

Dodge TAI/MTAI Excessive Gearbox Movement

All Dodge TAI/MTAI gearboxes that are shaft mounted in a typical fashion by using a torque arm assembly for anti-rotation, will have some inherent movement during operation. Dodge torque arm assemblies are designed to allow some degree of natural movement. It is difficult to define this "natural movement" of a system due to the many variables that go into an industrial gearbox driven application. This natural movement can also be known as "hop" and/or "wobble". The term "hop" refers to any perpendicular movement of the gearbox to the axis of the driven shaft. "Wobble" is where there is back and forth rocking movement of the gearbox as seen looking at the profile view of the gearbox and customer driven shaft. Both hop and wobble can be seen in Figure 1.

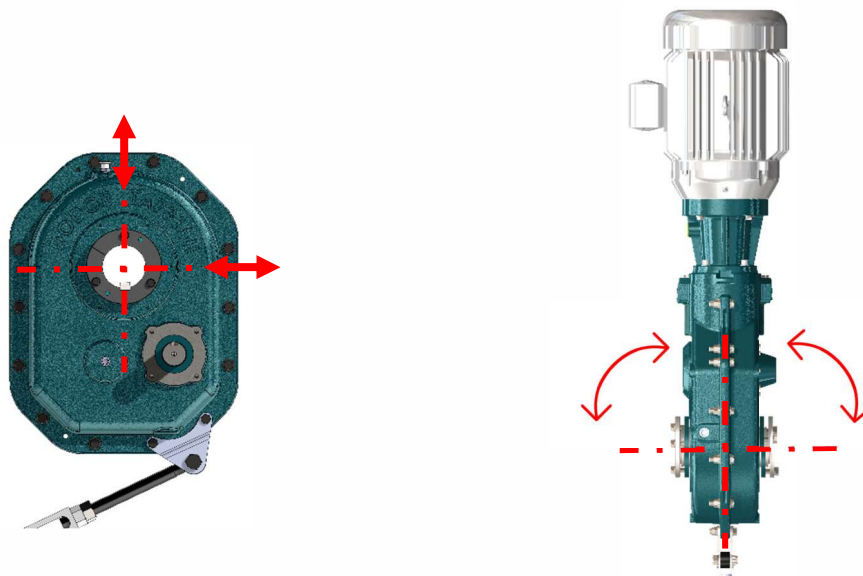


Figure 1: Gearbox Hop (left) and Wobble (right)

Both conditions will most likely always be present due to tolerances in the gearbox manufacturing process as well as customer shaft tolerances. A little natural movement in a gearbox during operation is acceptable but too much can be detrimental. The question remains - what amount of movement is excessive while a gearbox is in operation? It is difficult to define excessive gearbox movement, but this technical paper will aid in troubleshooting excessive gearbox movement during operation.

As a general guideline, the maximum movement should be within $\pm 1/8"$ at the tie rod connection point to the housing brackets on the gearbox. This will be the case for most gearboxes, however some applications may experience more movement than others. If there is no noticeable binding, the gearbox movement could be considered normal. If excess movement is observed, please see the table at the end of this document with troubleshooting steps.

The only way to check for this excessive movement is to measure while the gearbox is in operation. There are challenges to this method as it requires a measurement to be taken while equipment is in operation. This is not an easy task as usually the point of measurement is behind guards and may be difficult to see or safely access. A laser measuring device would be a good candidate for this

task to get an idea of movement while the gearbox is under normal loading and operation to check for movement. The following section covers an example on measuring excessive wobble. Measuring hop would be a similar process, but the measurement would take place along the same axis as the maximum movement.

Figure 2 shows an example of the location to take this measurement. Note that the gearbox may be oriented in a different mounting position than shown in the figure. The tie rod housing brackets need to be identified then a measurement taken on a flat spot on the bracket itself or possibly on the head of the bolt where the connection is made. These locations need to be in line of sight of the measuring device focused around the area circled in the figure.

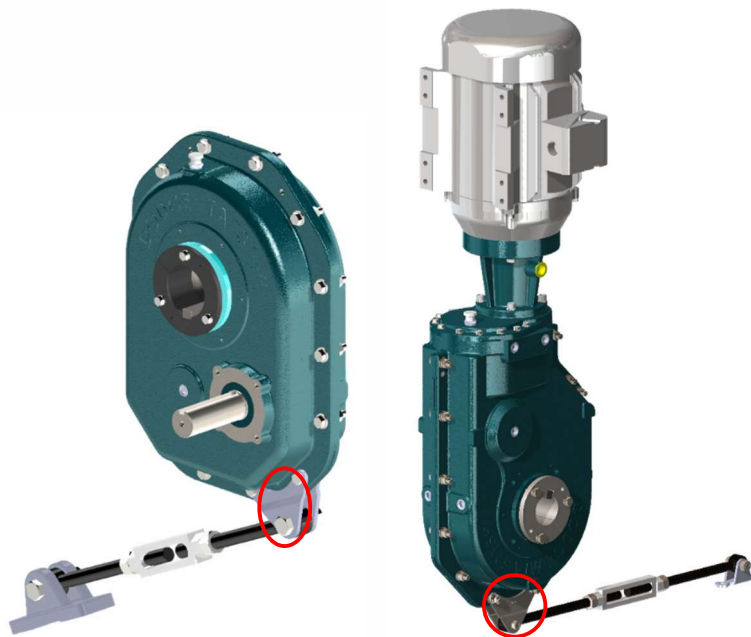


Figure 2: Example Location for Wobble Measurement

An example of maximum movement is given in Figure 3 from a profile view. This is meant to portray a gearbox that experiences wobble while in operation. Once a location is chosen to take the measurement from the previous figure, then a maximum and minimum value needs to be found. Figure 3 shows an example of the movement where total axial displacement would be equal to "A" + "B". Dimension "A" is the maximum movement from centerline to one end of travel and dimension "B" is the maximum movement from centerline to the other end of travel. The sum of these would be equal to the maximum movement, which should not exceed 1/4" total (+/- 1/8"). Typically, laser measuring devices have a setting to find maximum movement from a stationary measuring location.

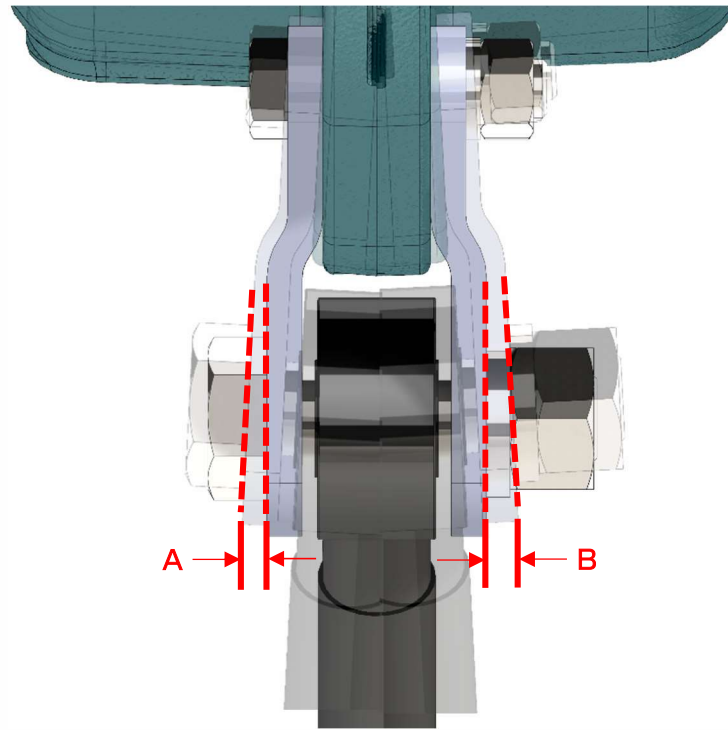


Figure 3: Profile Wobble Movement Example

Excessive gearbox movement can be a symptom of several different causes. The table below gives some troubleshooting steps to help identify the source of excessive movement. This is not an exclusive list but gives the most common causes to the symptoms of hop and/or wobble. Please contact Dodge Application Engineering with any additional questions on this topic.

Probable Cause	Remedy
Customer shaft and/or Gearbox hollow output shaft out of size tolerance	Measure shafts to verify. Re-machine or replace incorrect shaft.
Customer shaft bent	Check for runout and straighten or replace shaft
Incorrect tie rod assembly installation	Check instructions and correct - tighten all fasteners properly
Customer shaft not properly mounted entirely through gearbox hollow output shaft and bushings	Reposition gearbox on customer shaft or replace shaft if inadequate length
Worn or loose/incorrectly installed driven shaft key	Check key installation - if key was oriented correctly or check keyway size on solid shaft and bushing components
Output bearing looseness	Check bearing endplay and replace if necessary
Tapered bushings and/or hardware not installed properly	Verify bushing squareness and reinstall if necessary - taking care to tighten evenly and to specified torque values