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## Solid Oil bearings



# 19 Bearings with Solid Oil

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**Mounting instructions for individual bearings** → [skf.com/mount](https://skf.com/mount)

SKF bearings with Solid Oil are designed for use in applications where high levels of moisture and incidental contact with water and other contaminants are real issues.

Bearings with Solid Oil are lubricated for the life of the bearing and cannot be relubricated.

Solid Oil:

- is an oil saturated, polymer material
  - moulded into the bearing, forming very narrow gaps between the rolling elements, raceways and cage(s), enabling the bearing to rotate freely
  - having a porous structure, with millions of micro-pores that retain the lubricating oil by surface tension
- virtually fills all of the free space in the bearing
- releases oil into the narrow gaps, during operation, providing effective minimum quantity lubrication

- **Resists washout**

- Solid Oil cannot be washed out and virtually fills all free space, limiting the amount of wet contamination that can enter the bearing.
- Water cannot mix with the oil or Solid Oil polymer.

- **Virtually eliminates lubricant leakage**

- Solid Oil retains oil in the bearing.
- Integral bearing seals further increase the oil retention.

- **Protects against the ingress of contaminants**

- Close osculation between Solid Oil and the rolling elements and raceways significantly reduces the ingress of contaminants.
- Solid Oil provides additional support for integral bearing seals.

## Bearing features

- **Long service life**
  - An increase in operating temperature pushes the oil toward the surface of the polymer material, supporting consistent lubricant supply. During shutdown, any excess oil is re-absorbed back into the polymer material.
- **Extended lubricant life**
  - With Solid Oil bearings, a large amount of oil is available (two to four times more compared to conventional grease fill).
  - The Solid Oil polymer structure eliminates lubricant churning.
  - Solid Oil is a high-quality synthetic oil that resists oxidation.

## Designs and variants

The SKF standard assortment of bearings and bearing units with Solid Oil (fig. 1) includes:

- Deep groove ball bearings
- Spherical roller bearings
- Insert bearings and ball bearing units
- Tapered roller bearings
- Cylindrical roller bearings
- Self-aligning ball bearings

On request, SKF can supply other bearing types with Solid Oil to meet the needs of a particular application, except for CARB toroidal roller bearings which are unsuitable for use with Solid Oil. Bearings fitted with a large-volume cage are not suitable for Solid Oil because there is too little free space inside the bearing.

## Solid Oil variants

- Standard variant (designation suffix W64, table 1):
  - contains a high-quality synthetic oil
  - meets the needs of most applications
- Food-grade variant (designation suffix W64F, table 1):
  - contains an oil registered by NSF as category H1
  - meets the needs of food applications

## Sealed bearings

- with integral contact seals are strongly recommended in wet environments
- with Solid Oil increase the sealing effectiveness, as the Solid Oil supports the seals axially, preventing them from deflecting and opening under pressure

For information about sealing options, contact the SKF application engineering service.

Where carbon steel bearings are exposed to wet environments, additional external seals are recommended to protect the bearing's external surfaces from corrosion.

## Bearing data

### Dimension standards, tolerances, internal clearance

Refer to *Bearing data* in the relevant product section of the standard bearing.



Table 1

### Technical specifications for bearings and bearing units with Solid Oil

| Characteristic   | Standard variant                                    | Food-grade variant                                  |
|--|---|---|
| <b>Designation suffix</b>  | W64   | W64F  |
| <b>Base oil viscosity</b><br>at 40 °C (105 °F)<br>at 100 °C (210 °F)                                       | 150 mm <sup>2</sup> /s<br>20 mm <sup>2</sup> /s     | 220 mm <sup>2</sup> /s<br>25 mm <sup>2</sup> /s     |
| <b>NSF H1 food grade</b>   | no  | yes   |
| <b>Operating temperature</b><br>Minimum start-up temperature<br>Maximum continuous<br>Maximum intermittent | –50 °C (–60 °F)<br>85 °C (185 °F)<br>95 °C (205 °F) | –25 °C (–15 °F)<br>85 °C (185 °F)<br>95 °C (205 °F) |
| <b>Relubrication-free</b>  | yes   | yes   |
| <b>Polymer colour</b>  | blue  | white   |



# Loads

## Load carrying capacity

The basic dynamic and static load ratings for bearings with Solid Oil are the same as for corresponding SKF standard bearings.

## Temperature limits

The permissible operating temperature for bearings with Solid Oil can be limited by:

- the dimensional stability of the bearing rings and rolling elements
- the cage(s)
- the seals
- the Solid Oil

For limits of bearing rings, rolling elements, cage(s) and seals, refer to *Temperature limits* of the relevant product section of the standard bearing.

The relevant limits for Solid Oil are listed in [table 1, page 1025](#).

Where temperatures outside the permissible range are expected, contact SKF.

# Speed limits

The recommended speed values for bearings and bearing units with Solid Oil ([table 2](#)), operating in an ambient temperature of 20 °C (70 °F), are limited by the maximum continuous operating temperature of 85 °C (185 °F). Ambient temperature is the temperature closest to the bearing position, not necessarily room temperature.

For bearing types or variants not listed in [table 2](#), contact the SKF application engineering service.

For ambient temperatures above 20 °C (70 °F), the speed limit should be reduced using the reduction factor  $f_T$  ([diagram 1](#)).

## Calculation example

A deep groove ball bearing 6208/W64 is to operate at an ambient temperature of 50 °C (120 °F). What is the reduced speed limit?

### 1 Recommended speed limit for 20 °C (70 °F) ambient temperature

- From [table 2](#): speed value  
 $nd_m = 300\,000$  mm/min (single row deep groove ball bearing with a stamped metal cage)
- Dimensions:  $d = 40$  mm,  $D = 80$  mm  
 $n = 300\,000 / d_m$   
 $= 300\,000 / (0,5 (40 + 80))$   
 $= 5\,000$  r/min

### 2 Reduction for 50 °C (120 °F) ambient temperature

- From [diagram 1](#): speed reduction factor  
 $f_T \approx 0,53$   
 $n_{\text{reduced}} = 5\,000 f_T$   
 $= 5\,000 \times 0,53$   
 $= 2\,650$  r/min

Table 2

### Recommended limits for the speed value of bearings and bearing units with Solid Oil

| Bearing type                               | Speed value $nd_m$ |
|--|--------------------|
| –  | mm/min             |
| <b>Deep groove ball bearings</b>           |                    |
| – single row with a stamped metal cage     | 300 000            |
| – single row with a polymer cage           | 40 000             |
| – double row                               | 40 000             |
| <b>Angular contact ball bearings</b>       |                    |
| – with a stamped metal cage                | 150 000            |
| – with a polymer cage                      | 40 000             |
| <b>Self-aligning ball bearings</b>         |                    |
| – with a stamped metal cage                | 150 000            |
| – with a polymer cage                      | 40 000             |
| <b>Cylindrical roller bearings</b>         |                    |
| – with a stamped metal cage                | 150 000            |
| – with a polymer cage                      | 40 000             |
| <b>Tapered roller bearings</b>             | 45 000             |
| <b>Spherical roller bearings</b>           |                    |
| – E design                                 | 42 500             |
| – CC design                                | 85 000             |
| <b>Insert bearings, ball bearing units</b> | 40 000             |

$n$  = rotational speed [r/min]  
 $d_m$  = bearing mean diameter [mm]  
 $= 0,5 (d + D)$

For bearings with integral seals, use 80% of the quoted speed limits.



## Friction characteristics

The friction characteristics of a bearing with Solid Oil correspond to the relevant SKF standard bearing except that the Solid Oil polymer filling adds a fixed friction.

## Mounting

If a bearing with Solid Oil is to be hot mounted, it should be heated to a maximum of 120 °C (250 °F) by using an induction heater.

Heating plates or heated oil baths should not be used.

## Designation system

Refer to *Designation system* in the relevant product section of the standard bearing.

The designation suffixes used to identify bearings with Solid Oil are:

**W64** Synthetic base oil type, standard variant

**W64F** Synthetic base oil type, NSF H1 approved for food applications



Diagram 1

Speed reduction factor as a function of ambient temperature

