



PLIDCO® POWER+GRIP

INSTALLATION INSTRUCTIONS

LANGUAGES

ENGLISH

HEBREW -In Process

SPANISH - In Process



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PLIDCO® BOLTED POWER+GRIP CONNECTOR INSTALLATION INSTRUCTIONS

!! WARNING!!

IMPROPER SELECTION OR USE OF THIS PRODUCT CAN RESULT IN EXPLOSION, FIRE, DEATH, PERSONAL INJURY, PROPERTY DAMAGE AND/OR HARM TO THE ENVIRONMENT.
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Do not use or select a PLIDCO Power+Grip Connector until all aspects of the application are thoroughly analyzed. Do not use the Power+Grip Connector until you read and understand these installation instructions. If you have any questions, or encounter any difficulties using this product, please contact PLIDCO.

READ CAREFULLY

The person in charge of the repair must be familiar with these instructions and communicate them to all personnel involved.

Safety Check List

- ☐ Read and follow these instructions carefully. Follow your company's safety policy and applicable codes and standards.
- ☐ Whenever a PLIDCO product is modified in any form including adding a vent or changing seals by anyone other than the Engineering and Manufacturing Departments of The Pipe Line Development Company or a PLIDCO certified repacking company, the product warranty is voided. Products that are field modified do not have the benefit of the material traceability, procedural documentation, quality inspection and experienced workmanship that are employed by The Pipe Line Development Company.
- ☐ Verify that the correct seal material has been selected for the intended use. Contact PLIDCO or an authorized PLIDCO distributor if there are any questions about the seal compatibility with the pipeline chemicals and temperatures.
- ☐ Verify the pipe OD, wall thickness, and ovality are within tolerance at the location of the proposed installation. Pipe wall thickness thinner than what is required for internal pressure may be pushed inward by the force of the grip. Contact PLIDCO for recommended minimum wall thickness.
- ☐ Do not exceed the Maximum Allowable Operating Pressure (MAOP) and/or the pressure class or the temperature as indicated on the unit.

- ❑ The assigned Power+Grip Connector has an internal and external load limit. The Power+Grip Connector could slip or leak when subjected to excessive internal or external forces, such as internal pressure, thermal expansion and contraction, underwater currents, ground movement or any combination thereof. These additional forces must be determined by the customer and given to PLIDCO to confirm to be within the limit of the fitting.
- ❑ Calibrated torquing or tensioning equipment must be used. Under or over-tightening studs can cause the fitting to leak. Impact and hammer wrenches must not be used for installation.
- ❑ Repressurizing after the installation should be done with extreme caution. Repressurizing should be accomplished slowly and steadily without surges which could vibrate the pipeline and fitting. Industry codes and standards are a good source of information on this subject. Personnel should not be allowed near the fitting until the seal and end restraint have been proven.

Pipe Preparation

1. Verify the size and condition of the pipe. The following pipe tolerances must be verified prior to installation.

Nominal Pipe Size(s)	Undersize Tolerance	Oversize Tolerance
4" and smaller	-1% of nominal pipe	+1% of nominal pipe
6" to 8"	-1/16" (1.59mm)	+1/16" (1.59mm)
10" and larger	-1/8" (3.2mm)	+3/16" (4.63mm)

Table 1

2. Verify that the pipe where the fitting is being installed is not thin. Pipe wall thicknesses less than schedule 40 may fail to seal. Please contact PLIDCO if this condition exists.
3. Verify that fitting is not being installed on flattened or dented pipe.
4. Cut the existing pipe off reasonably square and grind a pilot bevel with a generous taper to eliminate the risk of damage to the seals as the fitting is slid onto the pipe. Remove all burrs and sharp edges from the pipe surface to prevent abrasion to the seals.
5. The existing pipe must be inserted a minimum distance into the Power+Grip Connector to ensure proper sealing and structural attachment to the pipe. Measure the distance from the inside of the fitting and mark the following dimensions on the pipe.
 - The minimum distance the pipe must be inserted into the fitting is shown as "L" in Figure 1. To determine distance "L", first measure the distance from the outer surface of the grip flange to the end of the last seal shown in Figure 1 as "A". Next add 20% of the existing pipe outside diameter or a minimum of 1" whichever is greater.
 - The maximum distance that the pipe can be inserted in the fitting is shown as "M". To determine distance "M", measure the distance from the outer surface of the grip flange to the stop on the inside of the fitting shown in Figure 3 as "N". Subtract 3/4" from distance "N".

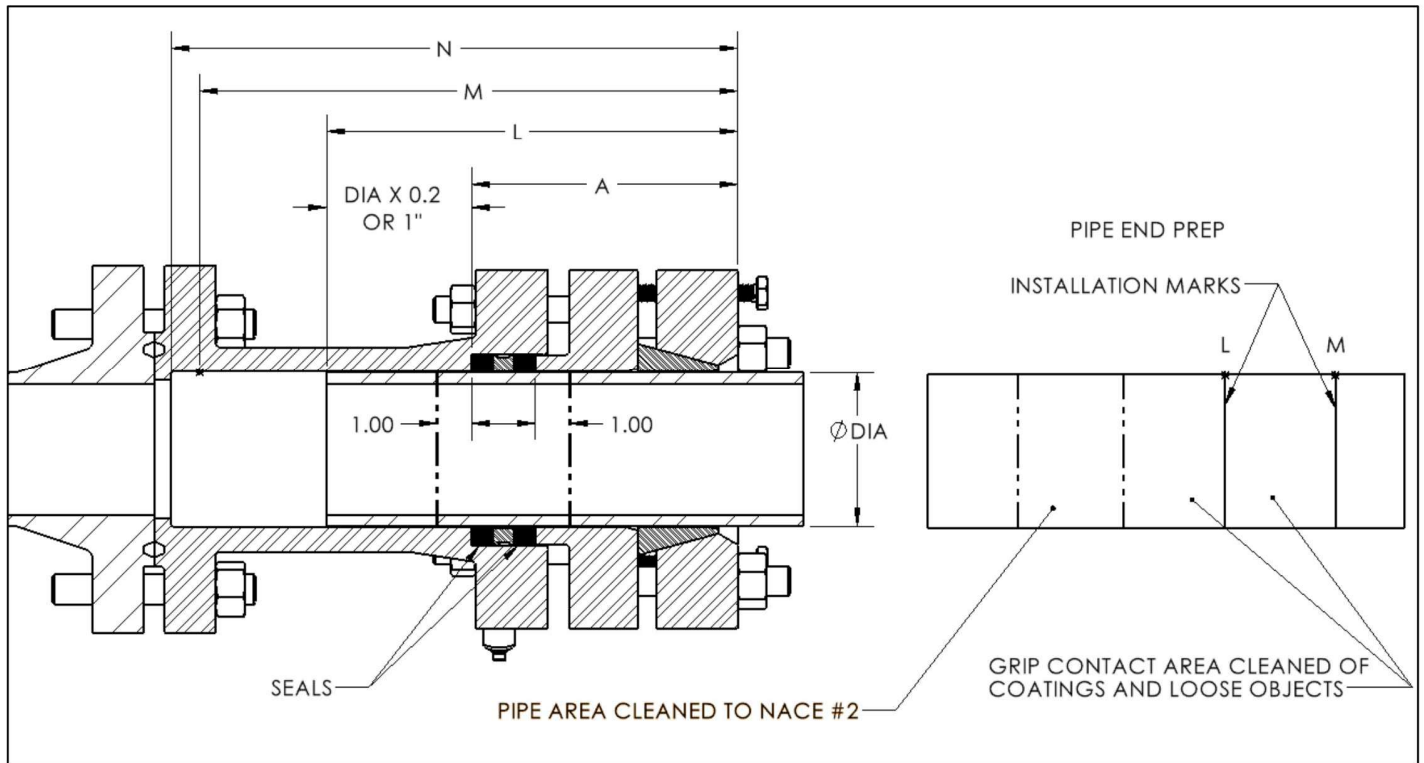


Figure 1

6. Measure from the cut end of the existing pipe and mark off distances "L & M" on the pipe.
7. Grind down any circumferential or longitudinal pipe weld seams or any other large protrusions flush with the pipe at least up to distance "M" that would interfere with fitting from sliding on the pipe.

Note: Additional grinding may be required for any tool clearances.

8. Remove all coatings, burrs, and thick scale from the pipe surface where the grip will contact the pipe.
9. Remove all coatings, rust, and scale from the pipe surface where the seals will contact the pipe (see Figure 1). A near-white finish, as noted in SSPC-SP10 / NACE No.2, is preferred 1" (25mm) before and after the seal. The cleaner the pipe surface the more positive the seal. Sandblasted surfaces should be buffed smooth.
10. The seals can tolerate minor surface irregularities up to $\pm 1/32$ in (0.8mm). The defective surfaces may be rendered suitable for sealing by applying a suitable epoxy such as Belzona 1161 and sanding or filing the surface to match the required outer diameter.

Note: Epoxy may only be applied to the area where the seals will land. It is not intended to rebuild the pipe wall to the nominal OD, or to repair large sections of exterior corrosion.

11. A PLIDCO Power+Grip Connector is capable of sealing on out-of-round pipe within the specific tolerance. This is based on the ability of the Hydraulic Seal and Grip activation to reshape the pipe. For very thick wall pipe, the Hydraulic Seal and Grip activation may not be able to reshape the pipe. Severely out-of-round pipe may require repositioning the PLIDCO Power+Grip Connector to ensure the seals are positioned on round pipe.

Handling

Careless handling can damage the seals or the grip. Lifting devices such as chains, cables or lift truck forks should not be allowed to contact the seals or grip. Contact can result in the seals being damaged or pulled from the groove, or the grip surface being damaged (See Figure 2).

The Power+Grip Connector comes equipped with hoist rings that can be moved to aid transportation, installation, and can be removed after installation. Older versions come equipped with lifting devices welded to the fitting from the factory. When not being moved or transported on a pallet, a Power+Grip Connector should always be lifted, transported, or installed using the installed lifting eyes or hoist rings.

Horizontal lifting can be achieved by attaching the appropriate lifting devices to the lifting lugs located at the base of the seal flange as shown in Figure 3. Additional lifting devices can be used for stability. Any additional equipment attached to the fitting such as tensioners may change the center of gravity, and cause the fitting not to balance evenly. A different combination of lifting lugs may be used.

Vertical lifting can be achieved by attaching the appropriate lifting devices to the top 2 lifting lugs located at the top of the seal flange as shown in Figure 4.

Verify that all hoist rings are firmly tightened with the flat flanged end of the hoist ring touching the flat machined surface of at each hoist ring connection on the Power+Grip prior to lifting.

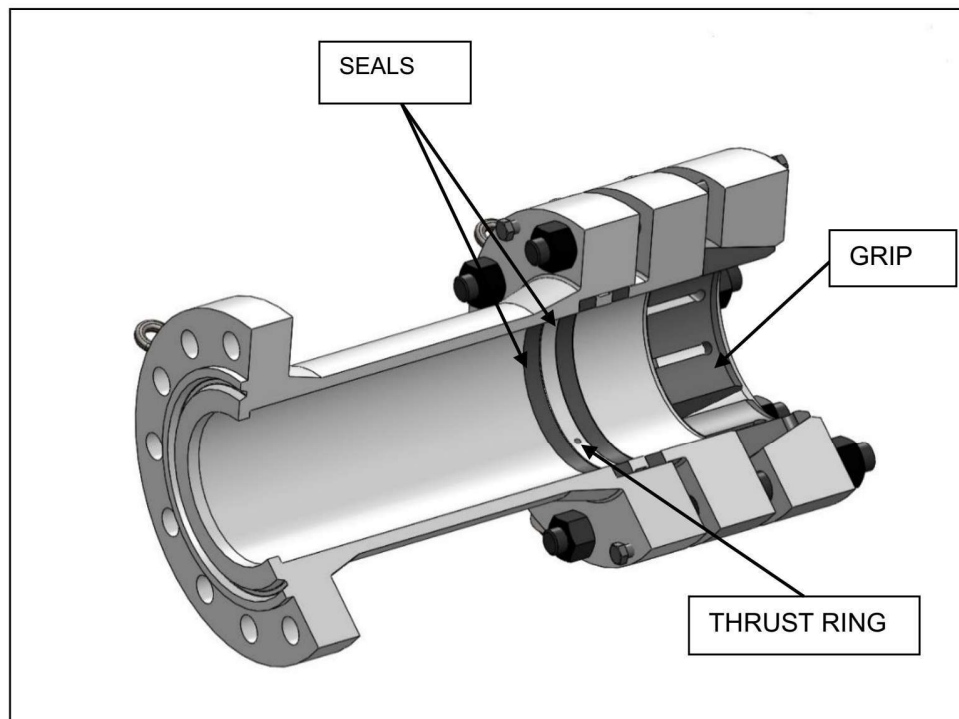


Figure 2

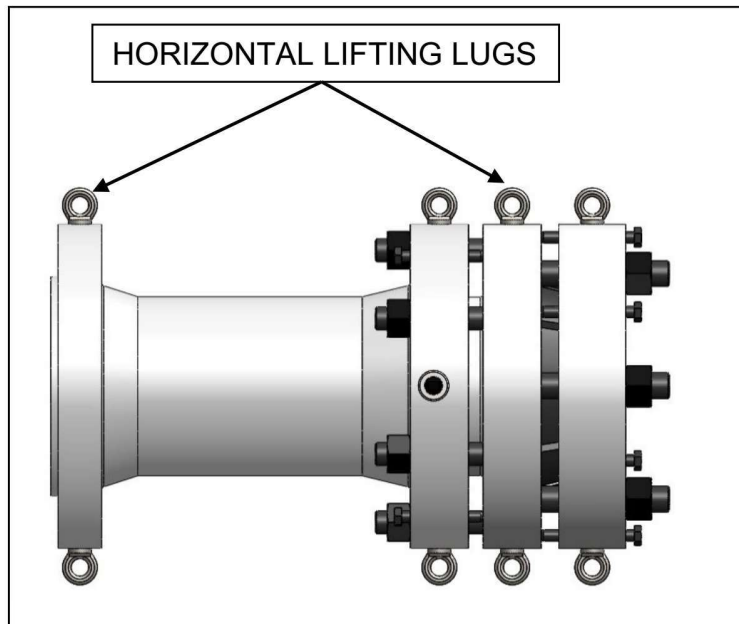


Figure 3

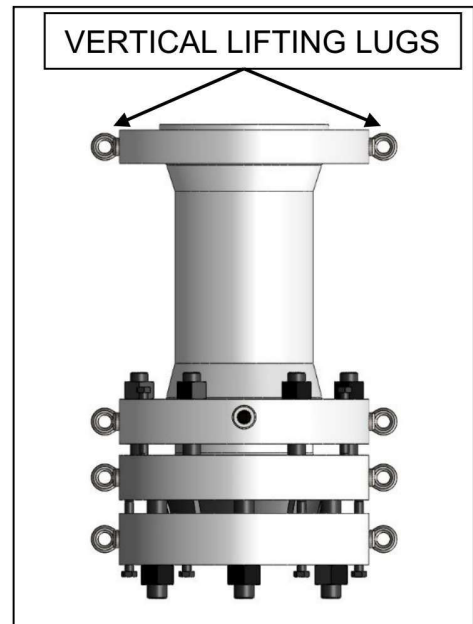


Figure 4

Assembly

The PLIDCO Power+Grip Connector is shipped fully assembled. If the Power+Grip Connector needs to be disassembled to change the seals, change hardware, or inspect for any reason, an exploded view of the Power+Grip Connector is shown in Figure 5.

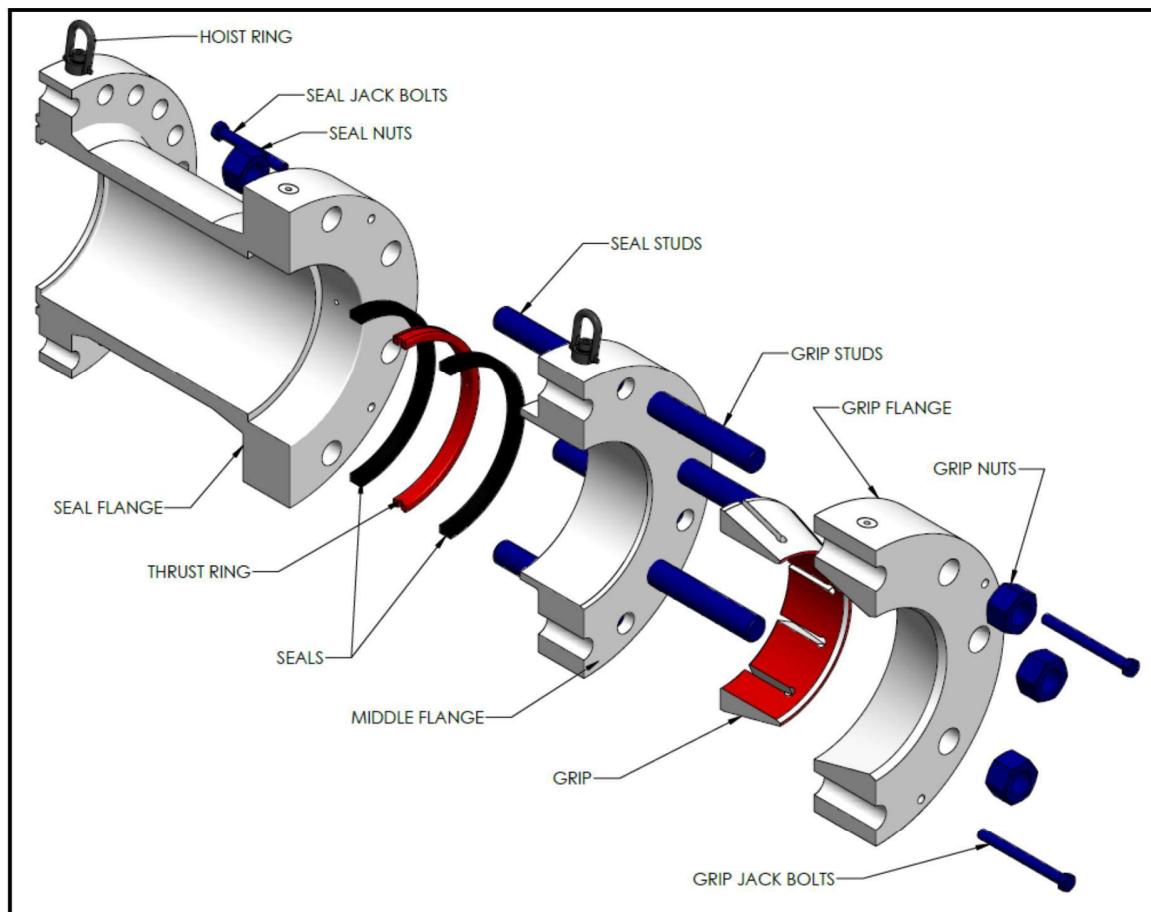


Figure 5

When reassembling the Power+Grip Connector, the spacing between the seal flange and middle flange should be set so that it does not squeeze the seals prior to installation as shown in Figure 6. Use the jack bolts to set the initial spacing. The seal jack bolts should be sticking out past the face of the seal flange just far enough so that the lip of the middle flange just comes in contact with the seals.

The spacing between the middle flange and grip flange should be set so that the grip does not squeeze inward as shown in Figure 6. The grip jack bolt should be sticking out past the face of the grip flange just far enough so that the grip fits firmly between middle and grip flanges, but the ID of the grip is not compressed. Setting the spacing too tight may restrict the Power+Grip Connector from sliding freely onto the pipe. Please contact PLIDCO to verify spacing dimension.

Note: The Grip and Seal studs must be threaded into the middle flange a minimum of 1.5 X the nominal stud diameter for safe operation.

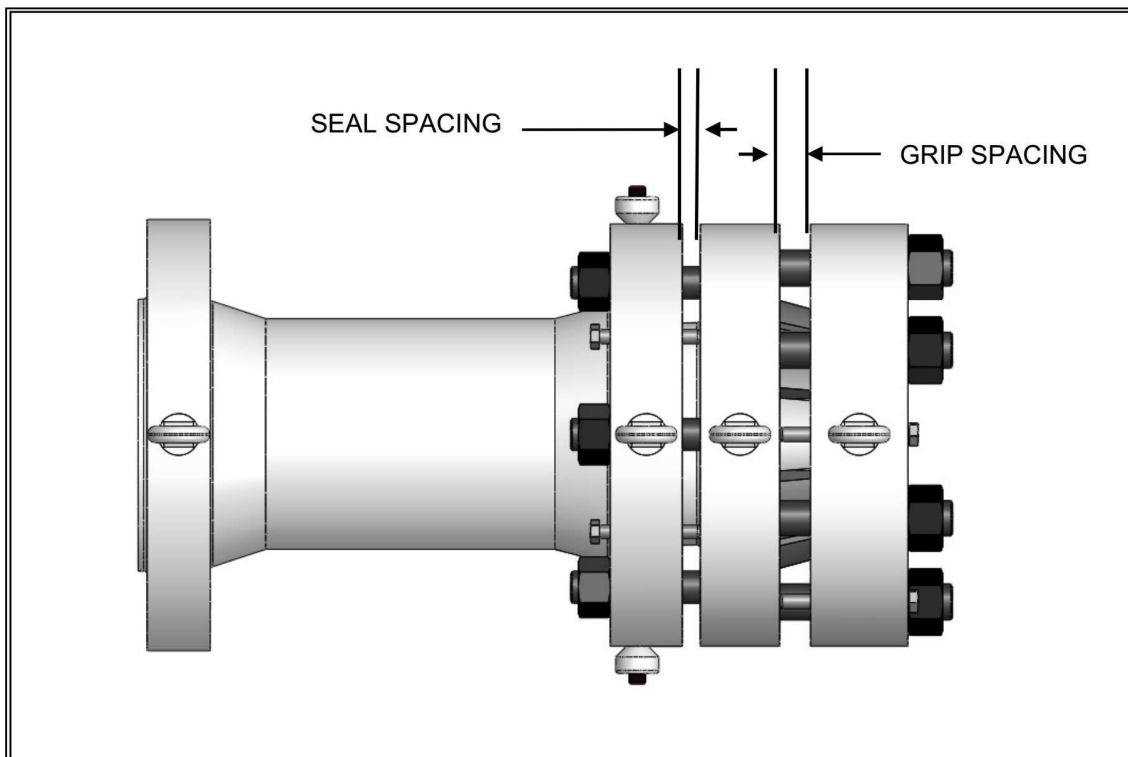


Figure 6

Installation

WARNING!

- ☐ For vertical installation follow instructions below. For horizontal installations follow the instruction below, but also read the Recommended Horizontal Installation suggestions at the end of the Installation Section.
- ☐ Hydraulic Tensioning equipment can be used to tighten all the studs on a PLIDCO Power+Grip Connector. Longer studs and nuts drilled for tommy bars are typically required depending on the make and model of the equipment used. If the fitting is not equipped with longer studs and nuts drilled for tommy bars, please contact a PLIDCO authorized representative.

1. Inspect the seals and grip, removing any dirt and foreign material. For underwater installation, PLIDCO does not recommend applying lubricant to the seals because foreign matter, such as sand, can stick to the lubricant. Do **not** apply lubricant to the grip surface.
2. Clean all studs, flange bolts, and nuts; prove free and easy nut running prior to the installation.
3. Depending on the application, bolting of the flanged end can be performed at any time during installation. However, PLIDCO recommends to position the fitting and tightening the flanged end first. Once the Seal and Grip sections have been fully activated, it is nearly impossible to adjust the location of the flanged end.

Some applications where the flanged end may be tightened last are blind flanges, pig launchers, or any condition where the flange and associated piece are free to move.

Examples of flanged end installations are listed below:

- a) Installing a riser connection, a blind flange, or a valve. Bolt the flanged end of the new piece of equipment to the Seal Flange Section of the Power+Grip Connector as shown in Figure 7. Torque the flange bolts uniformly to the appropriate torque using the bolting pattern defined in ASME PCC-1.
- b) Installing a new spool piece made with flanges on each end. Slide the Power+Grip Connectors onto each end of the prepared pipes. Insert the new spool piece between the two Power+Grip Connectors. Slide the Power+Grip Connectors up to the spool piece making sure that the pipe is inside the Power+Grips with sufficient space to activate the Seal and Grip mechanisms. Torque the flange bolts uniformly to the appropriate torque using the bolting pattern defined in ASME PCC-1.

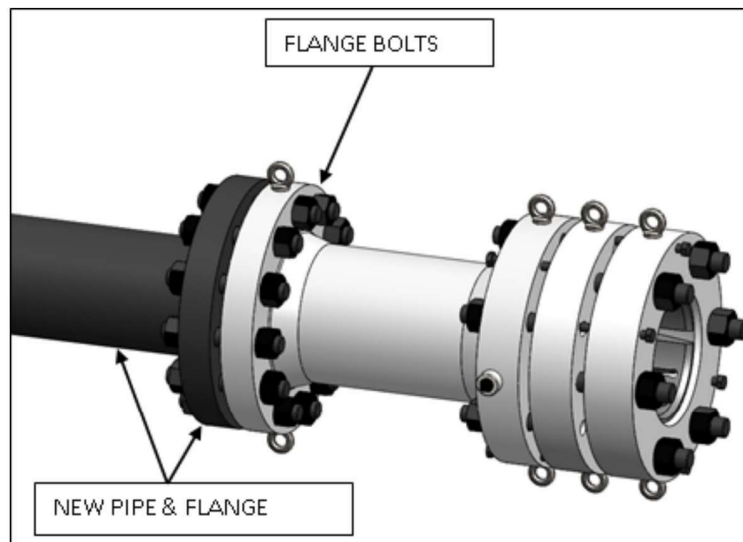


Figure 7

4. Lower the Power+Grip Connector assembly onto the existing pipe. Be sure the outer surface of the grip flange touches or goes past mark "L" and not past mark "M" on the pipe.
5. Back the seal jack bolts past the bottom face of the seal flange, or completely remove them. The seal jack bolts are shipped in place from PLIDCO. They are used to ensure that the seals are not prematurely squeezed preventing the fitting from sliding over the pipe.

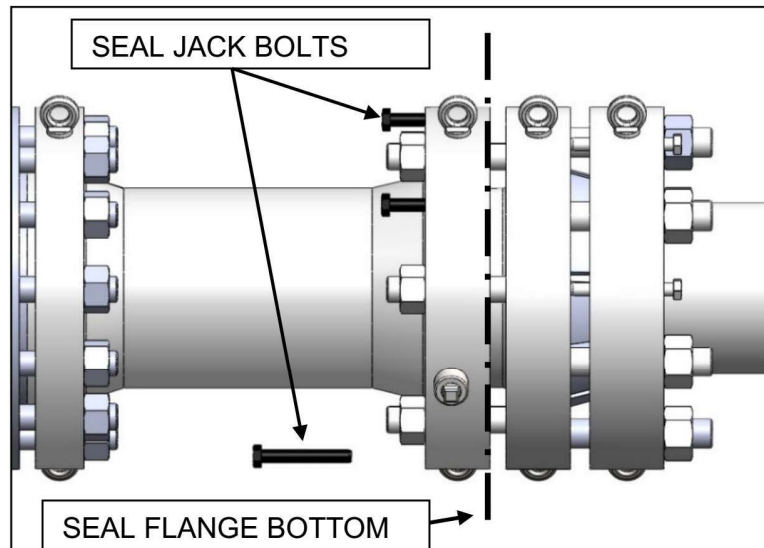


Figure 8

6. Please contact the PLIDCO Engineering Department for the proper Seal Torque Value for the pipe schedule (wall thickness) and grade
7. Torque the SEAL STUDS uniformly as indicated below using the PLIDCO-supplied Torque Value. The best results are obtained by maintaining an equal gap between the middle and seal flanges while tightening the studs. Do not move to another stud until the required torque has been reached. The sequence for torquing the studs should follow the crisscross pattern as shown in Figure 9.
 - a) 1st time- Hand tight or 10% of the minimum torque value
 - b) 2nd time - 50% torque.
 - c) 3rd time- 100% torque.
 - d) Repeat the sequence in a circular pattern at 100% torque until all the studs and nuts are unable to continue spinning or 3 complete revolutions have been made.

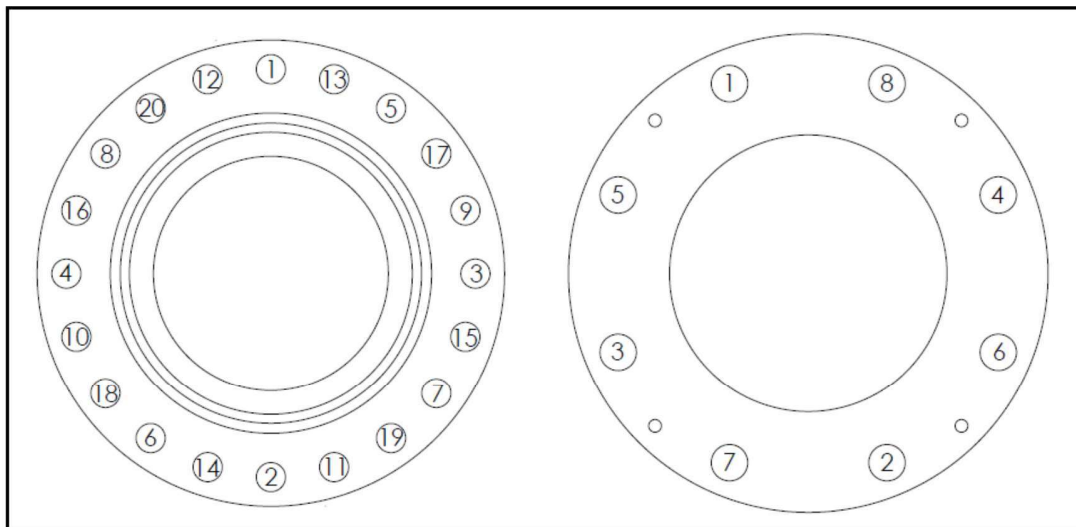


Figure 9: (12" 900# shown for reference)

Note: The gap distance between the seal and middle flange is not a set value. The gap may be larger or smaller depending on various factors such as the OD of the pipe, seal hardness, etc.

!!! Hold point !!!

If a seal verification test is required. Do the test prior to moving onto the next step. Failure to do so may result in a failed installation. Follow the “**Field Testing the Seals**” section below. Any questions contact PLIDCO for further information.

8. Back the grip jack bolts past the top face of the grip flange, or completely remove them. The grip jack bolts are shipped in place from PLIDCO. They are used to ensure that the grip is not prematurely squeezed preventing the fitting from sliding over the pipe, as well as helping prevent the grip from squeezing the pipe prematurely.

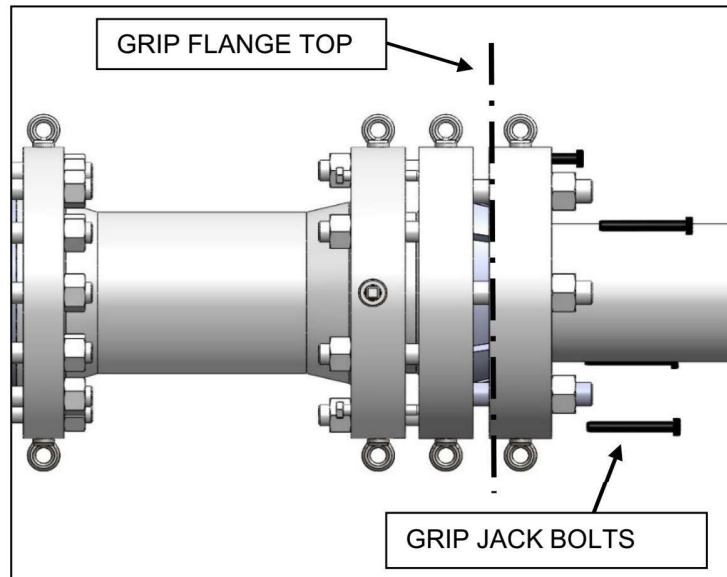


Figure 10

9. Please contact the PLIDCO Engineering Department for the proper Grip Torque Value for the pipe schedule (wall thickness) and grade.
10. Torque the GRIP STUDS uniformly as indicated below using the PLIDCO-supplied Torque Value. The best results are obtained by maintaining an equal gap between the middle and grip flanges while tightening the studs. Do not move to another stud until the required torque has been reached. The sequence for torquing the studs should follow the crisscross pattern as shown in Figure 9.
 - a) 1st time- Hand tight or 10% of the recommended torque value
 - b) 2nd time - 50% torque.
 - c) 3rd time- 100% torque.
 - d) Repeat the sequence in a circular pattern at 100% torque until all the studs and nuts are unable to continue spinning or 3 complete revolutions have been made.

Notes:

- 1) The gap distance between the middle and grip flange is not a set value. The gap may be larger or smaller depending on the OD of the pipe.
11. To complete the assembly, **ALL** studs should be rechecked at the recommended torque. **Warning:** an increase in torque on one bolt can cause a decrease in torque on adjacent studs.
12. Once all studs and nuts are properly torqued, the fitting can be field tested to ensure integrity of the seals. Please see the section “**Field Testing the Seals**”.

Horizontal Installation Suggestions

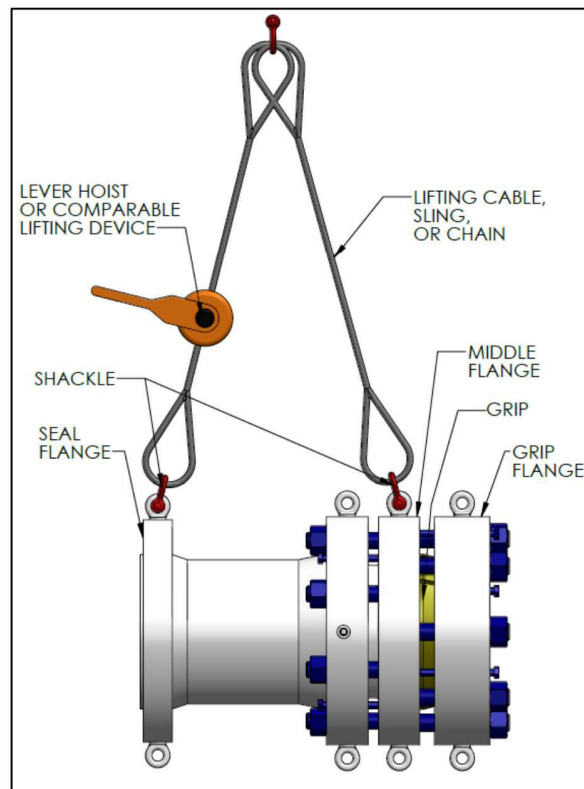


Figure 11

PLIDCO suggests using a lever hoist or comparable lifting device with a shackle on the seal flange of the Power+Grip Connector and a lifting cable, sling, or chain with a shackle connected to the middle flange. This is to allow the Power+Grip Connector to be adjusted to stay in line with the pipe as the fitting is being slid onto the pipe. PLIDCO does not recommend connecting a lifting cable, sling, or chain to the grip flange as the grip flange needs to be left free floating to help keep the grip from being prematurely engaged before the seals have been fully engaged and sealed.

Field Testing the Seals

The seal integrity of the Power+Grip Connector may be verified by pressurizing the annulus between the seals through the test port vent. Pressurizing should be done with extreme caution, and should be accomplished slowly and steadily without surges. Increasing the test pressure in 10% increments, as well as allowing time for equalization is recommended. Industry codes and standards are a good source of information on this subject. Except for testing purposes, do not exceed the design pressure of the Power+Grip Connector. The Power+Grip Connector is designed to be tested up to 1½ times its design pressure. PLIDCO recommends following API RP 2201 Section 6.5 on Testing. The test pressure should be at least equal to operating pressure of the line or vessel, but not to exceed internal pressure by 10%. This is meant to avoid possible internal collapse of the pipe or vessel wall. However, if prevailing conditions could cause collapse of the pipe or pressure walls, the test pressure may be reduced. (See API Standard 510 Section 5.8 for pressure testing precautions.) Personnel should not be allowed near the repair until the seal has been proven.

INSTALL AND TIGHTEN THE TEST PORT VENT PLUG AFTER COMPLETING THE SEAL TEST

Storage Instructions

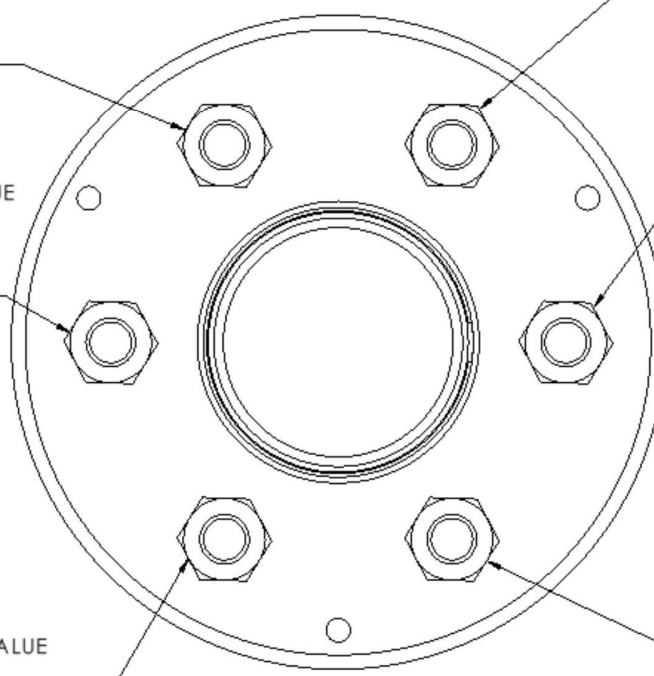
A Power+Grip Connector should be stored in a dry environment to prevent the unpainted surfaces from rusting. Storage temperatures should be between 32°F(0°C) & 120°F(49°C). Cover with dark polyethylene to keep the direct sunlight from the seals. It is best to exclude contamination, light, ozone and radiation. Improperly storing the Power+Grip Connector can cause the seals material to become cracked and brittle and lose its ability to seal.

Traceability

Power+Grip Connectors, as with most PLIDCO products, have a unique serial number by which the fitting is fully traceable. Additionally, all elastomer seals have a unique batch number by which the seals material is traceable.

Bolted Power+Grip Installation Checklist

- ☐ Installation Date: _____ Location: _____
- ☐ Serial Number: _____ Size: _____ Class: _____
- ☐ Actual Pipe Diameter: _____ Wall thickness: _____
- ☐ Calibration records for torquing/tensioning equipment
- ☐ Pipe preparation completed per installation instructions
- ☐ Flange connection:
 - Stud Size: _____
 - Qty: _____
 - Final Torque Value: _____
- ☐ Minimum (L) and Maximum (M) marked on pipe for installation depth
- ☐ Seal jack screw removed.
- ☐ Recorded Seal Side Stud Torque:

SEAL STUD #1 TORQUE VALUE 1ST PASS _____ 2ND PASS _____ 3RD PASS _____ CIRCULAR _____		SEAL STUD #6 TORQUE VALUE 1ST PASS _____ 2ND PASS _____ 3RD PASS _____ CIRCULAR _____
SEAL STUD #3 TORQUE VALUE 1ST PASS _____ 2ND PASS _____ 3RD PASS _____ CIRCULAR _____		SEAL STUD #4 TORQUE VALUE 1ST PASS _____ 2ND PASS _____ 3RD PASS _____ CIRCULAR _____
SEAL STUD #5 TORQUE VALUE 1ST PASS _____ 2ND PASS _____ 3RD PASS _____ CIRCULAR _____		SEAL STUD #2 TORQUE VALUE 1ST PASS _____ 2ND PASS _____ 3RD PASS _____ CIRCULAR _____

Seal Stud Torque Chart for 6 Stud Design

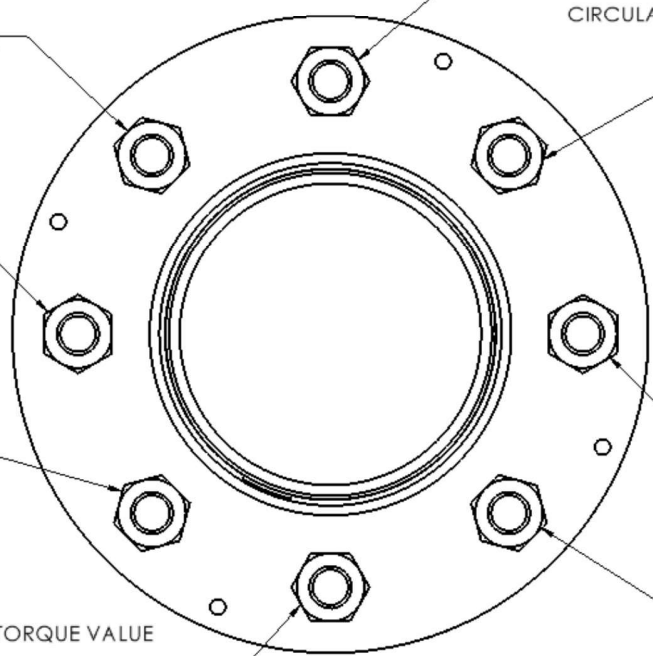


Diagram of an 8-stud flange with torque value input fields for each stud across four passes (1st, 2nd, 3rd, and Circular).

SEAL STUD #7 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #3 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #5 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #2 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #1 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #6 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #4 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

SEAL STUD #8 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

Seal Stud Torque Chart for 8 Stud Design

☐ Seal side gap check (even around flange): **Yes / No**

12 o'clock	3 o'clock	6 o'clock	9 o'clock

Flange Gap Measurement-Seal Flange to Middle Flange

☐ Seal Verification test

☐ Test Pressure: _____

☐ Test Duration: _____

☐ Grip jack screw removed.

☐ Recorded Grip Side Stud Torque:

GRIP STUD #1 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

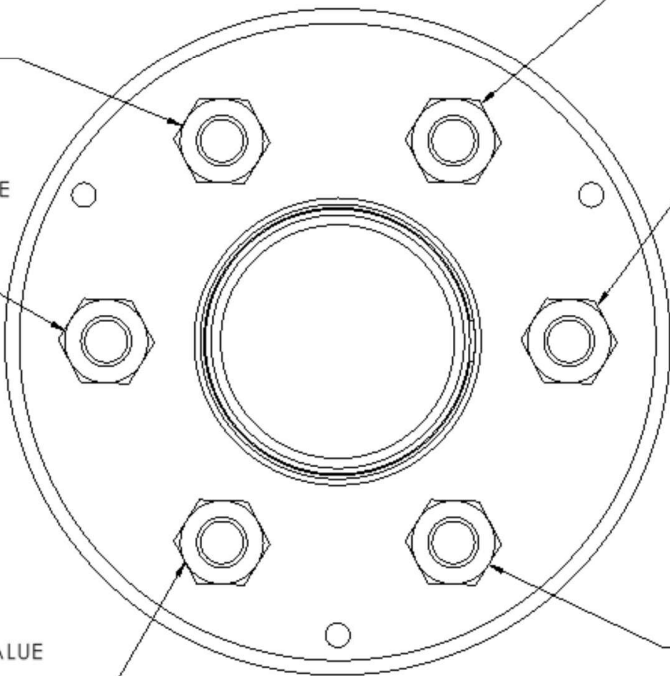
GRIP STUD #3 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #5 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #6 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #4 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #2 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____



Grip Stud Torque Chart for 6 Stud Designs

GRIP STUD #7 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #3 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #5 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

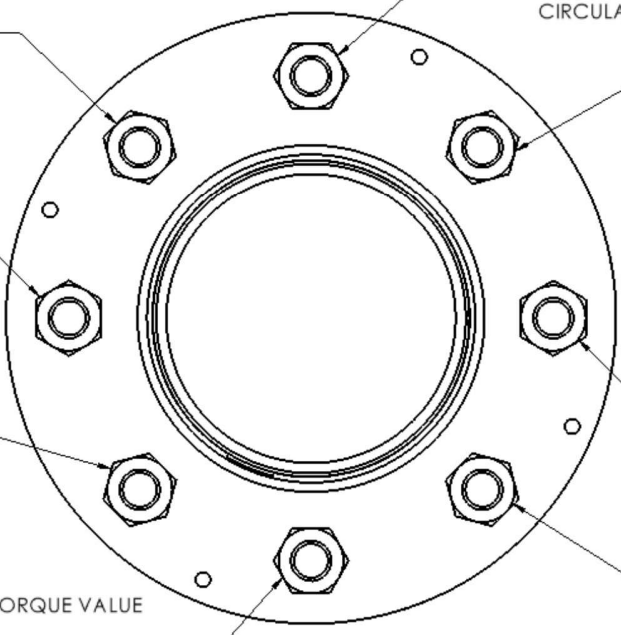
GRIP STUD #2 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #1 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #6 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #4 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____

GRIP STUD #8 TORQUE VALUE
 1ST PASS _____
 2ND PASS _____
 3RD PASS _____
 CIRCULAR _____



Grip Stud Torque Chart for 8 Stud Designs

☐ Grip side gap check (even around flange): **Yes / No**

12 o'clock	3 o'clock	6 o'clock	9 o'clock

Flange Gap Measurement-Grip Flange to Middle Flange

☐ Final system verification test

☐ Test Pressure: _____

☐ Test Duration: _____

☐ Company Representative Approval: _____

Abnormal Operating Conditions

1. The Power+Grip Connector leaks during testing between seals.
 - a. Verify that the seal jack bolts have been removed.
 - b. Check that proper torque has been applied to all seal studs.
 - c. Verify that the plugs on the seal test ports are installed correctly.
 - d. Verify that any test equipment is not leaking and is functioning properly.
 - e. Increase the seal bolt torque in 10% increments and retest. Repeat this procedure up to 20% higher than recommended torque.
 - f. Remove Power+Grip Connector and inspect seals for damage or debris. Inspect pipe for irregular surface conditions such as pitting, high welds, or out of round pipe.
 - g. Adjust seal location on pipe and reinstall the fitting.
 - h. In a Horizontal application verify the grip has not been engaged and is holding the middle flange from being fully engaged with the seal flange.
2. The Power+Grip Connector leaks after installation.
 - a. Re-torque all studs.
 - b. Verify that the plugs on the seal test ports are installed correctly.
 - c. Increase the seal bolt torque in 10% increments and retest. Repeat this procedure up to 20% higher than recommended torque.
 - d. Remove Power+Grip Connector and inspect seals for damage or debris. Inspect pipe for irregular surface conditions such as pitting, high welds, or out-of-round pipe.
3. The threads on the studs or nuts are damaged.
 - a. Visually inspect threads of stud bolt and nut for defects.
 - b. File damaged threads or run a die over the threads.
 - c. Replace stud bolt or nut.
4. The Power+Grip Connector cannot be slipped over the pipe end.
 - a. Make sure all coatings have been removed
 - b. Verify that any pipe welds are ground flush.
 - c. Use an external alignment clamp if pipe is out-of-round to correct ovality
 - d. Verify that the grip or seal spacer bolts are correctly positioned.
 - e. If pipe is oversized beyond PLIDCO specified tolerances our standard Power+Grip Connector cannot be used. A custom size must be fabricated.
 - f. Grip may have to be spread apart.
5. The Power+Grip Connector slides during re-pressurization
 - a. Remove all pressure from the line.
 - b. Verify that the grip spacer bolts have been removed.
 - c. Increase the grip bolt torque in 10% increments and retest. Repeat this procedure up to 20% above the recommended torque.
 - d. Remove the grip flange and inspect the condition of the grip for damage or debris.
 - e. Verify that the external loading does not exceed the Power+Grip Connector's specified end pull rating.
 - f. Check for undersized pipe