatrix}$	2.0	$-0.035 \begin{smallmatrix} -0.090 \end{smallmatrix}$							
28	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	32	$+0.025 \begin{smallmatrix} 0 \end{smallmatrix}$	28	32	$+0.090 \begin{smallmatrix} +0.050 \end{smallmatrix}$	2.0	$-0.035 \begin{smallmatrix} -0.090 \end{smallmatrix}$							
30	$0 \begin{smallmatrix} -0.021 \end{smallmatrix}$	34	$+0.025 \begin{smallmatrix} 0 \end{smallmatrix}$	30	34	$+0.090 \begin{smallmatrix} +0.050 \end{smallmatrix}$	2.0	$-0.035 \begin{smallmatrix} -0.090 \end{smallmatrix}$							

※Outer diameter is measured by exclusive gauge.

※The I.D. tolerance after press fitting is for reference only.

※I.D. $\phi 31 \sim \phi 160$ are shown on pages 147 to 148.

Length L Tolerance -0.3							I.D. tolerance after press fitting (reference)	I.D. ϕd
12	15	20	25	30	35	40		
							$+0.165 \begin{smallmatrix} +0.060 \end{smallmatrix}$	5
							$+0.165 \begin{smallmatrix} +0.060 \end{smallmatrix}$	6
0712							$+0.165 \begin{smallmatrix} +0.060 \end{smallmatrix}$	7
0812							$+0.165 \begin{smallmatrix} +0.060 \end{smallmatrix}$	8
							$+0.168 \begin{smallmatrix} +0.060 \end{smallmatrix}$	9
1012	1015	1020					$+0.168 \begin{smallmatrix} +0.060 \end{smallmatrix}$	10
1212	1215	1220					$+0.168 \begin{smallmatrix} +0.060 \end{smallmatrix}$	12
	1315						$+0.168 \begin{smallmatrix} +0.060 \end{smallmatrix}$	13
1412	1415	1420					$+0.168 \begin{smallmatrix} +0.060 \end{smallmatrix}$	14
1512	1515	1520	1525				$+0.188 \begin{smallmatrix} +0.070 \end{smallmatrix}$	15
1612	1615	1620	1625				$+0.188 \begin{smallmatrix} +0.070 \end{smallmatrix}$	16
	1715	1720					$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	17
1812	1815	1820	1825				$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	18
	1915						$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	19
2012	2015	2020	2025	2030			$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	20
2212	2215	2220	2225	2230			$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	22
	2415	2420	2425	2430			$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	24
2512	2515	2520	2525	2530	2535		$+0.191 \begin{smallmatrix} +0.070 \end{smallmatrix}$	25
	2615	2620		2630			$+0.201 \begin{smallmatrix} +0.070 \end{smallmatrix}$	26
2812	2815	2820	2825	2830		2840	$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	28
3012	3015	3020	3025	3030		3040	$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	30

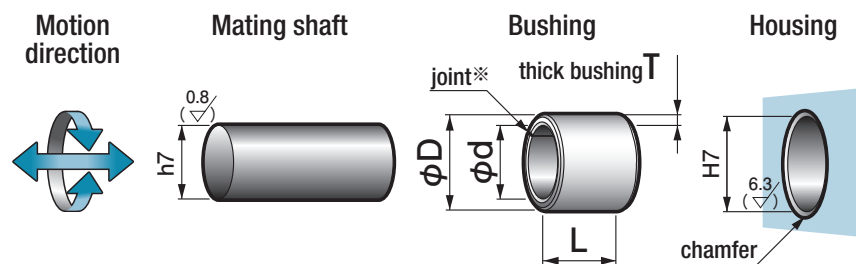
70B Oiles Drymet ST Bushings (I.D. $\phi 31 \sim \phi 160$)



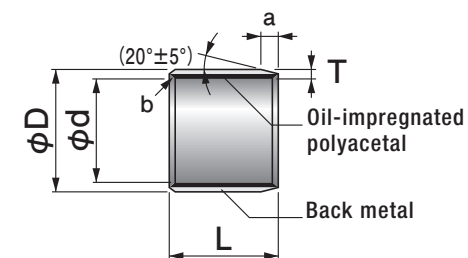
Specify Part No. by required I.D. and length.
(e.g.) I.D. is 60mm and length is 50mm.

70B - 6050

Part No.



※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.



a: Chamfering for O.D.

T	2.0	2.5
a	1.0	1.0

(mm)

b: Chamfering for I.D.

T	2.0	2.5
b	C0.5	C0.5

(mm)

Shaft		Housing		I.D.		O.D.		Wall thickness		Length L Tolerance -0.3						
Size	h7 Tolerance	Size	H7 Tolerance	φd	φD	Tolerance	T	Tolerance	12	15	20	25	30	40	50	
31	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	35	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	31	35	$\begin{smallmatrix} +0.090 \\ +0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.035 \\ -0.090 \end{smallmatrix}$				3125		3140		
32	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	36	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	32	36	$\begin{smallmatrix} +0.090 \\ +0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.035 \\ -0.090 \end{smallmatrix}$			3220	3225	3230	3240		
35	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	39	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	35	39	$\begin{smallmatrix} +0.095 \\ +0.055 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.035 \\ -0.090 \end{smallmatrix}$	3512	3515	3520	3525	3530	3540	3550	
38	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	42	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	38	42	$\begin{smallmatrix} +0.095 \\ +0.055 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.035 \\ -0.090 \end{smallmatrix}$			3820		3830	3840	3850	
40	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	44	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	40	44	$\begin{smallmatrix} +0.095 \\ +0.055 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.035 \\ -0.090 \end{smallmatrix}$	4012		4020	4025	4030	4040	4050	
42	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	47	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	42	47	$\begin{smallmatrix} +0.095 \\ +0.055 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.040 \\ -0.105 \end{smallmatrix}$						4240	4250	
45	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	50	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	45	50	$\begin{smallmatrix} +0.100 \\ +0.060 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.040 \\ -0.105 \end{smallmatrix}$			4520	4525	4530	4540	4550	
50	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	55	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	50	55	$\begin{smallmatrix} +0.105 \\ +0.060 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.040 \\ -0.105 \end{smallmatrix}$			5020		5030	5040		
55	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	60	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	55	60	$\begin{smallmatrix} +0.110 \\ +0.065 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.040 \\ -0.105 \end{smallmatrix}$					5530	5540		
60	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	65	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	60	65	$\begin{smallmatrix} +0.120 \\ +0.070 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.040 \\ -0.105 \end{smallmatrix}$					6030	6040	6050	
65	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	70	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	65	70	$\begin{smallmatrix} +0.125 \\ +0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.045 \\ -0.095 \end{smallmatrix}$					6530	6540		
70	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	75	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	70	75	$\begin{smallmatrix} +0.125 \\ +0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.045 \\ -0.095 \end{smallmatrix}$						7040		
75	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	80	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	75	80	$\begin{smallmatrix} +0.130 \\ +0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.045 \\ -0.095 \end{smallmatrix}$					7530	7540		
80	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	85	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	80	85	$\begin{smallmatrix} +0.130 \\ +0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.045 \\ -0.095 \end{smallmatrix}$						8040		
85	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	90	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	85	90	$\begin{smallmatrix} +0.130 \\ +0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.045 \\ -0.095 \end{smallmatrix}$						8540		
90	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	95	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	90	95	$\begin{smallmatrix} +0.130 \\ +0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.045 \\ -0.095 \end{smallmatrix}$						9040		
100	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	105	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	100	105	$\begin{smallmatrix} +0.140 \\ +0.080 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							10050	
110	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	115	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	110	115	$\begin{smallmatrix} +0.140 \\ +0.080 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							11050	
120	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	125	$\begin{smallmatrix} +0.040 \\ 0 \end{smallmatrix}$	120	125	$\begin{smallmatrix} +0.145 \\ +0.090 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							12050	
130	$\begin{smallmatrix} 0 \\ -0.040 \end{smallmatrix}$	135	$\begin{smallmatrix} +0.040 \\ 0 \end{smallmatrix}$	130	135	$\begin{smallmatrix} +0.145 \\ +0.090 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							13050	
140	$\begin{smallmatrix} 0 \\ -0.040 \end{smallmatrix}$	145	$\begin{smallmatrix} +0.040 \\ 0 \end{smallmatrix}$	140	145	$\begin{smallmatrix} +0.165 \\ +0.100 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							14050	
150	$\begin{smallmatrix} 0 \\ -0.040 \end{smallmatrix}$	155	$\begin{smallmatrix} +0.040 \\ 0 \end{smallmatrix}$	150	155	$\begin{smallmatrix} +0.185 \\ +0.120 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							15050	
160	$\begin{smallmatrix} 0 \\ -0.040 \end{smallmatrix}$	165	$\begin{smallmatrix} +0.040 \\ 0 \end{smallmatrix}$	160	165	$\begin{smallmatrix} +0.185 \\ +0.120 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.060 \\ -0.110 \end{smallmatrix}$							16050	

※Outer diameter is measured by exclusive gauge.

※The I.D. tolerance after press fitting is for reference only.

※I.D. $\phi 5 \sim \phi 30$ are shown on pages 145 to 146.

Length L Tolerance -0.3										I.D. tolerance after press fitting (reference)	I.D. ϕd
55	60	65	70	80	90	95	100	125			
										$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	31
										$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	32
										$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	35
										$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	38
										$+0.205 \begin{smallmatrix} +0.070 \end{smallmatrix}$	40
										$+0.235 \begin{smallmatrix} +0.080 \end{smallmatrix}$	42
										$+0.235 \begin{smallmatrix} +0.080 \end{smallmatrix}$	45
5055	5060	5065								$+0.240 \begin{smallmatrix} +0.080 \end{smallmatrix}$	50
	5560		5570							$+0.240 \begin{smallmatrix} +0.080 \end{smallmatrix}$	55
	6060			6080						$+0.240 \begin{smallmatrix} +0.080 \end{smallmatrix}$	60
	6560									$+0.220 \begin{smallmatrix} +0.090 \end{smallmatrix}$	65
	7060			7080						$+0.220 \begin{smallmatrix} +0.090 \end{smallmatrix}$	70
	7560			7580						$+0.220 \begin{smallmatrix} +0.090 \end{smallmatrix}$	75
	8060			8080						$+0.225 \begin{smallmatrix} +0.090 \end{smallmatrix}$	80
	8560			8580						$+0.225 \begin{smallmatrix} +0.090 \end{smallmatrix}$	85
	9060				9090					$+0.225 \begin{smallmatrix} +0.090 \end{smallmatrix}$	90
			10070			10095				$+0.255 \begin{smallmatrix} +0.120 \end{smallmatrix}$	100
			11070			11095				$+0.255 \begin{smallmatrix} +0.120 \end{smallmatrix}$	110
			12070			12095				$+0.260 \begin{smallmatrix} +0.120 \end{smallmatrix}$	120
				13080				130125		$+0.260 \begin{smallmatrix} +0.120 \end{smallmatrix}$	130
				14080			140100	140125		$+0.260 \begin{smallmatrix} +0.120 \end{smallmatrix}$	140
				15080			150100	150125		$+0.260 \begin{smallmatrix} +0.120 \end{smallmatrix}$	150
				16080			160100	160125		$+0.260 \begin{smallmatrix} +0.120 \end{smallmatrix}$	160

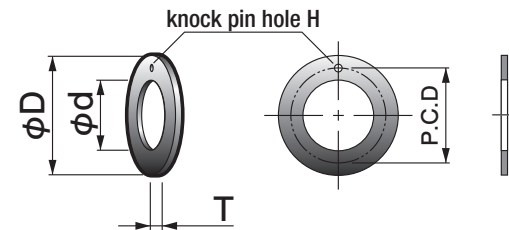
70W

Oiles Drymet ST Washers



Specify Part No. by required I.D. and thickness.
(e.g.) I.D. is 28mm and thickness is 1.5mm.

70W - 2815
Part No.

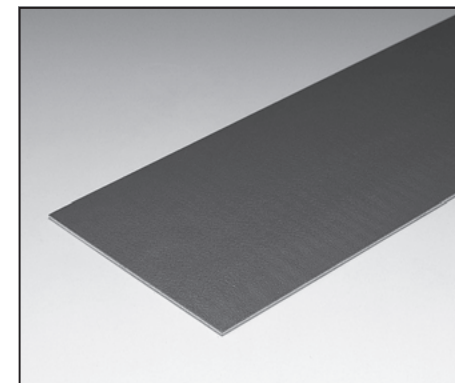


● Sliding surface consists of a plastic layer.

Part No.	I.D.		O.D.		Thickness		Knock pin hole		Position of knock pin	
	φd	Tolerance	φD	Tolerance	T	Tolerance	H	Tolerance	P.C.D.	Tolerance
70W-0815	8	+0.4 +0.1	16	0 -0.3	1.5	-0.015 -0.115	1.5	+0.25 0	12	+0.1 -0.1
70W-1000	10	+0.4 +0.1	18	0 -0.3	1.5	-0.015 -0.115	1.5	+0.25 0	14	+0.1 -0.1
70W-1015	10	+0.4 +0.1	20	0 -0.3	1.5	-0.015 -0.115	1.5	+0.25 0	15	+0.1 -0.1
70W-1215	12	+0.4 +0.1	24	0 -0.3	1.5	-0.015 -0.115	1.5	+0.25 0	18	+0.1 -0.1
70W-1415	14	+0.4 +0.1	26	0 -0.3	1.5	-0.015 -0.115	2.0	+0.25 0	20	+0.1 -0.1
70W-1615	16	+0.4 +0.1	30	0 -0.3	1.5	-0.015 -0.115	2.0	+0.25 0	23	+0.1 -0.1
70W-1715	17	+0.4 +0.1	30	0 -0.3	1.5	-0.015 -0.115	2.0	+0.25 0	23.5	+0.1 -0.1
70W-1815	18	+0.4 +0.1	32	0 -0.3	1.5	-0.015 -0.115	2.0	+0.25 0	25	+0.1 -0.1
70W-2015	20	+0.4 +0.1	36	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	28	+0.1 -0.1
70W-2215	22	+0.4 +0.1	38	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	30	+0.1 -0.1
70W-2315	23	+0.4 +0.1	40	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	31.5	+0.1 -0.1
70W-2415	24	+0.4 +0.1	42	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	33	+0.1 -0.1
70W-2615	26	+0.4 +0.1	44	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	35	+0.1 -0.1
70W-2815	28	+0.4 +0.1	48	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	38	+0.1 -0.1
70W-3215	32	+0.4 +0.1	54	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	43	+0.1 -0.1
70W-3415	34	+0.4 +0.1	58	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	46	+0.1 -0.1
70W-3615	36	+0.4 +0.1	60	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	48	+0.1 -0.1
70W-3815	38	+0.4 +0.1	62	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	50	+0.1 -0.1
70W-3915	39	+0.4 +0.1	66	0 -0.3	1.5	-0.015 -0.115	3.0	+0.25 0	52.5	+0.1 -0.1
70W-4215	42	+0.4 +0.1	66	0 -0.3	1.5	-0.015 -0.115	4.0	+0.25 0	54	+0.1 -0.1
70W-4420	44	+0.4 +0.1	74	0 -0.3	2.0	-0.015 -0.115	4.0	+0.25 0	59	+0.1 -0.1
70W-4720	47	+0.4 +0.1	78	0 -0.3	2.0	-0.015 -0.115	4.0	+0.25 0	62.5	+0.1 -0.1
70W-4820	48	+0.4 +0.1	74	0 -0.3	2.0	-0.015 -0.115	4.0	+0.25 0	61	+0.1 -0.1
70W-5020	50	+0.4 +0.1	84	0 -0.3	2.0	-0.015 -0.115	4.0	+0.25 0	67	+0.1 -0.1
70W-5220	52	+0.4 +0.1	78	0 -0.3	2.0	-0.015 -0.115	5.0	+0.25 0	65	+0.1 -0.1
70W-5525	55	+0.4 +0.1	92	0 -0.3	2.5	-0.015 -0.115	5.0	+0.25 0	73.5	+0.1 -0.1
70W-6025	60	+0.4 +0.1	100	0 -0.3	2.5	-0.015 -0.115	5.0	+0.25 0	80	+0.1 -0.1
70W-6525	65	+0.4 +0.1	108	0 -0.3	2.5	-0.015 -0.115	5.0	+0.25 0	86.5	+0.1 -0.1

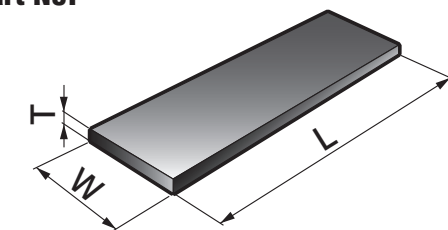
70P

Oiles Drymet ST Plates



Specify Part No. by required size.
(e.g.) Thickness is 1.5mm and length is 470mm.

70P - 1564
Part No.



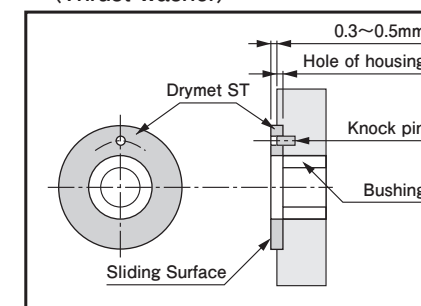
● Sliding surface consists of a plastic layer.

Part No.	Thickness		Width	Length
	T	Tolerance	W	L
70P-1064	1.0	-0.015 -0.115	120	470
70P-1067	1.0	-0.015 -0.115	120	720
70P-1564	1.5	-0.015 -0.115	120	470
70P-1567	1.5	-0.015 -0.115	120	720

Part No.	Thickness		Width	Length
	T	Tolerance	W	L
70P-2064	2.0	-0.015 -0.115	120	470
70P-2067	2.0	-0.015 -0.115	120	720
70P-2564	2.5	-0.015 -0.115	120	470
70P-2567	2.5	-0.015 -0.115	120	720

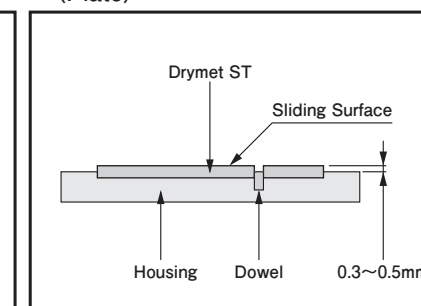
How to attach washers, plates

① Knock pin method (Thrust washer)



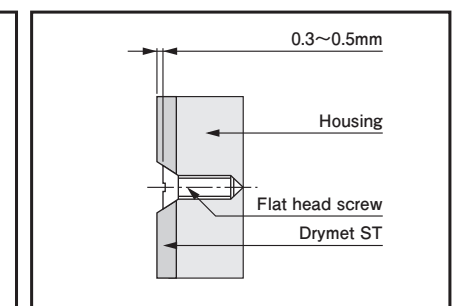
※Sliding surface consists of a plastic layer.

② Inlay method (Plate)



※Sliding surface consists of a plastic layer.

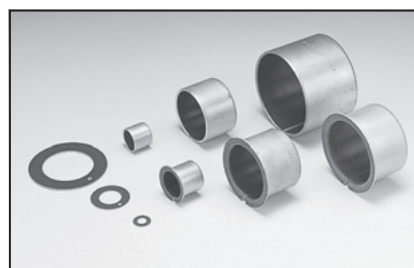
③ Flat head screw method



④ Using glue

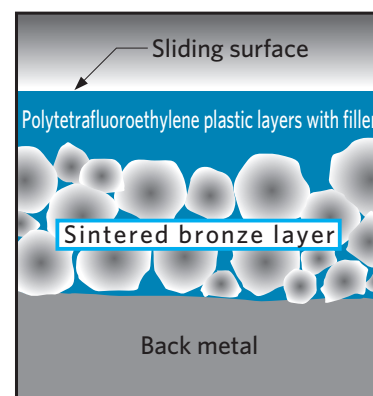
In the case of (2), the washer and plate may be inserted with glue, not a knock pin. Synthetic epoxy plastic glue is suitable, though no glue is specified, in particular. Be careful because fitting with glue only may result in separation in some cases.

Oiles Drymet LF Polytetrafluoroethylene plastic multi-layer bearings with back metals



Feature

- Serviceable without the need for lubrication. Thin and lightweight for compact design.
- Demonstrate low coefficient of friction and superior load performances in high-load, low-speed conditions.
- Usable at the high PV values even in the middle- and high-speed zones when lubricated.
- Usable in wide temperature ranges from low to high temperatures. Has superior chemical resistance.
- Features superior dimensional stability, mechanical strength, and thermal conductivity.
- The standard products and plate materials are available in various sizes.



image

Service range

Lubrication condition	Dry
Service temperature range °C	−200~+280
Allowable max. pressure P N/mm ² {kgf/cm ² }	49.0 (137) {500 (1,400)}
Allowable max. velocity V m/s {m/min}	0.65 {39}
Allowable max. PV value N/mm ² · m/s {kgf/cm ² · m/min}	3.60 {2,200}

The values in parentheses are static bearing pressures, which are the bearing pressures in applications with no motion or very small motion (≤ 0.0017 m/s {0.1 m/min}).

※ Allowable max. pressure of LFCF is 24.5 N/mm² {250 Kgf/cm²}.

Mechanical properties

Tensile strength	JIS Z 2241	N/mm ² {kgf/cm ² }	380 {3,875}
Elongation	JIS Z 2241	%	27
Hardness	JIS Z 2244	HV	107

※ The values shown above are typical values, not the standard values.

※ The values shown above are values of back metal.

Test data

Journal rotation test

<Testing conditions>

Bearing dimension : $\phi 40 \times \phi 44 \times \text{L} 30$

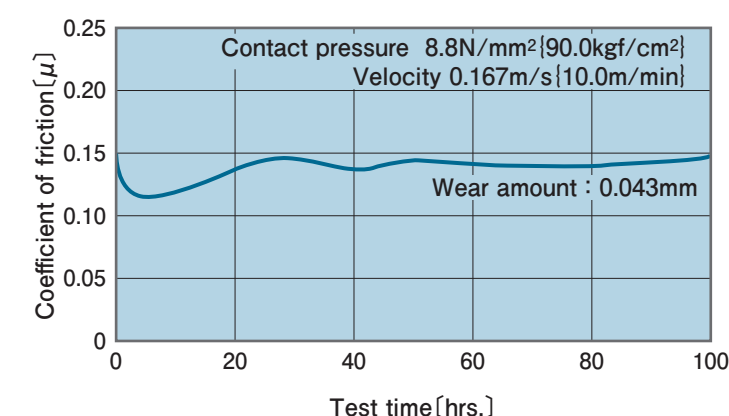
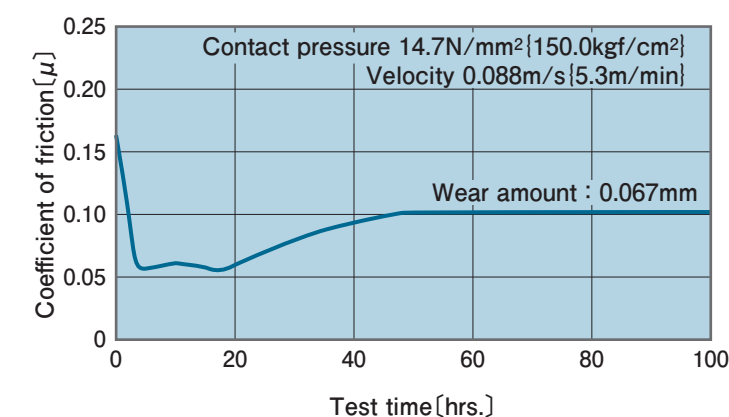
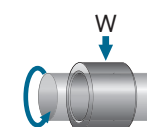
Mating material : S45C

Pressure : 14.7, 8.8, N/mm²
{150.0, 90.0 kgf/cm²}

Velocity : 0.088, 0.167 m/s
{5.3, 10.0 m/min}

Test time : 100 hrs.

Lubrication : dry



Press-fitting (Rolled bushing)

Press-fitting jig

Generally, as shown in the figure 1, a mandrel is used for the press-fitting. However use of a guide ring facilitates easier press-fitting. Use of a guide ring prevents damage of a bushing at the time of press-fitting. The dimension of a guide ring should be calculated from the table below.

Inner diameter of the guide ring should be the size so that the bushing can be inserted by hands. Length of the guide ring should be more than one-third of the bushing, or if possible, it should be the same length as the bushing.

The dimension of mandrel should be calculated from table below.

Dimension of bushing	Dimension of mandrel
I.D. D ₀	*1 d ₀ =D ₀ -(0.05 to 0.10)
O.D. D ₁	*2 d ₁ =D ₁ -(0.20 to 0.30)
Length L	ℓ ≥ L

*1 Techmet B Standard Type (TCB) should be D₀-(0.25 to 0.30).
*2 Use of flange bushings should be the same size of flange.

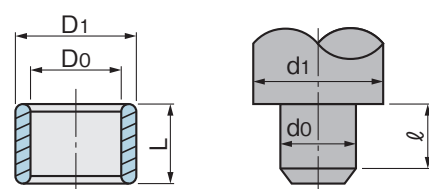


Figure 2

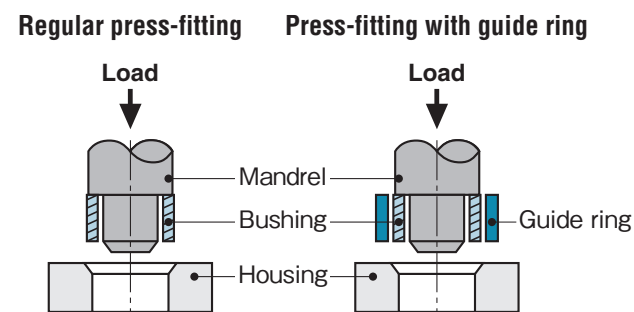


Figure 1

The dimension of guide ring should be calculated from table below.

Dimension of bushing	Guide ring I.D.	Guide ring O.D.
Up to φ40	D ₁ +(0.1 to 0.3)	
φ42 to φ60	D ₁ +(0.2 to 0.5)	D ₁ +(10 to 15)
Over φ65	D ₁ +(0.5 to 1.0)	

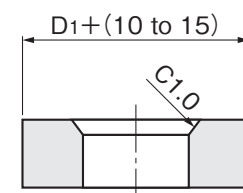


Figure 3

Inner diameter of the guide ring should be the size that bushing can be inserted by hands. The length of the guide ring should be more than one-third of the bushing, or if possible, it should be the same length as the bushing.

Housing chamfer

For the housing chamfer, either a round chamfer or a tapered chamfer is recommended. In case of a C-surface chamfer, (more than C1.0) make sure there is no burr. Smoother press-fitting is possible by applying small amount of grease or lubricant.

Press-fit force

Press-fit smoothly with hydraulic (pressure), pneumatic pressure, or a vice.

Avoid press-fit by use of impact such as use of a hammer.

It might induce damage of the bushing, or change the size of the inner diameter after press-fit.

Press-fit force is obtained by below formula.

$$F = (0.9 \text{ to } 1.2) \times 10^4 \cdot \frac{t \cdot L \cdot S}{D_1} \text{ [kg]}$$

t : thickness of the steel backing
L : length of the bushing
S : average interference
D₁ : O.D. of bushing

● Thickness of the steel backing

Drymet LF	Unit : mm
I.D. of bushing	t
Up to φ18	0.65
φ19 to φ25	1.15
φ26 to φ40	1.65
φ42 and over	2.15
LFCF	0.25

※ LFCF is obtained by below formula.

$$F = (0.4 \text{ to } 0.8) \times 10^4 \cdot \frac{t \cdot L \cdot S}{D_1} \text{ [kg]}$$

Techmet B	Unit : mm
I.D. of bushing	t
Up to φ18	0.50
φ20 to φ22	0.95

Toughmet / Toughmet D	Unit : mm
I.D. of bushing	t
Up to φ18	0.70
φ19 to φ25	1.10
φ26 to φ40	1.60
φ42 and over	2.10

Techmet E	Unit : mm
thickness of bearing	t
0.5	0.25
1.0	0.65

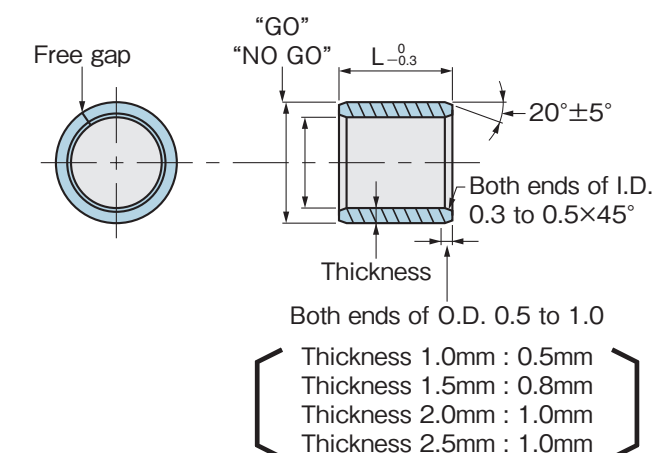
※ Techmet E (t0.5) is obtained by below formula.

$$F = (0.4 \text{ to } 0.8) \times 10^4 \cdot \frac{t \cdot L \cdot S}{D_1} \text{ [kg]}$$

Dimensional inspection and chamfering on Oiles Drymet LF

Oiles Drymet LF is dimensionally inspected before shipping as indicated below:

1. The O.D. is checked by "GO" and "NO GO" ring gauges.
2. The I.D. mounted in the "GO" ring gauge is checked by plug gauges.
3. The "GO" ring gauge stands for the upper limit and the "NO GO" ring gauge the lower limit of the O.D. tolerance.
4. Chamfering: Both ends of the I.D. and O.D. are chamfered as shown in the right diagram except those with the ID of 9mm or less which are not chamfered.



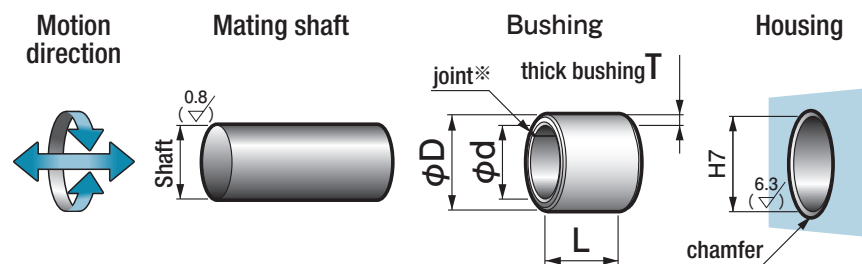
LFB Oiles Drymet LF Bushings (I.D. $\phi 3 \sim \phi 28$)



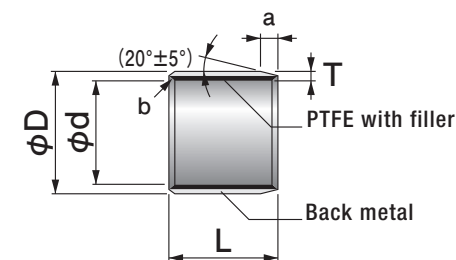
Specify Part No. by required I.D. and length.
(e.g.) I.D. is 15mm and length is 8mm.

LFB - 1508

Part No.



※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.



a: O.D. chamfering for the bushing I.D. of $\phi 10$ or more

T	1.0	1.5	2.0
a	0.5	0.8	1.0

b: I.D. chamfering for the bushing I.D. of $\phi 10$ or more

T	1.0	1.5	2.0
b	C0.3	C0.5	C0.5

※Chamfering of inner or outer diameters less than $\phi 10$ mm is done only to remove burrs.

Shaft		Housing		I.D.		O.D.		Wall thickness		Length L Tolerance -0.3					
Size	Tolerance	Size	H7 Tolerance	ϕd	ϕD	Tolerance	T	Tolerance		3	4	5	6	7	8
3	-0.025 -0.034	5	$+0.012$ 0	3	5	$+0.047$ $+0.017$	1.0	0 -0.025		0303	0304	0305	0306		
4	-0.025 -0.037	6	$+0.012$ 0	4	6	$+0.047$ $+0.017$	1.0	0 -0.025		0403	0404	0405	0406		0408
5	-0.025 -0.037	7	$+0.015$ 0	5	7	$+0.055$ $+0.025$	1.0	0 -0.025		0503	0504	0505	0506		0508
6	-0.025 -0.037	8	$+0.015$ 0	6	8	$+0.055$ $+0.025$	1.0	0 -0.025		0603	0604	0605	0606	0607	0608
7	-0.025 -0.040	9	$+0.015$ 0	7	9	$+0.055$ $+0.025$	1.0	0 -0.025				0705	0706	0707	0708
8	-0.025 -0.040	10	$+0.015$ 0	8	10	$+0.055$ $+0.025$	1.0	0 -0.025				0805	0806	0807	0808
9	-0.025 -0.040	11	$+0.018$ 0	9	11	$+0.060$ $+0.030$	1.0	0 -0.025				0906			
10	-0.025 -0.040	12	$+0.018$ 0	10	12	$+0.060$ $+0.030$	1.0	0 -0.025				1006	1007	1008	
12	-0.025 -0.043	14	$+0.018$ 0	12	14	$+0.060$ $+0.030$	1.0	0 -0.025				1206			1208
13	-0.025 -0.043	15	$+0.018$ 0	13	15	$+0.060$ $+0.030$	1.0	0 -0.025							1308
14	-0.025 -0.043	16	$+0.018$ 0	14	16	$+0.065$ $+0.035$	1.0	0 -0.025							1408
15	-0.025 -0.043	17	$+0.018$ 0	15	17	$+0.065$ $+0.035$	1.0	0 -0.025							1508
16	-0.025 -0.043	18	$+0.018$ 0	16	18	$+0.070$ $+0.035$	1.0	0 -0.025							
17	-0.025 -0.043	19	$+0.021$ 0	17	19	$+0.070$ $+0.035$	1.0	0 -0.025							
18	-0.025 -0.043	20	$+0.021$ 0	18	20	$+0.075$ $+0.040$	1.0	0 -0.025							
19	-0.025 -0.046	22	$+0.021$ 0	19	22	$+0.075$ $+0.040$	1.5	0 -0.030							
20	-0.025 -0.046	23	$+0.021$ 0	20	23	$+0.080$ $+0.045$	1.5	0 -0.030							
22	-0.025 -0.046	25	$+0.021$ 0	22	25	$+0.080$ $+0.045$	1.5	0 -0.030							
24	-0.025 -0.046	27	$+0.021$ 0	24	27	$+0.080$ $+0.045$	1.5	0 -0.030							
25	-0.025 -0.046	28	$+0.021$ 0	25	28	$+0.085$ $+0.050$	1.5	0 -0.030							
26	-0.025 -0.046	30	$+0.021$ 0	26	30	$+0.085$ $+0.050$	2.0	0 -0.030							
28	-0.025 -0.046	32	$+0.025$ 0	28	32	$+0.090$ $+0.050$	2.0	0 -0.030							

※Outer diameter is measured by exclusive gauge.

※The I.D. tolerance after press fitting is for reference only.

※I.D. $\phi 30 \sim \phi 160$ are shown on pages 157 to 158.

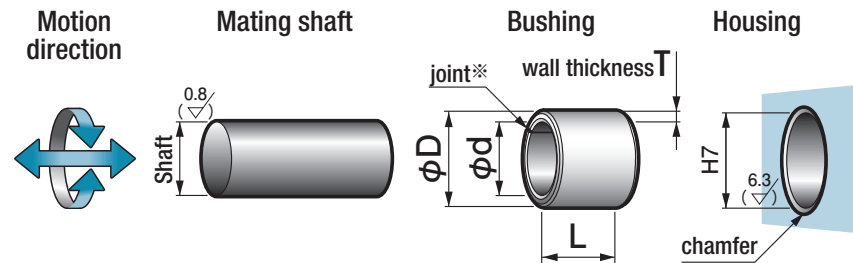
Length L Tolerance -0.3									I.D. tolerance after press fitting (reference)	I.D. ϕd
10	12	14	15	16	20	25	30	35		
									$+0.062$ 0	3
									$+0.062$ 0	4
									$+0.065$ 0	5
0610	0612								$+0.065$ 0	6
0710	0712								$+0.065$ 0	7
0810	0812		0815						$+0.065$ 0	8
0910									$+0.068$ 0	9
1010	1012		1015		1020				$+0.068$ 0	10
1210	1212		1215		1220				$+0.068$ 0	12
1310	1312		1315		1320				$+0.068$ 0	13
1410	1412	1414	1415	1416	1420				$+0.068$ 0	14
1510	1512		1515		1520	1525			$+0.068$ 0	15
1610	1612		1615		1620	1625			$+0.068$ 0	16
1710			1715						$+0.071$ 0	17
1810	1812		1815		1820	1825	1830		$+0.071$ 0	18
1910			1915		1920				$+0.081$ 0	19
2010	2012		2015		2020	2025	2030		$+0.081$ 0	20
2210	2212		2215		2220	2225	2230		$+0.081$ 0	22
			2415		2420	2425	2430		$+0.081$ 0	24
2510	2512		2515		2520	2525	2530	2535	$+0.081$ 0	25
			2615		2620	2625	2630		$+0.081$ 0	26
	2812		2815		2820	2825	2830		$+0.085$ 0	28

LFB Oiles Drymet LF Bushings (I.D. $\phi 30 \sim \phi 160$)

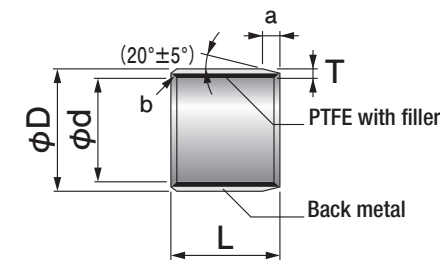


Specify Part No. by required I.D. and length.
(e.g.) I.D. is 70mm and length is 35mm.

LFB - 7035
Part No.



※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.



a: O.D. chamfering

T	2.0	2.5
a	1.0	1.0

(mm)

b: I.D. chamfering

T	2.0	2.5
b	C0.5	C0.5

(mm)

Shaft		Housing		I.D.		O.D.		Wall thickness		Length L Tolerance -0.3					
Size	Tolerance	H7	H7 Tolerance	ϕd	ϕD	Tolerance	T	Tolerance		12	15	20	25	30	35
30	-0.025 -0.046	34	$+0.025$ 0	30	34	$+0.090$ $+0.050$	2.0	0 -0.030		3012	3015	3020	3025	3030	3035
31	-0.025 -0.050	35	$+0.025$ 0	31	35	$+0.090$ $+0.050$	2.0	0 -0.030			3115		3125	3130	
32	-0.025 -0.050	36	$+0.025$ 0	32	36	$+0.090$ $+0.050$	2.0	0 -0.030			3215	3220	3225	3230	
35	-0.025 -0.050	39	$+0.025$ 0	35	39	$+0.095$ $+0.055$	2.0	0 -0.030		3512	3515	3520	3525	3530	3535
38	-0.025 -0.050	42	$+0.025$ 0	38	42	$+0.095$ $+0.055$	2.0	0 -0.030				3820	3825	3830	3835
40	-0.025 -0.050	44	$+0.025$ 0	40	44	$+0.095$ $+0.055$	2.0	0 -0.030		4012	4015	4020	4025	4030	4035
45	-0.025 -0.050	50	$+0.025$ 0	45	50	$+0.100$ $+0.060$	2.5	0 -0.040				4520	4525	4530	4535
50	-0.025 -0.050	55	$+0.030$ 0	50	55	$+0.105$ $+0.060$	2.5	0 -0.040				5020	5025	5030	5035
55	-0.025 -0.055	60	$+0.030$ 0	55	60	$+0.110$ $+0.065$	2.5	0 -0.040					5525	5530	5535
60	-0.025 -0.055	65	$+0.030$ 0	60	65	$+0.120$ $+0.070$	2.5	0 -0.040						6030	6035
65	$+0.035$ $+0.005$	70	$+0.030$ 0	65	70	$+0.125$ $+0.075$	2.5	-0.030 -0.080						6530	
70	$+0.035$ $+0.005$	75	$+0.030$ 0	70	75	$+0.125$ $+0.075$	2.5	-0.030 -0.080						7030	7035
75	$+0.035$ $+0.005$	80	$+0.030$ 0	75	80	$+0.130$ $+0.075$	2.5	-0.030 -0.080						7530	7535
80	$+0.035$ $+0.005$	85	$+0.035$ 0	80	85	$+0.130$ $+0.075$	2.5	-0.030 -0.080							
85	$+0.035$ 0	90	$+0.035$ 0	85	90	$+0.130$ $+0.075$	2.5	-0.030 -0.080							
90	$+0.035$ 0	95	$+0.035$ 0	90	95	$+0.130$ $+0.075$	2.5	-0.030 -0.080							
100	$+0.035$ 0	105	$+0.035$ 0	100	105	$+0.140$ $+0.080$	2.5	-0.030 -0.080							
110	$+0.035$ 0	115	$+0.035$ 0	110	115	$+0.140$ $+0.080$	2.5	-0.030 -0.080							
120	$+0.035$ 0	125	$+0.040$ 0	120	125	$+0.145$ $+0.090$	2.5	-0.030 -0.080							
130	$+0.035$ -0.005	135	$+0.040$ 0	130	135	$+0.145$ $+0.090$	2.5	-0.030 -0.080							
140	$+0.035$ -0.005	145	$+0.040$ 0	140	145	$+0.165$ $+0.100$	2.5	-0.030 -0.080							
150	$+0.035$ -0.005	155	$+0.040$ 0	150	155	$+0.185$ $+0.120$	2.5	-0.030 -0.080							
160	$+0.035$ -0.005	165	$+0.040$ 0	160	165	$+0.185$ $+0.120$	2.5	-0.030 -0.080							

※Outer diameter is measured by exclusive gauge.

※The I.D. tolerance after press fitting is for reference only.

※I.D. $\phi 3 \sim \phi 28$ are shown on pages 155 to 156.

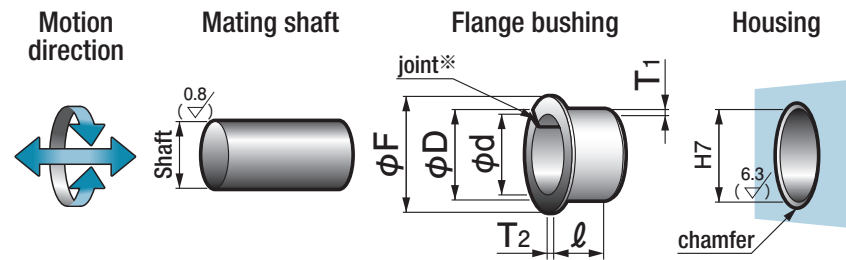
Length L Tolerance -0.3								I.D. tolerance after press fitting (reference)	I.D. ϕd
40	50	60	70	80	90	95	100		
3040	3050							$+0.085$ 0	30
3140								$+0.085$ 0	31
3240								$+0.085$ 0	32
3540	3550							$+0.085$ 0	35
3840								$+0.085$ 0	38
4040	4050							$+0.085$ 0	40
4540	4550							$+0.105$ 0	45
5040	5050	5060						$+0.110$ 0	50
5540	5550	5560						$+0.110$ 0	55
6040	6050	6060		6080				$+0.110$ 0	60
6540	6550	6560						$+0.190$ $+0.060$	65
7040	7050	7060	7070	7080				$+0.190$ $+0.060$	70
7540	7550	7560		7580				$+0.190$ $+0.060$	75
8040	8050	8060		8080				$+0.195$ $+0.060$	80
8540	8550	8560		8580				$+0.195$ $+0.060$	85
9040	9050	9060			9090			$+0.195$ $+0.060$	90
	10050		10070	10080		10095	100100	$+0.195$ $+0.060$	100
	11050		11070			11095	110100	$+0.195$ $+0.060$	110
	12050		12070			12095	120100	$+0.200$ $+0.060$	120
	13050			13080			130100	$+0.200$ $+0.060$	130
	14050			14080			140100	$+0.200$ $+0.060$	140
	15050			15080			150100	$+0.200$ $+0.060$	150
	16050			16080			160100	$+0.200$ $+0.060$	160



Specify Part No. by required I.D. and length.
(e.g.) I.D. is 20mm and length is 10mm.

LFF - 2010

Part No.

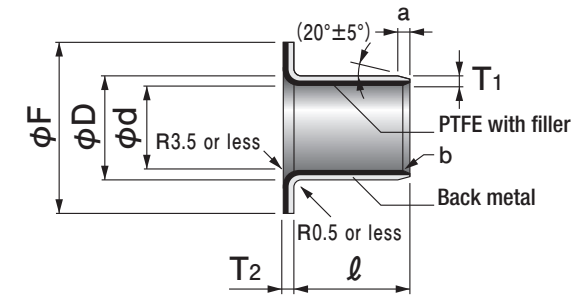


※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.

Shaft		Housing		I.D.	O.D.	Flange			Wall thickness		Length ℓ		Tolerance $-\overset{0}{0.3}$		
Size	Tolerance	Size	H7 Tolerance	ϕd	ϕD	ϕF	Tolerance	T ₂	Tolerance	T ₁	Tolerance	3	4	5	6
3	$-\overset{-0.025}{-0.034}$	4.6	$+\overset{0.012}{0}$	3	4.6	7	$-\overset{0}{0.8}$	0.8	$-\overset{0}{0.15}$	0.8	$-\overset{0}{0.025}$	0303		0305	
4	$-\overset{-0.025}{-0.037}$	5.6	$+\overset{0.012}{0}$	4	5.6	9	$-\overset{0}{0.8}$	0.8	$-\overset{0}{0.15}$	0.8	$-\overset{0}{0.025}$		0404		0406
5	$-\overset{-0.025}{-0.037}$	7	$+\overset{0.015}{0}$	5	7	10	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$		0504	0505	0506
6	$-\overset{-0.025}{-0.037}$	8	$+\overset{0.015}{0}$	6	8	12	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$			0605	0606
7	$-\overset{-0.025}{-0.040}$	9	$+\overset{0.015}{0}$	7	9	13	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$			0705	
8	$-\overset{-0.025}{-0.040}$	10	$+\overset{0.015}{0}$	8	10	15	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				0806
9	$-\overset{-0.025}{-0.040}$	11	$+\overset{0.018}{0}$	9	11	16	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				
10	$-\overset{-0.025}{-0.040}$	12	$+\overset{0.018}{0}$	10	12	18	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				1006
12	$-\overset{-0.025}{-0.043}$	14	$+\overset{0.018}{0}$	12	14	20	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				1206
13	$-\overset{-0.025}{-0.043}$	15	$+\overset{0.018}{0}$	13	15	21	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				
14	$-\overset{-0.025}{-0.043}$	16	$+\overset{0.018}{0}$	14	16	22	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				
15	$-\overset{-0.025}{-0.043}$	17	$+\overset{0.018}{0}$	15	17	23	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				
16	$-\overset{-0.025}{-0.043}$	18	$+\overset{0.018}{0}$	16	18	24	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				
18	$-\overset{-0.025}{-0.043}$	20	$+\overset{0.021}{0}$	18	20	26	$-\overset{0}{0.8}$	1.0	$-\overset{0}{0.15}$	1.0	$-\overset{0}{0.025}$				
20	$-\overset{-0.025}{-0.046}$	23	$+\overset{0.021}{0}$	20	23	31	$-\overset{0}{0.8}$	1.5	$-\overset{0}{0.15}$	1.5	$-\overset{0}{0.030}$				
22	$-\overset{-0.025}{-0.046}$	25	$+\overset{0.021}{0}$	22	25	33	$-\overset{0}{0.8}$	1.5	$-\overset{0}{0.15}$	1.5	$-\overset{0}{0.030}$				
24	$-\overset{-0.025}{-0.046}$	27	$+\overset{0.021}{0}$	24	27	35	$-\overset{0}{0.8}$	1.5	$-\overset{0}{0.15}$	1.5	$-\overset{0}{0.030}$				
25	$-\overset{-0.025}{-0.046}$	28	$+\overset{0.021}{0}$	25	28	36	$-\overset{0}{0.8}$	1.5	$-\overset{0}{0.15}$	1.5	$-\overset{0}{0.030}$				
26	$-\overset{-0.025}{-0.046}$	30	$+\overset{0.021}{0}$	26	30	38	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
28	$-\overset{-0.025}{-0.046}$	32	$+\overset{0.025}{0}$	28	32	40	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
30	$-\overset{-0.025}{-0.046}$	34	$+\overset{0.025}{0}$	30	34	42	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
31	$-\overset{-0.025}{-0.050}$	35	$+\overset{0.025}{0}$	31	35	45	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
32	$-\overset{-0.025}{-0.050}$	36	$+\overset{0.025}{0}$	32	36	46	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
35	$-\overset{-0.025}{-0.050}$	39	$+\overset{0.025}{0}$	35	39	49	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
38	$-\overset{-0.025}{-0.050}$	42	$+\overset{0.025}{0}$	38	42	52	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
40	$-\overset{-0.025}{-0.050}$	44	$+\overset{0.025}{0}$	40	44	54	$-\overset{0}{0.8}$	2.0	$-\overset{0}{0.15}$	2.0	$-\overset{0}{0.030}$				
45	$-\overset{-0.025}{-0.050}$	50	$+\overset{0.025}{0}$	45	50	60	$-\overset{0}{0.8}$	2.5	$-\overset{0}{0.15}$	2.5	$-\overset{0}{0.040}$				
50	$-\overset{-0.025}{-0.050}$	55	$+\overset{0.030}{0}$	50	55	65	$-\overset{0}{0.8}$	2.5	$-\overset{0}{0.15}$	2.5	$-\overset{0}{0.040}$				
55	$-\overset{-0.025}{-0.055}$	60	$+\overset{0.030}{0}$	55	60	70	$-\overset{0}{0.8}$	2.5	$-\overset{0}{0.15}$	2.5	$-\overset{0}{0.040}$				
60	$-\overset{-0.025}{-0.055}$	65	$+\overset{0.030}{0}$	60	65	75	$-\overset{0}{0.8}$	2.5	$-\overset{0}{0.15}$	2.5	$-\overset{0}{0.040}$				

※Outer diameter is measured by exclusive gauge.

※The I.D. tolerance after press fitting is for reference only.



a: O.D. chamfering for the bushing I.D. of Φ10 or more

T1	1.0	1.5	2.0	2.5
a	0.5	0.8	1.0	1.0

(mm)

b: I.D. chamfering for the bushing I.D. of Φ10 or more

T1	1.0	1.5	2.0	2.5
b	C0.3	C0.5	C0.5	C0.5

(mm)

※Chamfering of inner or outer diameters less than Φ10 mm is done only to remove burrs.

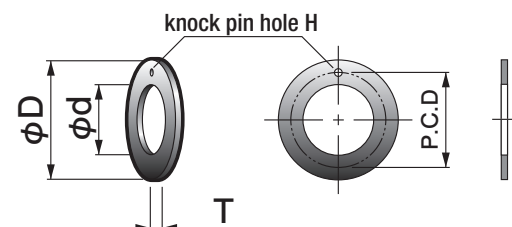
Length ℓ Tolerance $^{0}_{-0.3}$											I.D. tolerance after press fitting (reference)	I.D. Φd
7	8	10	12	15	20	25	30	40	50	60	$^{+0.062}_{0}$	3
											$^{+0.062}_{0}$	4
											$^{+0.065}_{0}$	5
0607	0608	0610									$^{+0.065}_{0}$	6
0707		0710	0712								$^{+0.065}_{0}$	7
	0808	0810	0812								$^{+0.065}_{0}$	8
		0910									$^{+0.068}_{0}$	9
1007	1008	1010	1012	1015							$^{+0.068}_{0}$	10
1207	1208	1210	1212	1215	1220						$^{+0.068}_{0}$	12
		1310		1315							$^{+0.068}_{0}$	13
		1410	1412	1415	1420						$^{+0.068}_{0}$	14
		1510	1512	1515	1520	1525					$^{+0.068}_{0}$	15
		1610	1612	1615	1620	1625					$^{+0.068}_{0}$	16
		1810	1812	1815	1820	1825					$^{+0.071}_{0}$	18
		2010	2012	2015	2020	2025	2030				$^{+0.081}_{0}$	20
		2210	2212	2215	2220	2225					$^{+0.081}_{0}$	22
				2415	2420	2425	2430				$^{+0.081}_{0}$	24
		2510	2512	2515	2520	2525	2530				$^{+0.081}_{0}$	25
				2615	2620						$^{+0.081}_{0}$	26
			2812	2815	2820		2830				$^{+0.085}_{0}$	28
			3012	3015	3020	3025	3030	3040			$^{+0.085}_{0}$	30
						3125					$^{+0.085}_{0}$	31
					3220	3225	3230				$^{+0.085}_{0}$	32
			3512		3520	3525	3530	3540	3550		$^{+0.085}_{0}$	35
					3820		3830	3840			$^{+0.085}_{0}$	38
			4012		4020	4025	4030	4040	4050		$^{+0.085}_{0}$	40
					4520	4525	4530	4540	4550		$^{+0.105}_{0}$	45
					5020		5030	5040		5060	$^{+0.110}_{0}$	50
							5530	5540		5560	$^{+0.110}_{0}$	55
							6030	6040		6060	$^{+0.110}_{0}$	60



Specify Part No. by required I.D. and thickness.
(e.g.) I.D. is 20mm and thickness is 1.5mm.

LFW - 2015

Part No.



● Sliding surface consists of a plastic layer.

Part No.	I.D.		O.D.		Thickness		Knock pin hole		Position of knock pin	
	φd	Tolerance	φD	Tolerance	T	Tolerance	H	Tolerance	P.C.D.	Tolerance
LFW-0815	8	+0.25 0	16	0 -0.25	1.5	-0.03 -0.08	1	+0.30 +0.10	12	±0.12
LFW-1015	10	+0.25 0	18	0 -0.25	1.5	-0.03 -0.08	1	+0.30 +0.10	14	±0.12
LFW-1215	12	+0.25 0	24	0 -0.25	1.5	-0.03 -0.08	1.5	+0.375 +0.125	18	±0.12
LFW-1415	14	+0.25 0	26	0 -0.25	1.5	-0.03 -0.08	2	+0.375 +0.125	20	±0.12
LFW-1615	16	+0.25 0	30	0 -0.25	1.5	-0.03 -0.08	2	+0.375 +0.125	23	±0.12
LFW-1815	18	+0.25 0	32	0 -0.25	1.5	-0.03 -0.08	2	+0.375 +0.125	25	±0.12
LFW-2015	20	+0.25 0	36	0 -0.25	1.5	-0.03 -0.08	3	+0.375 +0.125	28	±0.12
LFW-2215	22	+0.25 0	38	0 -0.25	1.5	-0.03 -0.08	3	+0.375 +0.125	30	±0.12
LFW-2415	24	+0.25 0	42	0 -0.25	1.5	-0.03 -0.08	3	+0.375 +0.125	33	±0.12
LFW-2615	26	+0.25 0	44	0 -0.25	1.5	-0.03 -0.08	3	+0.375 +0.125	35	±0.12
LFW-2815	28	+0.25 0	48	0 -0.25	1.5	-0.03 -0.08	4	+0.375 +0.125	38	±0.12
LFW-3215	32	+0.25 0	54	0 -0.25	1.5	-0.03 -0.08	4	+0.375 +0.125	43	±0.12
LFW-3815	38	+0.25 0	62	0 -0.25	1.5	-0.03 -0.08	4	+0.375 +0.125	50	±0.12
LFW-4215	42	+0.25 0	66	0 -0.25	1.5	-0.03 -0.08	4	+0.375 +0.125	54	±0.12
LFW-4820	48	+0.25 0	74	0 -0.25	2.0	-0.03 -0.08	4	+0.375 +0.125	61	±0.12
LFW-5220	52	+0.25 0	78	0 -0.25	2.0	-0.03 -0.08	4	+0.375 +0.125	65	±0.12



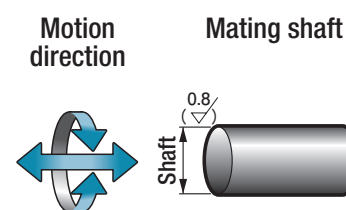
Specify Part No. by required I.D. and length.
(e.g.) I.D. is 8mm and length is 5.5mm.

LFCF - 0805

Part No.

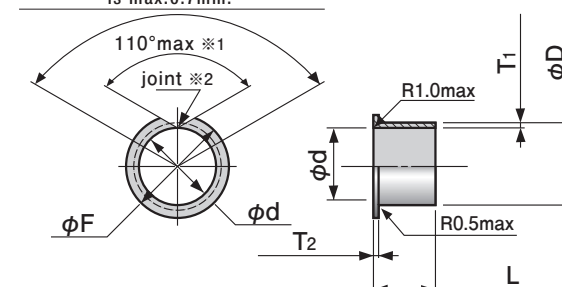
Feature

- This bearing is as thin as 0.5 mm, allowing the user who gives up an idea to use a bearing in a small space to use it.
- The sliding layer made of plastic containing special additives maintains stable coefficient of friction. It is effective to reduce abnormal noise and wear in applications without bushings.

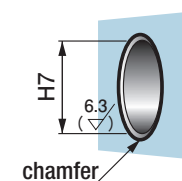


Tolerance of mating shaft
General use, high load e7

Flange thickness within 120° range
is max.0.7mm.



Housing



※1 The degree shown is after press-fitted into the ring gauge of φD +0.055mm.
(the ring gauge of φD+0.060mm is used for the bushings of φ11 or bigger.)

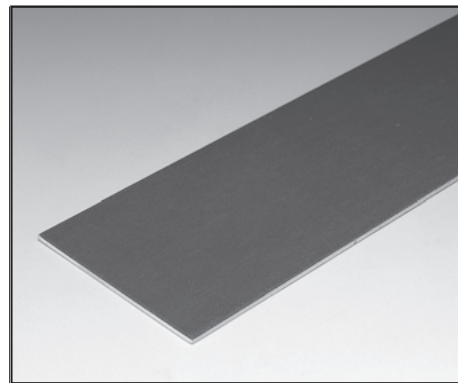
※2 The joint causes no influences upon rotation of the shaft. Be careful when
press-fitting so that the joint is not at the position to which the maximum load
is applied.

※3 There is no chamfer on LFCF.

Part No.	I.D.		O.D.		Flange			Thick bushing		Length L Tolerance ±0.3	I.D. tolerance after press fitting (reference)
	φd	Tolerance	φD	Tolerance	φF	Tolerance	T ₂	Tolerance	T ₁		
LFCF-0505	5		6	+0.055 +0.025	8.5	±0.5	0.48	±0.05	0.48	±0.02	5.5 +0.092 0
LFCF-0605	6		7	+0.055 +0.025	10	±0.5	0.48	±0.05	0.48	±0.02	5.5 +0.095 0
LFCF-0705	7		8	+0.055 +0.025	11	±0.5	0.48	±0.05	0.48	±0.02	5.5 +0.095 0
LFCF-0805	8		9	+0.055 +0.025	12	±0.5	0.48	±0.05	0.48	±0.02	5.5 +0.095 0
LFCF-1006	10		11	+0.060 +0.030	15	±0.5	0.48	±0.05	0.48	±0.02	6.5 +0.098 0
LFCF-1206	12		13	+0.060 +0.030	17	±0.5	0.48	±0.05	0.48	±0.02	6.5 +0.098 0
LFCF-1606	16		17	+0.060 +0.030	21	±0.5	0.48	±0.05	0.48	±0.02	6.5 +0.098 0

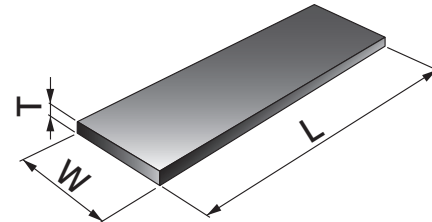
※Outer diameter is measured by exclusive gauge.

※I.D after press-fitted into the housing of φD H7 is reference value.



Specify Part No. by required thickness and width.
(e.g.) Thickness is 1.5mm and width is 90mm.

LFP - 1590
Part No.

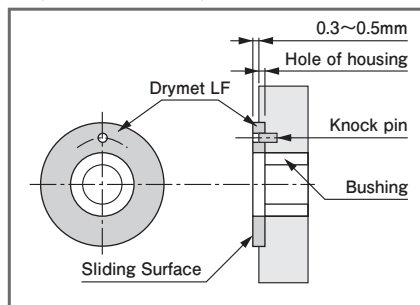


● Sliding surface consists of a plastic layer.

Part No.	Thickness		Width	Length
	T	Tolerance	W	L
LFP-1080	1.0	-0.03 -0.13	80	500
LFP-1590	1.5	-0.03 -0.13	90	500
LFP-20100	2.0	-0.03 -0.13	100	500
LFP-25100	2.5	-0.03 -0.13	100	500

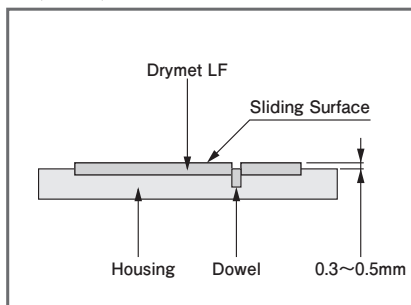
How to attach washers, plates

① Knock pin method (Thrust washer)



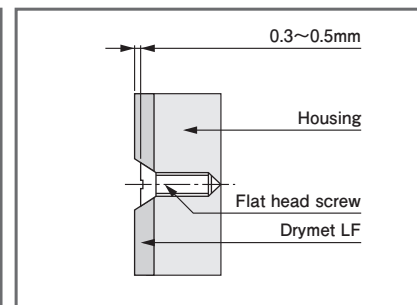
※ Sliding surface consists of a plastic layer.

② Inlay method (Plate)



※ Sliding surface consists of a plastic layer.

③ Flat head screw method



④ Using glue

In the case of (2), the washer and plate may be inserted with glue, not a knock pin. Synthetic epoxy plastic glue is suitable, though no glue is specified, in particular. Be careful because fitting with glue only may result in separation in some cases.

Oiles LF Guides

Guide unit bearings

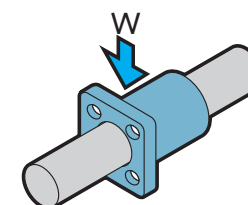
Standard product



Feature

- Incorporates Oiles bearings for self-lubricating operations.
- Features low coefficient of friction and superior wear resistance.
- Easily mountable. Compatible with ball bearing types.
- Low prices with simple structures.

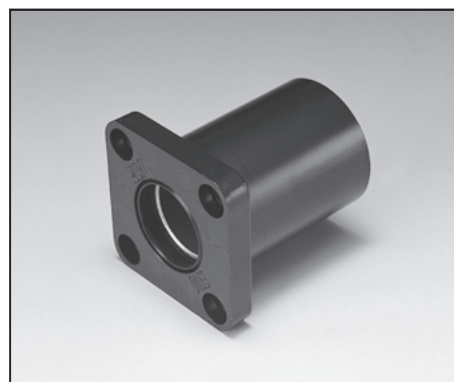
Design condition



Part No.	Allowable load W N [kgf]		Allowable velocity m/s [m/min]	Service temperature range ℃
	Dynamic	Static		
LFG12-30	235 { 24 }	706 { 72 }	0.67 { 40 }	-30~+130※
LFG16-37	376 { 38 }	1,129 { 115 }		
LFG20-42	588 { 60 }	1,764 { 180 }		
LFG25-59	980 { 100 }	2,940 { 300 }		
LFG30-64	1,323 { 135 }	3,969 { 405 }		

※ Temperature range for dust seal.

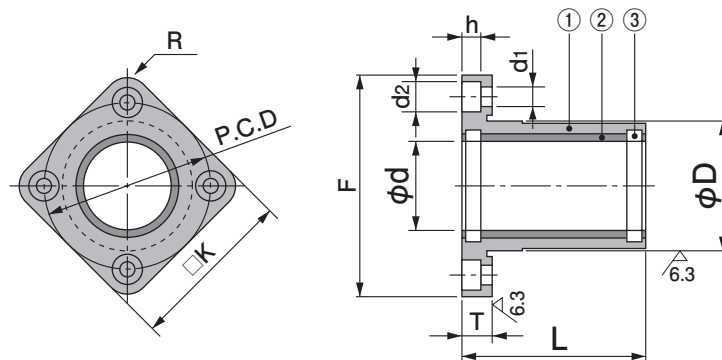
※ Unusable under the condition of water, splashing water and high humidity.



Specify Part No. by required I.D. and length.
(e.g.) I.D. is 20mm and length is 42mm.

LFG 20 - 42
Part No.

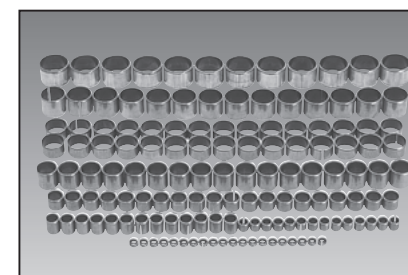
- Recommended mating shaft tolerance is g6 to e7.



	Part name	Material
①	Housing	Aluminum with rust-proof finish
②	Bearing	Drymet LF
③	Dust seal	NBR

Part No.	I.D.	O.D.		Length		F	K	T	P.C.D	R	Mounting hole			Bolt
	ϕd	ϕD	Tolerance	L	Tolerance						d1	d2	h	
LFG12-30	12	21	$\begin{smallmatrix} -0.017 \\ -0.032 \end{smallmatrix}$	30	$\begin{smallmatrix} 0 \\ -0.3 \end{smallmatrix}$	42.8	32	6	32	3	4.5	8	4.1	M4
LFG16-37	16	28	$\begin{smallmatrix} -0.017 \\ -0.032 \end{smallmatrix}$	37	$\begin{smallmatrix} 0 \\ -0.3 \end{smallmatrix}$	49.0	37	6	38	4	4.5	8	4.1	M4
LFG20-42	20	32	$\begin{smallmatrix} -0.024 \\ -0.038 \end{smallmatrix}$	42	$\begin{smallmatrix} 0 \\ -0.3 \end{smallmatrix}$	55.3	42	8	43	5	5.5	9.5	5.1	M5
LFG25-59	25	40	$\begin{smallmatrix} -0.024 \\ -0.038 \end{smallmatrix}$	59	$\begin{smallmatrix} 0 \\ -0.3 \end{smallmatrix}$	64.9	50	8	51	7	5.5	9.5	5.1	M5
LFG30-64	30	45	$\begin{smallmatrix} -0.029 \\ -0.042 \end{smallmatrix}$	64	$\begin{smallmatrix} 0 \\ -0.3 \end{smallmatrix}$	75.4	58	10	60	8	6.6	11	6.1	M6

※ Unusable under the condition of water, splashing water and high humidity.



Feature

- Serviceable without the need for lubrication. Features superior dimensional stability, mechanical strength, and thermal conductivity with a thin, lightweight, and compact design.
- Demonstrates stable low coefficient of friction and superior wear resistance under high-speed conditions.
- The plastic layers have machining allowance, allowing high dimensional accuracy when the inner diameter is machined.
- The standard products in various sizes are available on order.

Service range

Lubrication condition	Dry
Service temperature range °C	-50~+250
Allowable max. pressure P N/mm ² {kgf/cm ² }	19.5 {137} {199 {1,400}}
Allowable max. velocity V m/s {m/min}	2.50 {150}
Allowable max. PV value N/mm ² · m/s {kgf/cm ² · m/min}	1.45 {887}

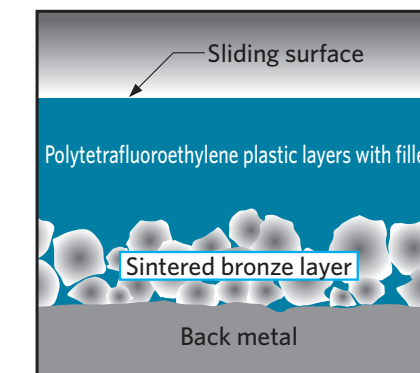
The values in parentheses are static bearing pressures, which are the bearing pressures in applications with no motion or very small motion (≤ 0.0017 m/s [0.1 m/min]).

Mechanical properties

Tensile strength	JIS Z 2241	N/mm ² {kgf/cm ² }	380 {3,875}
Elongation	JIS Z 2241	%	27
Hardness	JIS Z 2244	HV	107

- ※ The values shown above are typical values, not the standard values.
- ※ The values shown above are values of back metal.

◎ Please refer to the fitting method of Drymet LF. (P.153, 154)



image

Lathe turning

	carbide tool (JIS)	
	Cutting tool	Condition
Cutting tool	Relief angle	5~10°
	Rake angle	10~20°
	Nose radius, (mm)	0.10~0.20
Condition	Speed (m/min)	60~200
	Cut depth (mm)	0.05~0.10
	Feed (mm/rev)	0.05~0.20

Attention should be paid to dimensional variances due to thermal expansion, chucking, and bend of the material.

The Oiles Techmet should be ground. If it is reamed, it is difficult to maintain the dimension in mass production.

The I.D. machining allowance is 0.2 mm for the diameter.

Machining accuracy (bushing)

I.D.	O.D.	Length
class 7 (Note)	—	class 8 to 9

(Note) Accuracy after press fitting.

Classes here are in JIS standard.

This product demonstrates satisfactory performance at the slide surface roughness of Rz6.3 to 12.5μm.

Dimensions may change due to thermal expansion, chucking pressure, moisture absorption deformation, etc. High accuracy is ensured if the product is installed on the housing and then ground.

Test data

Journal rotation test

<Testing conditions>

Bearing dimension : $\phi 10 \times \phi 12 \times l 10$

Mating material : SUS304

(surface roughness $Rz1 \mu m$)

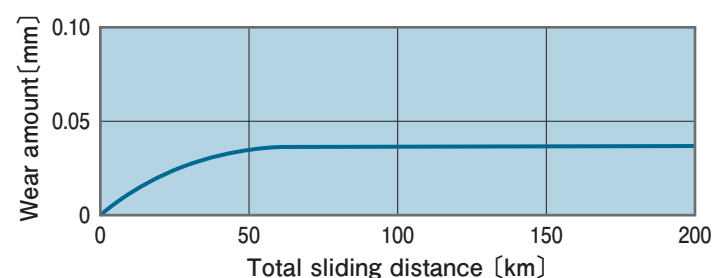
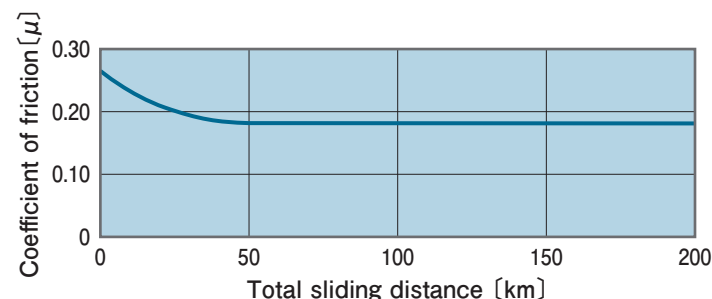
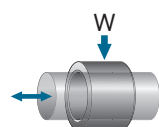
Pressure : $0.029 N/mm^2 \{0.3 kgf/cm^2\}$

Velocity : $0.600 m/s \{36.0 m/min\}$

Reciprocating cycle : 60cpm

Stroke : 300mm

Lubrication : dry



High temp. thrust rotation test

<Testing conditions>

Mating material : A5056

(surface roughness $Rz1 \mu m$)

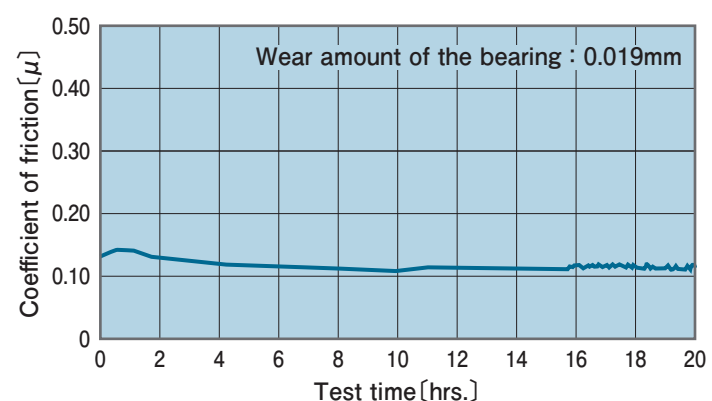
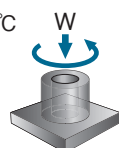
Pressure : $0.98 N/mm^2 \{10.0 kgf/cm^2\}$

Velocity : $0.083 m/s \{5.0 m/min\}$

Atmospheric temperature : $300^\circ C$

Test time : 20hrs.

Lubrication : dry



Journal rotation test

<Testing conditions>

Bearing dimension : $\phi 10 \times \phi 12 \times l 10$

Mating material : SUS304

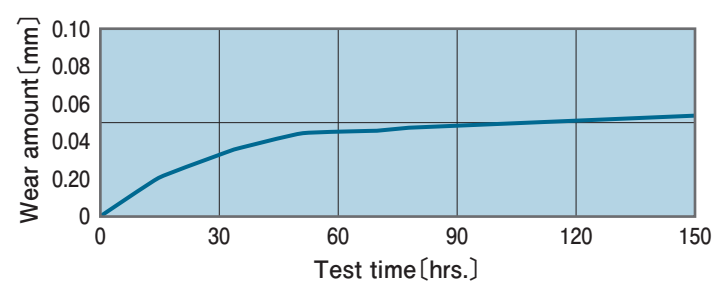
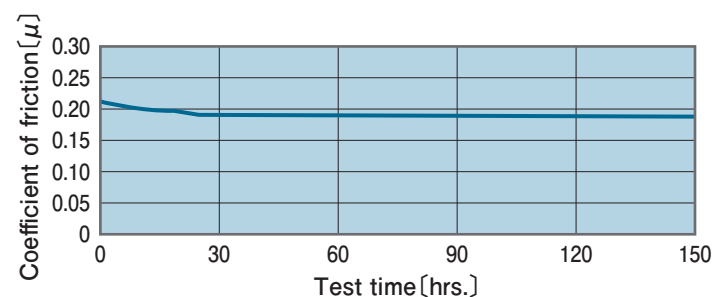
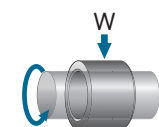
(surface roughness $Rz1 \mu m$)

Pressure : $0.49 N/mm^2 \{5.0 kgf/cm^2\}$

Velocity : $1.667 m/s \{100.0 m/min\}$

Test time : 150hrs.

Lubrication : dry

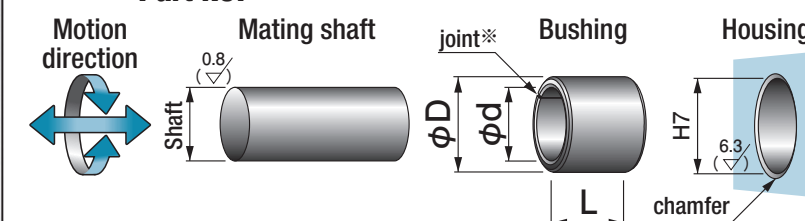


Specify Part No. by required I.D. and length.

(e.g.) I.D. is 12mm and length is 8mm.

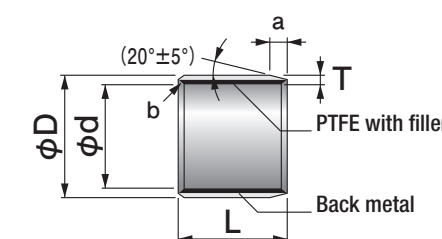
TCB - 1208

Part No.



● All Oiles Techmet products have I.D. machining allowance (0.2 mm for the diameter) and available on order.

※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.



a: O.D. chamfering for the bushing I.D. of $\phi 10$ or more

T	1.0	1.5
a	0.5	0.8

T	1.0	1.5
b	C0.3	C0.5

※Chamfering of inner or outer diameters less than $\phi 10$ mm is done only to remove burrs.

I.D.	O.D.		Length L Tolerance -0.3								
ϕd	ϕD	Tolerance	4	5	6	7	8	10	12	15	20
5	7	$+0.055$ $+0.025$	0504	0505			0508				
6	8	$+0.055$ $+0.025$		0605	0606			0610			
8	10	$+0.055$ $+0.025$			0806		0808	0810	0812		
10	12	$+0.060$ $+0.030$			1006			1010			
12	14	$+0.060$ $+0.030$			1206		1208	1210			
14	16	$+0.065$ $+0.035$						1410		1415	
15	17	$+0.065$ $+0.035$						1510		1515	
16	18	$+0.070$ $+0.035$				1607		1610		1615	1620
18	20	$+0.075$ $+0.040$						1810		1815	1820
20	23	$+0.080$ $+0.045$						2010		2015	2020
22	25	$+0.080$ $+0.045$						2210			2220

※Outer diameter is measured by exclusive gauge.

Oiles Techmet E

Polytetrafluoroethylene plastic multi-layer bearings with back metals



Feature

- Serviceable without the need for lubrication. Features superior dimensional stability, mechanical strength, and thermal conductivity with a thin, lightweight, and compact design. (Available from Thickness 0.5 mm)
- Features low coefficient of friction and superior wear resistance.
- Electrically conductive

Service range

Lubrication condition	Dry
Service temperature range °C	−50~+250
Allowable max. pressure P N/mm ² {kgf/cm ² }	49 (137) {500 (1,400)}
Allowable max. velocity V m/s {m/min}	0.5 {30}
Allowable max. PV value N/mm ² · m/s {kgf/cm ² · m/min}	3.27 {2,000}

The values in parentheses are static bearing pressures, which are the bearing pressures in applications with no motion or very small motion (≤ 0.0017 m/s [0.1 m/min]).

Mechanical properties

Tensile strength	JIS Z 2241	N/mm ² {kgf/cm ² }	380 {3,875}
Elongation	JIS Z 2241	%	27
Hardness	JIS Z 2244	HV	107

※The values shown above are typical values, not the standard values.

※The values shown above are values of back metal.

Test data

Thrust rotation test

<Testing conditions>

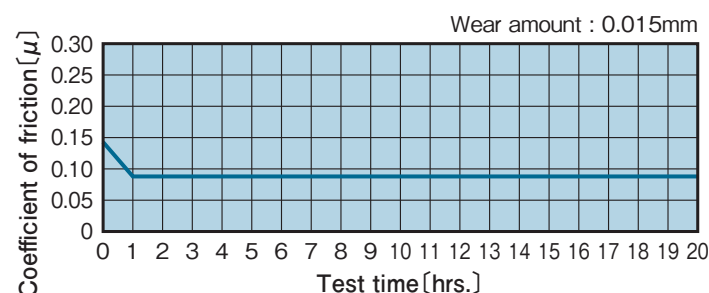
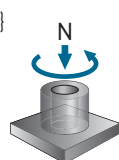
Mating material : S45C-N
(surface roughness Rz1.6μm)

Pressure : 9.8N/mm² {100kgf/cm²}

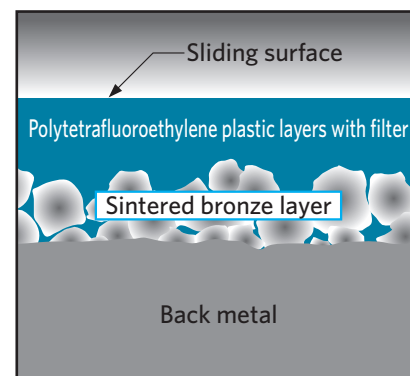
Velocity : 0.167m/s {10.0m/min}

Test time : 20hrs

Lubrication : dry



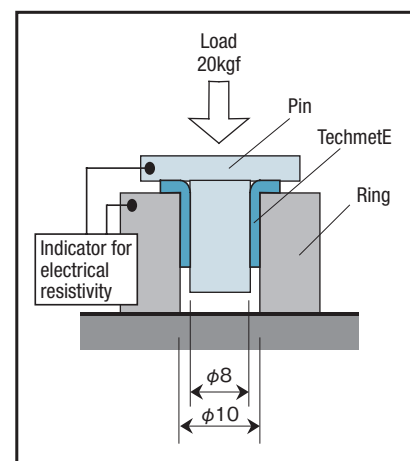
◎Please refer to the fitting method of Drymet LF. (P.153, 154)



image

Electrical resistivity

1000Ω or less with below measurement method



Oiles Toughmet

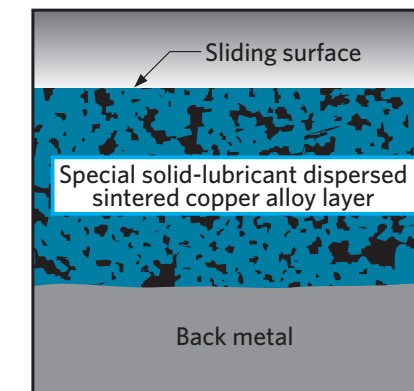
Solid-lubricant dispersed sintered bearings with back metals

Standard product/Custom-made product



Feature

- Has superior load resistance and heat resistance. Also conductive.
- Demonstrates superior performance even in reciprocating, oscillating, and intermittent operations.
- Demonstrates much superior performances by the action of oil retaining power of the sintered copper alloy layer and solid lubricant if lubricating oil is used together.
- Thin bearing allows compact design.
- Electrically conductive.
- The standard products are available in various sizes.



image

Service range

Lubrication condition	Dry
Service temperature range °C	−40~+350
Allowable max. pressure P N/mm ² {kgf/cm ² }	24.5 (49) {250 (500)}
Allowable max. velocity V m/s {m/min}	0.40 {24}
Allowable max. PV value N/mm ² · m/s {kgf/cm ² · m/min}	1.65 {1,010}

The values in parentheses are static bearing pressures, which are the bearing pressures in applications with no motion or very small motion (≤ 0.0017 m/s [0.1 m/min]).

Mechanical properties

Tensile strength	JIS Z 2241	N/mm ² {kgf/cm ² }	380 {3,875}
Elongation	JIS Z 2241	%	27
Hardness	JIS Z 2244	HV	107

※The values shown above are typical values, not the standard values.

※The values shown above are values of back metal.

Test data

Journal oscillation test

<Testing conditions>

Bearing dimension : $\phi 40 \times \phi 44 \times \ell 30$

Pressure : 9.8N/mm² {100.0kgf/cm²}

19.6N/mm² {200.0kgf/cm²}

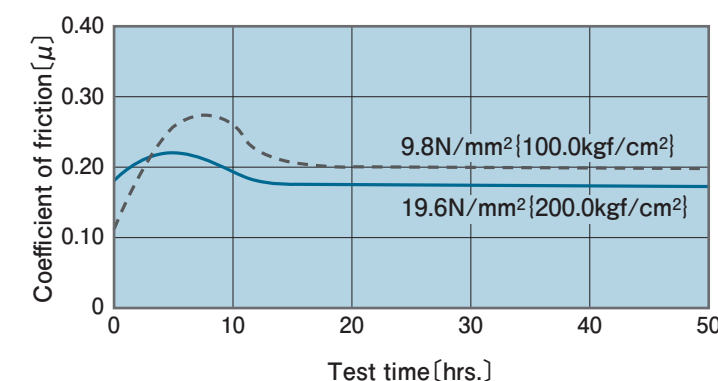
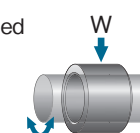
Velocity : 0.014m/s {0.84m/min}

Oscillating angle : $\pm 20^\circ$

Oscillating cycle : 30cpm

Test time : 50hrs.

Lubrication : grease is applied at assembly.



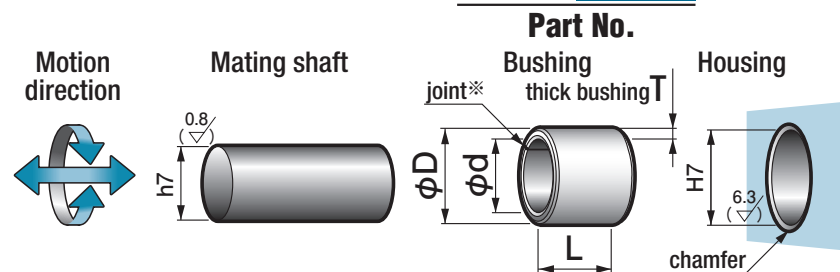
◎Please refer to the fitting method of Drymet LF. (P.153, 154)



Specify Part No. by required I.D. and length.

(e.g.) I.D. is 25mm and length is 20mm.

TMB - 2520

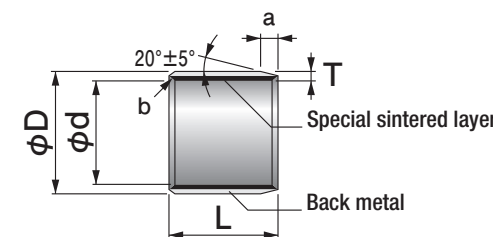


※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.

Shaft		Housing		I.D.		O.D.		Wall thickness		Length L Tolerance -0.3					
Size	h7 Tolerance	Size	H7 Tolerance	φd	φD Tolerance	φD	Tolerance	T	Tolerance	5	6	8	10	12	15
5	$\begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$	7	$\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}$	5	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	7	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$	0505		0508			
6	$\begin{smallmatrix} 0 \\ -0.012 \end{smallmatrix}$	8	$\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}$	6	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	8	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$		0606		0610		
7	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	9	$\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}$	7	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	9	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$					0712	
8	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	10	$\begin{smallmatrix} +0.015 \\ 0 \end{smallmatrix}$	8	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	10	$\begin{smallmatrix} +0.055 \\ -0.025 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$			0808	0810	0812	0815
9	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	11	$\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	9	$\begin{smallmatrix} +0.060 \\ -0.030 \end{smallmatrix}$	11	$\begin{smallmatrix} +0.060 \\ -0.030 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$				0910		
10	$\begin{smallmatrix} 0 \\ -0.015 \end{smallmatrix}$	12	$\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	10	$\begin{smallmatrix} +0.060 \\ -0.030 \end{smallmatrix}$	12	$\begin{smallmatrix} +0.060 \\ -0.030 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$				1010		1015
12	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$	14	$\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	12	$\begin{smallmatrix} +0.060 \\ -0.030 \end{smallmatrix}$	14	$\begin{smallmatrix} +0.060 \\ -0.030 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.030 \\ -0.075 \end{smallmatrix}$				1210		1215
14	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$	16	$\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	14	$\begin{smallmatrix} +0.065 \\ -0.035 \end{smallmatrix}$	16	$\begin{smallmatrix} +0.065 \\ -0.035 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.035 \\ -0.085 \end{smallmatrix}$		1406		1410		1415
15	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$	17	$\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	15	$\begin{smallmatrix} +0.065 \\ -0.035 \end{smallmatrix}$	17	$\begin{smallmatrix} +0.065 \\ -0.035 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.035 \\ -0.085 \end{smallmatrix}$				1510		1515
16	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$	18	$\begin{smallmatrix} +0.018 \\ 0 \end{smallmatrix}$	16	$\begin{smallmatrix} +0.070 \\ -0.035 \end{smallmatrix}$	18	$\begin{smallmatrix} +0.070 \\ -0.035 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.035 \\ -0.085 \end{smallmatrix}$						1615
18	$\begin{smallmatrix} 0 \\ -0.018 \end{smallmatrix}$	20	$\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	18	$\begin{smallmatrix} +0.075 \\ -0.040 \end{smallmatrix}$	20	$\begin{smallmatrix} +0.075 \\ -0.040 \end{smallmatrix}$	1.0	$\begin{smallmatrix} -0.035 \\ -0.085 \end{smallmatrix}$						1815
20	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	23	$\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	20	$\begin{smallmatrix} +0.080 \\ -0.045 \end{smallmatrix}$	23	$\begin{smallmatrix} +0.080 \\ -0.045 \end{smallmatrix}$	1.5	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$					2012	2015
22	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	25	$\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	22	$\begin{smallmatrix} +0.080 \\ -0.045 \end{smallmatrix}$	25	$\begin{smallmatrix} +0.080 \\ -0.045 \end{smallmatrix}$	1.5	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$				2210		
24	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	27	$\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	24	$\begin{smallmatrix} +0.080 \\ -0.045 \end{smallmatrix}$	27	$\begin{smallmatrix} +0.080 \\ -0.045 \end{smallmatrix}$	1.5	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
25	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	28	$\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	25	$\begin{smallmatrix} +0.085 \\ -0.050 \end{smallmatrix}$	28	$\begin{smallmatrix} +0.085 \\ -0.050 \end{smallmatrix}$	1.5	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$				2510		2515
26	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	30	$\begin{smallmatrix} +0.021 \\ 0 \end{smallmatrix}$	26	$\begin{smallmatrix} +0.085 \\ -0.050 \end{smallmatrix}$	30	$\begin{smallmatrix} +0.085 \\ -0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
28	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	32	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	28	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	32	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
30	$\begin{smallmatrix} 0 \\ -0.021 \end{smallmatrix}$	34	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	30	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	34	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						3015
31	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	35	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	31	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	35	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
32	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	36	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	32	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	36	$\begin{smallmatrix} +0.090 \\ -0.050 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
35	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	39	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	35	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	39	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						3515
38	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	42	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	38	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	42	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
40	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	44	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	40	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	44	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	2.0	$\begin{smallmatrix} -0.030 \\ -0.090 \end{smallmatrix}$						
42	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	47	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	42	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	47	$\begin{smallmatrix} +0.095 \\ -0.055 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
45	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	50	$\begin{smallmatrix} +0.025 \\ 0 \end{smallmatrix}$	45	$\begin{smallmatrix} +0.100 \\ -0.060 \end{smallmatrix}$	50	$\begin{smallmatrix} +0.100 \\ -0.060 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
50	$\begin{smallmatrix} 0 \\ -0.025 \end{smallmatrix}$	55	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	50	$\begin{smallmatrix} +0.105 \\ -0.060 \end{smallmatrix}$	55	$\begin{smallmatrix} +0.105 \\ -0.060 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
55	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	60	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	55	$\begin{smallmatrix} +0.110 \\ -0.065 \end{smallmatrix}$	60	$\begin{smallmatrix} +0.110 \\ -0.065 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
60	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	65	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	60	$\begin{smallmatrix} +0.120 \\ -0.070 \end{smallmatrix}$	65	$\begin{smallmatrix} +0.120 \\ -0.070 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
65	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	70	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	65	$\begin{smallmatrix} +0.125 \\ -0.075 \end{smallmatrix}$	70	$\begin{smallmatrix} +0.125 \\ -0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
70	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	75	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	70	$\begin{smallmatrix} +0.125 \\ -0.075 \end{smallmatrix}$	75	$\begin{smallmatrix} +0.125 \\ -0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
75	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	80	$\begin{smallmatrix} +0.030 \\ 0 \end{smallmatrix}$	75	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	80	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
80	$\begin{smallmatrix} 0 \\ -0.030 \end{smallmatrix}$	85	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	80	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	85	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
85	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	90	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	85	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	90	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
90	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	95	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	90	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	95	$\begin{smallmatrix} +0.130 \\ -0.075 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.035 \\ -0.095 \end{smallmatrix}$						
100	$\begin{smallmatrix} 0 \\ -0.035 \end{smallmatrix}$	105	$\begin{smallmatrix} +0.035 \\ 0 \end{smallmatrix}$	100	$\begin{smallmatrix} +0.140 \\ -0.080 \end{smallmatrix}$	105	$\begin{smallmatrix} +0.140 \\ -0.080 \end{smallmatrix}$	2.5	$\begin{smallmatrix} -0.055 \\ -0.115 \end{smallmatrix}$						

※Outer diameter is measured by exclusive gauge.

※The I.D. tolerance after press fitting is for reference only.



a: O.D. chamfering for the bushing I.D. of φ10 or more

T	1.0	1.5	2.0	2.5
a	0.5	0.8	1.0	1.0

(mm)

b: I.D. chamfering for the bushing I.D. of φ10 or more

T	1.0	1.5	2.0	2.5
b	0.3	0.5	0.5	0.5

(mm)

※Chamfering of inner or outer diameters less than φ10 mm is done only to remove burrs.

Length L Tolerance -0.3										I.D. tolerance after press fitting (reference)	I.D. φd
20	25	30	35	40	50	60	70	80	95		
										+0.165 +0.060	5
										+0.165 +0.060	6
										+0.165 +0.060	7
										+0.165 +0.060	8
										+0.168 +0.060	9
1020										+0.168 +0.060	10
1220										+0.168 +0.060	12
1420										+0.188 +0.070	14
1520	1525									+0.188 +0.070	15
1620	1625									+0.188 +0.070	16
	1825									+0.191 +0.070	18
2020	2025	2030								+0.201 +0.060	20
2220		2230								+0.201 +0.060	22
		2430								+0.201 +0.060	24
2520	2525	2530	2535							+0.201 +0.060	25
		2630								+0.201 +0.060	26
2820		2830		2840						+0.205 +0.060	28
3020	3025	3030	3035	3040						+0.205 +0.060	30
				3140						+0.205 +0.060	31
3220				3240						+0.205 +0.060	32
	3525	3530		3540	3550					+0.205 +0.060	35
		3830			3850					+0.205 +0.060	38
	4025	4030		4040	4050					+0.205 +0.060	40
					4250					+0.215 +0.070	42
		4530			4550					+0.215 +0.070	45
	5025	5030		5040	5050	5060				+0.220 +0.070	50
	5525			5540			5570			+0.220 +0.070	55
		6030		6040		6060				+0.220 +0.070	60
		6530		6540		6560				+0.220 +0.070	65
		7030		7040				7080		+0.220 +0.070	70
				7540				7580		+0.220 +0.070	75
				8040				8080		+0.225 +0.070	80
				8540				8580		+0.225 +0.070	85
				9040		9060				+0.225 +0.070	90
					10050				10095	+0.265 +0.110	100

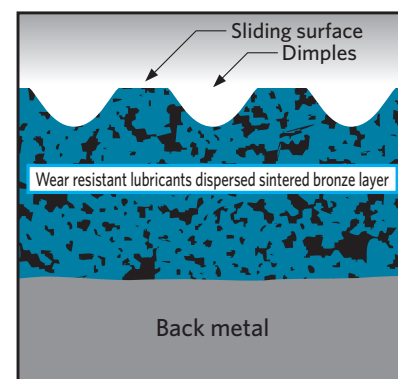
Oiles Toughmet D

Sintered bronze bearings consisting of a steel back and uniformly dispersed wear resistant lubricants



Features

- Superior durability and stable low coefficient of friction where lubrication is present.
- Able to handle reciprocating, oscillating, and intermittent motion where oil film is difficult to be formed.
- Thin walled configuration for compact design.
- Dramatically reduces lubrication intervals.
- Possesses high load carrying capacity, wear resistance, and seize resistance.
- Electric conductivity.
- Available in various standard and custom sizes.



image

Service range

Lubrication condition	Periodical lubrication	Oil lubrication
Service temperature range °C	-40~+150	
Allowable max. pressure P N/mm ² {kgf/cm ² }	50 (100) {510 (1,020)}	
Allowable max. velocity V m/s {m/min}	1.00 {60}	5.00 {300}
Allowable max. PV value N/mm ² · m/s {kgf/cm ² · m/min}	3.26 {2,000}	4.89 {3,000}

The values in parentheses are static bearing pressures, which are the bearing pressures in applications with no motion or very small motion (≤ 0.0017 m/s [0.1 m/min]).

Mechanical properties

Tensile strength	JIS Z 2241	N/mm ² {kgf/cm ² }	380 {3,875}
Elongation	JIS Z 2241	%	27
Hardness	JIS Z 2244	HV	107

※Value here is typical value, not standard.

※Above value indicates the value of back metal.

◎Please refer to the fitting method of Drymet LF. (P.153, 154)

Test data

Journal rotation test

<Testing conditions>

Bearing material : ○CAC603(LBC3)
○CAC406(BC6)
○Toughmet D

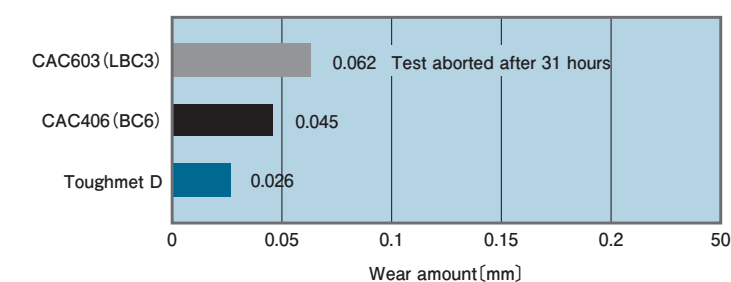
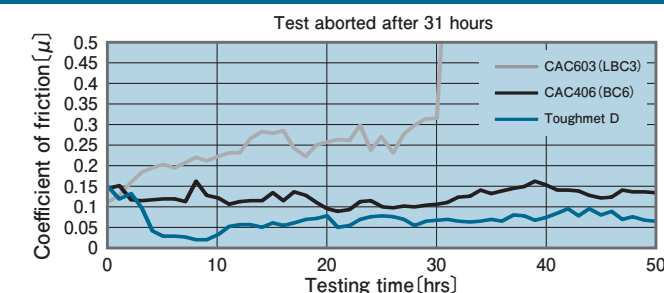
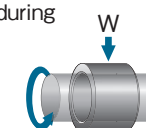
Mating material : S45C

Pressure : 20N/mm² {203.9kgf/cm²}

Velocity : 0.84×10⁻²m/s {0.5m/min}

Testing time : 50hrs

Lubrication : Grease is applied during assembling



Journal oscillation test

<Testing conditions>

Bearing material : ○CAC603(LBC3)
○CAC406(BC6)
○Toughmet D

Mating material : S45C

Pressure : 20N/mm² {203.9kgf/cm²}

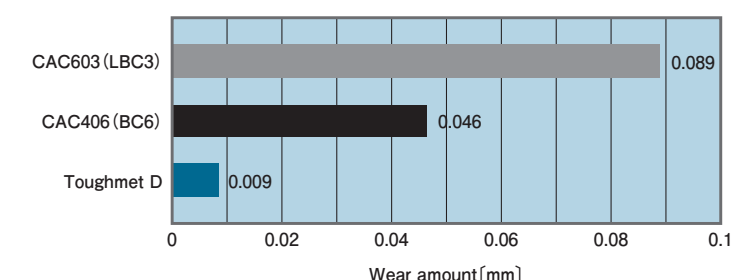
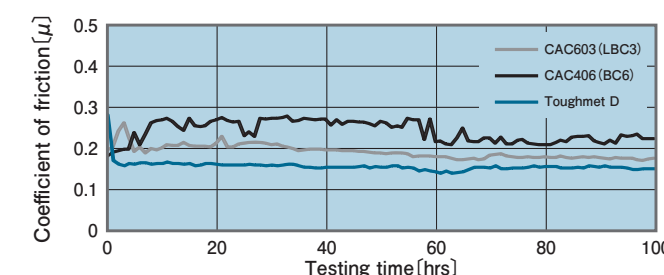
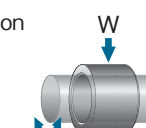
Velocity : 1.68×10⁻²m/s {1.0m/min}

Oscillation cycles : 16cpm

Oscillation angle : 90°

Testing time : 100hrs

Lubrication : Periodical lubrication {3cc/hr}



Journal oscillation test

<Testing conditions>

Bearing material : ○CAC603(LBC3)
○CAC406(BC6)
○Toughmet D

Mating material : S45C

Pressure : 30N/mm² {305.9kgf/cm²}

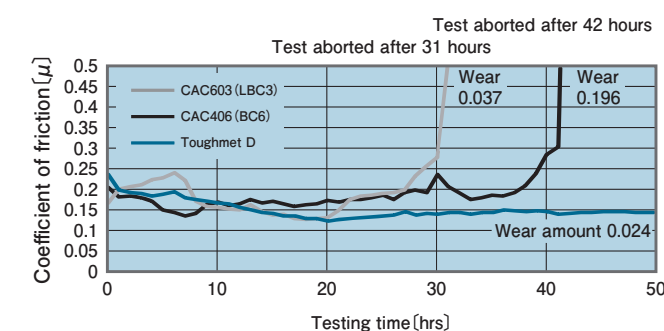
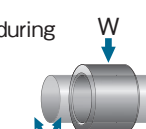
Velocity : 0.841×10⁻²m/s {0.5m/min}

Oscillation cycles : 8cpm

Oscillation angle : ±45° {90°}

Testing time : 50hrs

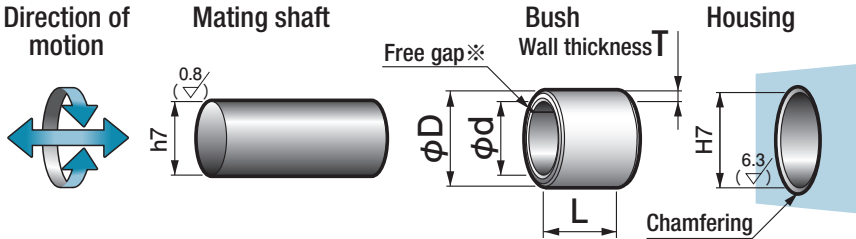
Lubrication : Grease is applied during assembling



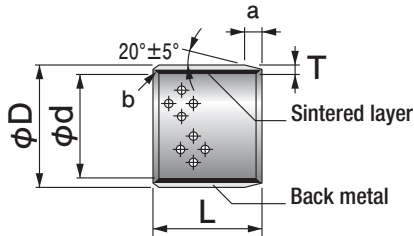
TMDB OILES Toughmet D Bushings



Choose Part No. by required inner diameter and length.
(e.g.) For the inner diameter of **TMDB - 3020**
30mm with 20mm length, choose **Part No.**



※Although free gap does not affect bearing rotation, please avoid maximum load point for free gap.



a: Chamfering on outer diameter

T	1.0	1.5	2.0	2.5
a	0.5	0.8	1.0	1.0

(mm)

b: Chamfering on inner diameter

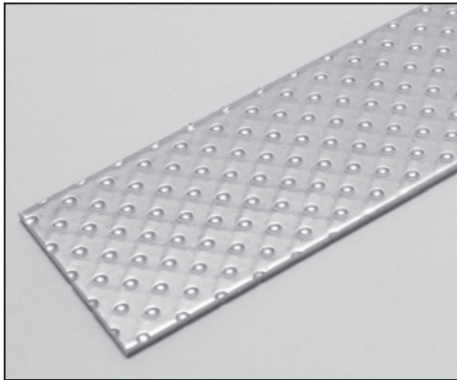
T	1.0	1.5	2.0	2.5
b	0.3	0.5	0.5	0.5

(mm)

Mating Shaft		Mating Hole		I.D.		O.D.		Thickness		Length L Tolerance -0.3					
Size	$h7$ Tolerance	Size	$H7$ Tolerance	ϕd	ϕD	Tolerance	T	Tolerance		10	15	20	25	30	40
12	0 -0.018	14	$+0.018$ 0	12	14	$+0.070$ $+0.035$	1.0	-0.015 -0.040		1210	1215	1220			
14	0 -0.018	16	$+0.018$ 0	14	16	$+0.070$ $+0.035$	1.0	-0.015 -0.040		1410	1415	1420			
15	0 -0.018	17	$+0.018$ 0	15	17	$+0.070$ $+0.035$	1.0	-0.015 -0.040		1510	1515	1520	1525		
16	0 -0.018	18	$+0.018$ 0	16	18	$+0.070$ $+0.035$	1.0	-0.015 -0.040			1615	1620	1625		
18	0 -0.018	20	$+0.021$ 0	18	20	$+0.085$ $+0.045$	1.0	-0.015 -0.045			1815	1820	1825		
20	0 -0.021	23	$+0.021$ 0	20	23	$+0.085$ $+0.045$	1.5	-0.024 -0.054			2015	2020	2025	2030	
22	0 -0.021	25	$+0.021$ 0	22	25	$+0.085$ $+0.045$	1.5	-0.024 -0.054			2215	2220	2225	2230	
24	0 -0.021	27	$+0.021$ 0	24	27	$+0.085$ $+0.045$	1.5	-0.024 -0.054			2415	2420	2425	2430	
25	0 -0.021	28	$+0.021$ 0	25	28	$+0.085$ $+0.045$	1.5	-0.024 -0.054			2515	2520	2525	2530	
26	0 -0.021	30	$+0.021$ 0	26	30	$+0.085$ $+0.045$	2.0	-0.024 -0.054				2620		2630	2640
28	0 -0.021	32	$+0.025$ 0	28	32	$+0.105$ $+0.055$	2.0	-0.024 -0.054				2820		2830	2840
30	0 -0.021	34	$+0.025$ 0	30	34	$+0.105$ $+0.055$	2.0	-0.024 -0.054				3020		3030	3040
31	0 -0.025	35	$+0.025$ 0	31	35	$+0.105$ $+0.055$	2.0	-0.037 -0.072				3120		3130	3140
32	0 -0.025	36	$+0.025$ 0	32	36	$+0.105$ $+0.055$	2.0	-0.037 -0.072				3220		3230	3240
35	0 -0.025	39	$+0.025$ 0	35	39	$+0.105$ $+0.055$	2.0	-0.037 -0.072				3520		3530	3540
38	0 -0.025	42	$+0.025$ 0	38	42	$+0.105$ $+0.055$	2.0	-0.037 -0.072						3830	3840
40	0 -0.025	44	$+0.025$ 0	40	44	$+0.105$ $+0.055$	2.0	-0.037 -0.072						4030	4040
42	0 -0.025	47	$+0.025$ 0	42	47	$+0.105$ $+0.055$	2.5	-0.037 -0.072						4230	4240
45	0 -0.025	50	$+0.025$ 0	45	50	$+0.105$ $+0.055$	2.5	-0.037 -0.072						4530	4540
50	0 -0.025	55	$+0.030$ 0	50	55	$+0.120$ $+0.060$	2.5	-0.037 -0.072						5030	5040
55	0 -0.030	60	$+0.030$ 0	55	60	$+0.120$ $+0.060$	2.5	-0.053 -0.098							5540
60	0 -0.030	65	$+0.030$ 0	60	65	$+0.120$ $+0.060$	2.5	-0.053 -0.098							6040
65	0 -0.030	70	$+0.030$ 0	65	70	$+0.120$ $+0.060$	2.5	-0.053 -0.098							6540
70	0 -0.030	75	$+0.030$ 0	70	75	$+0.120$ $+0.060$	2.5	-0.053 -0.098							7040
75	0 -0.030	80	$+0.030$ 0	75	80	$+0.120$ $+0.060$	2.5	-0.053 -0.098							7540

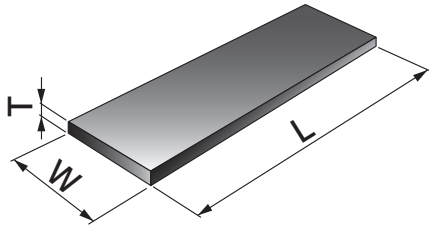
※Outer diameter is measrued by exclusive gauge.

Length L Tolerance -0.3				I.D.Tolerance after press fitting (Reference Value)	I.D. ϕd
50	60	70	80		
				$+0.098$ $+0.030$	12
				$+0.098$ $+0.030$	14
				$+0.098$ $+0.030$	15
				$+0.098$ $+0.030$	16
				$+0.111$ $+0.030$	18
				$+0.129$ $+0.048$	20
				$+0.129$ $+0.048$	22
				$+0.129$ $+0.048$	24
				$+0.129$ $+0.048$	25
				$+0.129$ $+0.048$	26
				$+0.133$ $+0.048$	28
				$+0.133$ $+0.048$	30
				$+0.169$ $+0.074$	31
				$+0.169$ $+0.074$	32
3550				$+0.169$ $+0.074$	35
3850				$+0.169$ $+0.074$	38
4050				$+0.169$ $+0.074$	40
4250				$+0.169$ $+0.074$	42
4550				$+0.169$ $+0.074$	45
5050	5060			$+0.174$ $+0.074$	50
5550	5560			$+0.226$ $+0.106$	55
6050	6060			$+0.226$ $+0.106$	60
	6560		6580	$+0.226$ $+0.106$	65
	7060		7080	$+0.226$ $+0.106$	70
	7560		7580	$+0.226$ $+0.106$	75



Choose Part No. by required inner diameter and length.
(e.g.) For the thickness of 2.0mm with 100mm width, choose

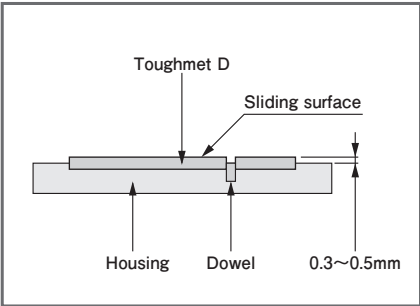
TMDP - 20100
Part No.



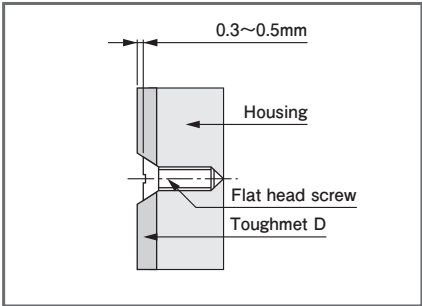
Part No.	Thickness		Width	Length
	T	Tolerance	W	L
TMDP-1080	1.0	-0.03 -0.13	80	500
TMDP-1590	1.5	-0.03 -0.13	90	500
TMDP-20100	2.0	-0.03 -0.13	100	500
TMDP-25100	2.5	-0.03 -0.13	100	500

How to attach plates

① Inlay method (Plate)



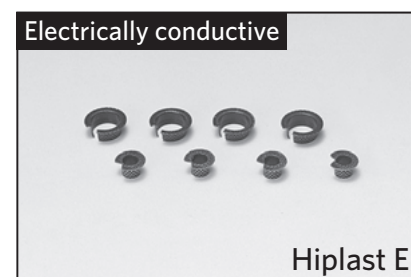
② Flat head screw method



③ Method for bonding

You can use adhesive instead of dowel for inlay method. Epoxide-based adhesive is recommended. Please note that the plate may Separate if adhesive is used only.

Oiles Hiplast N/E Metallic mesh polytetrafluoroethylene plastic composite bearings



Electrically conductive



Feature

- Serviceable without the need for lubrication. Features superior load resistance and wear resistance. As thin as 0.5 mm, allowing for a compact design.
- Features superior chemical and heat resistance.
- Special mounting method unique to the Hiplast series allows zero clearance. (Backlash prevention)
- Metallic mesh offers lower thermal expansion coefficient and higher thermal conductivity than plastic bearings.
- Press-formed and available in intended forms.
- The conductive grade Hiplast E is available when electric conductivity is required.

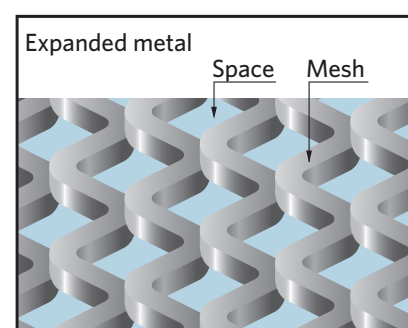
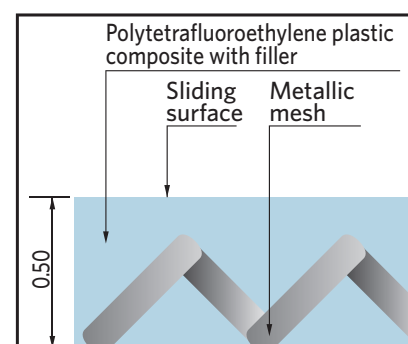
Service range

Lubrication condition	Dry
Service temperature range °C	−50~+250
Allowable max. pressure P N/mm ² {kgf/cm ² }	49.0 {500}
Allowable max. velocity V m/s {m/min}	0.35 {21}
Allowable max. PV value N/mm ² · m/s {kgf/cm ² · m/min}	1.65 {1,010}

Mechanical properties

Tensile strength	JIS K 7113	N/mm ² {kgf/cm ² }	34.3 {350}
Elongation	—	%	30

※The values shown above are typical values, not the standard values.

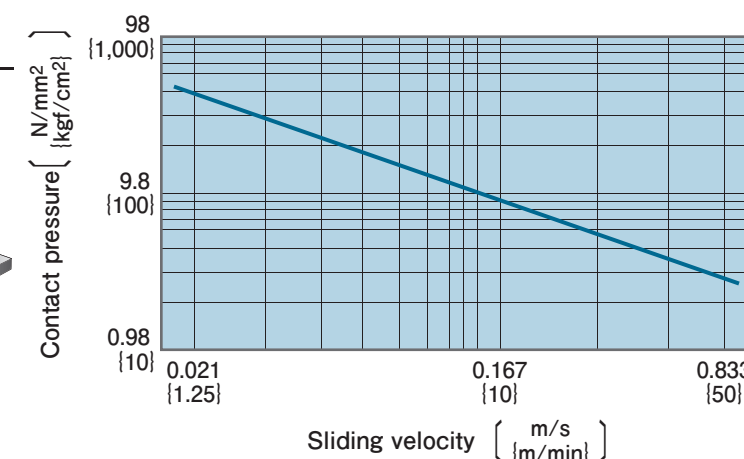
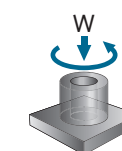


image

Test data

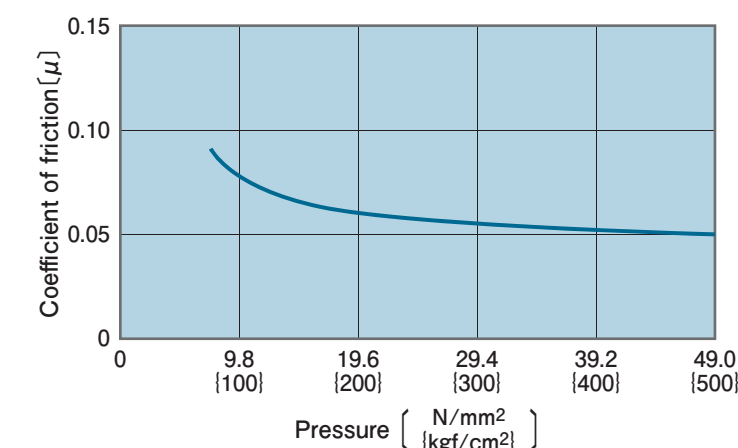
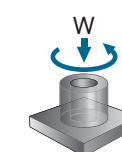
Thrust test (limit PV value)

<Testing conditions>
Mating material : S45C
Test time : 100hrs.
Lubrication : dry



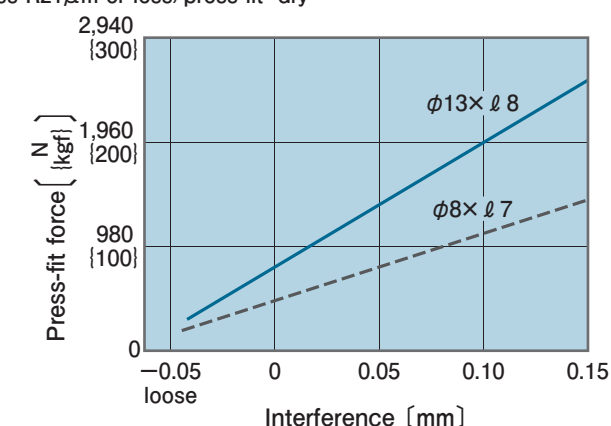
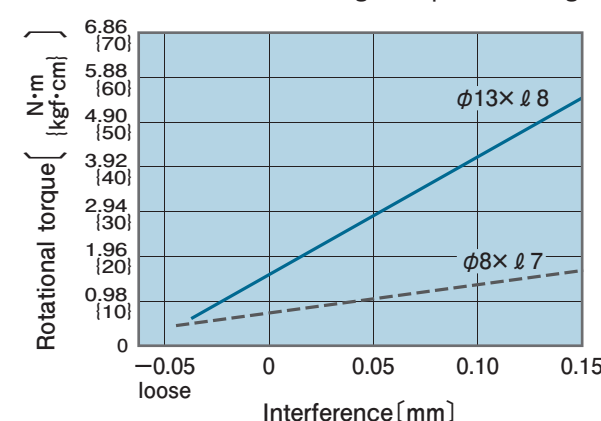
Thrust test

<Testing conditions>
Mating material : S45C
Pressure : 9.8N/mm² {100kgf/cm²} is incrementally loaded every one hour.
Velocity : 0.083m/s {5.0m/min}
Lubrication : dry



Rotational torque, pin press fit force vs. interference

Mating shaft pin S45C roughness Rz1μm or less/press-fit dry

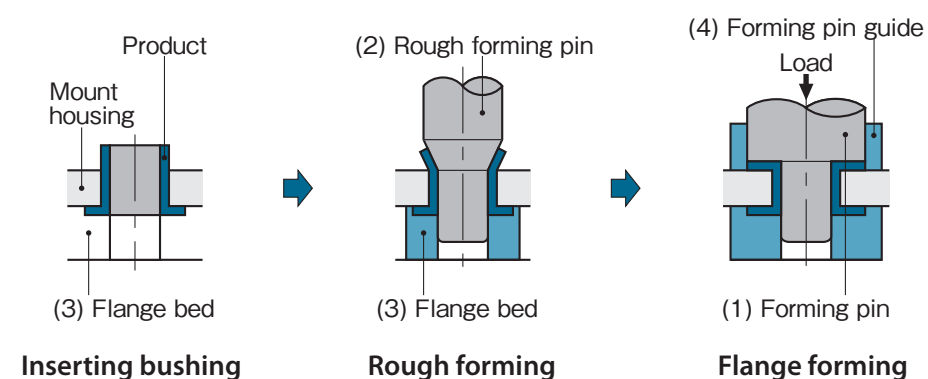


Outline of Flange Forming

- The single-flange Oiles Hiplast bushing may be formed into a both-flange bushing easily.

Set a product on the mount housing, carry out preliminary forming once, and carry out final forming. It has much superior assembly performance and economic efficiency than combination of the conventional single-flange bushing and washer.

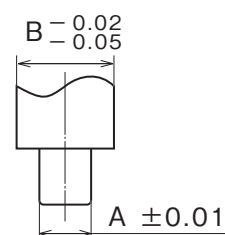
※The Drymet LF (t 0.5) also allows flange machining. Contact the nearest sales office for details.



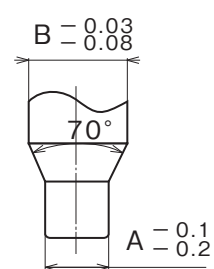
Flange forming jigs

Four jigs are needed to form the flange: (1) Forming pin, (2) rough forming pin, (3) flange bed, and (4) forming pin guide. The dimensions necessary for making the jigs are shown below for reference.

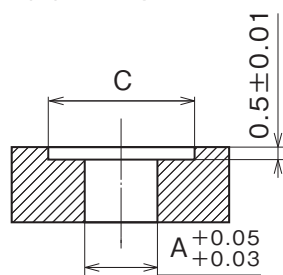
(1) Forming pin



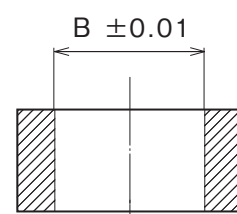
(2) Rough forming pin



(3) Flange bed

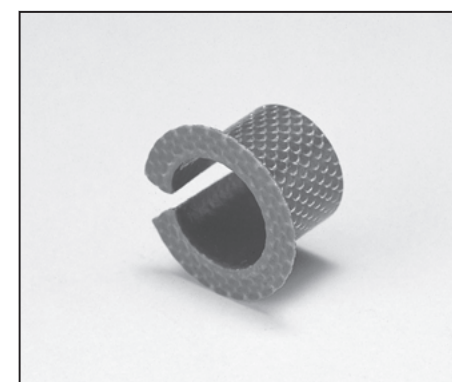


(4) Forming pin guide



A: Forming pin diameter (minimum mating hole diameter — 1 mm)
B: Forming flange diameter (flange diameter after forming)
C: Upper limit of product flange diameter tolerance + 0.2 mm

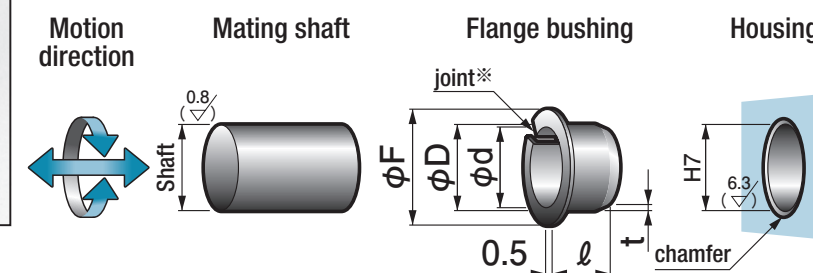
HPF Oiles Hiplast N Flange Bushings



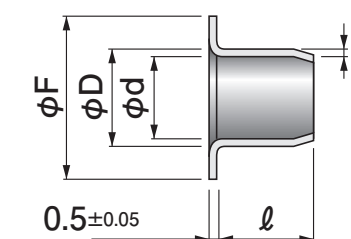
Specify Part No. by required I.D. and length.
(e.g.) I.D. is 8mm and length is 8mm.

HPF - 0808

Part No.



※The joint causes no influences upon rotation of the shaft. Be careful when press-fitting so that the joint is not at the position to which the maximum load is applied.



Shaft		I.D.	O.D.	Flnqe	Thickness		Length ℓ Tolerance ± 0.3							I.D. toleran after pres fitting (refere
Size	Tolerance	ϕd	ϕD	ϕF	t	Tolerance	5	6	8	10	12	15	20	
4	$\begin{smallmatrix} -0.040 \\ -0.055 \end{smallmatrix}$	4	5	8	0.5	± 0.05	0405							$\begin{smallmatrix} +0.112 \\ -0.100 \end{smallmatrix}$
5	$\begin{smallmatrix} -0.040 \\ -0.055 \end{smallmatrix}$	5	6	10	0.5	± 0.02	0505			0510				$\begin{smallmatrix} +0.055 \\ -0.040 \end{smallmatrix}$
6	$\begin{smallmatrix} -0.040 \\ -0.055 \end{smallmatrix}$	6	7	11	0.5	± 0.02		0606		0610				$\begin{smallmatrix} +0.055 \\ -0.040 \end{smallmatrix}$
8	$\begin{smallmatrix} -0.040 \\ -0.055 \end{smallmatrix}$	8	9	13	0.5	± 0.02			0808			0815		$\begin{smallmatrix} +0.055 \\ -0.040 \end{smallmatrix}$
10	$\begin{smallmatrix} -0.040 \\ -0.058 \end{smallmatrix}$	10	11	16	0.5	± 0.02				1010		1015		$\begin{smallmatrix} +0.058 \\ -0.040 \end{smallmatrix}$
12	$\begin{smallmatrix} -0.040 \\ -0.058 \end{smallmatrix}$	12	13	18	0.5	± 0.02					1212		1220	$\begin{smallmatrix} +0.058 \\ -0.040 \end{smallmatrix}$
15	$\begin{smallmatrix} -0.040 \\ -0.058 \end{smallmatrix}$	15	16	22	0.5	± 0.02						1515	1520	$\begin{smallmatrix} +0.058 \\ -0.040 \end{smallmatrix}$

※The HPF0405, HPF0505, HPF0510, HPF1515 and HPF1520 have straight flange bottoms.

※The I.D. tolerances after press fitting are the reference values measured in the condition where the bushings are inserted into the housings and in close contact with them.