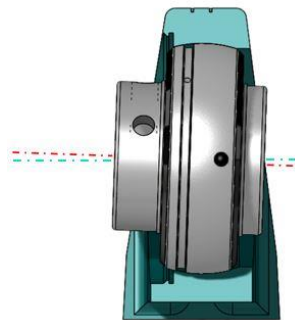


## Dodge® mounted bearings: manual alignment vs. self alignment

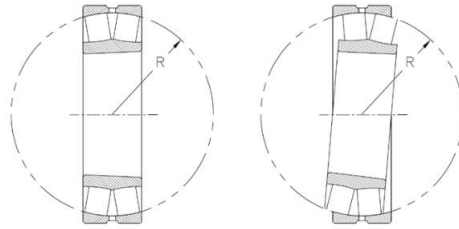
Bearing alignment is important to ensure proper loading between the rollers and raceways. When a bearing is not properly aligned, it can cause high localized stress on the rollers and raceways. This additional stress causes bearing failure to occur prematurely. Therefore, proper bearing alignment is critical to achieving maximum bearing life. Although proper bearing alignment is important, some bearings are considered self-aligning and do not require manual alignment as long as it is within the misalignment capability of the bearing.

Dodge mounted ball bearings can accept static misalignment due to the ability of the insert to swivel in the housing. This can be seen in **Figure 1**. The torque required to pivot the bearing insert in the housing is known as swivel torque. The reason a ball bearing is considered self-aligning, is due to the amount of swivel torque required to align the bearing to the shaft. The misalignment between the shaft and bearing will force the bearing insert into the correct position. Dodge controls the amount of swivel torque to allow for misalignment. In an application where a bearing is mounted to a flexible base, commonly seen in an air handling application, the swivel torque can be reduced to allow the insert to align more easily.



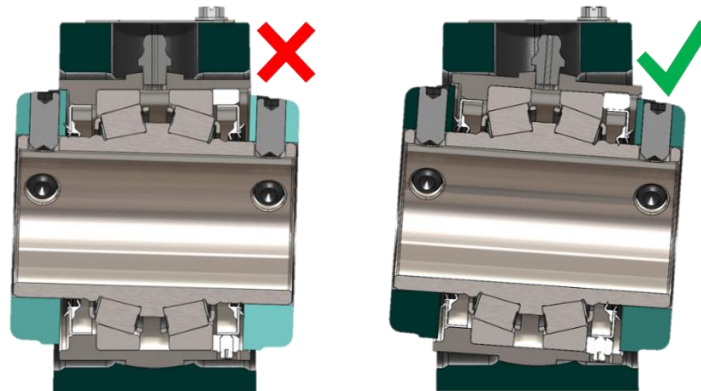
**Figure 1.** A misaligned ball bearing insert

Dodge spherical roller bearings can accept static and dynamic misalignment due to the spherical shape of the outer ring and rollers, but misalignment capability is limited by the seals. **Figure 2** shows how the radius of the outer ring allows the inner ring and rollers on a spherical roller bearing to swivel. Although the inner ring and rollers are misaligned in the outer ring, the rollers maintain full contact with the raceways. Once the rollers no longer maintain full contact with the raceway, the bearing has exceeded its misalignment capability.



**Figure 2.** Outer ring radius of a spherical roller bearing

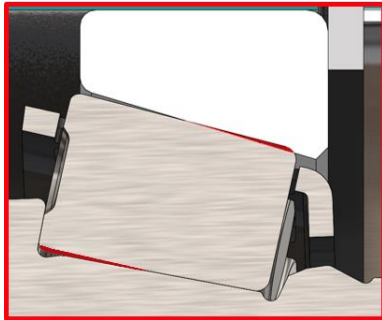
Dodge split housed tapered roller bearings can accept static misalignment; however, the insert must be manually aligned. Tapered roller bearings are particularly susceptible to misalignment due to the line contact between the rollers and the raceways. An example of a misaligned tapered roller bearing is shown in **Figure 3** in comparison to a properly aligned bearing. In the bearing on the left, the cone, or inner ring, is misaligned; however, the cup, or outer rings, are not. In a properly aligned bearing, shown on the right, the inner unit misaligns within the housing. This ensures that the contact pressure between the rollers and the raceways is evenly distributed.



**Figure 3.** Misaligned tapered roller bearing (left) and aligned tapered roller bearing (right)

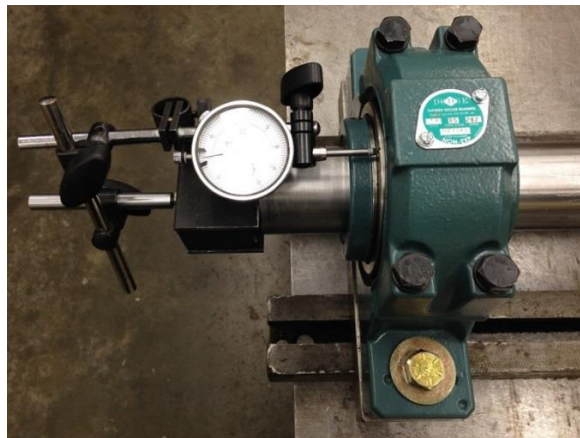
A close-up of a tapered roller under edge loading is shown in **Figure 4**. The image on the right shows the effects of a misaligned bearing on the cup. A meandering wear pattern can be seen on the cup where half of the cup's surface is unloaded and the other half is severely loaded to the point of fatigue failure. If this meandering wear pattern is visible, it is apparent that misalignment occurred. Bearing misalignment can also lead to increased bearing temperatures and vibration.





**Figure 4.** Close-up of cup/cone assembly (left) and wear pattern on bearing cone (right)

In order to properly align a tapered roller bearing, it must be done manually. First, one must tighten the mounting bolts on the bearing feet. A dial indicator must contact a machined surface on the insert, as shown in **Figure 5**, to measure TIR. The inner unit of Dodge tapered roller bearings has one machined surface. Position the bearing in such a way that the machined surface is accessible. It is recommended that the non-expansion bearing is aligned first before aligning the expansion bearing. To adjust the alignment of the insert, a hammer and a drift must be used until the required TIR has been reached. The manual alignment process can become difficult to achieve if access to the bearing is cumbersome.



**Figure 5.** Measurement of inner unit runout

Misalignment can cause severe damage to the rollers and raceways. It is important to ensure that mounted bearings are aligned properly. Dodge mounted ball bearings are considered self-aligning; however, there are situations where the swivel torque may need to be adjusted. Spherical roller bearings are best in applications experiencing both static and dynamic misalignment; however, they can be more limited in the degree of misalignment due to the seals. Dodge tapered roller bearings can accept static misalignment, but they must be manually aligned.





For any questions concerning Dodge brand anti-friction bearings or PT Component parts, contact Dodge Application Engineering at 864.284.5700 or email to [engineering@dodgeindustrial.com](mailto:engineering@dodgeindustrial.com).

