Technical Note

Mounting Procedures – Flanged Reducers

Mechanical

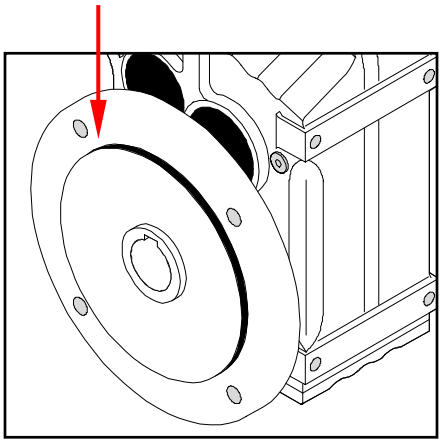
Drives must be properly installed if they are to produce rated torque. Incorrectly installed drives may experience oil leaks, reduced life spans, or even catastrophic failure. An appropriate mounting site should contain the following:

- Ambient temperatures between 0°C and 40°C (32°F to 104°F).
- Unimpeded airflow to and around the units.
- Accessibility to oil drain, level and breather plugs.
- Adequate space for removing the fan guard from the brakemotor when adjusting or replacing the brake.
- A mounting surface that is flat, torsionally rigid, and dampened against vibration. Flatness tolerances should not exceed the following values:

Reducer Sizes 87 and smaller:	0.004 inches
Reducer Sizes 97 and larger:	0.008 inches

Tenon

The tenon on the flange is an important element of the installation. Since it has a tolerance, it is not painted at SEW. In addition, the hole to which it attaches should have a tolerance fit. When properly installed, the tenon provides the following benefits.



1. **Allows easier installation.**

   Tenon provides a surface lip that allows the customer to anchor the reducer in position while securing the bolts of the flange.

2. **Locates exact center of the reducer shaft.**

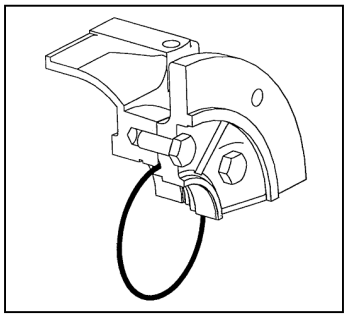
   Since the diameter of the tenon has a tolerance, the exact center of the output shaft is known, which aids in proper bearing alignment.

3. **Prevents movement of reducer.**

   The through-holes on the flange are larger than the bolts for which they are intended. Therefore, if the bolts were to loosen over time, the reducer could shift out of alignment. With the proper tolerance, the mounting hole tightly secures the tenon to prevent the reducer from shifting if the bolts loosen.

Mounting Surface

If a flange is tightly bolted to an uneven surface, it distorts. As a result, it may crack or develop a gap between the flange and the housing. To help prevent oil from escaping the gearbox during an improper installation, SEW incorporates an O-ring in the flange, as shown at right.



It is strongly recommended that the surface remain within the tolerance range (as specified on page 1) so that the flange face aids in supporting shear forces. However, if this tolerance cannot be met, shims should be used around the flange bolts. The following shimming procedure is recommended.

1. Use a quality straight edge to check for high spots on the supporting surface. Grind all necessary areas and remove any raised material around mounting holes.
2. Clean entire surface prior to mounting.
3. Set unit into place by using the tenon for support. Align the boltholes.
4. Place bolts into holes and finger tighten them until snug.
5. Check for gaps between the flange and the mounting surface at each bolt.
6. Fill any gap(s) with shims. "U" shaped shims are best because they fill space on both sides of the bolt. The shim width should be about 2 times the width of the bolt. Over-shimming is detrimental and can actually worsen the irregular surface.
7. Tighten the bolts similar to how you tighten a wheel of a car. First tighten one bolt, then tighten a bolt 180° opposite the first bolt, then tighten a bolt next to the first bolt, etc. NOTE: Observe the flange and mounting surface as you tighten. If the flange or surface deflects, then stop, loosen bolts, adjust shims, and retighten.
8. Check alignment of the driven component and reducer to ensure all bearings are 100% concentric.

Flange Face

The flange face is also an important element of the installation. It is intentionally shipped unpainted to provide a rough surface for maximum friction. When tightly bolted to a flat surface, the face provides a large surface area to distribute the shear forces created by the following.

- The weight of the reducer and motor
- The weight of the customer's shaft
- The weight of all components suspended from the customer's shaft
- The force component of the torque produced by the reducer. This force is very large during a shock load.

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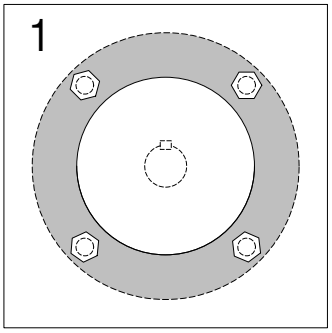
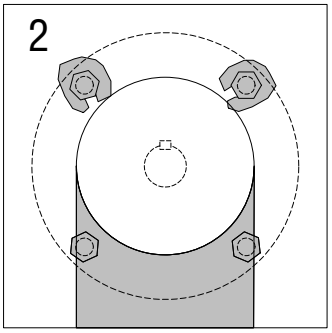
Mounting

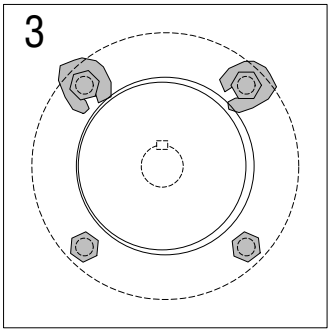
These illustrations represent three different mounting scenarios, depending upon the flatness of the mounting surface and the size of the mounting hole. The shaded areas support the weight of the gearmotor plus all stresses induced by the load.



Correct



Not Recommended



Incorrect

#1

- The flange mounts to a flat surface within acceptable tolerance. Therefore, no shims are needed around the bolts.
- The mounting hole is made to tolerance. Therefore, the tenon fits snugly inside the mounting hole and the center of the solid shaft is located exactly.
- All shear and shock forces are supported via the large area of contact on the face of the flange. Friction provides the support. The only force imposed onto the bolts is the tension created from tightening the nuts in order to hold the flange snugly against the surface.

#2

- The flange mounts to a non-flat surface. Therefore, shims are needed around the bolts to prevent the flange from cracking or distorting.
- The mounting hole is made to tolerance. Therefore, the tenon fits snugly inside the hole and the center of the solid shaft is located exactly.

Problem: Since the surface is not flat, there is minimal contact area for the flange face. Although the edge of the mounting hole supports gravity forces, only the bolts support the force component of torque (which is large during a shock) to prevent flange rotation.

Solution: Ensure that the surface is flat and within tolerance. Although this design is not recommended, sometimes it is unavoidable if the surface cannot be made flat. A correctly sized mounting hole at least provides some support, unlike Design #3 that provides none.

#3

- The flange mounts to a non-flat surface. Therefore, shims are needed around the bolts to prevent the flange from cracking or distorting.
- The mounting hole is out of tolerance and is much larger than the tenon.

Problem: Since the surface is not flat, there is minimal contact area for the flange face. Thus, the face provides minimal support for all forces.

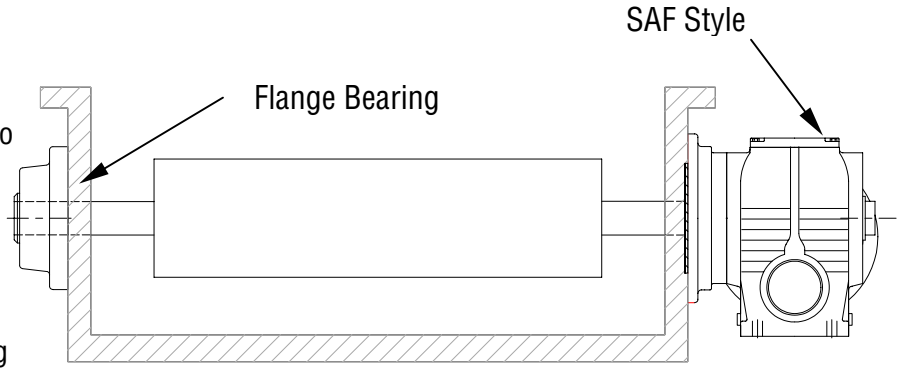
Since the tenon does not fit snugly, the center of the shaft is not known. In addition, the mounting hole supports nothing. Basically, the tenon serves no purpose in this design.

The bolts support all gravity forces as well as the force component of the torque, which is quite large during a heavy shock. Furthermore, since the bolts are smaller than their mounting holes, the reducer will jolt if the bolts loosen and cause the reducer to shift from position.

Solution: Ensure that the surface is flat and within tolerance. Also, ensure that the mounting hole is made within the tolerance of the tenon.

For heavy shock load applications, the use of dowel pins (in addition to mounting bolts) is recommended to control flange movement or flange rotation. Basically, a dowel pin is a metal cylinder that is the same diameter as the mounting hole. It fits very snugly in the mounting hole to stiffen the mounting, unlike a bolt that fits loosely.

Flange mounted reducers with a hollow shaft require careful mounting to prevent the bearings inside the reducer from being subject to a bending moment (preload) caused by misalignment. When a solid shaft is mounted inside the reducer's hollow shaft, all bearings supporting the solid shaft should be exactly concentric with the two bearings inside the reducer so that the solid shaft remains perfectly straight. Only one, not two, external bearings should be used to support the solid shaft, as shown on the conveyor above. Observe how the flange bearing on the left supports one side of the conveyor shaft, while the reducer bearings on the right support the other side.



Technical Note

Flange-Opposite-Shaft

The K-series and S-series reducers are available with a 'flange-opposite-shaft' configuration, as shown at right. The solid output shaft and mounting flange are located on opposite sides of the reducer. In this configuration, a small radial force (OHL) on the output shaft creates a large bending moment on the flange due to the long lever arm (distance L).

Without additional support, the allowable overhung load (OHL) must be reduced to 25% of the published maximum OHL to avoid distorting or fracturing the flange. Contact Regional Engineering for more information.