OILES 500

Selflubricating bearing

with embedded solid lubricant

Your first choice in bronze

OILES 500 For high load and low speed

OILES 500 is a selflubricating bearing used where the demand for maintenance free operation, high load or high temperature make it impossible to use conventional bearings.

OILES 500 has been developed by the Oiles Corporation in Japan. Johnson Metall AB in Sweden has since 1973 being a part of the production and sales network for Oiles 500.

Johnson Metall AB have the license to manufacture and sell the bearing throughout Scandinavia.

Function

OILES 500 selflubricating bearings use highgrade bronze alloys as their base material and have a finely finished surface with pockets in which a specially formulated solid lubricant is embedded. The pattern of the lubricating material is arranged geometrically, so that the entire bearing surface is lubricated permanently, in the direction of motion.

During operation a very thin, but nevertheless extremely strong, lubricating film is deposited automatically over the complete moving surface. This film remains intact at all times, even at standstill. The solid lubricant covers 27–33% of the sliding surface. OILES 500 bearings are primarily intended for intermittent duty.

Design

The geometry as well as the choice of material is based on the specific application of the bearing. This means that each bearing is specially made to meet all load, environmental and temperature requirements where it is to be used. We also have a series of Oiles 500 SP1 standard bushings in high-strength brass with embedded solid lubricant, see separate brochure.

Designation

When ordering an OILES 500 bearing the following data shall be given: Dimensions, base material, lubricant, lubricant pattern and direction of movement, Rotation or Axial. For radial bearings the letter R after the lubricant pattern designation stands for Rotation and the letter A for Axial movement. Ex. OILES 500-JM1-15-SL4-B1R.

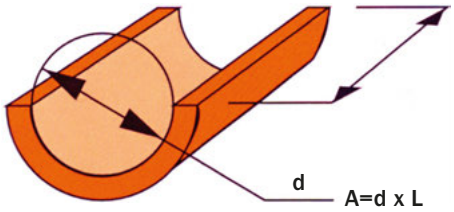
Solid lubricants

Three different kinds of solid lubricants are available, two of which are based on graphite and one on PTFE. They are produced by compression which gives plugs with high density and good lubrication properties. In 2025 we will replace plug type SL403 with SL464, a leadfree, blue plug.

Lubricant	**Features**	**Lubricant pattern** General use		
		-B1	**-W1**	**-P1**
SL103 graphite+add	General use. Excellent resistance against chemical attacks. Temperature range C° –40 to +300			
SL201 graphite+add	General use. Temperature range C° –40 to +150			
SL464 PTFE+add Leadfree	General use. Underwater. When possible, always recommended because of the excellent friction properties. Temperature range C° –40 to +80			

Plug type SL464 will replace previously used plug SL403 during the year 2025. Performance is equivalent, but less environmental impact.

Base material



Loadable area=
Projected bearing area

Johnson Metall AB produce a wide range of copperbased alloys, which are used as base material on OILES 500 bearings. Data relating to four of those alloys is given in the table below.

The capacity or carrying load is very much dependent on the choice of alloy, The selection of the base material will thus be based on the requirement of load carrying capacity.

Note that the temperature has an influence on the allowable load values and also the choice of lubricant.

Base Material	**JM1-15** Cu82 Sn7 Pb7 Zn4			**JM3-15** Cu88 Sn12			**JM5-15** Cu80 Sn10 Pb10			**JM7-15** Cu80 Al10 Ni5 Fe5		
Lubricant	**SL1**03	**SL2**01	**SL4**64	**SL1**03	**SL2**01	**SL4**64	**SL1**03	**SL2**01	**SL4**64	**SL1**03	**SL2**01	**SL4**64
Max sliding Velocity V m/s	0.2	0.5	0.8	0.2	0.5	0.7	0.2	0.5	0.8	0.2	0.3	0.5
Max load P at 20°C N/mm²		30			50			30			90	
Max load P at max allowable temp N/mm²	25	25	30		45		20	20	25	75	80	90
Max load P static (v≈0) N/mm²		55			90			60			160	
Max allowable Temp °C	250	150	80	300	150	80	200	150	80	400	150	80
Max PV-value Dry condition N/mm² x m/s	0.2	0.4	0.8	0.3	0.6	0.7	0.2	0.4	0.8	1.0	1.0	3.0
Max PV-value In water N/mm² x m/s			1.2			2.0			1.2			3.0

Converison factors: *Velocity V in m/s ft/min: multiply by 197*
Load P in N/mm to psi. multiply by 145
PV-value in N/mm x m/s to psi x ft/min multiply by 28523.

OILES 500 everywhere

Floating production unit (FPSO)

Hydro Power

Garbage truck

Dam gates

Floating Offshore Wind Power
© Windeed AB

Fair leads (offshore)

Mating Material

Three important parameters to be considered when selecting mating material:

1. Type of material

If stainless steels are used, martensitic types are preferable. Austenitic steels may be used but their low hardness must be taken into account.

Unprotected carbon steels may through corrosion increase wear rate. In this case added lubrication could be used as corrosion protection.

2 Hardness

When the load in near p_{max} the hardness of the mating surface is important. The harder mating material the better. A hard surface will always have a positive effect on bearing life and friction.

As a general rule the mating material should be at least 100 HB harder than the bearing bronze.

This gives the following recommended minimum hardness of mating material:

Bearing Material	Hardness of mating material
JM1 Red Bronze (Gun Metal)	>165 HB
JM3 Tin Bronze	>210 HB
JM5 Lead-Tin Bronze	>180 HB
JM7 Ni-Al Bronze	>270 HB

A softer mating material than recommended will not necessarily endanger the function of the bearing, especially when the loads are moderate (<30% of p_{max}).

In the offshore industry softer mating material than recommended in the table is often used with good results. In many applications Ni-coated surfaces with hardness as low as 220 HB are running against JM7 Ni-Al Bronze without problems.

3. Surface finish

Recommended <1 Ra.

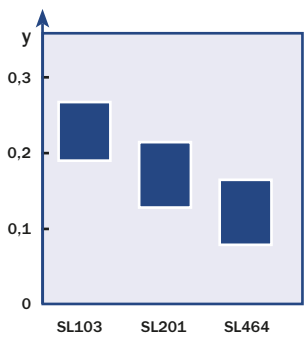
Installation

OILES 500 selflubricating bearings require minimum or no maintenance provided they are correctly dimensioned and installed. Their high strength will then give a long bearing life. The following points are important when installing the bearing:

- OILES 500 is specially packed for transporation. Please do not remove the protective cover until installation.
- The sliding surface of the bearing is treated with a solid lubricant coating. This is applied to improve the running-in process. Please make sure that this film is not damaged at the installation.
- Make sure the mating material is cleaned carefully. This is very important for the life of the bearing.

Friction

The coefficient of friction for selflubricating bearings with solid lubricants is μ = 0.08–0.25. The lowest values are obtained with SL464 with μ=0.1 generally. When the lubricants based on graphite: SL201, SL103, are used μ =0.2 can be obtained. For more accurate friction values, please contact our specialists.



Coefficient of friction for the solid lubricants.

Dimensions-clearance

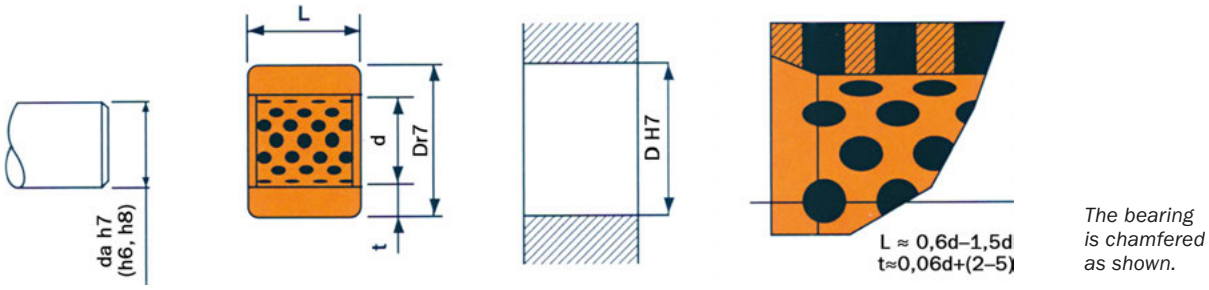
The geometry of the bearing should be calculated according to the figure. The tolerance band for the bearing inside diameter is shown in the table below. Operating temperature and bearing load are decisive factors in the choice of clearance class.

The values in the table are based on a shaft tolerance h7 (h6, h8).

For application involving operating temperature above 300°C please contact Johnson Metall AB, whose engineers will help you.

The figures in the column headed “After fitting” refer to the resulting dimensions if the outside diameter of the bearing is manufactured with a tolerance or r7. The bearing clearance can be calculated from the table values considering a shaft tolerance of h7.

Making a decision is a complex operation: if you have a problem or would like some guidance, do not hesitate to contact Johnson Metall AB, whose tribologists will be pleased to help you.



The bearing is chamfered as shown.

Tolerances for inside diameter d

Bearing inside diameter d mm	Class 1 Special case Small clearance				Class 2 Normal applications Temperature 150°C				Class 3 For high temp 300°C Heavy load <50N/mm2			
	Manufacture		After fitting		Manufacture		After fitting		Manufacture		After fitting	
	Upper+	Lower +	Upper+	Lower+	Upper+	Lower+	Upper+	Lower+	Upper+	Lower+	Upper+	Lower+
-10	70	55	60	40	85	70	80	50	110	95	100	80
(10)-18	80	60	70	40	130	110	120	90	165	145	160	130
(18)-30	100	80	90	50	175	155	170	130	230	210	220	180
(30)-50	130	105	120	70	235	210	220	180	305	280	290	250
(50)-80	175	145	150	100	295	265	280	230	405	370	390	330
(80)-120	220	185	190	140	365	330	340	280	515	480	490	430
(120)-180	270	230	250	170	440	400	420	340	625	585	590	520
(180)-250	325	280	280	200	530	480	480	400	740	695	690	610
(250)-315	390	340	330	250	615	560	560	470	860	805	810	730
(315)-400	460	405	390	300	700	640	630	540	980	925	920	820
(400)-500	545	480	460	360	800	735	720	620	1105	1040	1030	920

We are the Nordic countries' biggest manufacturer of castings and machined components made of bronze. We cast and machine sliding bearings and mechanical parts made of bronze alloys with great precision, and to your specifications.

We are your partner for high-quality bronze solutions. With a strong passion for innovation and sustainability, we are proud to be a reliable supplier to both local businesses and major global companies.

Manufacturing unit and head office are located in Sweden, Örebro. Sales companies in Sweden, Denmark and Norway.

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Tryck: AB Kontorsutb 2025