# OILES 500

## Selflubricating bearing

### with embedded solid lubricant

Where bronze comes first

# 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 soild lubricant covers 25–30% 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

## Designation

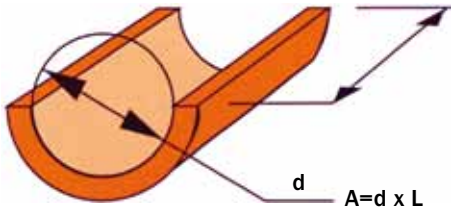
When ordering an OILES 500 bearing the following data shall be given: Dimensions, base material, lubricant, lubricant pattern and direction of movement, Rotation or Axial. For radial bearings the letter R after the lubricant pattern designation stands for Rotation and the letter A for Axial movement.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

| **Lubricant** | **Features**<br>All lubricants may be used in temperatures down to –40°C | **Lubricant pattern**<br>General use | | |
|---|---|---|---|---|
| | | **-B1** | **-W1** | **-P1** |
| **SL1**01<br>graphite+add | Excellent resistance against chemical attacks Temperature <300°C |  |  |  |
| **SL2**01<br>graphite+add | Lubricant for general use. Temperature <150°C |  |  |  |
| **SL4**03<br>PTFE+add | Lowest in friction. Temperature <80°C<br>Good for shock loads. When possible always recommended because of the excellent friction properties, for example in water |  |  |  |

# 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.

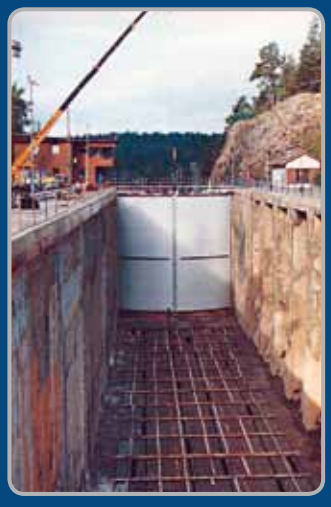
The capacity or carrying load is very much dependent on the choice of alloy, The selection of the base material will thus be based on the requirement of load carrying capacity.

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

| **Base Material** | **JM1-15** Cu85 Sn5 Pb5 Zn5 | | | **JM3-15** Cu88 Sn12 | | | **JM5-15** Cu80 Sn10 Pb10 | | | **JM7-15** Cu82 Ni4 A110 Fe4 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lubricant | **SL**101 | **SL**201 | **SL**403 | **SL**101 | **SL**201 | **SL**403 | **SL**101 | **SL**201 | **SL**403 | **SL**101 | **SL**201 | **SL**403 |
| 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 top psi x ft/min nultiply by 28523.*

# OILES 500 everywhere



*Sluice gates*

*Floating production unit (FPSO)*

*Press tools in the automotive industry*

*Dam gates*

*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 |
|---|---|
| JMI 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.

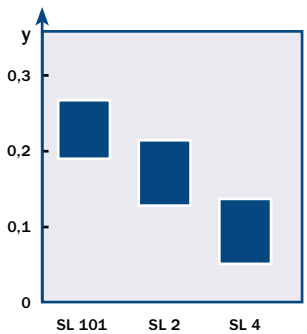
# Installation

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 soild lubricants is μ = 0.05–0.25. The lowest values are obtained with SL 4 with μ=0.1 generally. When the lubricants based on graphite: SL2, SL101, 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

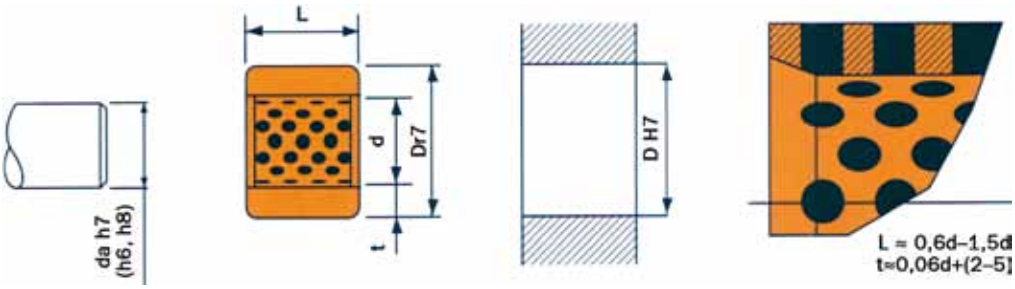
The geometry of the bearing should be calculated according to the figure. The tolerance band for the bearing inside diameter is shown in the table below. Operating temperature and bearing load are decisive factors in the choice of clearance class.

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 |


Johnson Metall AB is the Nordic countries biggest manufacturer of castings and machined components made of bronze. Manufacturing units are located in Sweden, and sales companies in Denmark and Norway. The head office is in Örebro.

SWEDEN
Johnson Metall AB
Visiting address: Stålgatan 15, 703 63 Örebro
Postal address: Box 1513, 701 15 Örebro
Delivery adress: Slöjdgatan 2-4, 703 63 Örebro
Phone: +46 (0)19 17 51 00
Mail: info@johnson-metall.com
Internet: www.johnson-metall.com

DENMARK
Johnson Metal A/S
Dybendalsvænget 2
DK-2630 Taasttrup
Phone: +45 36-70 00 44
Mail: j-m@johnson-metal.dk

NORWAY
Johnson Metall AS
Apalveien 1
NO-3360 GEITHUS
Phone: +47 32 78 32 00
Mail: sales.geithus@johnson-metall.com

Tryck AB Kontorsnutin 2020