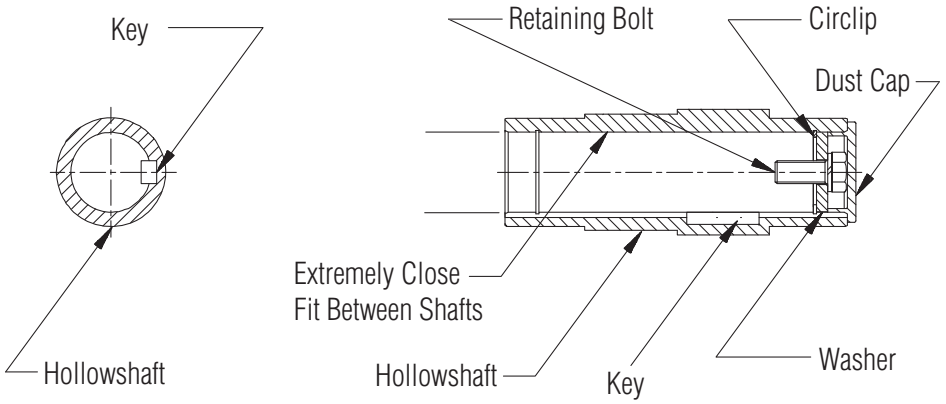
Technical Note

TorqLOC® Advantages

Traditionally, two methods have been used to transmit torque from a hollow shaft gear reducer to a solid driven shaft: a keyed shaft or a shrink disc. Now there is a third – TorqLOC. TorqLOC eliminates the problems associated with either a keyed shaft or a shrink disc and retains the keyless advantage.

Traditional Methods:

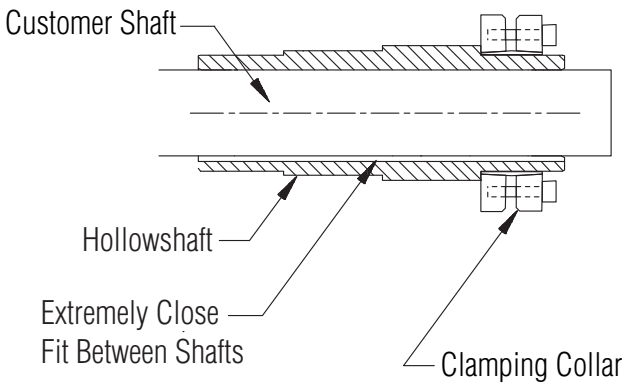
Keyed shaft



Disadvantages:

- Corrosion: In time, the user's solid shaft can corrode or weld to the hollow shaft of the gear reducer, making it difficult or impossible for the user to remove the gearbox.
- Keyway Cost: User needs to cut a keyway in his solid shaft – an added expense.
- Deformation: The keyway is the only item that transmits torque. Fatigue stress can occur over time, depending on the application. For correct installation, the user must use a key of sufficient length and must ensure a proper fit between the key and the keyway. Otherwise, the keyway may experience plastic deformation that produces a loose fit, especially on reversing applications.
- Tapped Hole: To secure the user's shaft inside the gear reducer and to prevent axial movement, the end of the shaft should contain a tapped hole, which is an extra expense.
- Limited sizes: Keyed shafts are usually available in only one or two diameters. Alternate bores require a special shaft (expensive).
- Backlash: Because of the air gap around the key, a keyed shaft has inherently higher backlash than a keyless shaft.

Shrink Disc

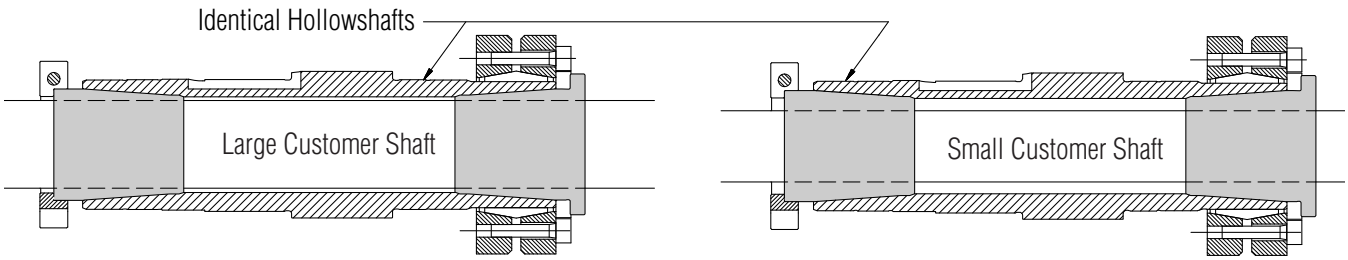


Disadvantages:

- High Tolerance: The user must machine a shaft within a very close tolerance, which is expensive. Example: +0 to -.00083 inch.
- Removal: High clamping forces prevent corrosion at the clamping area. However, if the user's shaft corrodes on the inside of the reducer or outside the clamping area, the high shaft tolerance prevents the shaft from easily sliding out of the reducer.

  In addition, the shrink disc does not provide a method to help push the solid shaft out of the bore after the bolts are loosened.
- Limited Sizes: There is usually only one bore size available with a shrink disc. Other diameters require a special shaft (expensive).

TorqLOC Method:



Advantages:

- Liberal Tolerance: +0 to -.0087". The bushing on the TorqLOC allows nearly 10 times the tolerance of the user's shaft when compared against a shrink disc (+0 to -.00083") or a keyed shaft (+0 to -.001"). Liberal tolerance means less machining cost.

- Shaft Stock: Due to the liberal tolerance, shaft stock can be used without additional modifications, reducing machining costs. The words "shaft stock" and "bar stock" may be used interchangeably, providing the bar stock is clean.

- Retrofits: TorqLOC may be used on existing solid shafts, including keyed shafts, without modification – providing the shaft is clean and free from corrosion.

- Symmetrical Design: TorqLOC is available with a shaft extension on both sides, allowing the user to mount the clamping collar to either side. A symmetrical shaft eliminates the need to stock two different gear reducers (one with a collar on side A, one with a collar on side B).

- Ample Sizes: Several bushing diameters provide flexibility and allow the user to standardize on a few reducer sizes for multiple shaft diameters. If the user has a keyed solid shaft with a non-standard diameter, a TorqLOC bushing may be available in the desired diameter, eliminating the cost of a custom keyed hollow shaft.

- Easy Removal: The same bolts that are used to mount the shaft are also used to remove the shaft. In addition, corrosion is kept to a minimum on both ends of the reducer. On the end nearest to the user's machine, a bronze bushing eliminates corrosion because bronze (bushing) and steel (user's shaft) are dissimilar metals that do not react with each other. On the other end of the reducer, high clamping forces exerted by the clamping collar prohibit oxidation.

- No Keyway: The TorqLOC does not require a keyway to transmit torque. Therefore, it can be used on a reversing application without creating deformation or a loose fit. No keyway also yields less backlash.

TorqLOC vs. Competition

- No Bearing Preload: Since the clamping forces are located on the outside of the gear reducer, there are no component forces acting against a bearing. Therefore, the bearings are not subject to a preload, which can shorten their life. On some non-SEW products, the tightening bolts force a bushing into the hollow shaft – like a wedge – which creates radial pre-loading on the bearings (see pages 5 - 6).

- No Axial Movement: As the TorqLOC bolts tighten, the diameter of the shrink disc collar becomes smaller, forcing the collar to "clamp" around the user's solid shaft. The bushing does not act like a wedge, so the reducer does not move relative to the user's shaft.

  Conversely, on other non-SEW products, the tightening bolts act like a wedge and force a bushing into a hollow shaft, causing the reducer to move axially along the user's shaft (see pages 5 – 6).

- Closer Mounting: Since TorqLOC utilizes a single clamping collar on only one side of the reducer, the side without the collar mounts close to the machine. Some non-SEW products utilize a clamping collar on both sides, which means the user must provide more space between the reducer and the machine in order to have enough room to tighten the collar bolts.

- Corrosion Resistant: TorqLOC is available with stainless steel components (optional) to prevent corrosion. Other non-SEW products may use materials that corrode.

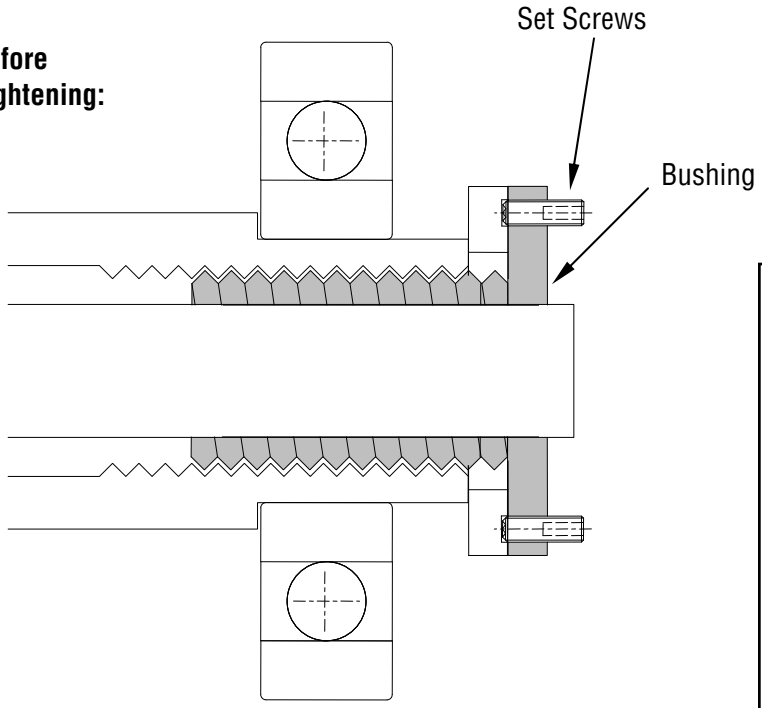
- No Keyway: TorqLOC does not need a keyway to transmit torque. Some non-SEW products still use a keyway, which has its inherit disadvantages as explained on page 1.

- Price: Not only is TorqLOC cheaper than an SEW shrink disc (in most cases), it is often considerably cheaper than other brands with similar features.

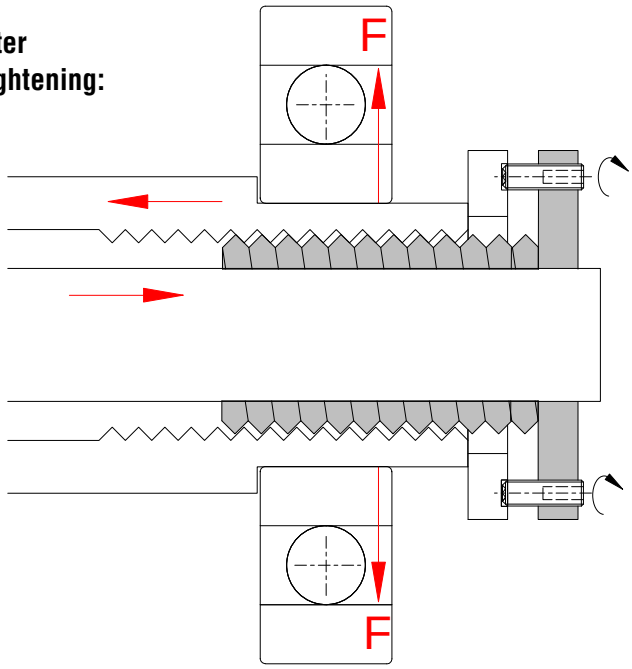
- Patented: SEW holds a patent for the TorqLOC design. Therefore, it is nearly impossible to produce a similar taper-bushing design without infringing on either SEW's patent or other patents.

Competitor Design 1

Before Tightening:



After Tightening:



Concept:

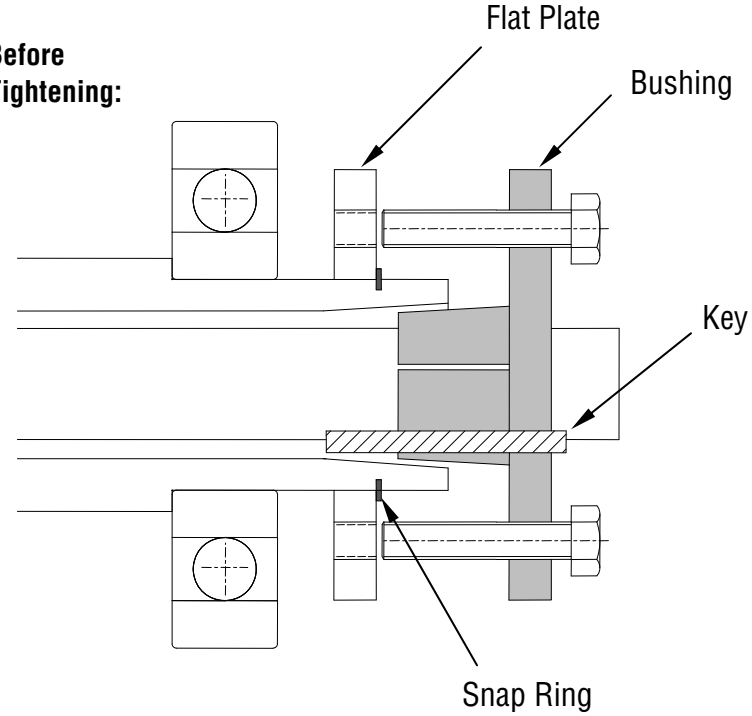
In this design, the hollow shaft contains threads. The “bushing” resembles a cylinder with outer threads. Tightening the setscrews attempts to pull the bushing out of the hollow shaft.

But, when the threads contact each other, the angle of the thread acts like a wedge and tries to expand the diameter of the hollow shaft. Since the bearings prevent the shaft from expanding, the wedging action induces a radial force, **F**, against the bearing.

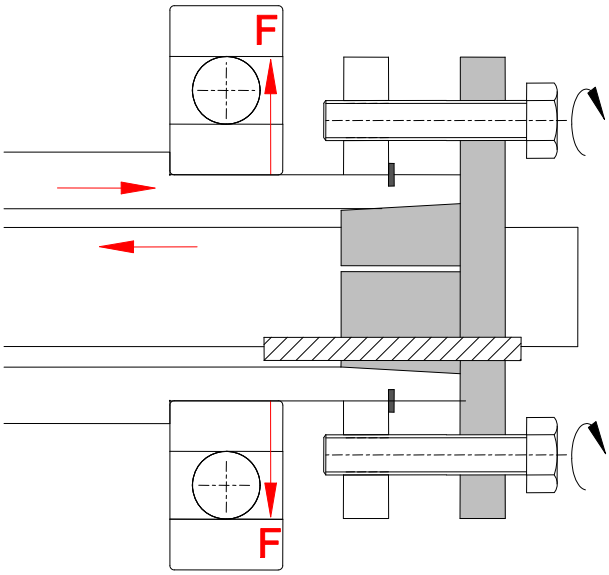
At the same time, the reducer may tend to move along the user’s shaft, producing an undesirable axial movement.

Competitor Design 2

Before Tightening:



After Tightening:



Concept:

Tightening the bolts attempts to pull the flat plate off of the shaft. However, since a snap-ring prevents the plate from sliding, the bolts push the bushing inward. At the same time, the sliding action of the bushing may tend to move the reducer to the left, yielding undesirable axial movement.

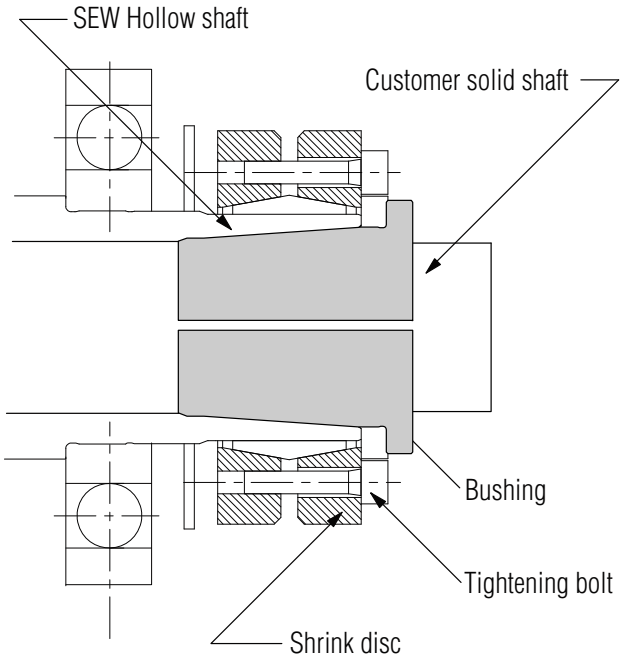
As the bolts tighten further, the angle on the bushing tries to increase the inner diameter of the hollow shaft, like a wedge. Since the bearings prevent the hollow shaft from expanding, the wedging action creates a radial preload force, **F**, against the bearings.

A slit in the bushing allows the bushing to shrink and tighten onto the user's solid shaft.

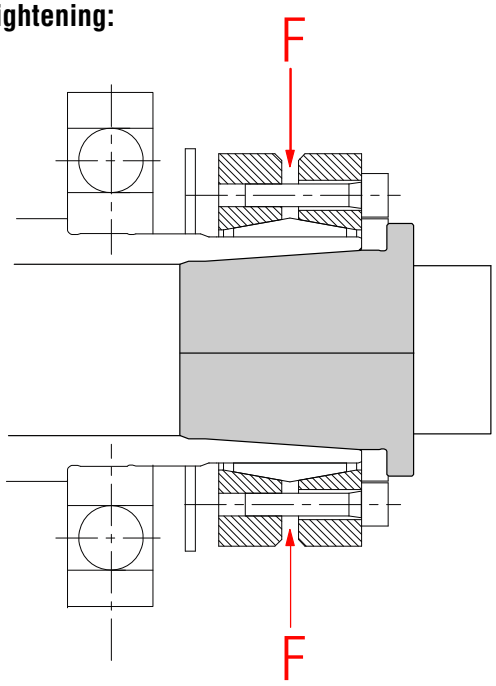
Notice how this design still requires a key to transmit torque!

TorqLOC® Design

Before Tightening:



After Tightening:



Concept:

Tightening the bolts creates a radial clamping force, **F**. As this force on the hollow shaft increases, the force on the bushing increases.

A slit in the bushing allows the bushing diameter to shrink and to tighten onto the user's solid shaft.

Notice how the bushing slit gets smaller after the TorqLOC® is tightened.

The total resultant force acts radially on the customer's solid shaft.

Therefore:

1. No key is needed to transmit torque.

2. The bearings are not preloaded since there is no wedging action on the bearings.