GENERAL CHARACTERISTICS and TYPICAL BEARING USES

Oilite bearing products are made by the P/M process, with close controls on materials and manufacturing to produce the premier self-lubricating bearing. With the emphasis on quality throughout the process, we produce Oilite bearings with large interconnected pores vital for the channeling of lubricants to areas between the shaft and bearing. At rest, the capillary action will recover lubricant from the surface and replenish the reservoirs. This porosity feature of Oilite is the most sought-after quality of our bearings.

THE P/M PROCESS

Fine powders are combined and blended into a mix and are compacted in a die under high pressure. The compacted parts are sintered at high temperature in a protective atmosphere belt furnace. Sintered parts are then sized to obtain the exact dimensions and close tolerances desired. The final step in the P/M process is vacuum impregnation of the bearings, or filling the pores with lubricant.

TYPICAL PROPERTIES* OILITE BEARING MATERIALS

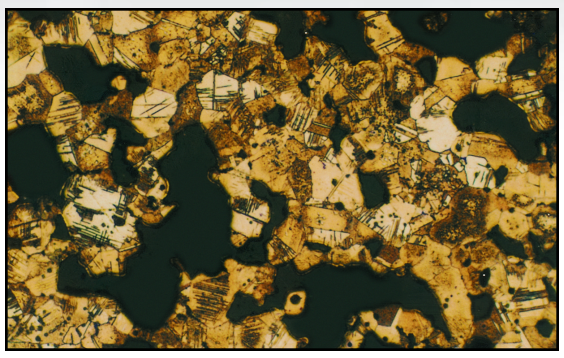
PROPERTIES	OILITE BRONZE†	SUPER OILITE	SUPER OILITE 16
Composition — Percent			
COPPER	87.5 - 90.5	18.0 - 22.0	18.0 - 22.0
IRON	1.0 MAX	BALANCE	BALANCE
LEAD	—	—	—
CARBON	1.75 MAX	—	0.6 - 1.0
TIN	9.5 - 10.5	—	—
ACID INSOLUBLES (MAX.)	—	—	—
MAGNESIUM	—	—	—
TOTAL OTHER ELEMENTS (MAX.)	0.5	2.0	2.0
BALANCE	—	—	—
Physical & Mechanical Properties			
DENSITY (GM PER CU. CM.)	6.4 - 6.8	5.8 - 6.2	6.0 - 6.4
POROSITY (% OIL BY VOLUME)	18 MIN.	15 MIN.	15 MIN.
"K" STRENGTH CONSTANT	26,500	40,000	60,000
TENSILE STRENGTH (PSI)	14,000	22,000	32,000
ELONGATION (% IN ONE INCH)	1	1	0.5
YIELD STRENGTH IN COMP. (PSI)**	11,000	22,000	40,000
Comparable Specifications			
ASTM	B-438-95A GR 1 TYPE II	B-439-95 GR 4	— —
MILITARY	MIL-B-5687D TYPE 1 GR. 1	MIL-B-5678D TYPE 2 GR. 4	— —
MPIF	CT-1000-K26	—	N/A
SAE — NEW OLD	841 TYPE 1 CLASS A	863 TYPE 3	— —

*Bearings may exhibit appreciable differences in properties due to size, shape, thickness, etc.
**For .001" permanent set on text specimens 1-1/4" diameter by 1" long.

ADVANTAGES and APPLICATIONS

OILITE

Self-lubricating, highly wear-resistant, ductile, conformable and corrosion resistant. Large pore structure complete with complete alpha phase bronze and twinning. Most widely used of all Oilite bearing materials.



Used in appliances, business machines, cylinders, exercise apparatus, lawn and garden equipment, medical applications, material handling, packaging and printing machines, and tools.

OILITE *PLUS*

The advantage of Oilite *Plus* is realized in applications in which mixed-film, and boundary lubrication is exhibited. These kinds of conditions occur in well over 75% of all self-lubricating bearings applications.

Shaft oscillation or slow speed, intermittent use, pulsating or uneven loads are conditions that inhibit full-film lubrication from developing or being maintained. These applications would benefit significantly from using Oilite *Plus*.

Oilite *Plus* features a complex bearing system that greatly reduces friction. The impregnation of the bearing includes a finely dispersed Teflon® in an oxidation and corrosion inhibiting turbine oil. On average a 17% reduction of friction will result in smoother and quieter operation, easier "break-in", lower power requirements and longer life.

Applications include all equipment in the Oilite section with emphasis on agricultural and construction equipment, material handling machines, man-lifts and computer peripherals.

SUPER OILITE

Self-lubricating, harder, higher strength and generally more economical than Oilite bronze, but a lower speed rated bearing material for general application. Recommended for high load applications at low speeds.

Used in farm equipment, off-road equipment, winches, sheaves, conveyors, pulleys, etc.

SUPER OILITE 16

Self-lubricating. Similar metallurgically to Super Oilite, but heat treated to a particle hardness greater than Rc50. High compressive strength for extreme load, low speed reciprocating and oscillating applications. Requires hardened steel shaft.

Used in earth-moving equipment, cranes and hoists, railway brake rigging, presses, conveyors, etc.

LOADS AND SPEEDS

The best method for evaluating the acceptability of Oilite bearings for any given application is by using PV factor (Pressure x Surface Velocity) where:

P = the load in (psi) on the projected bearing area (Bearing ID x Length).

V = surface velocity of the shaft in feet per minute (SFM).

$$PV = \frac{W}{LD} \times \frac{\pi DN}{12} = \frac{3.14\,WN}{12L}$$

W = total load on bearing (pounds)

L = bearing length (inches)

D = ID of bearing (inches)

N = shaft speed (rpm)

NORMAL UPPER LIMITS FOR OILITE BEARING MATERIALS

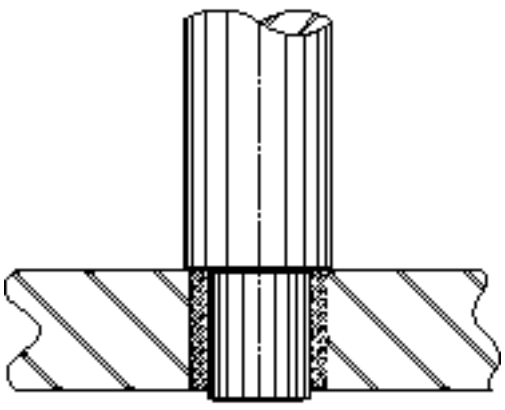
MATERIAL	PV	P(psi) STATIC	P(psi) DYNAMIC	V (sfm)
OILITE BRONZE	50,000	8,000	2,000	1,200
SUPER OILITE	35,000	20,000	4,000	225
SO-16	75,000	50,000	8,000	35

This information, based on our experience, is in line with accepted engineering practice and is believed to be reliable. Oilite bearings should not be used in applications that exceed operating conditions outlined, either in this catalog or in other information provided. Beemer Precision Inc. assumes no obligation or liability in connection with its use or the users end product.

INSTALLATION, SIZING and SHAFTING

INSTALLATION

Bearings are usually installed by means of a shouldered arbor plug inserted in an arbor press. A chamfer in the housing bore is necessary to serve as a lead for the bearing. An unchamfered edge might shear metal from the bearing OD, seriously reducing the press fit. The OD chamfer on the lead end of the bearing acts as a pilot, and the ID chamfer in the bearing serves as a lead when the shaft is inserted. Any out-of-roundness condition is corrected when the bearing is pressed into the housing. See our interactive website at www.oilite.com to calculate close-ins and press fits.



A Shouldered Arbor

SIZING

The sizing of the ID is controlled by the method selected. Several methods are commonly used:

1. No Tool Contacting ID

The bearing is pressed into the housing without the use of tools. This method allows the ID to close-in without restraint. The approximate amount of close-in is determined by the bearing material wall thickness and housing conditions.

2. Combination Insertion and Sizing Plug

The amount of close-in may be controlled by use of a combination insertion and sizing tool. The plug diameter should be approximately .0003" greater than the desired final bearing ID. The plug should fit freely in the bearing ID before installation. When the bearing is pressed into the housing, its ID will close-in on the plug. The interference between the ID and the tools is less than the interference between the OD and the housing. Upon tool withdrawal, the ID will spring back between .0002" and .0005", depending on material, bearing size and mounting conditions. The exact amount of the springback range should be determined by actual tests.

3. Roller-Type Burnisher

Roller-type burnishing tools can be used for high-production work, especially where ID tolerances are to be held within .0005".

SHAFTING

Optimum bearing operation requires a shaft of proper material, hardness and surface finish. Generally, carbon steel shafts are preferred over stainless steels. Stainless steel shafts can be problematic under certain conditions and applications. Contact our engineering department for assistance.

Shaft hardness must always be harder than the bearing (particle hardness) selected. Hardened shafts add to the load carrying ability of the bearing. Along with hardness, surface finish will improve the bearing's performance. Each application is unique and, therefore, load considerations and subsequent testing is recommended.

MACHINING

Machining Oilite presents no problems. There are a few basic procedures that should be followed to preserve the open-pore structure of the Oilite material so it will retain its full self-lubricating qualities.

Cutting tools must be sharp. For this reason tungsten carbide tooling is highly recommended since they hold a cutting edge much longer. This preserves the open-pore structure from which oil can flow freely. A dull tool will smear the pores, greatly reducing the self-lubricating qualities in the material.

Oilite bearings may be reamed provided a dead-sharp cutting tool is used. However, reaming does destroy porosity more than single point tooling.

Honing and grinding are never recommended on Oilite bearings on any surface which will become the bearing surface. These operations will smear the pores and will not allow the oil to flow freely.

LUBRICATION

Lubrication is a very important consideration, since certain conditions will necessitate the need for different oils and lubricants. These choices can greatly affect the performance and efficiency of the bearing.

Oilite is a metallic sponge with the lubricant stored in the interconnected pores of the bearing. Capillary action holds the lubricant in the bearing and prevents it from dripping. Pressure and/or heat applied to the bearing brings the lubricant to the surface where it forms a protective oil film or optimally a hydrodynamic wedge between the bearing and the shaft.

LUBRICANTS

Oilite bearings are vacuum impregnated with a filtered oxidation and corrosion inhibited turbine oil. There are many grades of oils and lubricants specifically developed to meet special or extreme conditions or requirements such as,high and low temperature,high loads,high speeds, low loads, low speeds, plastic compatibility or FDA compliance. Many applications combine several of these conditions.

Viscosity is the most important property of a lubricant. Viscosity is the internal friction of a fluid, or its resistance to flow. Speed and subsequent temperature build-up can cause the viscosity to become too thin to support the shaft loads, resulting in bearing failure.

OIL CHARACTERISTICS	OILITE 1	OILITE / PLUS (diluent only)	OILITE 3
Viscosity (SUS) @ 100° F	522	302	228
@ 210° F	63	64	142
Viscosity Index	95	189	90
Flash Point	457° F	500° F	450° F
Pour Point	+10° F	-75° F	—

NOTE: Oilite *Plus* may not be compatible with some plastics.

TOLERANCES ALL FIGURES ARE IN INCHES

PLAIN AND FLANGE BEARINGS

Inside and Outside Diameters

OVER	UP TO & INCL.		OILITE / OILITE PLUS	SUPER OILITE
–	1/2	+.000	–.001	–.001
1/2	1	+.000	–.001	–.001
1	1-1/2	+.000	–.001	–.0015
1-1/2	2-1/2	+.000	–.0015	–.002
2-1/2	3-1/2	+.000	–.002	–.003
3-1/2	4-1/2	+.000	–.0025	–.003
4-1/2	5-1/2	+.000	–.0035	–.0045
5-1/2	6-1/2	+.000	–.004	–.006

Length

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1-1/2	±.005	±.010
1-1/2	3	±.0075	±.015
3	4-1/2	±.010	±.020
4-1/2	6	±.015	±.030

Flange Diameters — Based on Flange OD

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1-1/4	±.005	±.010
1-1/4	2-1/2	±.010	±.015
2-1/2	4	±.015	±.020
4	6	±.025	±.025

Flange Thickness — Based on Flange OD

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1-1/4	±.0025	±.005
1-1/4	2-1/2	±.005	±.0075

Flange Fillets, Radii — Based on Body OD

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1	1/32 ±.010	1/32 ±.010
1	2	3/64 ±.010	3/64 ±.010
2	2-1/2	1/16 ±.010	1/16 ±.010
2-1/2	4	3/32 ± 1/64	3/32 ± 1/64
4	6	1/8 ± 1/64	1/8 ± 1/64

Concentricity, ID with respect to OD
(Maximum Total Dial Indicator Reading) — Based on ID

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1	.003	.003
1	1-1/2	.003	.004
1-1/2	3	.004	.005
3	4-1/2	.005	.006
4-1/2	6	.006	.007

THRUST BEARINGS

Inside Diameter

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1-1/4	±.005	±.005
1-1/4	2-1/2	±.010	±.010
2-1/2	4	±.015	±.015
4	6	±.020	±.020

Outside Diameter

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1-1/2	±.010	±.010
1-1/2	3	±.015	±.015
3	4-1/2	±.020	±.020
4-1/2	6	±.025	±.025

Thickness

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
1/32	1/4	±.0025	±.005

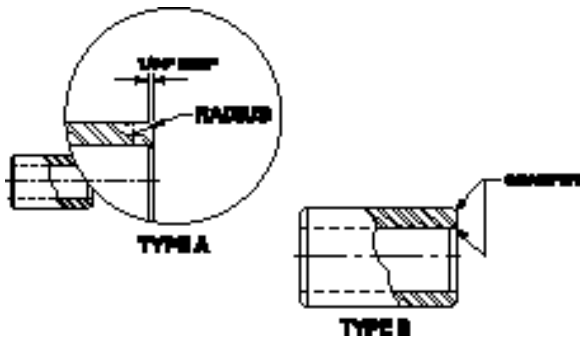
Parallelism of Faces — Based on OD

OVER	UP TO & INCL.	OILITE / OILITE PLUS	SUPER OILITE
–	1-1/2	.002	.003
1-1/2	3-1/2	.003	.004
3-1/2	6	.004	.005

CHAMFERS

Recommended Bearing Chamfers

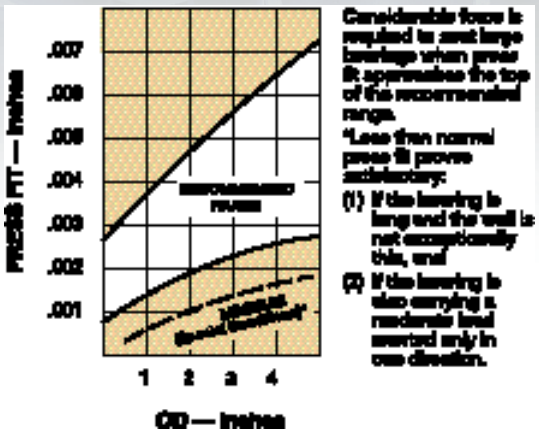
RANGE	MINIMUM CHAMFER SIZE	TYPE
ALL THIN WALLS UP TO AND INCLUDING 1/16	ROUNDED END (1/64 "TRUE RADIUS")	A
ON WALLS GREATER THAN 1/16 UP TO 3" O.D.	1/64 X 45°	B
ON ALL BEARINGS 3" O.D. AND OVER	1/32 X 45°	B



PRESS FIT VALUES / BEARING CLEARANCE / ID CLOSE-IN

PRESS FIT VALUES

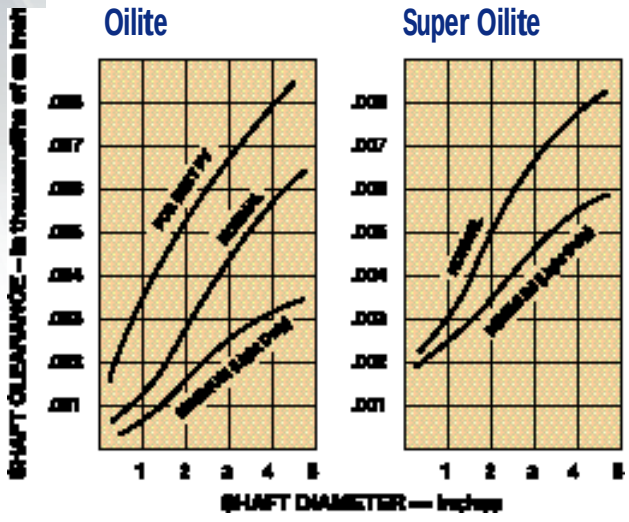
Oilite and Super Oilite Bearings



BEARING CLEARANCE

Oilite

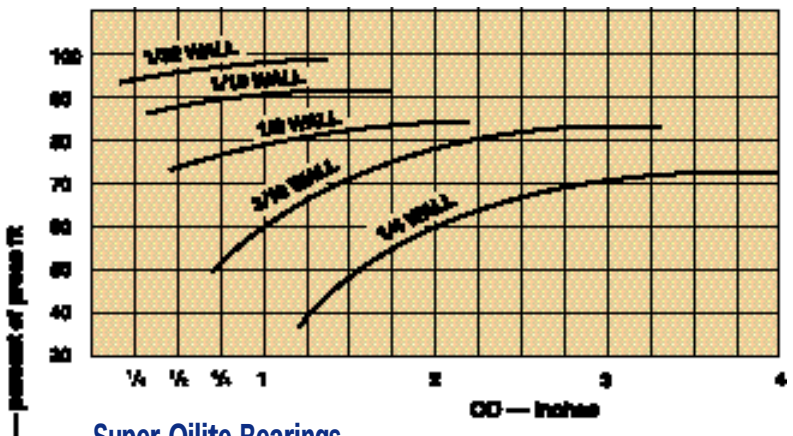
Super Oilite



ID CLOSE-IN

As Related to Wall Thickness (Approximate Values) for Normal Press Fit

Oilite Bearings



Super Oilite Bearings