

# Mounting and dismounting advice for the SKF Three-barrier solution

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## Abstract:

For many years SKF has focused on bulk handling machinery and has now developed a new range of sealed spherical roller bearings for harsh environments based on our findings. The new development has been done in close cooperation with SKF core knowledge teams resulting in the *SKF Three-barrier solution* with a sealed bearing, sealed housing and selected lubricant. In combination, these have proven to provide excellent protection and increased life. This has now led to increased productivity in tough and harsh environments.

# The SKF Three-barrier solution

## Application advice

### Bearing dimension considerations

Part of the range of SKF sealed spherical roller bearings have an extended width compared to corresponding standard open bearings. For this reason all SKF SNL housings can be supplied with locating rings to match all sealed bearings in the 222 series.

Due to the tapered seal land, the face diameter  $d_2$  is smaller in sealed bearings than in corresponding open bearings. When determining an abutment diameter  $d_a$ , the lower  $d_2$  value for these bearings must be taken into consideration (→ fig 1). Read also the information under the following heading.

### Bearing space considerations

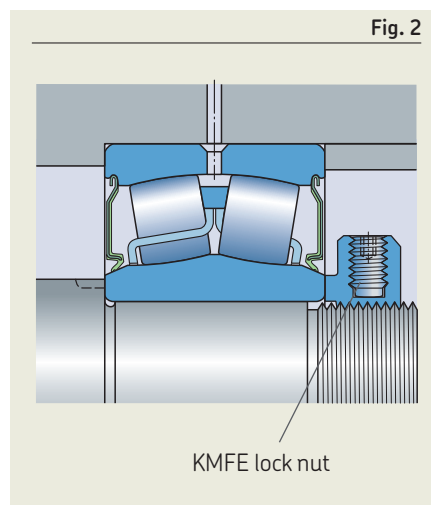
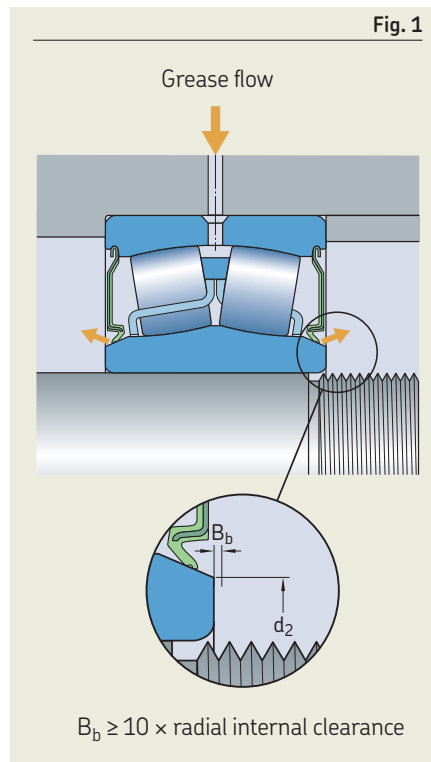
SKF sealed spherical roller bearings are designed in such a way that the seals are positioned inside the side face plane. However, care must be taken that nothing in the housing or on the shaft can interfere with the bearing seals during operation.

Excessive grease must not be hindered to escape when relubricating the bearing (→ fig 1). Therefore, there should be a sufficient amount of free axial space outside the seals. The axial free space should be least 10 times the maximum radial internal clearance value for the unmounted bearing. This recommendation is valid for Normal, C3 and C4 clearances.

## Mounting and dismounting

### Mounting

When mounting sealed spherical roller bearings it is important not to subject the bearings to excessive misalignment. If there is a considerable moment load imposed on the seals via the rollers or cages, there is a risk that the seals may be dislodged or damaged. The SKF Three-barrier solution works with bearings that have either a cylindrical or tapered bore. However, SKF recommends using a tapered bore as soon as the shaft diameter is larger than 150 mm. Since the tapered bore mounting is independent of tolerances, it secures the right interference between the inner ring and the shaft to avoid



fretting corrosion. A tapered bore mounting will have a greater interference than the cylindrical bore mounting, a larger clearance reduction, to compensate for this the radial clearance classes are larger for some of these bearings.

Bearings with tapered bores are preferably mounted with the SKF drive-up method, which is a method that is independent of fitter and the non-precise measurement

with filler gauges. This method will give the same mounting independent of the fitters' skills. The important thing when mounting bearings with a tapered bore is to get the right interference between the inner ring and the shaft, and not the clearance reduction. The clearance reduction is only one way to verify a correct mounting when using the filler gauge mounting method. This method is not possible with a sealed bearing. Three barrier works for all seal variants but it is possible to increase the sealing capacity or keep the same sealing ability with a more cost-effective sealing solution e.g. standard labyrinth seal.

### Bearings with a cylindrical bore

Sealed bearings with a cylindrical bore can be heated with an induction heater and hot mounted or pressed onto the shaft with a mounting dolly.

SKF does not recommend heating sealed bearings above 80 °C (175 °F). However, if higher temperatures are necessary, make sure that the temperature does not exceed the permissible temperature of either the seal or grease, whichever is lowest. SKF does not recommend using a heating plate. However, if using a heating plate is unavoidable, the seal should not make contact with the plate. Appropriate distance washers should be used.

SKF recommends using KMFE lock nuts for the axial location of sealed spherical roller bearings (→ fig 2). These nuts provide the proper free space for the grease to escape when relubricating the bearings. The alternative is to use a standard nut and lock washer. In this case, however, a spacer must be fitted between the lock washer and the inner ring.

The width of the spacer has to match the axial free space condition, not to hinder the escape of grease.

### Bearings with a tapered bore

When mounting sealed spherical roller bearings with a tapered bore, the expansion of the inner ring cannot be measured using feeler gauges.

Therefore, SKF recommends using the SKF Drive-up method for reliable and easy

drive-up. If the SKF Drive-up method is not an option, the traditional drive-up method with a hook spanner and angle measurement is recommended.

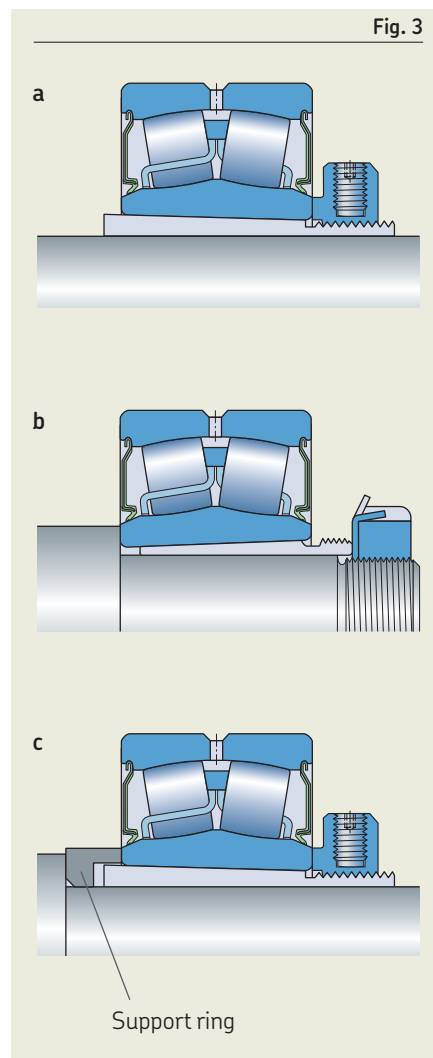
### Mounting on an adapter sleeve:

Adapter sleeves facilitate mounting and dismounting and generally simplify the arrangement design (→ **fig 3a**). For bearings that need to be axially positioned, it is preferable to use a withdrawal sleeve (→ **fig 3b**). However, if an adapter sleeve is to be used, it is preferable to use a support ring → **fig 3c**).

Some bearings have a relatively small radial space for the support ring and should therefore not be subjected to a heavier axial load than the adapter sleeve can accommodate. Note that the bore chamfer radius  $r_{1,2min}$  for sealed spherical roller bearings with a tapered bore differs from bearings with a cylindrical bore.

### Dismounting

The general recommendations at [www.skf.com/bearings](http://www.skf.com/bearings) are valid also for sealed spherical roller bearings. If the sealed bearing is to be reused, care should be taken to avoid damaging the seal.



## Example of commercial benefits of the SKF Three-barrier solution

At an open-cast coal mine operation in Germany, replacement of open spherical roller bearings in conveyor bending pulleys with sealed spherical roller bearings resulted in a 100 % increase of the service life. Mounting the sealed spherical roller bearing arrangement took half the time of conventional bearings and the greased-for-life solution eliminated relubrication costs and disposal of used grease. In addition, maintenance staff was able to focus on more critical mining operations.

At an iron ore mine in Sweden, grease use in a pinion drive was cut by 100 kg per year for each bearing position, by replacing open spherical roller bearings with sealed spherical roller bearings. The investment paid off in a year while the operational costs associated with each bearing position were halved.

A customer in Sweden had major problems with the life of their total bearing units on their conveyor pulley. SKF provided a test with one side of the pulleys equipped with the taconite labyrinth seal and open spherical roller bearing and the other side of the pulley with a standard housing seal and a sealed spherical roller bearing. Previously the bearing unit failed after 9 month in operation, now both new solutions lasted for more than 24 months. The sealed spherical bearing solution had a total operating cost that was almost half of the taconite, which is why the customer went for the new solution.

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