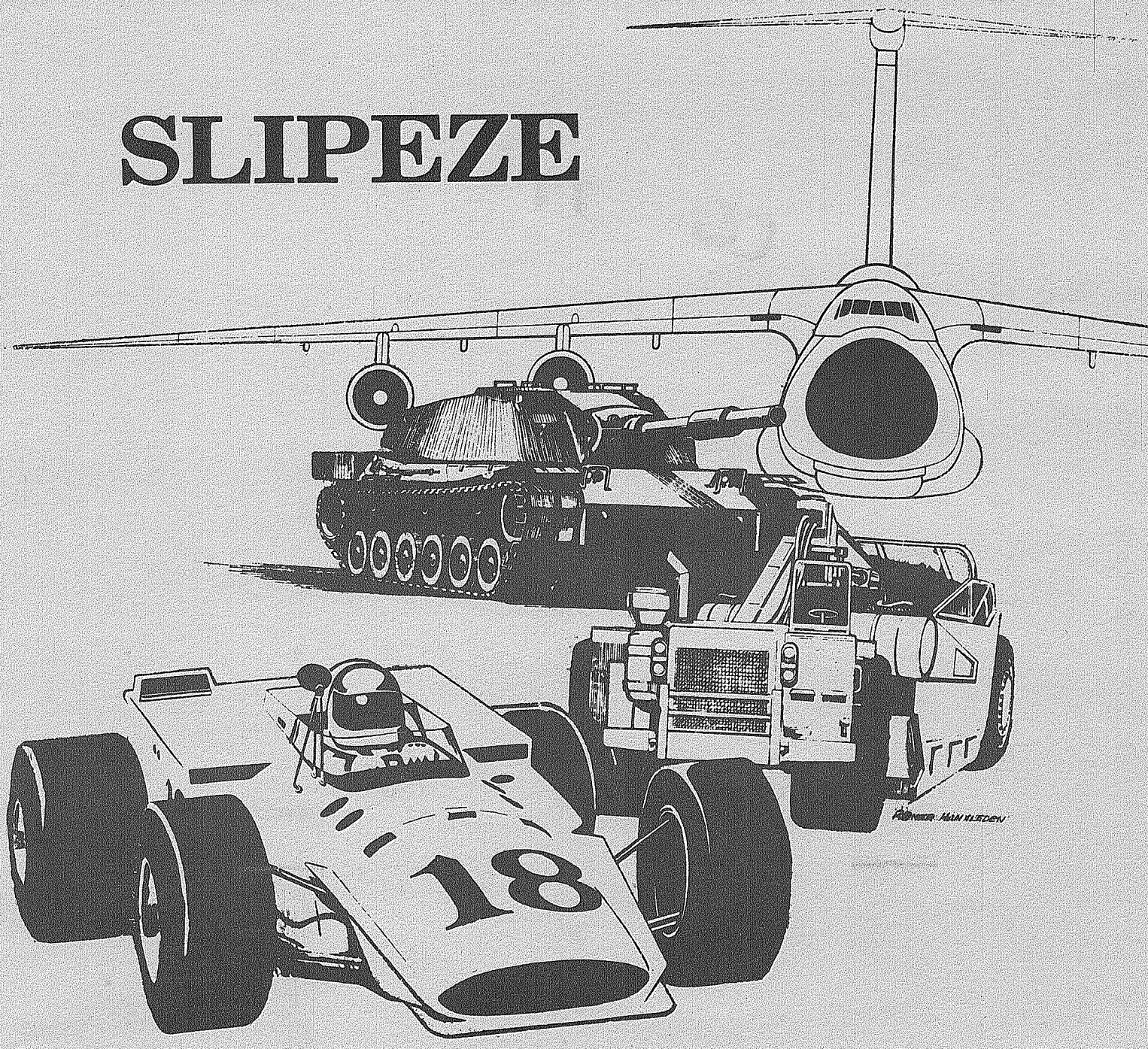
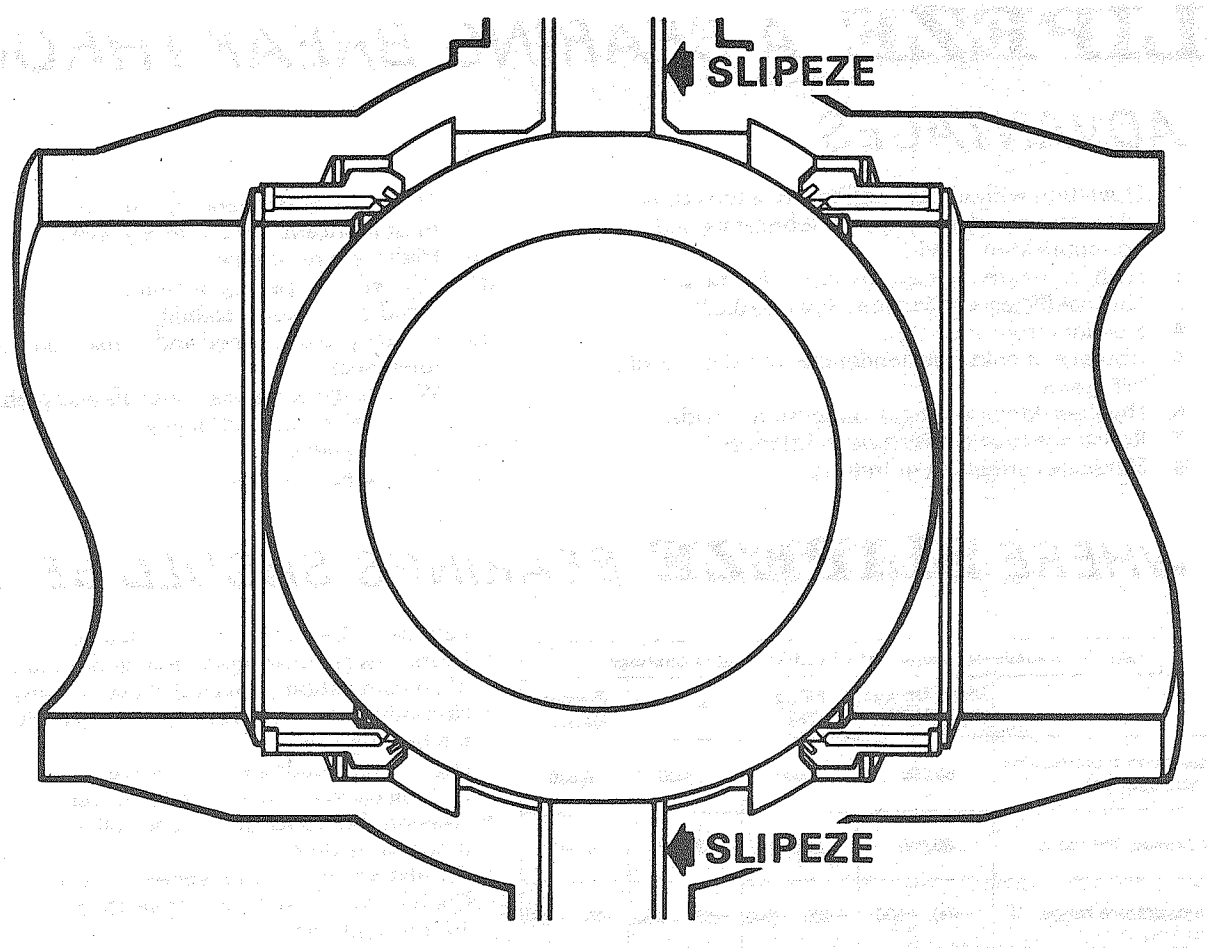
SLIPEZE



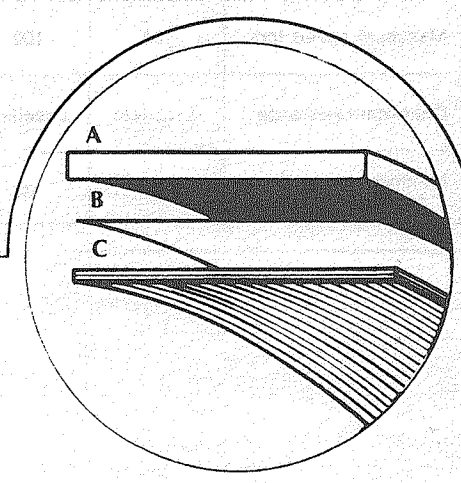
SOLID STATE LUBE

10532 STANFORD AVE., GARDEN GROVE, CALIF. 92640

PHONE (714) 638-4950



Construction of typical SLIPEZE bearing:
A Metal or molded phenolic backing
B Adhesive bonding agent
C Teflon flock SLIPEZE material



SLIPEZE bearings are available with many backup materials in a wide variety of standard configurations. In addition, solid state lube offers special bearings with an almost unlimited range of configurations and metal backings.

SLIPEZE A BEARING BREAKTHROUGH

ADVANTAGES

1. Operation without lubrication while tolerating all common and many special lubricating and non-lubricating fluids.
2. High load-carrying capacity (up to 80,000 psi).
3. Low coefficients of friction (down to 0.02).
4. Freedom from stick-slip.
5. Absence of cold-flow tendencies of solid and filled TFE resins.
6. High resistance to fatigue under shock loads.
7. Resistance to attack by most substances.
8. Eliminates brinelling or fretting.
9. Operation at temperatures beyond the range of most lubricants (−200 to +400°F).
10. High wear resistance.
11. Inherent dampening qualities.
12. Good dimensional stability.
13. Capacity to be formed and to maintain close tolerances.
14. Wide range of mating materials acceptable.
15. Electrically non-conducting.
16. Non-magnetic.
17. Eliminates corrosion.

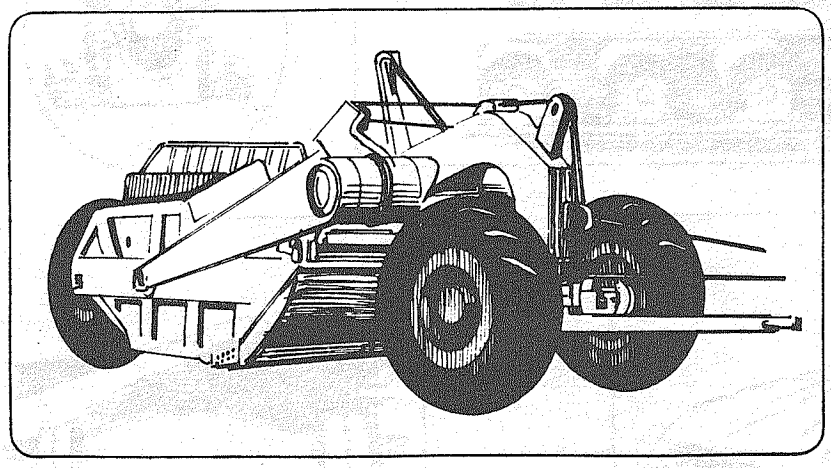
WHERE SLIPEZE BEARINGS SHOULD BE USED

Table 1. Mechanical properties of self-lubricated bearings

	Metal-backed SLIPEZE	Filled TFE	Nylon	Porous Bronze
Maximum compression strength psi	80,000	2,500	1,000	8,500
Maximum PV value	60,000	10,000	3,000	50,000
Temperature range, °F.	−400, +500	−400, +500	−65, +200	−65, +250
Maximum speed fpm	150	100	50	1500
Chemical resistance	Excellent	Excellent	Fair	Fair
Minimum coef. of friction	.02	.02	.25	.05

- Lubricant films cannot be maintained.
- Lubricants are unacceptable or undesirable because of contamination or bearing inaccessibility.
- Non-lubricating fluids are difficult to exclude from the bearing area.
- High impact loads are encountered.
- Fretting corrosion occurs with conventional bearings.
- Freedom from stick-slip or controlled friction is a desirable feature.
- Oscillating or sliding movements are involved.
- Conditions of high load with relatively low speeds are encountered.
- Corrosive substances are present.
- Unusual temperature conditions prevail.
- Distortion problems create misalignment.
- Maintenance cost reduction is important.

SLIPEZE *APPLICATIONS*

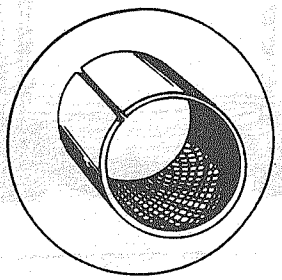


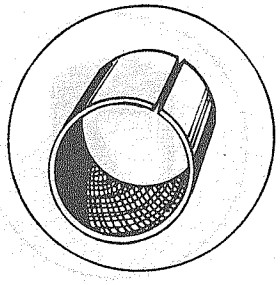
Steering systems for trucks, passenger cars, farm tractors, off-highway equipment
Heavy-duty suspension systems of trucks, tractors and related equipment

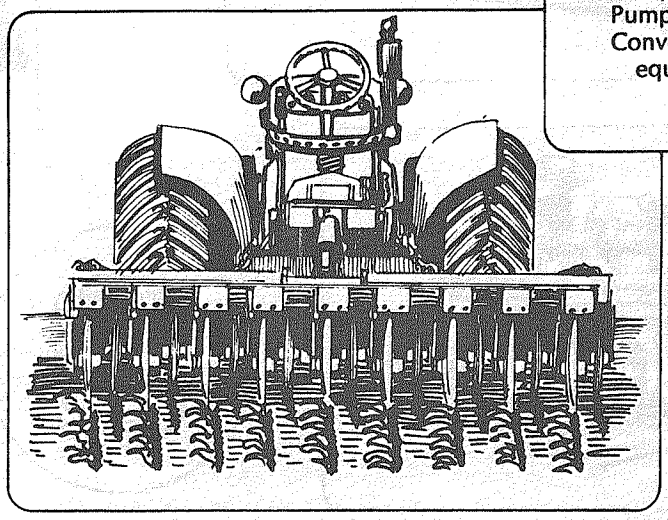
Brakes for trucks, automobiles, off-highway vehicles.
Transmission shift linkages and pivots
Pneumatic and hydraulic tools and actuators

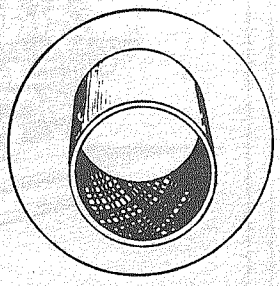
Butterfly, ball, plug valves
Printing machinery
Packaging machinery
Food processing machinery
Marine equipment
Textile machinery

Bridge and other structure support bearings
Pumps
Conveying and handling equipment









SLIPEZE *OPERATING PARAMETERS*

The values used in the following sections are for extended bearing life under "dry" conditions. These values may be exceeded at some reduction of life and increase in wear. Also SLIPEZE bearings often have a higher load-speed limitation when operating in a fluid atmosphere. The design parameters here should be used as a guide only, noting that higher performance can be obtained. Where this occurs, or where any of the limits shown here are exceeded, check with GSB solid state lube for specific recommendations.

PV FACTOR—For plain bearings, it is desirable to reference a Pressure-Velocity (PV) factor as a guide for selecting an unlubricated bearing:

NORMAL RECOMMENDED PV (Dynamic Pressure x Velocity):
Continuous—20,000 (ft/min. x lb./in.^{2})
Maximum —60,000 (ft/min. x lb./in.^{2})

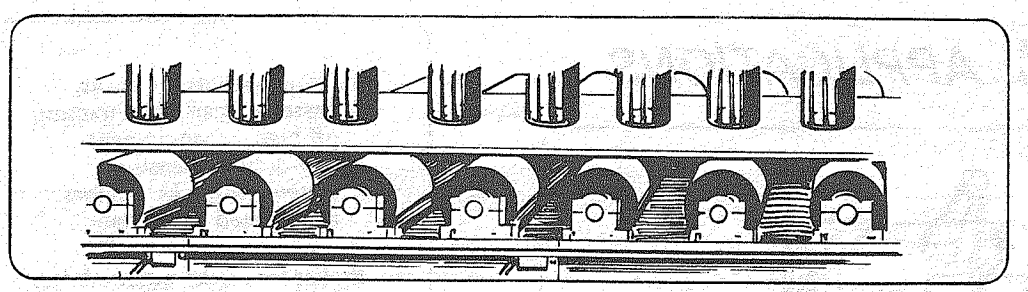
$$Fpm = \frac{\pi DN}{12} = .262 \times \text{shaft dia. in inches} \times \text{rpm}$$

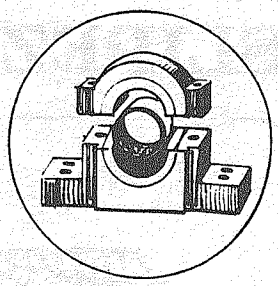
WEAR RATE—During running-in, SLIPEZE liner deposits a PTFE coating on the mating surface, and surplus PTFE may be ejected from the bearing. The coefficient of friction may be slightly higher during this period than experienced throughout the rest of the life cycle (Fig. 1). After run-in, wear rate is low and depends upon pressure and velocity. Allowable wear with SLIPEZE bearings is normally .008-.010 in., however, in certain applications it may be necessary to restrict total wear to a lower figure. It is often possible to design a bearing for negligible wear or with a large wear potential.

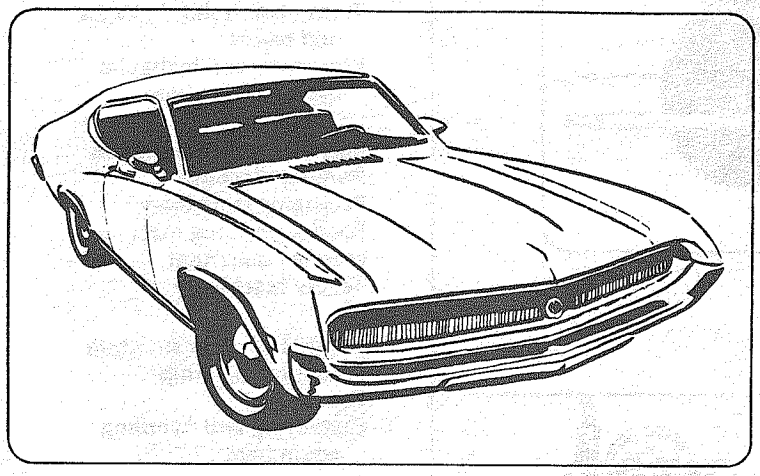
DYNAMIC PRESSURE LIMIT— 20,000 lb./in.^{2} for all backing materials.

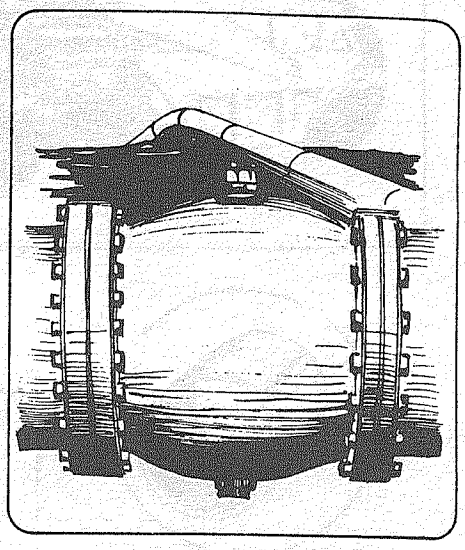
STATIC PRESSURE LIMIT

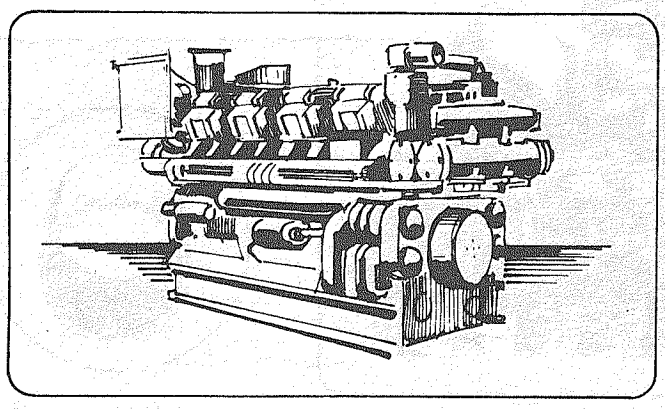
BACKING MATERIAL	UNIT LOAD (lb./in.^{2})
phenolic or laminated liner	50,000
Stainless steel Mild steel Aluminum	80,000

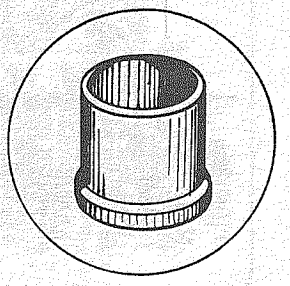


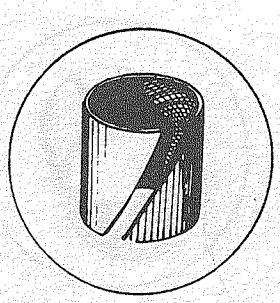












VELOCITY LIMIT— For dry, continuous running, velocity should not exceed 150 surface ft/min.

TEMPERATURE LIMIT— Approximately 400°F. There is a reduction in load-carrying capacity when ambient exceeds 250°F. SLIPEZE materials can be used below −200°F. For temperatures exceeding 400°, consult the Solid State Lube Engineering Dept.

COEFFICIENT OF EXPANSION—When bonded to a metal backing, SLIPEZE coefficient of expansion can normally be regarded as identical to that of the backing. With molded phenolic backing, coefficient is approx. 11.3 x 10^{-6}/°C.

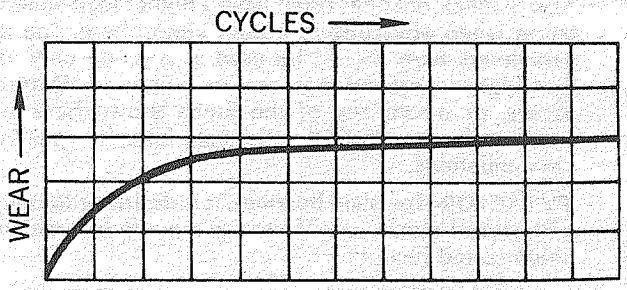


Fig. 1 – Typical wear rate curve of a phenolic-backed SLIPEZE journal bearing shows gradual wear after initial run-in period.

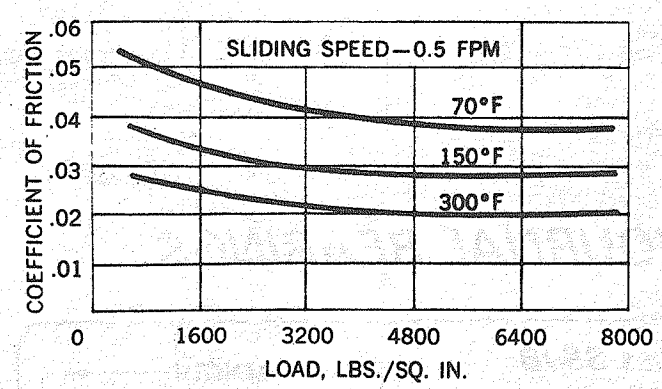


Fig. 2 – Effect of load and temperature on SLIPEZE bearing friction

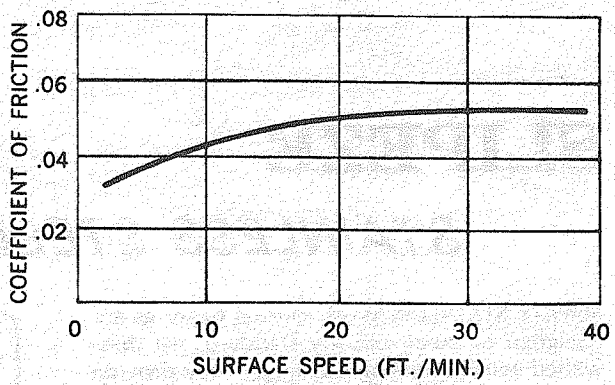


Fig. 3 – Coefficient of friction at 10,000 lb./in.² Normal unit load and 70°F vs. surface speed

COEFFICIENT OF FRICTION depends upon type of movement, finish of mating surface, ambient temperature, bearing pressure, velocity and other variables. Figs. 2, 3 and 4 were obtained from flat specimens and may be used as a guide. Note in Fig. 2 that the coefficient drops off as bearing load increases. This offers the advantage of using the smallest bearing sizes to obtain the least amount of friction. Fig. 3 shows the coefficient of friction increasing as surface velocity increases from 0-20 ft./min. This feature is particularly desirable for vehicle steering systems.

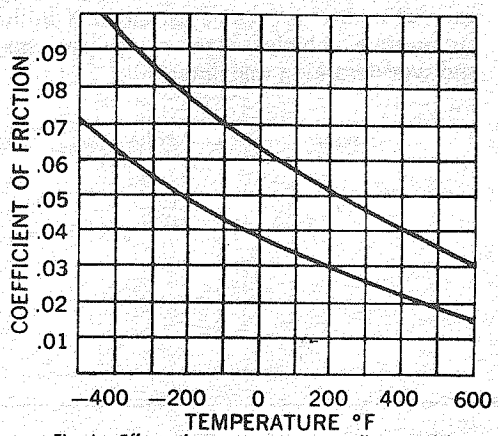


Fig. 4 – Effect of temperature on coefficient of friction

MATING SURFACES – Being non-metallic, SLIPEZE will operate against most metals, but better performance is usually obtained with the hardest available mating surfaces, such as hardened steel, hard anodized aluminum, hard chrome and nickel plate. A surface hardness of 45-50 Rc is desirable. Satisfactory performance can also be obtained with softer materials, however, the harder the surface, the less likely that it will be nicked or scratched prior to assembly. Generally, a surface finish on the mating components of 16-32 micro-in. or bettter should be provided. To prevent damage to the bearing surface during insertion, shaft end should be radiused or provided with a lead-in chamfer. For dry operation, select shaft materials or surface treatments that will effectively resist corrosion.

DIRTY ENVIRONMENTS – SLIPEZE will tolerate solid matter that, with most bearing materials, would severely score the mating surface. However, it is desirable to exclude dirt particles from the bearing area for maximum bearing life.

RUNNING CLEARANCE – As a general rule, close running fits, and often slight interference fits (.0005 in.), are selected for oscillating motion when minimum starting torque is less important than the elimination of free play. For constant rotation, a free-running fit is normally recommended the exact amount depending on bearing bore size. A rule of thumb would be 0.0015 in. per inch of bore (bearing installed).

BEARING HOUSING FITS – SLIPEZE journal bearings are generally installed using a press fit with the housing bore, the amount of interference depending on bearing size. General guidelines.

.0005 to .003 up to 1-in. O.D.
.001 to .004 for 1-3-in. bore dia.
.002 to .005 for bore dia. above 3 in.

For standard thin-walled journal bearings, a 100% close-in can be expected. Adhesives are recommended to effect installation when the close-in condition must be eliminated.

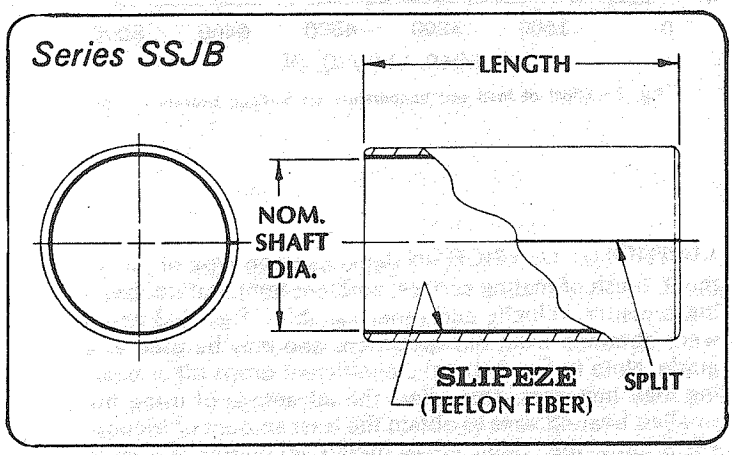
CONTAMINATING FLUIDS – SLIPEZE is unaffected by most fluids and contaminants found in bearing applications. Following are some of the environments in which these bearings have operated successfully:

- Sea water
- Hydraulic oils
- Greases
- Gasoline
- Kerosene
- Toluene
- Mild acids
- Ammonium hydroxide
- Lubricating oils
- Detergent solutions
- Liquid nitrogen

SLIPEZE

STAINLESS STEEL JOURNAL BEARINGS

SLIPEZE STAINLESS STEEL journal bearings are designed to meet industry standards for thin-walled self-lubricating bushings. They provide all of the many advantages of SLIPEZE at minimum cost. Other metals can be supplied upon special order. Typical applications include automotive vehicles, farm equipment, textile and woodworking machinery.



Part number example: SSJB-1014 is a coiled steel journal bearing with 5/8-in. bore, 7/8-in. long.

DASH NO.	SHAFT DIA. MAX.*	HOUSING BORE RECOM'D	BEARING LENGTH ±.010
-0806	.5000	.5945	.375
-0808		.5935	.500
-0812			.750
-0816			1.000
-1008	.6250	.7195	.500
-1010		.7185	.625
-1012			.750
-1014			.875
-1208	.7500	.8755	.500
-1210		.8745	.625
-1212			.750
-1216			1.000
-1412	.8750	1.0005	.750
-1414		.9995	.875
-1416			1.000
-1420			1.250
-1608	1.0000	1.1255	.500
-1616		1.1245	1.000
-1624			1.500
-1812	1.1250	1.2820	.750
-1816		1.2810	1.000
-1818			1.125
-2012	1.2500	1.4068	.750
-2016		1.4058	1.000
-2020			1.250
-2024			1.500
-2216	1.3750	1.5320	1.000
-2222		1.5310	1.375
-2224			1.500
-2416	1.5000	1.6573	1.000
-2424		1.6558	1.500
-2428			1.750
-2816	1.7500	1.9385	1.000
-2824		1.9370	1.500
-2828			1.750
-3216	2.0000	2.1885	1.000
-3224		2.1870	1.500
-3232			2.000

*To assure free-running fit, reduce maximum shaft diameter by .001.

THESE BEARINGS CAN BE MANUFACTURED IN BORE DIAMETERS UP TO 15 INCHES WITHOUT SPECIAL TOOLING.

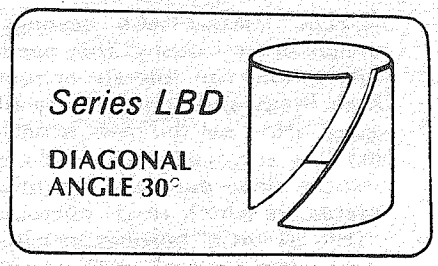
SLIPEZE

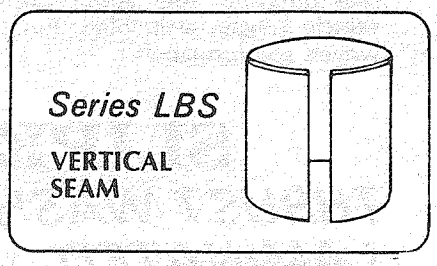
LINER TYPE NON-LUBRICATED JOURNAL BEARINGS

The LINER type of SLIPEZE bearing provides high load capacity and low friction in the form of thin-walled sleeve for use in butterfly valves, trunnion bearings, ball and plug valve stem bushings, hydraulic and pneumatic cylinder guide bushings, vehicle kingpin bearings, food handling machinery, ship hatch covers and door hinge bushings, among others.

Because these bearings are completely non-metallic – fabricated of Teflon fibers supported by a laminated backing—there is no possibility of corrosion. Maximum compressive strength is 50,000 psi, with operating temperature range of −200° to +400°F. Maximum speeds normally 150 surface ft./min.

For conditions exceeding these specifications, contact our Engineering Department.



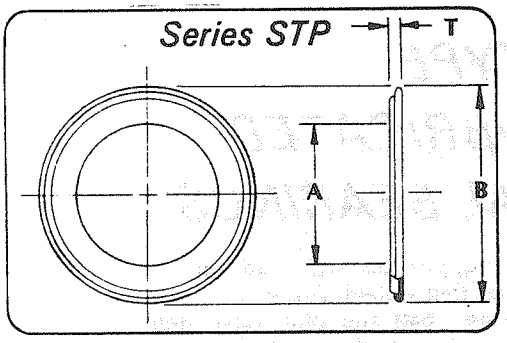


Part number example: LBD-1224 is a diagonal liner bearing, with 3/4-in. bore, 1 1/2 in. long.

DASH NO.	SHAFT DIA. MAX.	HOUSING BORE RECOM'D	WALL THICKNESS	LENGTH
−0606	.3750	.426/.427	.022/.025	3/8
−0609				9/16
−0612				3/4
−0808	.5000	.551/.552	.022/.025	1/2
−0812				3/4
−0816				1
−1010	.6250	.676/.677	.022/.025	5/8
−1015				15/16
−1020				1-1/4
−1212	.7500	.811/.812	.027/.030	3/4
−1218				1-1/8
−1224				1-1/2
−1414	.8750	.936/.937	.027/.030	7/8
−1421				1-5/16
−1428				1-3/4
−1616	1.000	1.061/1.062	.027/.030	1
−1624				1-1/2
−1632				2
−1818	1.125	1.186/1.187	.027/.030	1-1/8
−1827				1-11/16
−1836				2-1/4
−2020	1.250	1.311/1.312	.027/.030	1-1/4
−2030				1-7/8
−2040				2-1/2
−2222	1.375	1.436/1.437	.027/.030	1-3/8
−2233				2-1/16
−2244				2-3/4
−2424	1.500	1.561/1.562	.027/.030	1-1/2
−2436				2-1/4
−2448				3
−2828	1.750	1.811/1.812	.027/.030	1-3/4
−2842				2-5/8
−2856				3-1/2
−3232	2.000	2.126/2.127	.059/.062	2
−3248				3
−3636	2.250	2.376/2.377	.059/.062	2-1/4
−3654				3-3/8
−4040	2.500	2.626/2.627	.059/.062	2-1/2
−4060				3-3/4
−4444	2.750	2.876/2.877	.059/.062	2-3/4
−4466				4-1/8
−4848	3.000	3.126/3.127	.059/.062	3
−4872				4-1/2
−5656	3.500	3.626/3.627	.059/.062	3-1/2
−5684				5-1/4
−6464	4.000	4.126/4.127	.059/.062	4
−6496				6

SLIPEZE *THRUST PACKS*

SLIPEZE "THRUST PACK" bearings are unique in the industry. They need no lubrication, can tolerate extremely high loads and require very little space. (Nominal thickness is only 1/8 in.) This advanced design includes a self-contained dust seal and utilizes materials which resist corrosion. "THRUST PACK" bearings are particularly suited for such applications as vehicle kingpin assemblies, furniture swivels and turntables.



DASH NO.	A ±.010	B ±.010	T ±.010
-1628	1.040	1.750	.130
-2032	1.290	2.000	.130
-2436	1.540	2.250	.130
-2840	1.790	2.500	.130
-3244	2.040	2.750	.130
-3648	2.290	3.000	.130
-4052	2.540	3.250	.130

T is measured with pack loaded

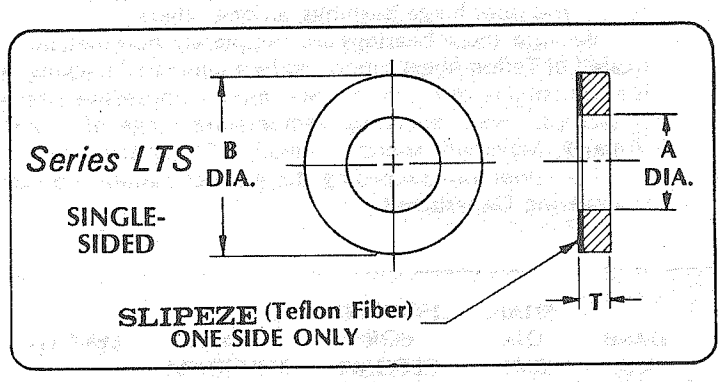
SLIPEZE *THRUST WASHERS LAMINATED PHENOLIC-BACKED*

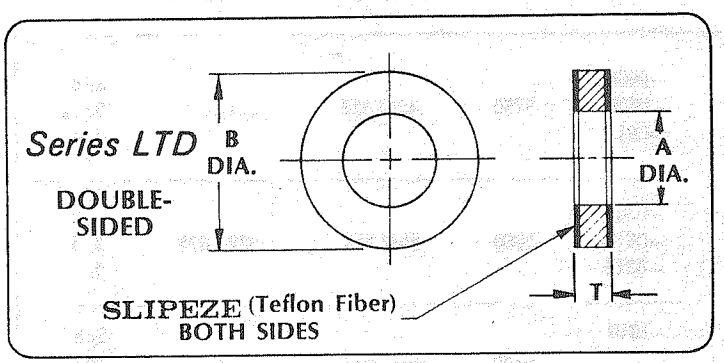
PHENOLIC-BACKED SLIPEZE thrust washers provide high load capacity and low friction for use where lubrication is to be eliminated. Typical applications include industrial valves and valve actuators, vehicle kingpin assemblies and marine drives.

Non-metallic and non-corrosive, SLIPEZE thrust washers are lightweight and are fabricated of Teflon fibers backed by a laminated phenolic resin system. They are available with the fabric bonded on one or both sides. Double-sided construction extends washer life. It is important that mating surface be smooth and free from sharp edges.

Maximum compressive strength is 50,000 psi, with operating temperature range of −250° to 400°F. Friction coefficients as low as 0.02 with no added lubricant are obtainable.

For conditions exceeding these specifications, contact the solid state lube Engineering Department.





Part number example: LTS-1834 is a single-sided thrust washer, with 1 1/8-in. bore, 2 1/8 in. O.D.

DASH NO.	NOM. SHAFT DIA.	A +.010 −.000	B +.000 −.010	T ±.002
−0408	1/4	.280	.500	.031
−0510	5/16	.344	.625	.031
−0612	3/8	.406	.750	.031
−0714	7/16	.468	.875	.031
−0816	1/2	.531	1.000	.031
−0918	9/16	.593	1.125	.063
−1020	5/8	.656	1.250	.063
−1122	11/16	.718	1.375	.063
−1224	3/4	.781	1.500	.063
−1326	13/16	.843	1.625	.063
−1428	7/8	.906	1.750	.063
−1530	15/16	.968	1.875	.063
−1632	1	1.031	2.000	.063
−1834	1-1/8	1.156	2.125	.063
−2036	1-1/4	1.281	2.250	.063
−2240	1-3/8	1.406	2.500	.063
−2442	1-1/2	1.531	2.625	.094
−2644	1-5/8	1.656	2.750	.094
−2846	1-3/4	1.781	2.875	.094
−3048	1-7/8	1.906	3.000	.094
−3252	2	2.062	3.250	.094

Dowel hole available upon special order.
Non-listed sizes can be obtained on special order.

7563 ?