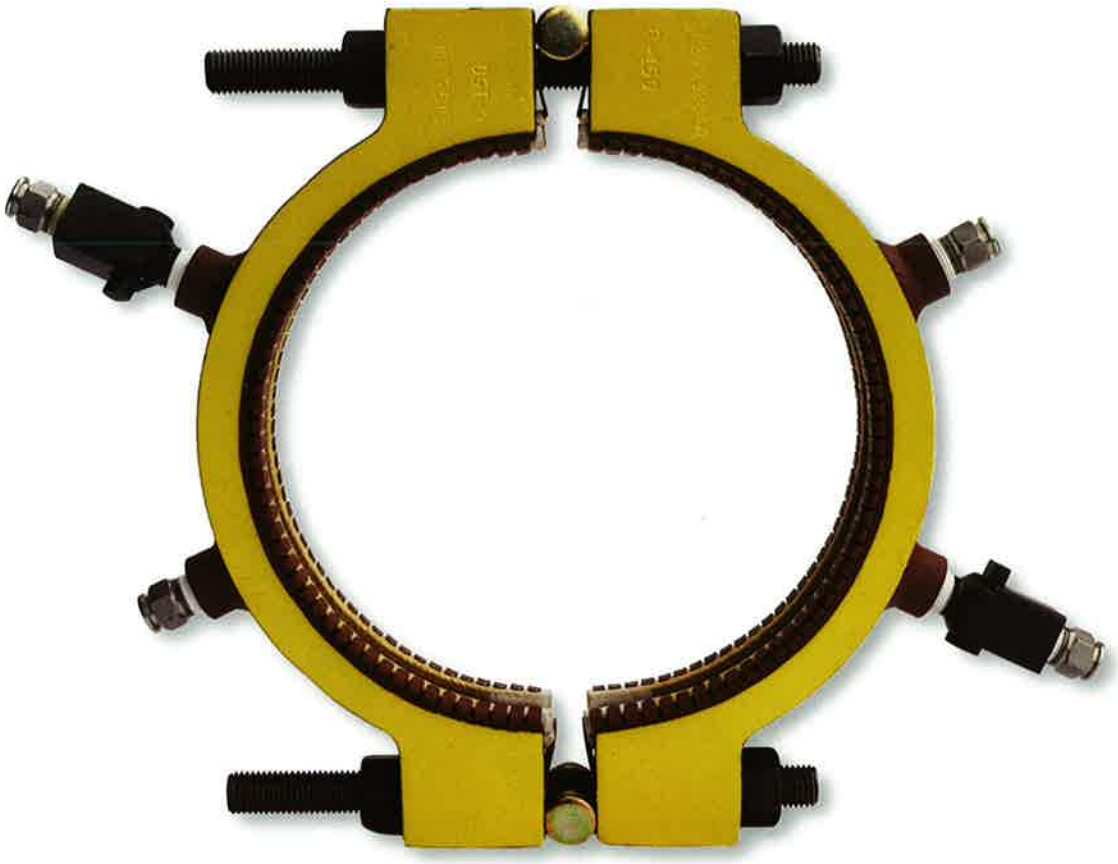
PLIDCO® FLANGE+REPAIR RING

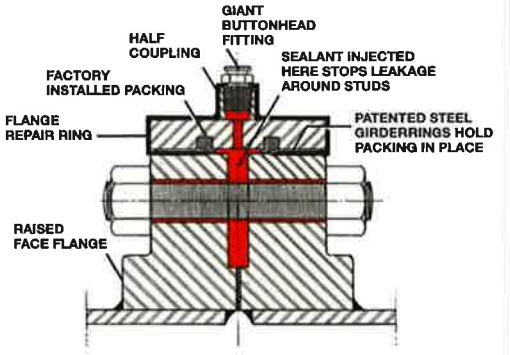
Stops leaks in flange gaskets, on stream

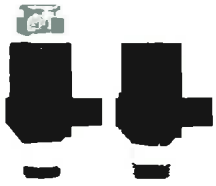


Plidco® Flange+Repair Rings can be installed by your own personnel. There is no drilling or altering of flanges. On a scheduled turnaround the Plidco® Flange+Repair Ring can be reconditioned and used again. Give us your conditions — pressure, temperature, fluid — and we will recommend the proper sealant and packing. Standard packing is non-asbestos aramid fiber.

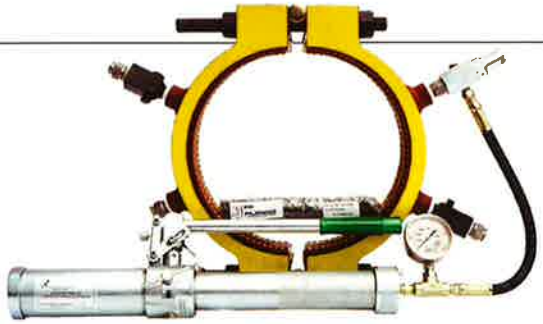
Plidco® Flange+Repair Rings incorporate patented steel GirderRings to hold packing in place during installation. Normally available from stock in standard flange sizes 1/2" through 12", ASME class 150 through class 600. Larger or special sizes, higher temperature and pressure ratings are available.

Maximum temperature rating for the standard Plidco® Flange+Repair Ring is 700°F. Standard material is ASTM A516 Gr. 70 Plate, ASTM A193 Gr. B7 bolting and ASTM A194 Gr. 2H nuts. Other materials are available for higher or lower temperatures. NACE MR0175/ISO 15156 compliant materials also available.





Sealant cocks are included for venting and direct sealant injection.



We offer complete repair kits, including optional sealant, pressure gun, etc. Prices quoted on request.

PIP048

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ISO 9001:2008 REGISTERED FIRM
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"Working together to make hazardous piping safer"

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PLIDCO® FLANGE+REPAIR-RING 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.

Do not use or select a Plidco Flange+RepairRing until all aspects of the application are thoroughly analyzed. Do not use the Plidco Flange+RepairRing until you read and understand these installation instructions. 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.

Safety Check List

- ❑ The Plidco Flange+RepairRing may be used with the pipeline in operation or shut down.
- ❑ The Plidco Flange+RepairRing should be considered a temporary repair for the reason noted in the section on *Buried or Inaccessible Flanges.*
- ❑ Read and follow these instructions carefully. Follow your company's safety policy and applicable codes and standards.
- ❑ Be absolutely certain that the correct seal material has been selected for the intended use.
- ❑ The Plidco Flange+RepairRing must never be used to couple flanges. No end restraint is provided with the Plidco Flange+RepairRing.
- ❑ Observe the working pressure and temperature on the label of the Plidco Flange+RepairRing. Do not exceed the maximum working pressure or temperature as indicated on the label.
- ❑ Verify the tightness of all threaded vents and connections.
- ❑ Review the sections on *Buried or Inaccessible Flanges* and *Underwater Installation* if either of these cases is applicable.

Preparation

1. Remove all coatings, rust and scale from the flange surface where the circumferential seals of the Plidco Flange+RepairRing will contact the flanges. The seals can tolerate minor surface irregularities up to ± 1/32 inch (± 0.8 mm).
2. Make sure the gap between the flanges is open to the flange stud bolts. This will ensure injected sealant can reach the stud bolts. For flat face or insulating flanges, contact PLIDCO.
3. Clean and lubricate all Plidco Flange+RepairRing studs and nuts. Ensure the nuts are free and easy running prior to installation.
4. Coat all exposed surfaces of the seals with a lubricant. The chart below lists the lubricants that are recommended and the maximum temperature limit for the various seals. The customer must determine if the lubricant is compatible with the product in the pipeline.

Petroleum based lubricants	= A
Silicone based lubricants	= B
Glycerin based lubricants	= C
Super Lube® Grease (1)	= D

		Temperature (2)
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)
Teflon	A, B, C, D	500°F (260°C)
Kevlar	A, B, C, D	750°F (399°C)

(1) Super Lube® Grease is a product of Synco Chemical Corporation. (www.super-lube.com)
(2) Temperature limit is for the seal material only and does not imply the pressure rating is necessarily applicable at this limit.

Installation

Careless handling can damage the seals and GirderRings (gasket retainers). Lifting devices such as chains, cables or lift truck forks should not be allowed to contact the seals or GirderRings. Contact can result in the seals being pulled from their grooves.

1. Assemble the Plidco Flange+RepairRing around the flanges making sure the fitting is centered over the gap between the flanges and the yellow painted ends are matched.
2. Assemble the studs and nuts hand tight.
3. All stud bolts and nuts should be uniformly torqued as indicated by the *Plidco Torque Chart*. The torque values shown apply up to and including 700°F (371°C). For higher temperatures, contact PLIDCO for recommended torque values.
4. The best results are obtained by maintaining an equal gap between the side bars while tightening the bolts. Ensure a minimum of 1/4 inch (6 mm) of stud bolt extends beyond the nut.
5. To complete assembly the stud bolts should be rechecked at the recommended torque. The side bars are gapped approximately 1/8 to 3/16 inch (3 to 5 mm) when the Plidco Flange+RepairRing is fully tightened.

Sealant Injection

One or more sealant cocks are supplied with each Plidco Flange+RepairRing. These may be used for venting by removing the button heads while the cocks are closed. Open the sealant cocks to allow product to vent while bolting, if desired. Close cocks and re-install button heads. Be sure cocks are open before injecting sealant.

Connect a sealant gun to the fitting and inject sealant through all button head fittings a little at a time until the Plidco Flange+RepairRing is full. Leakage will usually slow down to a whisper through the flange bolts.

Injection should proceed slowly, injecting a little at a time through the button head nearest the leak until total seal off is attained. Sometimes a total seal off is instant, in which case all sealant injection should be stopped. Observe for a while to see if a leak develops.

Generally, as the rate of leakage decreases the rate of sealant injection should be decreased proportionately. Often, during the final phases of seal off, there is an impulse to pump sealant zealously. This does not always give desirable results. The confined sealant, having no where to go, is forced out a previously sealed bolt hole or gasket.

Occasionally, the surfaces to be sealed are unreasonably gapped or badly corroded. These may require sealants which are very coarse and which cannot be pumped through the restriction of standard button heads. These sealants can be injected directly through the sealant cock. Please contact PLIDCO for supplementary instructions.

Buried or Inaccessible Flanges

Due to the nature of sealants and/or the exact application, it is possible for a leak to redevelop over time. As such, the Plidco Flange+RepairRing should be considered a temporary repair. If a leaf does develop, additional sealant may have to be injected into the Plidco Flange+RepairRing. For this reason, PLIDCO cautions the end user against using a Plidco Flange+RepairRing for a buried, sub-sea, or any other installation in which subsequent access is not feasible.

Storage Instructions

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

Traceability

Plidco Flange+RepairRings, 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.

Underwater Installation

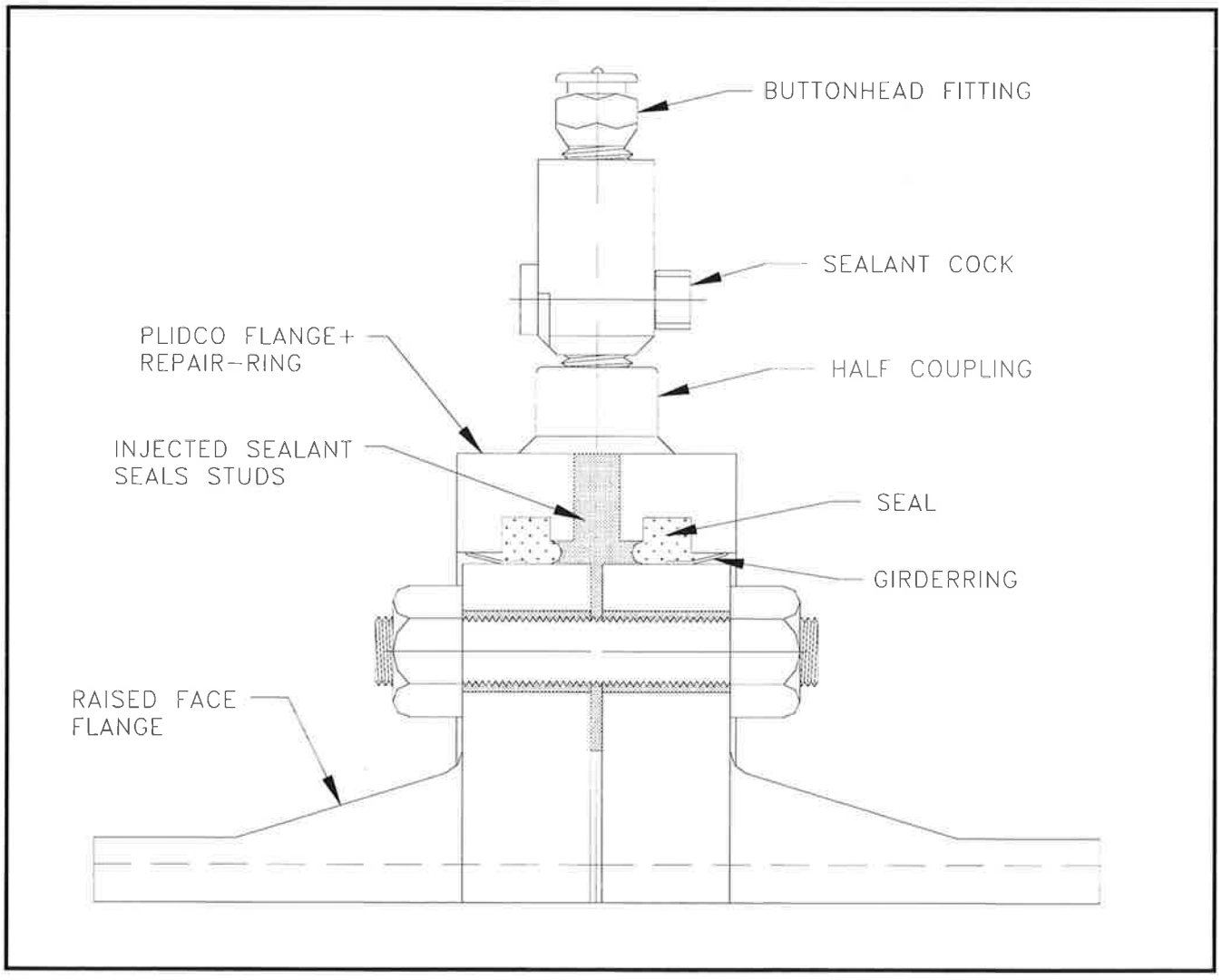
WARNING!

This warning is only applicable to a non-leaking, underwater installation. When assembling a Plidco Flange+RepairRing under water (or under any liquid) it is possible to build up thousands of pounds of pressure in the annulus between the fitting and the flanges. The pressure is caused by compressing the fluid trapped in the annulus as the two fitting halves are closed and tightened. For installations over a leak, pressure in the annulus equalizes with the pressure in the pipe. The pressure trapped in the annulus may have the following effects:

- The pressure rating of the Plidco Flange+RepairRing is exceeded causing leakage or damage.
- The flanges on which the Plidco Flange+RepairRing is installed are damaged.
- Personal injury or death due to subsequent removal of a button head fitting or pipe plug.

PLIDCO strongly recommends that the sealant cocks are open and the button head fittings removed before installing the Plidco Flange+RepairRing. Caution: only the button head fittings threaded into a sealant cock should be removed. It may be extremely difficult to reinstall a button head against line pressure without the benefit of closing the sealant cock.

(Additionally, please read the cautionary note under the section titled *Buried or Inaccessible Flanges*.)



Plidco Torque Chart

Nominal Diameter of Studbolt (inches)	Wrench Opening Across Flats (inches)	Torque Values			
		0.08 C_f		0.15 C_f	
		ft-lbs	Nm	ft-lbs	Nm
		25,000 psi pre-stress			
5/8	1-1/16	33	45	56	76
3/4	1-1/4	57	77	98	133
7/8	1-7/16	91	123	156	212
1	1-5/8	135	183	233	316
1-1/8	1-13/16	197	267	342	464
1-1/4	2	274	372	480	651
1-3/8	2-3/16	370	502	651	883
1-1/2	2-3/8	485	658	857	1162
1-5/8	2-9/16	617	837	1096	1486
1-3/4	2-3/4	782	1060	1394	1890
1-7/8	2-15/16	968	1313	1730	2346
2	3-1/8	1180	1600	2116	2869
2-1/4	3-1/2	1695	2298	3053	4140
2-1/2	3-7/8	2340	3173	4231	5737
		23,000 psi pre-stress			
2-3/4	4-1/4	2880	3904	5224	7083
3	4-5/8	3785	5133	6885	9336
3-1/4	5	4826	6545	8799	11931
3-1/2	5-3/8	6043	8194	11037	14967
3-3/4	5-3/4	7447	10099	13626	18477
4	6-1/8	9055	12278	16590	22497
		18,800 psi pre-stress			
4-1/4	6-1/2	8891	12057	16313	22120
4-1/2	6-7/8	10569	14331	19413	26324
4-3/4	7-1/4	12444	16874	22882	31028
5	7-5/8	14530	19703	26743	36263
5-1/4	8	16837	22830	31014	42055
5-1/2	8-3/8	19375	26272	35717	48433
5-3/4	8-3/4	22156	30044	40873	55425
6	9-1/8	25191	34160	46504	63059

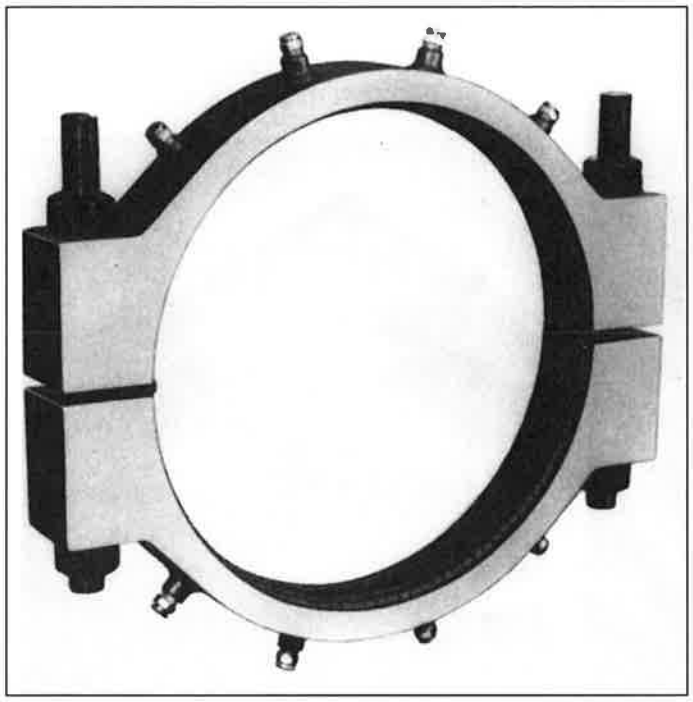
Studs: ASTM A193 Grade B7 - Nuts: ASTM A194 Grade 2H

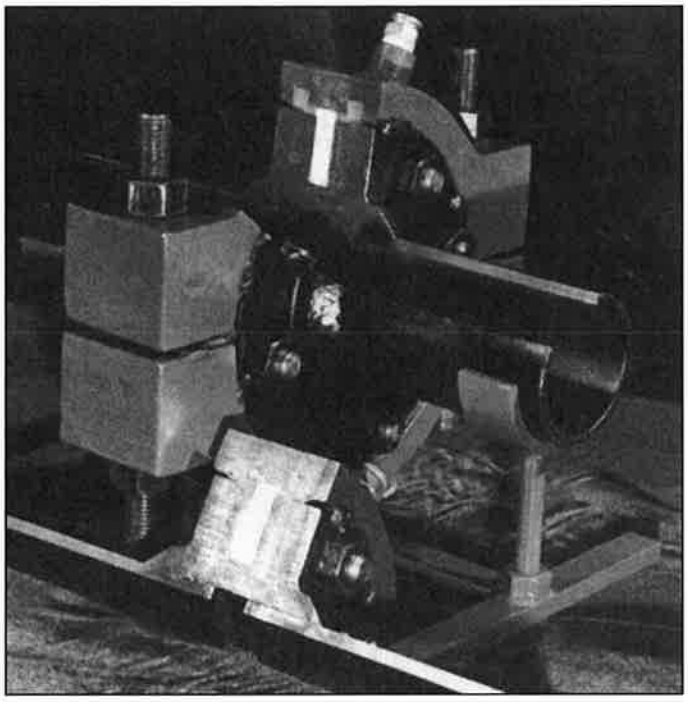
Torque values shown in the table represent two different coefficients of friction (C_f); 0.08 and 0.15. When C_f equals 0.08, it is assumed the studs and nuts are clean, free running, free of obvious flaws and lubricated with a high-grade graphite-oil thread lubricant. When C_f equals 0.15, it is assumed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

Notes

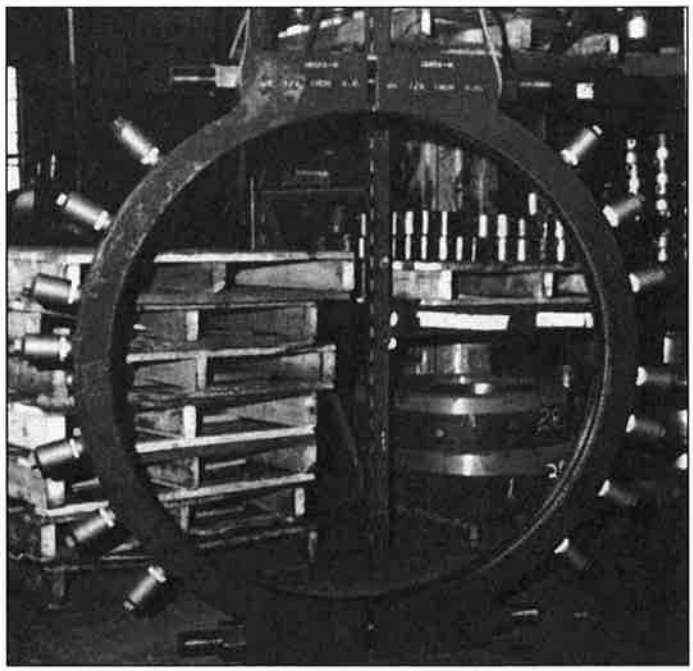
PLIDCO®

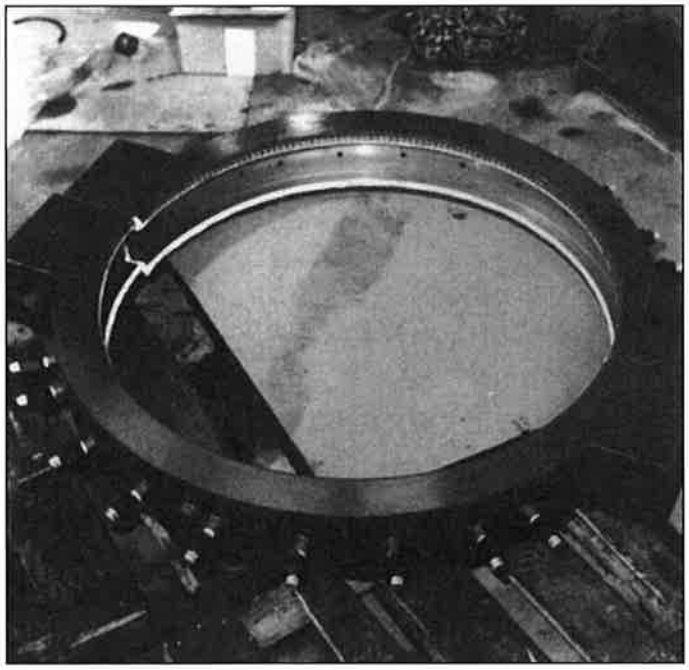
FLANGE+REPAIR RING





Above: Standard Plidco Flange+Repair Ring. Cutaway at right shows how leakage around the flange bolts is sealed off by injecting sealants through giant buttonhead fittings with a pressure gun into the space between flanges and around studs and nuts.





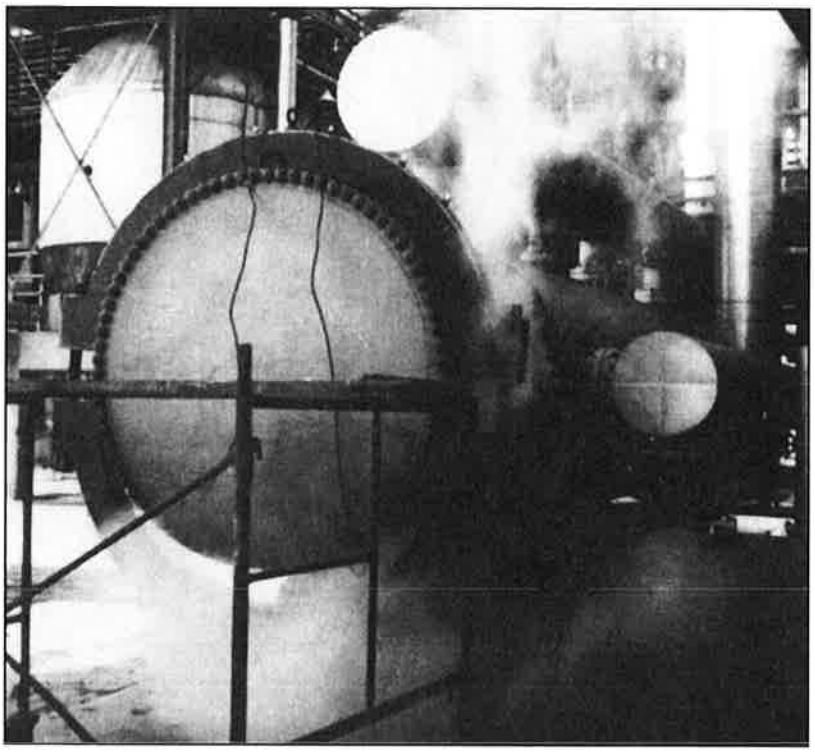
Special Plidco Flange+Repair Rings

48" 400 lb. for bonnet flanges

41" I.D. with a 3" relief

PLIDCO®

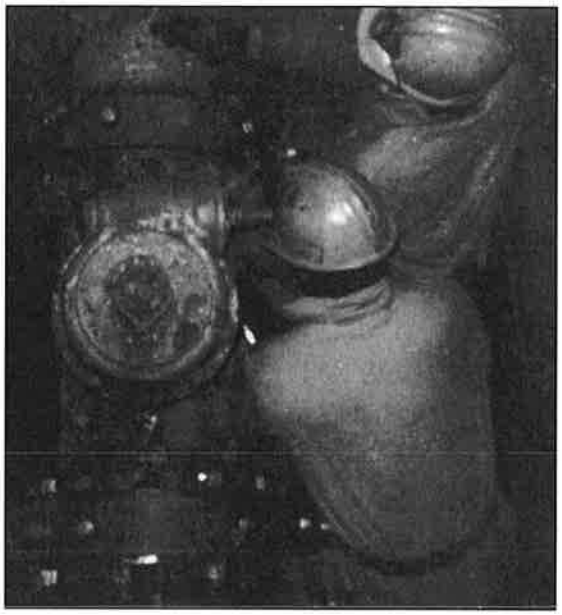
FLANGE+REPAIR RING



Installation of a Special 66-1/8" O.D. Plidco Flange+Repair Ring on a heat exchanger operating at 500 psig working pressure, 500°F.

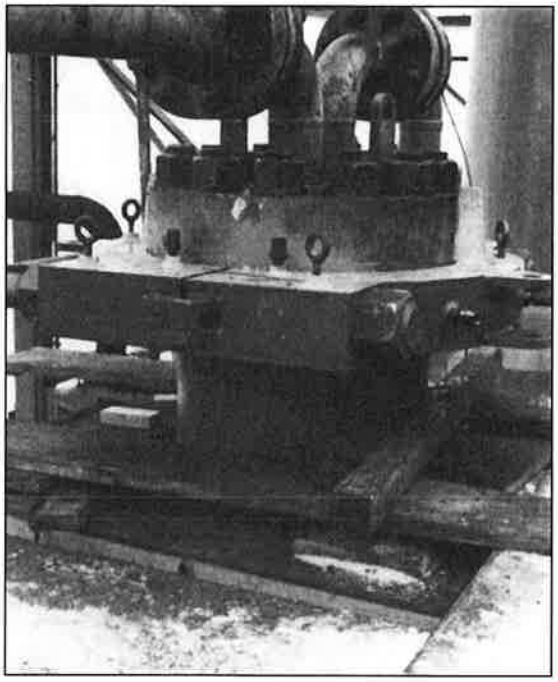
FLANGE LEAKS . . . . .

STOP THEM WITH PLIDCO FLANGE+REPAIR RINGS



Two 12" 300# Plidco Flange+Repair Rings installed on a gas pipeline operating at 500 psig. A major shutdown was avoided.

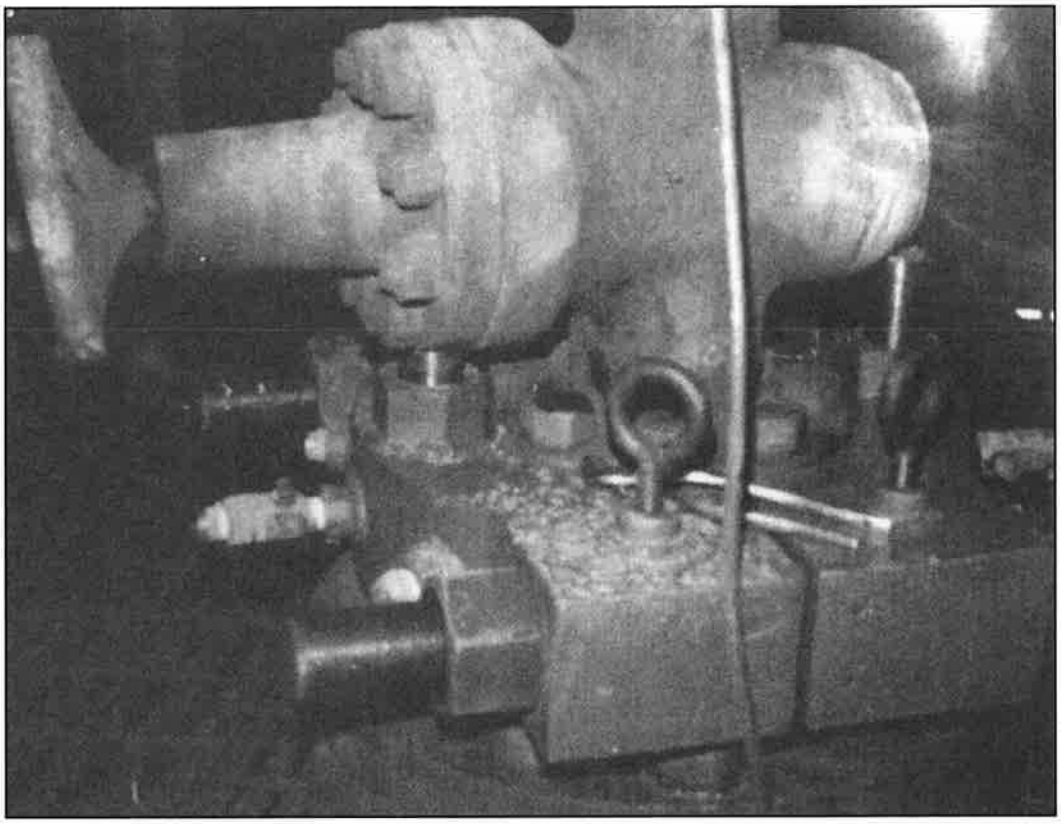
A series of 6" Plidco Flange+Repair Rings were installed on an old steam line at a large steel company, avoiding a shutdown.



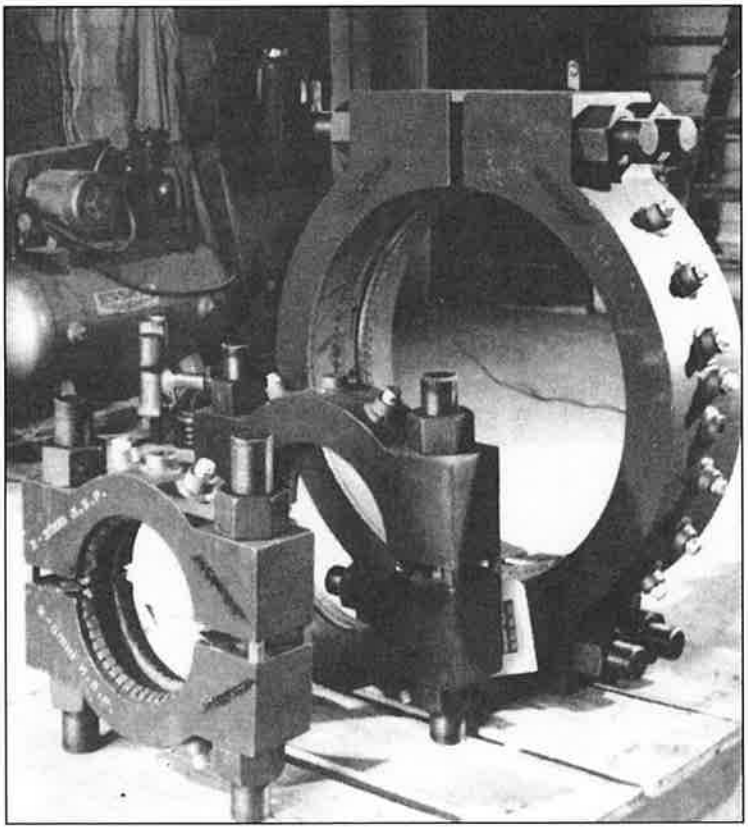
A large oil company had a leaking head gasket on an ammonia pressure vessel, 5000 psig working pressure. The leak was sealed off with a 33" O.D. Special Plidco Flange+Repair Ring.

PLIDCO®

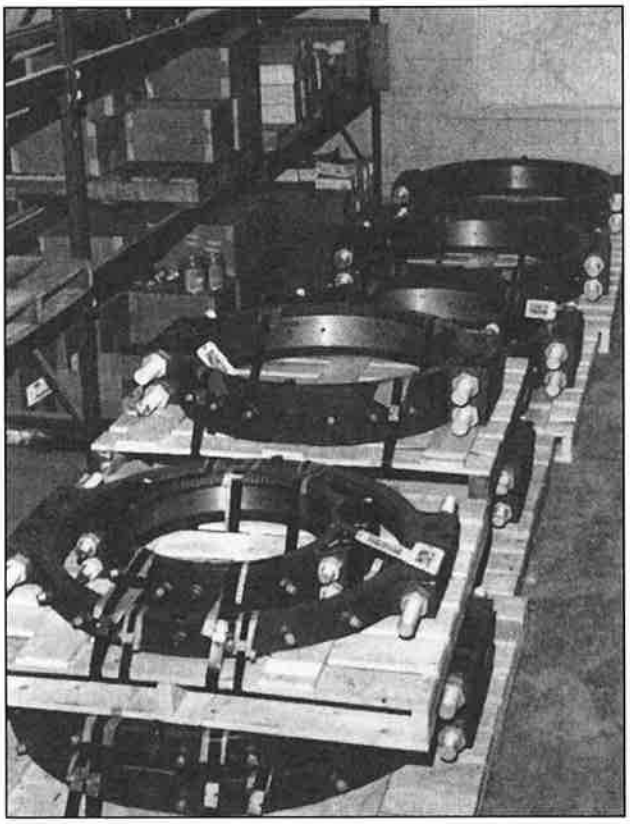
FLANGE+REPAIR RING



Installation of a Special Plidco Flange+Repair Ring on 2-1/2" 5000 lb. API wellhead flanges on an offshore platform in the Gulf of Mexico.



Plidco Flange+Repair Rings, designed for 3000 psig working pressure, for installation on wellhead flanges.



Plidco Flange+Repair Rings for offshore installation in the Gulf of Mexico.

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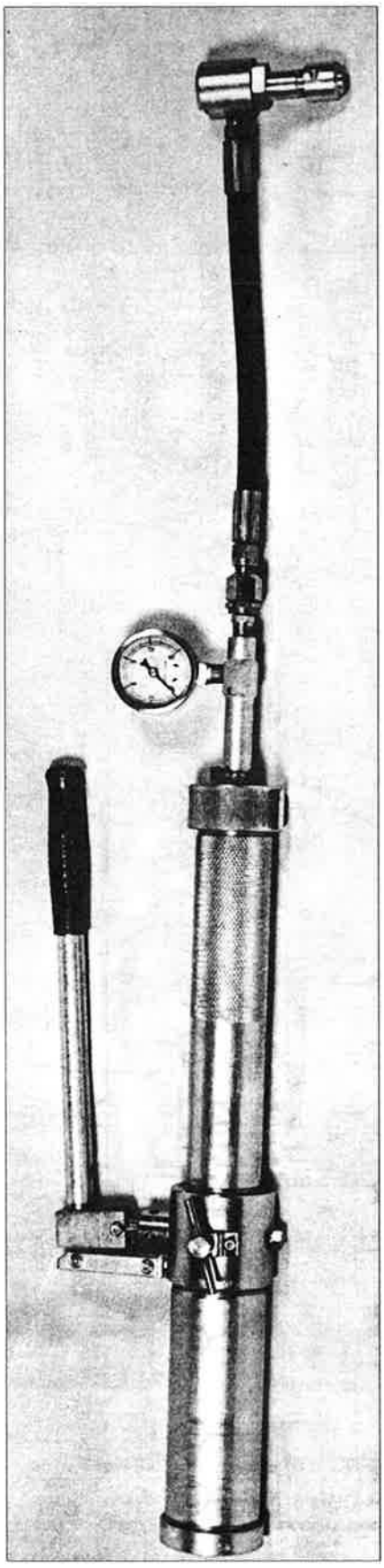


HIGH PRESSURE HYDRAULIC SEALANT GUN

The PLIDCO Sealant Gun is a precision designed, high pressure hydraulic sealant gun of exceptional light weight (15 lbs.).

The PLIDCO Sealant Gun is built to withstand the rigors of field demands, due to the exacting manufacturing procedures as evidenced by the precise fit of the polished, hardened steel piston in the sealant barrel which provides for the smoothest operation.

The self-priming feature permits use of this sealant gun in any position to inject sealant.

Do not attempt to disengage coupler from buttonhead fitting while the sealant gun is under pressure. To relieve pressure, turn by-pass valve one full turn counter clockwise. DO NOT open tight against the stop nor close by-pass valve to the point that it is jammed into the seat. The valve should be closed firmly but not tight.

The hydraulic system of the sealant gun is protected with a "built-in" relief valve to protect the sealant gun from damage should the operator continue to pump after the sealant is depleted. As an additional feature, the PLIDCO Sealant Gun can be equipped with a 15,000 psi gauge (with recalibration screw) and tee to assist in determining the point where sufficient pressure has been developed. The internal relief valve is preset at 7,500 psi and should not be tampered with, reset in the field or removed from the sealant gun.

In the operation of the PLIDCO Sealant Gun, the hydraulic fluid is pumped to the space behind the piston, which in turn drives the free-moving piston forward through the barrel forcing the sealant through the high pressure (20,000 psi burst) hose into the sealant fitting.

Depleted supply of sealant is indicated to the operator when a sharp increase in resistance to operation of the lever handle will be noted and reading on the pressure gauge drops rapidly.

Procedure for Loading the Sealant Gun:

A. Relieve pressure by opening by-pass valve one full turn.

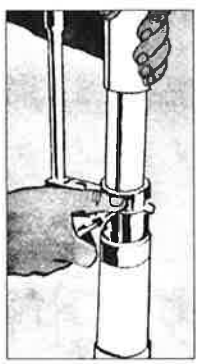
B. Unscrew handle from fulcrum of sealant gun, placing the hole drilled in handle over the protruding button on the sealant barrel cap, and rotate counter clockwise unscrewing cap and hose assembly.

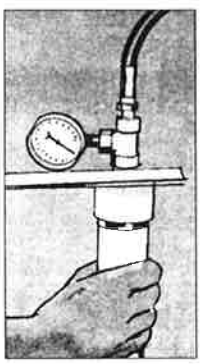
C. Using the handle, return piston to bottom of the sealant barrel and close by-pass valve firmly.

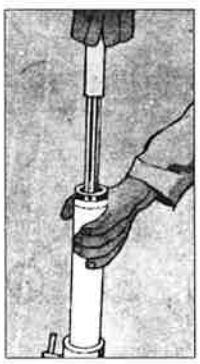
D. Fill sealant gun with recommended sealant for service conditions.

E. Replace cap and hose assembly and tighten with handle as in "B" above.

NOTE: DO NOT carry by handle.

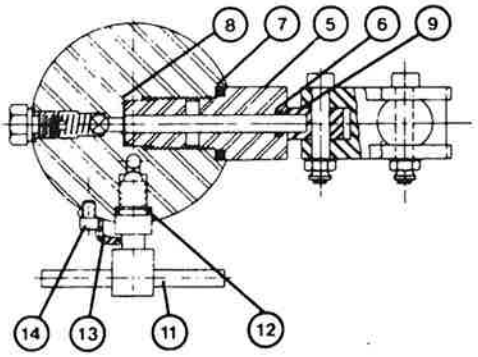


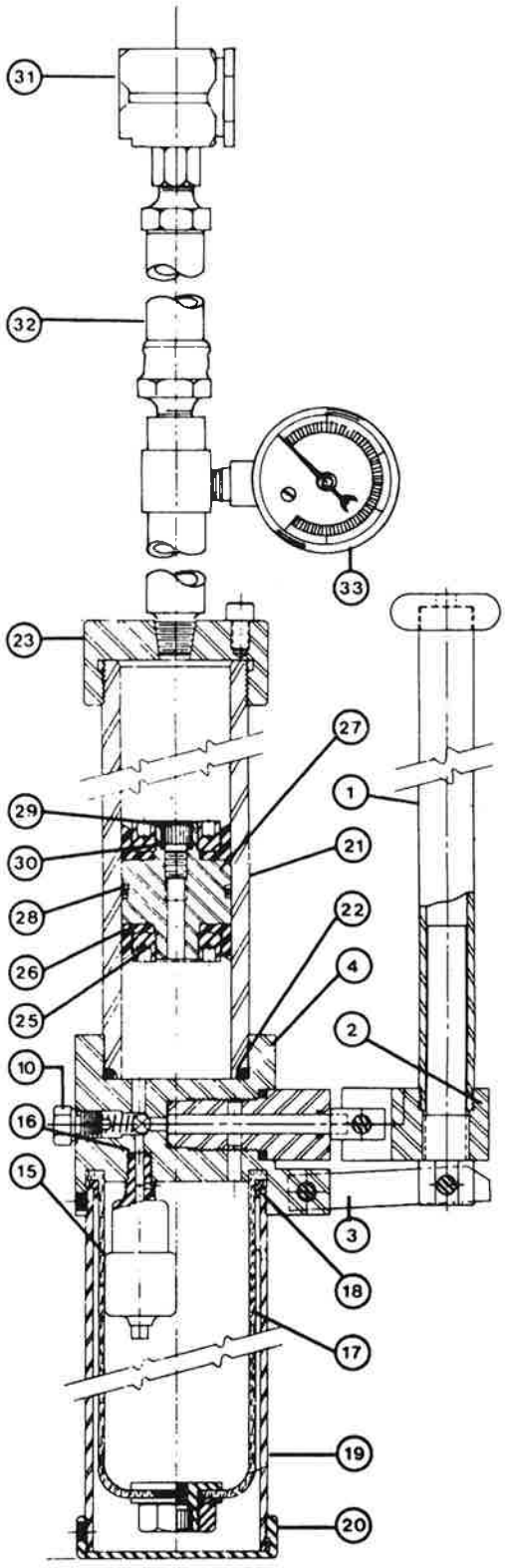




PLIDCO High Pressure Hydraulic Gun Parts and Accessories List

Ill. No.	Part No.	Part
1.	1603-09	Handle w/Knob
2.	1604-09	Fulcrum Assy.
3.	1605-09	Linkage Assy.
—	1606-09	Links (2)
—	1607-09	Link Bolts (3)
—	1608-09	Link Nuts (3)
—	1609-09	Body Assembly
4.	1610-09	Body
5.	1611-09	Hydraulic Pump Cyl. (w/Piston "O" Ring)
6.	1612-09	6227-5 "O" Ring (Piston Seal)
7.	1613-09	6227-15 "O" Ring (Top of Pump Cylinder)
8.	1614-09	6227-10 "O" Ring (Bottom of Pump Cylinder)
9.	1615-09	Pump Piston
10.	1616-09	Check Valve Assy.
11.	1617-09	By-Pass Valve w/"O" Ring
12.	1618-09	6227-5 "O" Ring (By-Pass Valve)
13.	1619-09	By-Pass Valve Stop
14.	1620-09	By-Pass Valve Stop Screw
15.	1621-09	Internal Relief Valve
16.	1622-09	6227-3 "O" Ring (Internal Relief Valve)
17.	1623-09	Hydraulic Fluid Bag w/Bleeder
18.	1624-09	Hydraulic Fluid Bag Seal Ring
19.	1625-09	Hydraulic Fluid Bag Barrel
20.	1626-09	Hydraulic Fluid Bag Barrel Cap
21.	1627-09	High Pressure Sealant Barrel
22.	1628-09	6227-29 "O" Ring (Sealant Barrel)
23.	1629-09	Sealant Barrel Cap
24.	1630-09	Piston Assy.
25.	1631-09	Washer Nut (2)
26.	1632-09	Leather Cups (2)
27.	1633-09	Piston
28.	1634-09	6227-24 "O" Ring (Piston Body)
29.	1635-09	Piston Cap Screw (2)
30.	1636-09	6227-5 "O" Ring (Piston Cap Screw)
31.	1015-09	Giant Buttonhead Coupler w/Adapter
32.	1013-09	High Pressure Hose w/Swivel
33.	1500-09	15000 Lb. Gauge w/Adapter





For more detailed information on Plidco products contact:

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THE PIPE LINE DEVELOPMENT CO.

PLIDCO SEALANTS AND SEALANT GUN INFORMATION

PLIDCO SP-SEAL: Temperature range -40°F. to 500°F. Available in J-stick form (1-3/8 x 8-1/2) for use in sealant gun. 16 sticks per box, 6 boxes per case. SP-Seal is a plastic-like sealant, filled with non-asbestos fibers. Recommended for: steam, natural gas, most crude oils, most straight petroleum distillates and residuals. It is also suitable for most aromatic and aliphatic hydrocarbons. SP-Seal is pumpable and non-hardening. It does not crack under conditions of pressure or temperature change. This is of heavy viscosity and requires a good hydraulic sealant gun.

COPALTITE CEMENT: Temperature range 450°F. to 1200°F. Available in quart cans, 24 quarts per case. It is a very pourable, black liquid that hardens by evaporation of vehicle. Insoluble in water and petroleum but readily soluble in alcohol. Will not harden under 314°F. and is slow hardening below 450°F. Recommended for use in high-temperature applications, especially steam; resists most chemicals.

WHITE BAKER SEAL: Temperature range -75°F. to 550°F. Available in quart cans, 12 quarts per case. Non-hardening, non-toxic; recommended for sealing steam, hydrocarbons, saltwater, air, fuels, refrigerants, acids, alkalies, solvents and gases. Especially good in areas where the sealant has restricted areas to flow through in order to create the seal.

CHEMOFLUOR PAK: Temperature range -30°F. to 400°F. Available in J-Sticks (1-3/8 x 8-1/2) for use in sealant gun. 16 sticks per box, 6 boxes per case. Recommended for aromatic hydrocarbons, ketones including methyl ethyl ketone, benzene, butane, solvent, napthas, toluene; resistant to all acids and most caustics and alkalies.

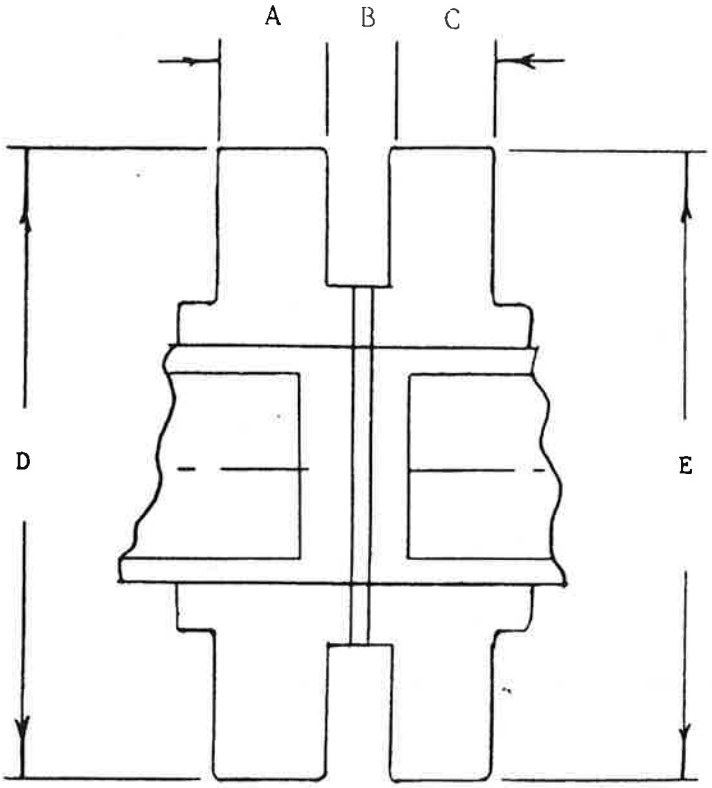
OTHER SEALANTS: We do have other sealants available for various services. Advise us the temperature, fluid and pressure and we will advise.

TEMPERATURES: Consider that the flange perimeters' temperature may be considerably less than the line temperature when choosing a sealant.

SEALANT GUN: Our sealant gun is a high pressure (10/15,000 psi) grease gun with built-in 7500 psi relief and giant buttonhead adapter. A similar gun may be used.

(SEE OTHER SIDE)

FLANGE DIMENSION CHART



WHEN ORDERING FLANGE + REPAIR-RINGS

PLEASE SPECIFY:

1. Dimensions:
   - A=
   - B=
   - C=
   - D=
   - E=
2. Flange rating and maximum operating pressure.
3. Maximum operating temperature.
4. Type of fluid (product).
5. Type of flange facing.
6. Heat exchangers, Re: Tube Sheets; diameter, thickness, and location.

RECOMMENDED SEALANTS AND AMOUNTS

ANSI 150 lb. and 300 lb. PLIDCO Flange + Repair Rings

IN NORMAL USAGE

ANSI 600 lb. - Requires Approximately 50% More

450°F. to 1200°F	-40°F. to 500°F.
Copaltite	Plidco S.P. Seal

SIZE	QUARTS	J-STICKS
2″	2	2
3″	2	3
4″	3	4
6″	4	6
8″	5	8
10″	6	10
12″	7	12
14″	8	14
16″	9	16
18″	10	18
20″	12	20
22″	14	22
24″	16	24

PLIDCO®

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