

### 12.3.2 Mounting bearings with tapered bore

Bearings with tapered bores are mounted on the tapered shaft and on cylindrical shafts with adapters and withdrawal sleeves, as shown in Figure 12.3, 12.4.

Large spherical roller bearings are mostly mounted by using hydraulic pressure. Spherical roller bearings should be mounted while checking their clearance reduction. When a large bearing is mounted on a shaft, the outer ring may be deformed into an oval shape by its own weight. If the clearance is the lowest part of the deformed bearing, the measured value may be bigger than the true value. If an incorrect radial internal clearance is obtained in this manner and the values in clearance is obtained in this manner and the values are used, then the interference fit may become too tight and the true residual clearance may become too small.

When a self-aligning ball bearing is mounted on a shaft with an adapter, be sure that the residual clearance does not become too small. Sufficient clearance for easy alignment of the outer ring must be allowed.

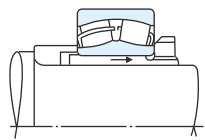


Fig. 12.3 Mounting with adapter

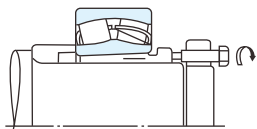


Fig. 12.4 Mounting with withdrawal sleeve

### 12.4 Operation inspection

After the mounting has been completed, a running test should be conducted to determine if the bearing has been mounted correctly. Small machines may be manually operated to assure that they rotate smoothly. Items to be checked include sticking due to foreign matter, visible flaws, brinelling uneven torque caused by improper mounting or an improper mounting surface, and excessive torque caused by an inadequate clearance, mounting error, or seal friction. If there are no abnormalities, powered

operation may be started.

Large machines which cannot be turned by hand, can be started after examination with no load, and the power immediately cutoff and the machine allowed to coast a stop. Confirm that there is no abnormality such as vibration, noise, contact of rotating parts, etc.

Powered operation should be observed carefully until it is determined that no abnormalities exist, then gradually increase the speed, load, etc. to their normal levels. Items to be checked during the test operation include the existence of abnormal noise, excessive rise of bearing temperature, leakage and contamination of lubricants, etc. If any abnormality is found during the test operation, it must be stopped immediately and the machine should be inspected. If necessary, the bearing should be dismantled for examination.

Although the bearing temperature can generally be estimated by the temperature of the outside surface of the housing, it is more desirable to directly measure the temperature of outer ring using oil holes for access.

The bearing temperature should rise gradually to the steady state level within one to two hours after the operation starts. If the bearing or its mounting is improper, the bearing temperature may increase rapidly and become abnormally high. The cause of this abnormal temperature may be an excessive amount of lubricant, insufficient bearing clearance, incorrect mounting, or excessive friction of the seals.

In the case of high speed operation, an incorrect selection of a bearing type or lubrication method may also cause an abnormal temperature rise. The sound of a bearing may be checked with a noise locator or other instrument. Abnormal conditions are indicated by a loud metallic sound, or other irregular noise, and the possible cause may include incorrect lubrication, poor alignment of the shaft and housing, or the entry of foreign matter into the bearing. The possible causes and countermeasures for irregularities are listed in Table 12.1.

Table 12.1 Reasons and countermeasures for abnormal of bearings

Running order	Reasons detected	Countermeasure
Abnormal sound	Abnormal load	Amendment fitting, bearing internal clearance, modulate preload quantity, amend position of low-necked housing block
	Improper mounting	Processing precision of axle and housing, improve accuracy and method of mounting
	Unsuitable lubricant	Supply lubricant, select proper lubricant
	Contact of rotate accessory	Modify the sealed contacting section of loops
	Rolling surface generate indentation, rust and scar due to impurity	Replace bearing, clean relevant accessory, improve sealing device, and use pure lubricant
	Surface deformation(after steel carbonizing)	Replace bearing
	Raceway fracture	Replace bearing
	Over-size of internal clearance	Study fitting and bearing internal clearance, modify preload quantity
	Impurity penetration	Replace bearing, clean relevant accessory, improve sealing device, and use clean lubricating oil
	Spherical injury, fracture	Replace bearing
Exceptional temperature rise	Superabundance of lubricant grease	Re-running after venting superabundant lubricant grease
	Insufficiency and unsuitable lubricating grease	Supply lubricating grease, select appropriate lubricating grease
	Abnormal load	Modify fitting, study internal clearance of bearing, modulate preload, and modify position of low-necked block.
	Improper mounting	Improve processing precision of axle and housing, improve accuracy and method of mounting
	Creep of fitting surface and over-size of sealing device friction	Replace bearing, study fitting, modify axle and housing, change seal form
Large vibration (jump of axle)	Surface deformation fracture (after steel carbonizing)	Replace bearing, pay attention to operation
	Fracture	Replace bearing
	Improper mounting	Improve precision of bearing housing and amend method of mounting
	Impurity penetration	Replace bearing, clean relevant accessory, improve sealing device
Much lubricant leakage, large discoloration	Superabundant lubricant, friction powder generated by impurity penetration	Use right amount of lubricant, investigate to change selection of lubricating
Accelerate or decelerate (start or stop)	Mechanical resonance	Improve rigidity of shaft

**Remarks:**

For medium & large-sized cylindrical roller bearing, ball bearing, and grease lubrication, especially when in environmental condition of low temperature, there will be the problem of rolling sound. Normally, the temperature of bearing will not rise even rolling sound occurs, which will not influence its fatigue life and lubricating life duration. The bearing can be used as usual. If you have any enquiries about rolling sound, please contact the technical center of C&U group.