

# Electric Motor Bearings

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## Types of Electric Motor Bearings

**Bearing-related failures account for 51% of all electric motor failures.** The more you know about the types of electric motor bearings, their failure modes, and how to maintain them, the better prepared you will be to enact measures to help extend the life of your motor bearings.

## Rolling-Element Bearings

**Rolling-element bearings**, also known as anti-friction bearings, are an indispensable part of most electric motors. They allow shafts and axes to rotate at incredible speeds with minimal power loss, and they do this by drastically reducing friction by replacing sliding motion with a rolling motion. Rolling-element bearings are usually classified by the type of element used, with the most common being ball bearings and cylindrical bearings.

### Ball Bearings

In ball bearings, the rolling motion is provided by balls held in position by a race and cage. Ball bearings support high speeds and very low friction and they can handle light to medium loads. Electric motor ball bearings are typically used in direct-coupled applications and can handle both radial and axial loads.

### Roller Bearings

As the name implies, roller bearings depend on rolling elements that are cylindrical in shape. These bearings don't require a cage and race in the same way that ball bearings do. Electric motor roller bearings are used for belted applications with motors 150 HP and above. The surface of the cylindrical shape rolling elements helps to account for the high level of radial load that the belts put onto the bearings.

# Sealing Types of Rolling-Element Bearings

Now that we've talked about the different types of sealing for rolling-element bearings, we should take a few minutes and talk about the types, or styles, of bearings. The three most common types are sealed, shielded, and open, and each has its own pros and cons.

## Sealed Bearing

In sealed bearings, the bearing chamber is packed with grease and then sealed during manufacturing. This prevents any contaminants (e.g., dirt, dust, metal shavings) from becoming entrapped in the grease and eliminates the need to regrease the bearings. However, electric motor sealed bearings have a shorter lifespan than other bearings and need to be replaced completely when there are signs of a problem.

## Shielded Bearing

Shielded bearings are similar to sealed bearings in that the rolling elements are protected from contamination during installation and use. However, unlike sealed bearings, they use a removable shield to retain grease within the bearing chamber. Because it is removable, it allows the bearings to be regreased (which you can't do with a sealed bearing). The ability to regrease these bearings results in them having a longer lifespan.

## Open Bearing

The last style of rolling element bearing is the open bearing. These bearings are neither shielded nor sealed. This allows them to run cooler, results in less friction, and makes it possible for them to be easily regreased. However, the bearing system itself must be designed to protect the bearing from contamination and keep the grease where it is needed.

## Sleeve Bearings

Another type of bearing that you can find on electric motors is sleeve bearings. These bearings are much more simple than anti-friction bearings in their

design and they depend much more on proper lubrication to do their job. Sometimes known as journal or babbitted bearings, sleeve bearings often consist only of a lubricated sleeve in which a shaft rotates.

## Vertical Motor Bearings

There are also bearings for vertical motors oriented to run vertically as opposed to horizontally. These include thrust bearings, which can include anti-friction bearings (such as ball bearings, roller bearings, or cylindrical bearings) or Kingsburg tilting pad bearings. Many times multiple thrust bearings stacked so that they can handle both upthrust and downward thrust. You may also see a bottom guide bearing on vertical motors. Guide bearings can either take the form of a sleeve bearing or rolling element bearing and are located toward the bottom of the motor.

## Care and Maintenance of Bearings

The main task involved in **maintaining your anti-friction bearings** (especially ball bearings) is greasing them properly. It is extremely important to keep your bearings properly lubricated because bearings are the number one cause of electric motor failure. The key in greasing bearings is to **strike a balance** between using too much grease (more is not always better!) and too little grease (which can destroy a bearing very quickly).

## Electric Motor Bearing Failures

Most **bearing failures** are related to one of two things: either the source of failure lies with lubrication (too much, too little, or contamination) or electrical damage (including fluting). The good news is that both of these failure modes are preventable.

### Bearing Failure Related to Lubrication and Contamination

As mentioned earlier, keeping your motor bearings properly lubricated is vital. **Too much grease** can result in cage failure or a dislocated shield, and can even affect the winding temperature on your electric motor. On the other hand, not using enough grease will lead to metal-on-metal contact which will

destroy a bearing (and other components, too) if not addressed. Finally, another major issue with bearings is contamination. If the grease is contaminated with abrasive particles, it will speed up the rate of wear and result in a bearing that doesn't last its expected life.

## Electrical Damage to Bearings

Another common cause of bearing failure in electric motors is electrical damage. One form of electrical damage is fluting, which is the **passage of current** through the bearings that results in visible damage. The damage occurs on the surfaces of ball bearings (which may look frosted or pitted) and roller bearings (which will have evenly spaced lines or patterns on the surface). Fortunately, fluting can be addressed through electrically isolating the bearing or, in the case of **VFD motors**, a **shaft grounding ring** (such as those made by AEGIS).

## Conclusion

If you have been encountering issues with the bearings in your electric motors and are looking for answers, then contact HECO. HECO provides robust repair solutions that you won't find anywhere else. In addition, we have the equipment and know-how to help you track down the source of your bearing problems, including fluting in VFD motors. We are EASA accredited and follow strict procedures for repair and reconditioning that allow us to provide you with the highest quality repairs that will reduce the M&O costs for your electric motor powertrain.