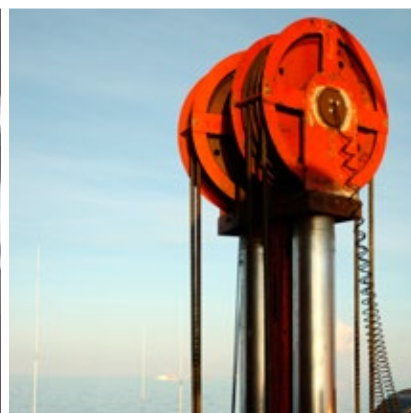
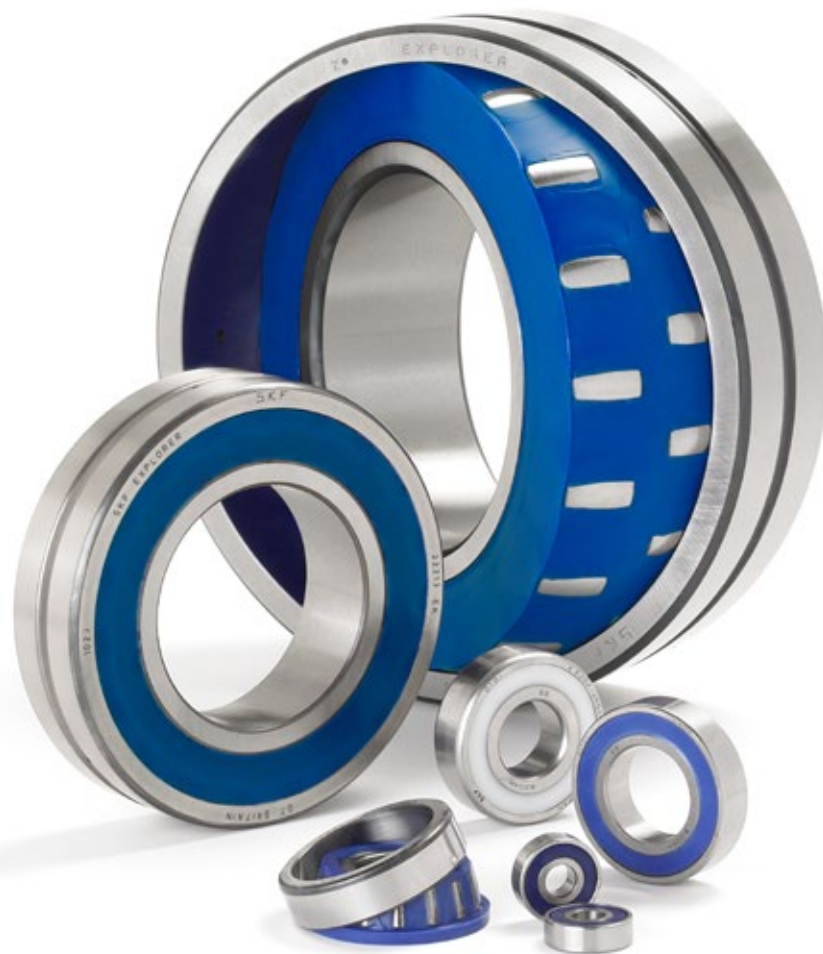


SKF bearings with Solid Oil

Relubrication-free solutions for harsh environments and tough locations












2-4x
MORE OIL THAN A
GREASE-LUBRICATED
BEARING



Benefits of Solid Oil

Solid oil, which was developed for applications where traditional relubrication methods are not practical, can provide a number of benefits, including:

-  keeps contaminants out of the bearing cavity
-  resistant to chemicals
-  can withstand high g-forces
-  eliminates the need for seals to retain the lubricant
-  eliminates the need for relubrication
-  supplies more oil to the bearing than grease
-  safety



SKF bearings with Solid Oil

The third lubrication choice

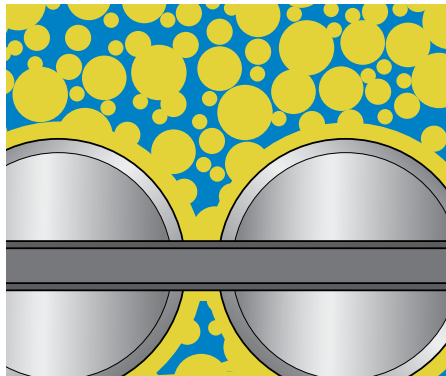
There are three ways to supply oil to a ball or roller bearing:

- oil bath, oil recirculation or nozzles
- oil in a thickened form (grease)
- Solid Oil, where oil is retained in a polymer matrix

About Solid Oil

Solid oil is an oil-saturated, polymer matrix that completely fills the free space in the bearing, encapsulating both the rolling elements and cage. The polymer material has a porous structure, with millions of micro-pores, to hold the lubricating oil. The pores are so small that the oil is retained in the material by surface tension.

As the oil-filled polymer material is pressed into the bearing, a very narrow gap forms around the rolling elements and raceways, enabling the bearing components to rotate freely. The oil, which seeps into the gap, provides good lubrication for the bearing, right from the start.



Solid oil forms a narrow gap around the rolling elements and raceways. The oil in the micro pores will seep into the gap.

When to use Solid Oil

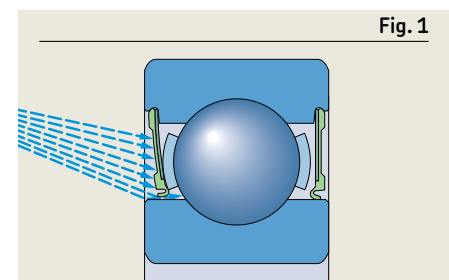
In most applications, standard greases and oils provide an adequate amount of lubricant to a bearing. However, in cases where accessibility to the bearing for relubrication is impractical or impossible, Solid Oil is an excellent solution. Solid oil can also be used effectively in applications where premature bearing failure is the result of high levels of contamination.

Solid oil is really two solutions in one. It provides lubricant to the bearing and acts as an extremely effective seal by completely filling the bearing cavity.

Sealing solutions

For optimal performance in wet environments, it is strongly recommended that bearings with Solid Oil with integral contact seals be used, wherever possible. When combining Solid Oil and contacting seals, the sealing capacity is improved as the Solid Oil acts as an axial support preventing the seals from deflecting and opening under pressure (→ Fig. 1).

For more information regarding sealing options, see *SKF Rolling bearings catalogue* or contact SKF application engineering service.



Seals deflected by high pressure washing

Typical Solid Oil applications

- dirty or humid
- aggressive chemicals
- very cold
- centrifugal forces
- vertical shafts
- hard to reach
- oscillating movements
- high cleanliness demands

Advantages of Solid Oil

Consistent lubricant supply

When a metal surface, like the raceway of a bearing, slides against Solid Oil, it is coated with an even and consistent film of oil. Then, with only a moderate increase in operating temperature, oil is pushed toward the surface of the polymer matrix. This “flow” of oil within the polymer matrix occurs because the oil has a higher coefficient of thermal expansion than the polymer matrix and because the viscosity of the oil decreases with increasing temperature.

When the bearing stops running, excess oil is reabsorbed into the polymer matrix.

More lubricant available

A bearing with Solid Oil contains two to four times more oil than a conventional grease-lubricated bearing. This is because the bearing is completely filled with the Solid Oil, whereas a grease-lubricated bearing normally operates with approximately one third of its free space filled with grease.

Keeps contaminants out

Because Solid Oil fills the bearing cavity completely, it is difficult for contaminants to reach the bearing contact surfaces.

In highly contaminated environments, SKF recommends filling the free space in the housing with a suitable grease to provide an additional layer of protection.

Eliminates relubrication

Solid oil contains such a large reservoir of oil that relubrication is not required.

No seals required

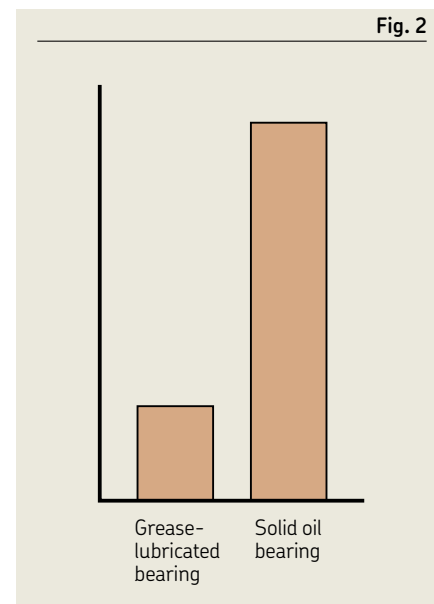
Seals are not needed to retain the lubricant in the bearing, even on vertical shafts. However, if the arrangement already incorporates seals, they should be retained as extra protection against contamination.

Resistant to chemicals

The Solid Oil polymer matrix is unaffected by most chemicals. However, organic solvents like kerosene, will remove the oil from the polymer matrix.

Withstands high g-forces

Solid oil becomes an integral part of the bearing so that lubricant cannot be expelled, even when subjected to high centrifugal forces.



A bearing with solid oil contains between two and four times more oil than a corresponding grease-lubricated bearing.

Table 1

Technical specifications for bearings and units with Solid Oil

Characteristic	Standard variant	Medium load variant	Heavy load variant	Low temp variant	Standard food grade variant	Low temp food grade variant
Designation suffix	W64	W64E	W64H	W64L	W64F	W64FL
Base oil viscosity	mm ² /s					
at 105 °F (40 °C)	150	430	933	32	220	32
at 210 °F (100 °C)	20	48	80	6	25	6
NSF H1 food grade	no	no	no	no	yes	yes
Operating temperature	°F (°C)					
Maximum continuous	185 (85)	185 (85)	185 (85)	185 (85)	185 (85)	185 (85)
Minimum start-up temperatures	-60 (-50)	-44 (-42)	5 (-15)	-65 (-54)	-15 (-25)	-65 (-54)
Maximum intermittent	205 (95)				205 (95)	
Color designation of Solid Oil	blue	blue	blue	light orange	white	white

Technical data

Composition of Solid Oil

Solid oil is normally produced with a very high quality synthetic oil which is suitable for most applications.

Oil viscosity	140 mm ² /s	at 105 °F (40 °C)
	19 mm ² /s	at 210 °F (100 °C)

Oils having other viscosities can also be used successfully, as can special oils for the food industry. Additives, such as rust inhibitors, are included in the Solid Oil composition to provide extra protection. For additional information, contact SKF.

Bearing types available

Most standard SKF bearings can be supplied with solid oil.

Bearings with solid oil are identified by the designation suffix W64.

The assortment includes a standard variant containing a high quality synthetic oil which meets the needs of most applications (designation suffix W64) and a food

grade variant containing an oil registered by NSF as a category H1 (designation suffix W64F) (→ **Table 1**).

Temperature limits

The temperature limits for bearings lubricated with Solid Oil, measured on the bearing outer ring, are listed in **Table 2**.

Load carrying capacity

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

Limiting speeds

Table 3 lists recommended limit values for the speed factor A.

$$A = n \times dm$$

Where

A = speed factor [mm/min]

n = rotational speed [r/min]

dm = bearing mean diameter
= 0.5 (d + D)

d = bearing bore diameter [mm]

D = bearing outside diameter [mm]

It is important to remember that the higher the speed, the higher the operating temperature. It may therefore be necessary to limit the bearing speed for high temperature operation so that the temperature limit for the Solid Oil is not exceeded.

As with most lubricants, the service life of a bearing with Solid Oil is extended if the operating temperature is kept low.

The speed limits listed in **Table 3** apply to open (unsealed) bearings.

For bearings with integral seals, 80% of the quoted values should be used.

If bearings with Solid Oil are to operate under extreme conditions, contact the SKF application engineering service for additional information.

Table 3

Recommended limit for speed factor A	
Bearing type	limit for A
Single row deep groove ball bearings with a steel cage	300,000
Ball bearings with a polyamide cage (including Y-bearings)	40,000
Angular contact ball bearings	150,000
Cylindrical roller bearings	150,000
Tapered roller bearings	45,000
Spherical roller bearings	
• E-design	42,500
• other designs	85,000

If temperature exceeds 70 °F (20 °C) the speed limit will be lower.

Table 2

Temperature limits

Max. continuous operating temperature	185 °F (85 °C)
Max. intermittent operating temperature	205 °F (95 °C)
Min. start-up temperature (standard oil)	-40 °F (-40 °C)

Bearings with Solid Oil can be heated to a maximum of 210 °F (100 °C) for mounting purposes with an induction heater. Heating plates and oil bath heating methods are not compatible with Solid Oil bearings.

Note: The temperature limits in **Table 2** apply to both open and sealed versions. In general, sealed bearings have higher operating temperatures.



Solid Oil filled in the USA





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Bearing and Solid Oil calculations are based off SKF and MRC testing.

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