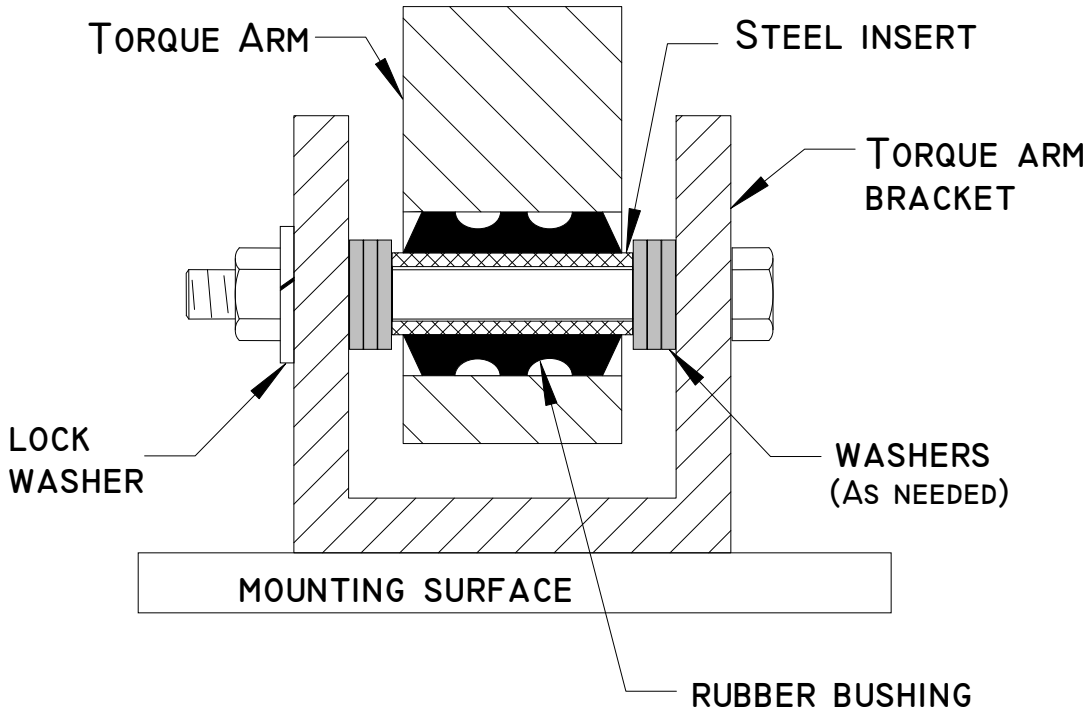
Technical Note

Mounting Procedures – Torque Arms

In order for a gear reducer to transmit torque and to rotate a load shaft, it must be held stationary. Otherwise, the entire reducer will spin around the shaft rather than rotate it. Feet, flanges, and torque arms are three methods used to provide a necessary restraint.

The torque arm concept is the most preferred, since it enables a hollow shaft reducer to hang from a solid shaft and to be totally supported by that shaft. In addition, it guards against potential misalignment caused by foot mounting or flange mounting. When correctly installed, the reducer experiences zero binding and zero overhung load, even with a load shaft that is out-of-round. Since a perfectly concentric shaft is difficult to manufacture, it is quite common for the reducer to slightly wobble during normal operation.

SEW offers torque arms that include a rubber bushing and a steel insert for all shaft-mounted products. The rubber bushing absorbs starting and stopping shocks. It also allows the reducer to move in order to prevent binding when the driven shaft is out-of-round. If desired, users may design and fabricate their own torque arm. Shown below is a recommended bracket design to be used with the S, K, and W-series torque arms that are available from SEW.



The following guidelines ensure a correct torque arm design and installation.

1. **Surface**: The torque arm bracket plus the surface to which the bracket attaches must be rigid and not deflect or vibrate under load.

2. **Reducer Bolts**: The bolts used to attach the torque arm to the reducer housing should be secured with a thread locking compound, such as Loctite 242, and should thread into the entire depth of the tapped holes.

3. **Torque Arm Bolt**: The mounting bolt used in the torque arm bracket should be securely fixed with a second nut or with a lock washer to prevent it from loosening when the rubber bushing compresses. At least one bolt diameter length should protrude from the nut after tightening.

   Reference Tech Note **#GM-023** for recommended bolt sizes used with SEW torque arms.

4. **Bushing**: A flexible bushing (rubber) should be used to absorb shocks due to starting and stopping and also to ensure that slight misalignments or shaft deflections do not impose a strain on the reducer housing. At minimum, the reducer must be padded (via bushings) in the direction of rotation. However, for best results it should be padded in both directions to account for shaft wobble and slight misalignment – either of which may induce a force that is in the opposite direction of rotation.

5. **Bracket**: Torque arm bracket should hold both sides of the torque arm, not just one. Thus, a "U" shaped bracket is recommended.

6. **Steel Insert**: The steel insert inside the torque arm bushing should be centered in the torque arm and centered inside the bracket.

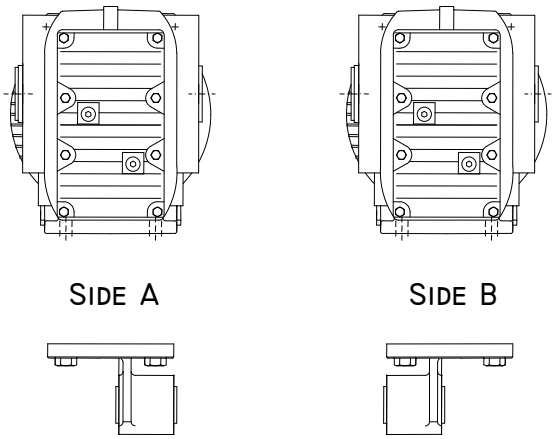
7. **Washers**: Torque arm bracket must not touch or hinder torque arm. Where necessary, use washers between the steel insert and the bracket to provide clearance and a snug fit.

8. **Alignment**: Do not force torque arm. If it does not align properly in the bracket, move the bracket.

Technical Note

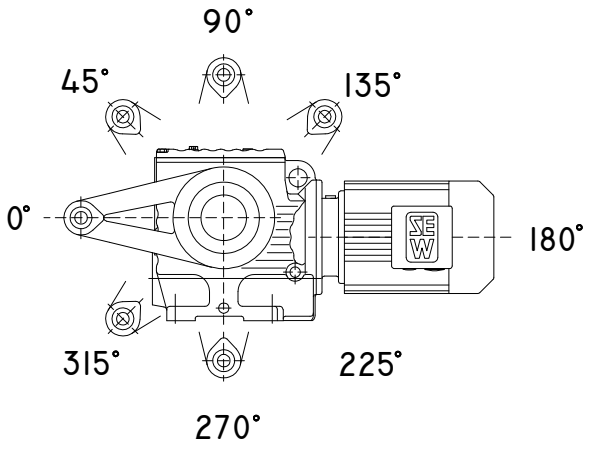
K-Series:

The SEW torque arm for the helical-bevel reducer is cast iron and attaches to the base of the reducer via bolts that thread into the tapped holes on the bottom of the housing. Since the torque arm lug is off-center, it may be installed with the lug on either side A or side B, as shown below. Torque arms are not available for sizes KH167 and KH187.



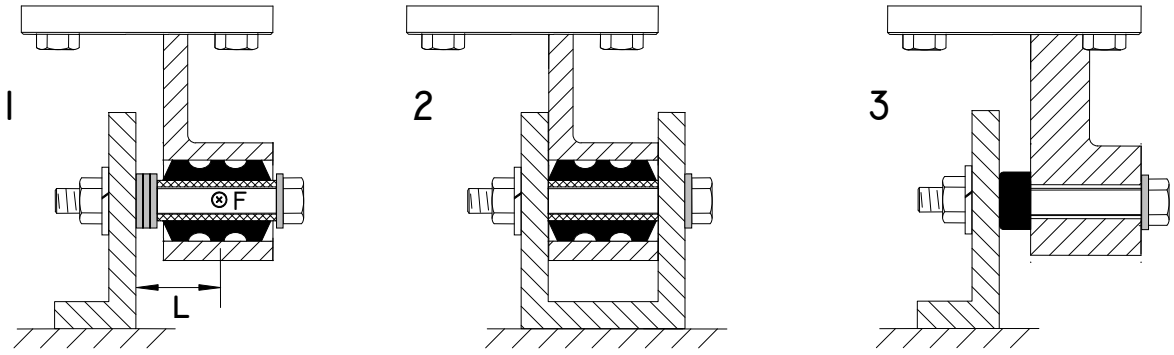
S-Series:

The SEW torque arm for the helical-worm reducer is cast iron and attaches to either side of the reducer via bolts that thread into the tapped holes on the face of the housing. Since the torque arm has eight evenly spaced holes, it may be positioned in eight different angles. Positive increments occur in the CW direction, with 90° located at the top, as shown below.



Technical Note

The following illustrations show incorrect installations of a torque arm for K, S or W-series.



Incorrect **Incorrect** **Incorrect**

#1: An SEW torque arm is anchored on one side. A lock washer and spacers are properly used, along with a bushing and metal insert. However, as the load shaft rotates, the torque arm produces a force, F with its direction going into or out of the page. This force is located at a distance, L from the edge of the mounting surface.

Problem: The bolt experiences a bending moment equal to (F x L). Eventually, the bolt loosens or fails from fatigue stress.

Solution: Anchor torque arm on both sides.

#2: An SEW torque arm is anchored on both sides. It incorporates a lock washer, a rubber bushing, and a metal insert.

Problem: Washers between the torque arm and the mounting bracket are missing. Friction between the bracket and the face of the torque arm restrict the torque arm and reduce the effectiveness of the rubber buffer.

Solution: Widen the torque arm bracket and use spacers (washers).

#3: This illustration represents a torque arm not designed by SEW. In lieu of SEW's built-in bushing, another type of rubber bushing is used between the torque arm and bracket, which is supposed to cushion and give adequate space between the bracket.

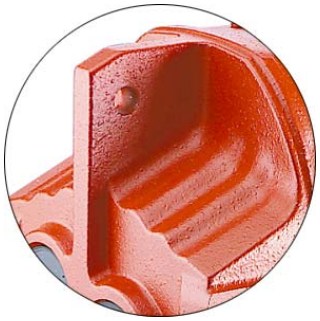
Problem 1: Same as #1 above.

Problem 2: The rubber bushing cushions forces from left to right only. However, the direction of the problematic forces is in and out of the page and is perpendicular to the bolt. Thus, the bushing provides no real cushion, just space between the bracket and the mounting surface.

Solution: In addition to solution for #1 above, use a hollow bushing that is entirely surrounded with rubber to cushion the forces going in and out of page.

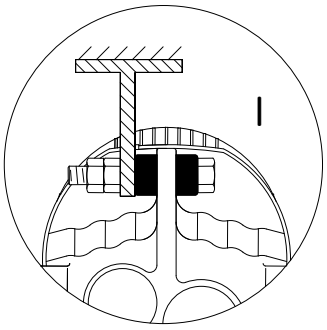
Technical Note

F-Series:

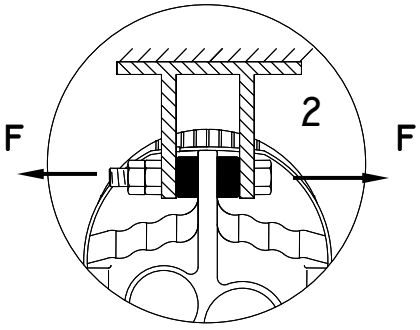


The F-series (theSnuggler®) has a built-in torque arm lug at the top of the reducer. Rubber bushings are optional on all FA, FV, and FH units. They are not needed on gear units with a flange as the flange prohibits rotation. The letter "G" is added to the nomenclature after the reducer size to designate that the unit is supplied with rubber bushings (Ex: FA67**G**).

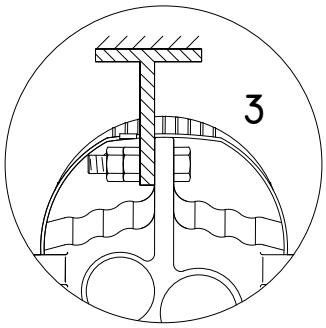
The following are correct and incorrect methods for installing a torque arm.



Correct



Correct



Incorrect

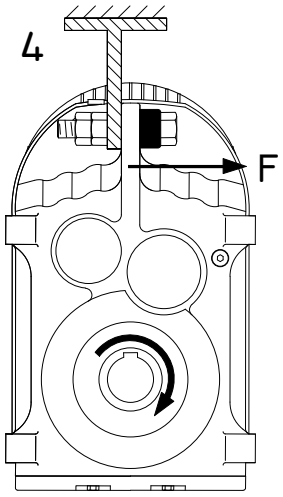
#1 and #2:

The built-in lug on the F-series reducer is padded on both sides with a rubber bushing, which protects the reducer in both the clockwise or counterclockwise directions. The only difference between #1 and #2 is the shape of the torque arm bracket. Since the force from the reducer (F) is parallel to the retaining bolt as shown in #2, a twisting force is not induced on the bolt in either CW or CCW direction. Thus, a rigid single bracket arm provides adequate restraint for both directions.

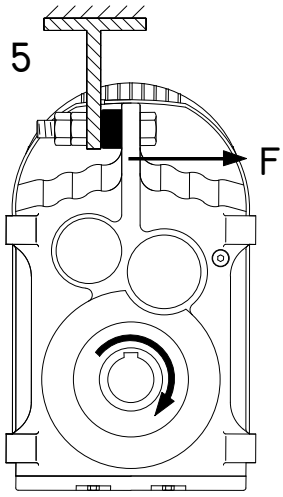
#3:

The lug is not protected on either side with a rubber bushing. Therefore, the reducer is very rigidly fixed. A shaft that is slightly out-of-round will cause stress on the bearings and on the reducer shaft. Ultimately, the bearings may fail prematurely.

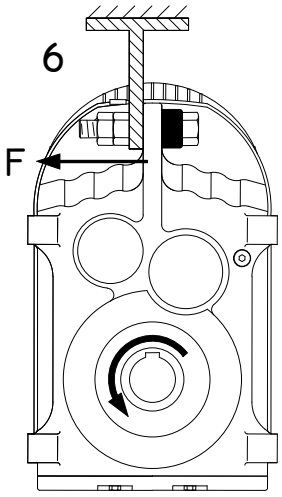
Technical Note



Not Recommended



Incorrect



Incorrect

#4:

The reducer moves in a clockwise direction. A rubber bushing is placed between the reducer lug and the bolt head to cushion the reducer from the force, F that occurs when the reducer operates CW. While this design appears acceptable, it is not recommended due to the fact that a force opposite to the one shown may occur if the load shaft is out-of-round. Since there is no bushing to the left of the reducer lug, there is no cushion. Therefore, binding and bearing stress may still occur.

#5:

The reducer moves in a clockwise direction. The force, F, is present due to the direction of rotation. Even though a rubber bushing is placed to the left of the reducer lug, it does not cushion the reducer from shock forces in the same direction as F.

#6:

This design is the opposite of #5 since the reducer moves in a CCW direction. The force, F, is present due to the direction of rotation. Even though a rubber bushing is placed to the right of the reducer lug, it does not cushion the reducer from shock forces in the same direction as F.

Solution to #4, #5, #6: Provide a rubber bushing on both sides of lug, regardless of the direction of rotation.