The Pipe Line Development Company
870 Canterbury Road • Westlake, Ohio 44145
Phone: (440) 871-5700 • Fax: (440) 871-9577
Toll Free: 1-800-848-3333
web: www.plidco.com • e-mail: pipeline@plidco.com

PLIDCO® HOT TAPPING+SADDLE with or without CLAMPING ELEMENTS INSTALLATION INSTRUCTIONS

Depending on the application the PLIDCO HotTapping+Saddle may have been supplied with clamping elements. The need for and applicable specific instructions for clamping elements are discussed in the last section of this manual.

!! WARNING!!

IMPROPER SELECTION OR USE OF THIS PRODUCT CAN RESULT IN EXPLOSION, FIRE, DEATH, PERSONAL INJURY, PROPERTY DAMAGE AND/OR HARM TO THE ENVIRONMENT.

Do not use or select a PLIDCO HotTapping+Saddle until all aspects of the application are thoroughly analyzed. Do not use the PLIDCO HotTapping+Saddle until you read and understand these installation instructions. Every effort has been made to securely package this product prior to shipment. Thoroughly inspect for any damage that may have occurred during shipment. If you have any questions, or encounter any difficulties using this product, please contact:

PLIDCO "DEPARTMENT 100" at 440-871-5700
toll free U.S. & Canada at 800-848-3333

READ CAREFULLY

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

Safety Check List

- ❑ Read and follow these instructions carefully. Follow your company's safety policy and applicable codes and standards.
- ❑ Be absolutely certain the correct packing material has been selected for the intended use.
- ❑ The PLIDCO HotTapping+Saddle should never be used to couple pipe unless it was supplied with clamping elements designed specific for that purpose. Consideration should be given to the increased longitudinal stress imposed on the pipeline due to the cut into the pipe.
- ❑ The valve and tapping equipment attached to the PLIDCO HotTapping+Saddle may cause unreasonable loads on the fitting's branch. The equipment may need to be braced or supported, particularly when hot tapping horizontally. (See the section on clamping elements or contact PLIDCO for further details.)

- ❑ Observe the working pressure and temperature on the label of the PLIDCO HotTapping+Saddle. Do not exceed the maximum working pressure or temperature as indicated on the fitting. PLIDCO HotTapping+Saddles for plugging operations may have a lower pressure rating applicable only during the plugging operation. The maximum plugging pressure is located on the label.
- ❑ The PLIDCO HotTapping+Saddle must be hydrostatically tested before tapping into the pipeline. Testing may be conducted through the branch. The test pressure must not exceed the pressure inside the pipe at the time of testing. There is a danger of collapsing the pipe should this pressure be exceeded.
- ❑ Verify the tightness of all threaded vents and connections.

Pipe Preparation

1. Remove all coatings, rust and scale from the pipe surface where the circumferential seals of the PLIDCO HotTapping+Saddle and clamping elements, if applicable, will contact the pipe. A near-white finish, as noted in SSPC-SP10 / NACE No.2, is preferred. The cleaner the pipe the more positive the seal.
2. Pipe outside diameter tolerance is ± 1% for 6-inch nominal pipe size and smaller. For pipe sizes larger than 6-inch the tolerance is ±0.06 inch (± 1.5 mm).
3. The seal can tolerate minor surface irregularities up to ± 1/32 inch (0.8 mm).
4. Grind any pipe welds flush with the outside of pipe surface where the circumferential seals and clamping elements, if applicable, will contact the pipe.
5. Circumferential pipe welds within the circumferential seals do not need to be ground flush as long as the weld height does not exceed 3/16 inch (4.7 mm).
6. A PLIDCO HotTapping+Saddle is capable of sealing on out-of-round pipe up to approximately 5% ovallity. This is based on the ability of the bolting to reshape the pipe. For very thick wall pipe the bolting may not be able to reshape the pipe. Badly out-of-round pipe may require repositioning the PLIDCO HotTapping+Saddle.
7. A PLIDCO HotTapping+Saddle is not capable of reshaping flatten or dented pipe.

Installation

The packing, GirderRing (seal retainers), and flange face can be damaged by careless handling. Lifting devices such as chains, cables or lift truck forks should not be allowed to contact the packing or GirderRing. Contact can result in the packing being pulled from their grooves. (See Figure 1)

1. If the any fitting halves were shipped as an assembled unit they would have been shipped with spacers between the two halves to prevent damage to the longitudinal seals and ends of the circumferential seal. Typically small diameter nuts are used for the spacers. The spacers must be removed and discarded before installing the PLIDCO HotTapping+Saddle. Failure to remove the spacer will prevent proper compression of the seals.

2. Coat all exposed surfaces of the packing material with a lubricant. The chart below lists the lubricants that are recommended for various packing materials. The customer must determine if the lubricant is compatible with the product in the pipeline. A lubricant is not recommended for underwater installation due to sand or silt that could adhere to the lubricant and create a leak passage.

3. Clean and lubricate all studbolts and nuts. Ensure all nuts are free and easy running prior to the installation. A lubricant is not recommended for underwater installations due to sand or silt that could adhere to the lubricant and lock the threads.
4. Assemble the PLIDCO HotTapping+Saddle around the pipe making sure the yellow painted ends are matched and that the fitting is centered over the area to be hot tapped.
5. If a separate clamping element is used it must be assembled immediately adjacent to the PLIDCO HotTapping+Saddle at the downstream end. Ensure there is no gap between the PLIDCO HotTapping+Saddle and the separate clamping element. The hydraulic forces acting on the plug during the plugging operation are transferred to the clamping element thereby preventing axial movement of the PLIDCO HotTapping+Saddle. (See Figure 2)

6. All studbolts and nuts should be uniformly torqued as indicated by the *PLIDCO Torque Chart*. Note there is a separate torque chart for bolts in any clamping element. The best results are obtained by maintaining an equal gap all around, between side bars, while tightening the studbolts. Ensure a minimum of 1/4 inch (6 mm) of studbolt extends beyond the nut. Different torque values are required for clamping elements, if so equipped. Refer to the section on clamping elements, if applicable.

7. To complete assembly, ALL studbolts should be rechecked at the recommended torque. Keep in mind that an increase in torque on one studbolt can cause a decrease in torque on neighboring studbolts.

8. The sidebars should be gapped approximately 1/8 inch (3 mm) when the PLIDCO HotTapping+Saddle is fully tightened. The gap between the sidebars on clamping elements, if so equipped, is typically greater than 1/8 inch (3 mm) and is dependent on the pipe diameter.

Petroleum based lubricants	= A
Silicone based lubricants	= B
Glycerin based lubricants	= C
Super Lube® Grease (i)	= D

		Temperature (ii)
Buna-N	A, B, C, D	225°F (107°C)
Viton	A, B, C, D	250°F (121°C)
Silicone	C, D	300°F (149°C)
Neoprene	B, C, D	250°F (121°C)
Aflas	A, B, C, D	225°F (107°C)
Hycar	A, B, C, D	180°F (82°C)

(i) Super Lube® Grease is a product of Synco Chemical Corporation. (www.super-lube.com)

(ii) Temperature limit is for the seal material only and does not imply the pressure rating is necessarily applicable at this limit.

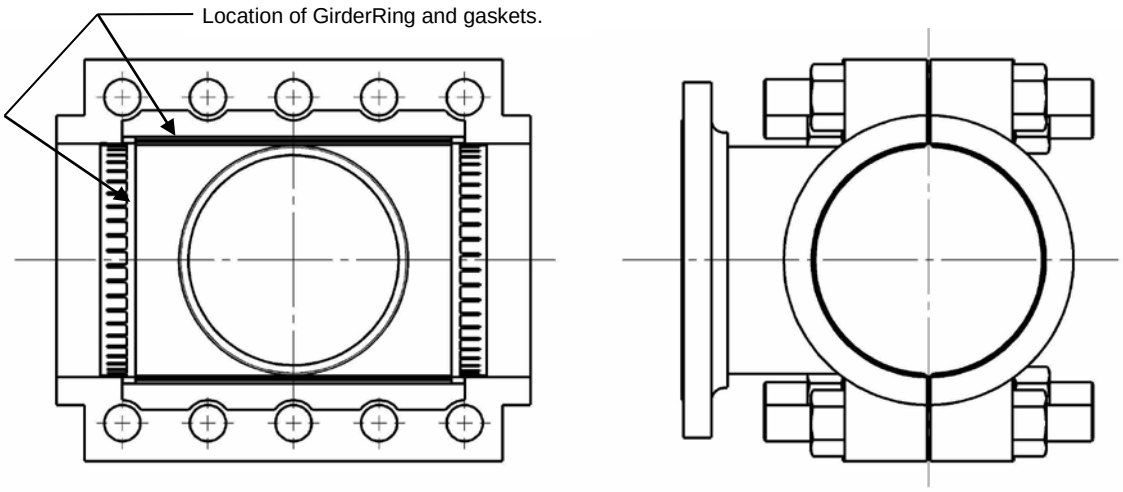

Figure 1
PLIDCO HotTapping+Saddle
without clamping elements

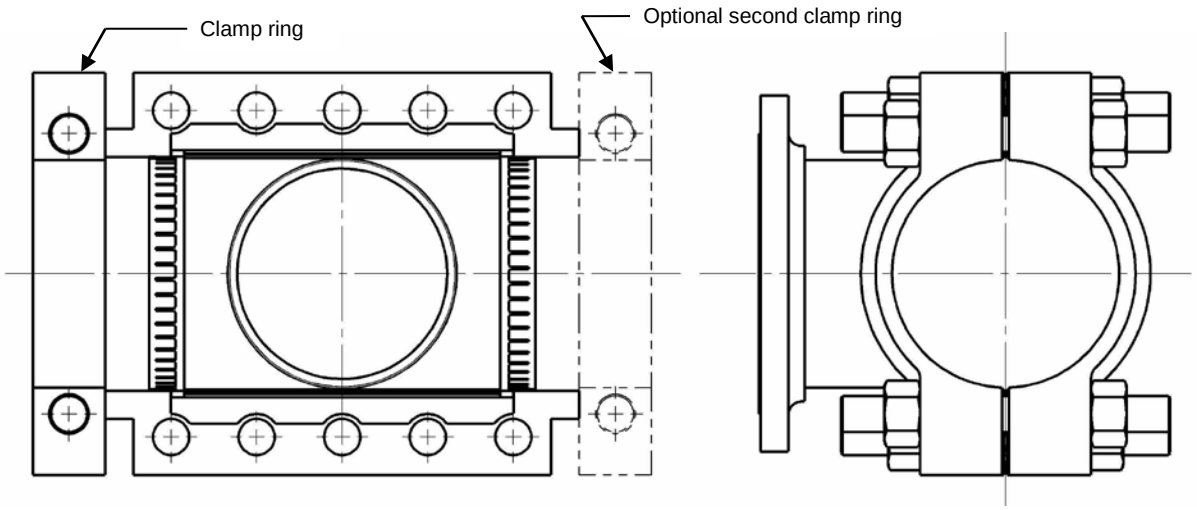

Figure 2
PLIDCO HotTapping+Saddle
with separate clamp ring(s)

Field Testing

Except for testing purposes, do not exceed the design pressure of the PLIDCO HotTapping+Saddle. The PLIDCO HotTapping+Saddle is capable of being field tested up to 1½ times its design pressure. However, consideration must be given to the differential external pressure on the pipeline. For testing purposes it is recommended not to exceed the pressure inside the pipe at the time of testing. There is a danger of collapsing the pipe should this pressure be exceeded. Personnel should not be allowed near the installation until the seal has been proven.

Field Welding Instructions

Welding is not a requirement for the pressure sealing ability of the PLIDCO HotTapping+Saddle. The issue of welding is dependent on your company's requirements, applicable codes, and if longitudinal loads need to be carried by a circumferential fillet weld(s).

Failure to follow field welding instructions could result in explosion, fire, death, personal injury, property damage and/or harm to the environment.

PIPELINE SHOULD BE FULL AND UNDER FLOW

Use weld material with equal or greater tensile strength than the pipe. Carefully control the size and shape of the circumferential fillet welds. The size of the fillet weld should be at least 1.4 times the wall thickness of the pipe. This assumes a 1.0 joint efficiency. You may need to select a different joint efficiency based on your level of inspection. Strive for a concave faced fillet weld, with streamlined blending into both members; avoid notches and undercuts. The smoother and more streamlined the weld, the greater the resistance to fatigue failure. The worst possible shape would be a heavy reinforced convex weld with an undercut. Improper weld shape can lead to rapid fatigue failure, which can cause leakage, rupture or an explosion with serious consequences.

Welders and weld procedures should be qualified in accordance with API Standard 1104, *Welding of Pipelines and Related Facilities*, Appendix B, *In-Service Welding*. We strongly recommend the use of a low hydrogen welding process such as GMAW or SMAW using low hydrogen electrodes (E-XX18) because of their high resistance to moisture pick-up and hydrogen cracking. These are also the preferred welding processes for seal welding the studbolts and nuts. SMAW electrodes must be absolutely dry.

It is very important that the field welding procedure closely follow the essential variables of the qualified procedure so that the quality of the field weld is represented by the mechanical tests performed for the procedure qualification.

We do not recommend the use of thermal blankets for pre-heating. Thermal blankets can generate hot spots and reduce the ability of the PLIDCO HotTapping+Saddle to dissipate welding heat in the vicinity of the seals. We recommend a small torch, such as a cutting torch, being careful not to aim the flame directly into the gap between the PLIDCO HotTapping+Saddle and the pipe towards the seals. The flame from a preheat torch is helpful in burning off oils and other contaminates. Do not use a large torch, commonly called a rosebud, because of the difficulty controlling the size of the area being preheated.

Monitor the heat generated by welding or preheating, particularly near the area of the seals, by using temperature crayons or probe thermometers. If the heat generated approaches the temperature limit of the seal material, which is indicated on the label, welding should be discontinued or sequenced to another part of the fitting so that the affected area has a chance to cool.

Seal welding the Grade B7 studbolts of the PLIDCO HotTapping+Saddle is the most difficult phase of field welding. They are made of AISI 4140 steel with a high carbon equivalence. By using a low hydrogen welding process with preheat the problem of hydrogen cracking and pinholes can be reduced. Preheat will dry out any moisture, oil dampness or thread lubricant that may be present in the weld area. If the studbolt lengths need to be cut back, allow at least 1/4 inch (6.4 mm) of studbolt beyond the nut for the fillet weld. Preheat the studbolt and nut and then weld the nut to the studbolt. Check the preheat temperature and weld the nut to the sidebar.

WELDING AFTER A CONSIDERABLE TIME LAPSE AFTER THE INITIAL INTALLATION

PLIDCO recommends that if the PLIDCO HotTapping+Saddle is to be welded, the welding be completed as soon as possible after the installation; as conditions permit. Welding at a significantly later date relies heavily on whether proper installation procedures were followed and the compatibility of the elastomeric gaskets with the product in the pipeline.

After the installation of the PLIDCO HotTapping+Saddle there is no meaningful test that can be performed to determine the condition of the gaskets or the remaining service life the gaskets. There are many variables that can affect the condition of the gaskets over which PLIDCO has no control.

If the PLIDCO HotTapping+Saddle is to be welded at a significant time lapse from the installation, the follow precautions should be followed:

1. The PLIDCO HotTapping+Saddle must be closely inspected for any leakage that may have developed.
2. The studs and nuts should be retightened per the recommended torque value.
3. If possible, the pressure in the line should be reduced.
4. Some flow in the line is still required to dissipate the welding heat to prevent damage to the elastomeric seals.
5. Following the recommended welding practices as listed under Field Welding Instructions.

Welding Sequence

1. Caution should be observed so that welding does not overheat the seals. Sequence the welding so that the heat is not concentrated in one area. It will be necessary to re-torque the studbolts and nuts periodically during field welding because weld contraction causes them to loosen.
2. Fillet weld ends to pipe. (See Figure 3)
3. Seal Weld side openings.
4. Re-torque studbolts and nuts.
5. Seal weld nuts to studbolts.
6. Seal weld nuts to sidebars.
7. Seal weld vent plugs, if applicable.

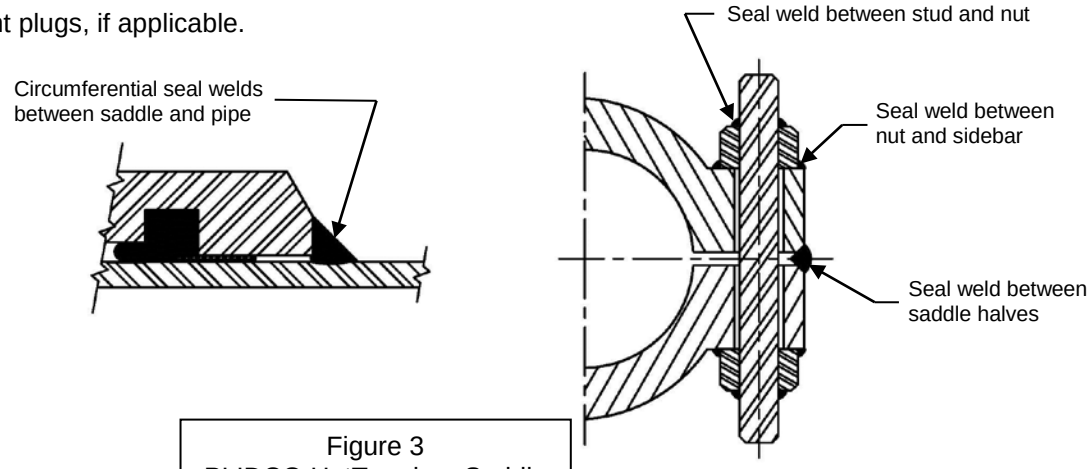

Figure 3
PLIDCO HotTapping+Saddle seal welds

Storage Instructions

PLIDCO HotTapping+Saddles should be stored in a dry environment to prevent the unpainted surfaces from rusting. Storage temperatures should not exceed 120°F (49°C). Cover with dark polyethylene to keep the direct sunlight from the packing. It is best to exclude contamination, light, ozone and radiation. Improperly stored PLIDCO HotTapping+Saddles can cause the seal material to become cracked and brittle and lose its ability to seal.

Traceability

PLIDCO HotTapping+Saddles, as 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 seal material is traceable.

PLIDCO Torque Chart

Nominal Diameter of Studbolt (inches) (see Note 2)	Wrench Opening Across Flats (inches)	Torque Values (see Note 1)			
		0.08 C_f		0.15 C_f	
		ft-lbs	Nm	ft-lbs	Nm
		25,000 psi pre-stress (see Note 3)			
5/8--11	1-1/16	35	45	55	75
3/4--10	1-1/4	60	80	100	135
7/8--9	1-7/16	90	125	155	215
1--8	1-5/8	135	185	235	315
1-1/8--8	1-13/16	200	270	345	465
1-1/4--8	2	275	375	480	650
1-3/8--8	2-3/16	370	505	650	885
1-1/2--8	2-3/8	485	660	860	1160
1-5/8--8	2-9/16	620	840	1100	1490
1-3/4--8	2-3/4	785	1060	1400	1890
1-7/8--8	2-15/16	970	1320	1730	2350
2--8	3-1/8	1180	1600	2120	2870
2-1/4--8	3-1/2	1700	2300	3060	4140
2-1/2--8	3-7/8	2340	3180	4230	5740
		23,000 psi pre-stress (see Note 3)			
2-3/4--8	4-1/4	2880	3910	5230	7090
3--8	4-5/8	3790	5140	6890	9340
3-1/4--8	5	4830	6550	8800	12000
3-1/2--8	5-3/8	6050	8200	11100	15000
3-3/4--8	5-3/4	7450	10100	13700	18500
4--8	6-1/8	9060	12300	16600	22500
		18,800 psi pre-stress (see Note 3)			
4-1/4--8	6-1/2	8900	12100	16400	22200
4-1/2--8	6-7/8	10600	14400	19500	26400
4-3/4--8	7-1/4	12500	16900	22900	31100
5--8	7-5/8	14600	19700	26800	36300
5-1/4--8	8	16900	22900	31100	42100
5-1/2--8	8-3/8	19400	26300	35800	48500
5-3/4--8	8-3/4	22200	30100	40900	55500
6--8	9-1/8	25200	34200	46500	63100

Note 1: Torque values shown in the table represent two different coefficients of friction (C_f); 0.08 and 0.15. When C_f equals 0.08, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with a high-grade graphite-oil thread lubricant. When C_f equals 0.15, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with light weight machine oil. The torque values are safe minimums and represent approximately the bolt pre-stress values.

The torque values are based on ASTM A193 Grade B7 studbolt material. If different studbolt material was ordered these torque values and pre-stress values may needed to be revised. Contact PLIDCO if applicable.

Use the 0.15 C_f values for non-lubricated underwater installations and for PTFE coated studbolts.

Note 2: The second number is the pitch, which is shown in number of threads per inch.

Note 3: Use the pre-stress value shown for the applicable studbolt size if bolt tensioners are to be used and follow the bolt tensioner manufacturer's instructions.

Clamping Elements

There are various reasons a PLIDCO HotTapping+Saddle may require clamping ends. Several reasons are listed below and it is possible multiple reasons may be applicable to your application.

- If a PLIDCO HotTapping+Saddle is to be used for a plugging operation the hydraulic forces acting on the plug can cause the PLIDCO HotTapping+Saddle to move longitudinally on the pipe. This movement could prevent the withdrawal on the plug. If this is the sole purpose of the clamping element a non-integral clamp ring will suffice. During an application involving a double plug and bypass, the direction of the hydraulic forces can be reversed when the isolated section of pipe is depressurized. For this type of application either two non-integral clamp rings or integral clamping elements are required.
- If a PLIDCO HotTapping+Saddle is to be used on a vertical pipe a clamping element can be used to support the weight of the saddle and the tapping equipment. For this type of application a non-integral clamp ring will suffice. The weight of the tapping equipment, if not supported, can induce a bending moment on the pipe. To resist the bending moment integral clamping elements are required.
- If the tapping equipment is to be used horizontally without support, integral clamping elements are required to resist rotation of the PLIDCO HotTapping+Saddle.
- If there is concern regarding the separation of the pipe whether it is due to the condition of the pipe or the amount of cross sectional area removed by the coupon, integral clamping elements will impart structural strength to the pipe and prevent separation.

The types of clamping elements are as follows:

One Separate Clamp Ring – This consists of a single split clamp ring that is bolted onto the pipe and grips in a vice-like manner. The clamp ring must be installed immediately adjacent to the PLIDCO HotTapping+Saddle with no gap between the PLIDCO HotTapping+Saddle and the clamp ring. The user must fully understand the direction of the force acting on the PLIDCO HotTapping+Saddle and position the clamp ring so as to resist this force.

Two Separate Clamp Rings – This consists of a two split clamp rings that are bolted on the pipe on both sided of the PLIDCO HotTapping+Saddle and grip the pipe in a vice-like manner. The clamp rings must be installed immediately adjacent to both ends of the PLIDCO HotTapping+Saddle with no gaps between the PLIDCO HotTapping+Saddle and the clamp rings. Clamps rings cannot resist rotation. To prevent rotation integral clamping elements are required.

Integral Clamping Elements – The clamping elements are usually located on both ends of the PLIDCO HotTapping+Saddle and are integral (one piece) with the body of the saddle. The clamping elements grip the pipe in a vice-like manner. (See Figure 4)

The two additional concerns when installing a PLIDCO HotTapping+Saddle with clamping ends are:

1. The torque value requirements are different for the studbolts in the clamping elements than the studbolts in the saddle sealing section. Refer to the *PLIDCO Clamping Elements Torque Chart* at the end of these installation instructions.
2. The gap between the two halves of the clamping element is not necessarily the same as for sealing section. The sealing section gap is always 1/8 inch, whereas the clamping end gap can be between 1/8 and 1/4 inch, depending on pipe diameter. Consult PLIDCO if this dimension is required.

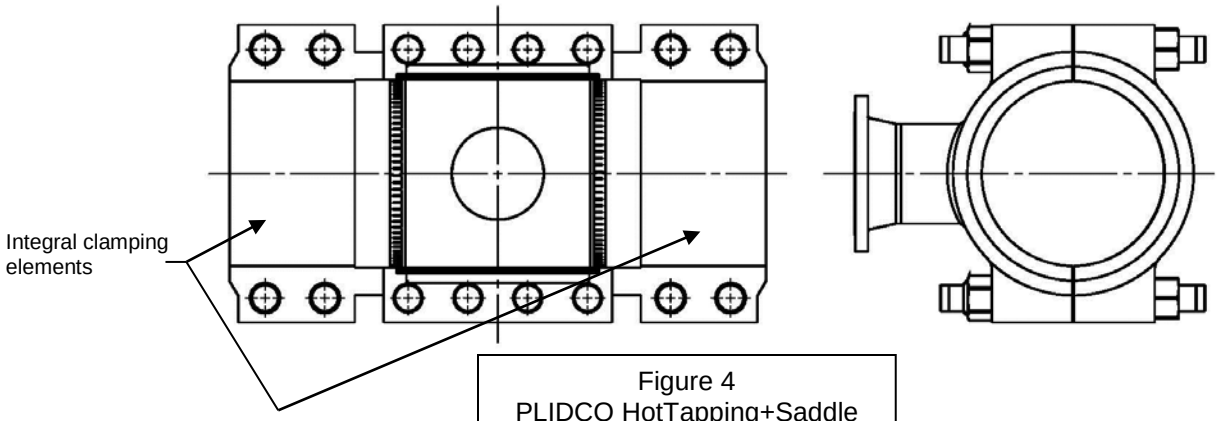

Figure 4
PLIDCO HotTapping+Saddle
with integral clamping elements

PLIDCO Clamping Element Torque Chart

Nominal Diameter of Studbolt (inches) (see Note 2)	Wrench Opening Across Flats (inches)	Torque Values (see Note 1)			
		0.08 C_f		0.15 C_f	
		ft-lbs	Nm	ft-lbs	Nm
		52,500 psi pre-stress (see Note 3)			
5/8--11	1-1/16	70	95	120	160
3/4--10	1-1/4	120	165	205	280
7/8--9	1-7/16	195	260	330	445
1--8	1-5/8	284	385	490	664
1-1/8--8	1-13/16	415	560	720	975
1-1/4--8	2	575	785	1010	1370
1-3/8--8	2-3/16	780	1060	1370	1860
1-1/2--8	2-3/8	1020	1390	1800	2440
1-5/8--8	2-9/16	1300	1760	2310	3120
1-3/4--8	2-3/4	1650	2230	2930	3970
1-7/8--8	2-15/16	2040	2760	3640	4930
2--8	3-1/8	2480	3360	4450	6030
2-1/4--8	3-1/2	3560	4830	6420	8700
2-1/2--8	3-7/8	4920	6670	8890	12100
		47,500 psi pre-stress (see Note 3)			
2-3/4--8	4-1/4	5950	8070	10800	14700
3--8	4-5/8	7820	10600	14300	19300
3-1/4--8	5	9970	13600	18200	24700
3-1/2--8	5-3/8	12500	17000	22800	31000
3-3/4--8	5-3/4	15400	20900	28200	38200
4--8	6-1/8	18700	25400	34300	46500
		37,500 psi pre-stress (see Note 3)			
4-1/4--8	6-1/2	17800	24100	32600	44200
4-1/2--8	6-7/8	21100	28600	38800	52600
4-3/4--8	7-1/4	24900	33700	45700	61900
5--8	7-5/8	29000	39400	53400	72400
5-1/4--8	8	33600	45600	61900	83900
5-1/2--8	8-3/8	38700	52500	71300	96700
5-3/4--8	8-3/4	44200	60000	81600	111000
6--8	9-1/8	50300	68200	92800	126000

Note 1: Torque values shown in the table represent two different coefficients of friction (C_f); 0.08 and 0.15. When C_f equals 0.08, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with a high-grade graphite-oil thread lubricant. When C_f equals 0.15, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with light weight machine oil. The torque values are safe minimums and represent approximately the bolt pre-stress values.

The torque values are based on ASTM A193 Grade B7 studbolt material. If different studbolt material was ordered these torque values and pre-stress values may needed to be revised. Contact PLIDCO if applicable.

Use the 0.15 C_f values for non-lubricated underwater installations and for PTFE coated studbolts.

Note 2: The second number is the pitch, which is shown in number of threads per inch.

Note 3: Use the pre-stress value shown for the applicable studbolt size if bolt tensioners are to be used and follow the bolt tensioner manufacturer's instructions.