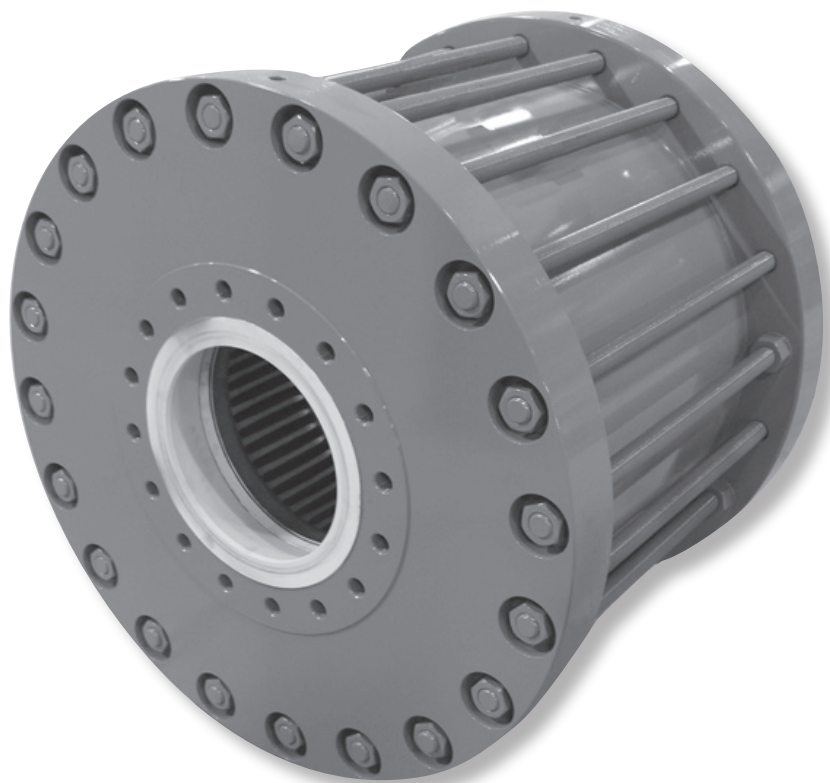


# Model 887

Flexflo\* Surge Reliever

Installation/Operation/Maintenance Manual



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## Scope

This manual provides instructions for installing, operating, maintaining and determining the Jacket Pressure Set Point (JPSP) for all sizes of Flexflo surge relievers.

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## Product Description

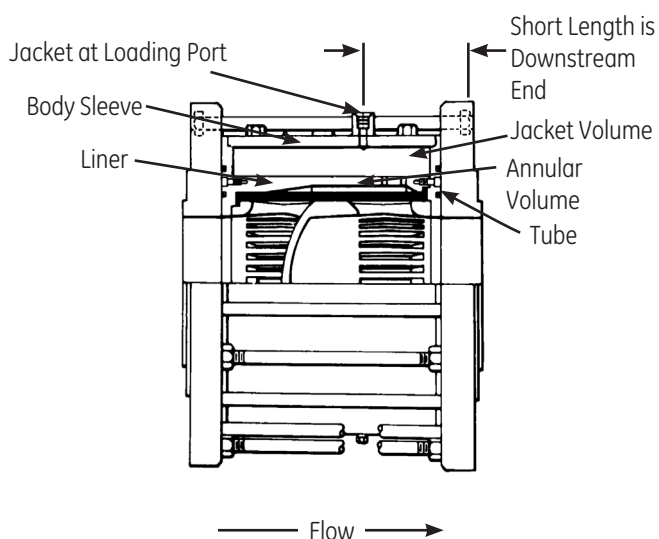
The Flexflo Surge Reliever consists of a slotted metal Core over which a flexible rubber tube is installed. Tubes each have a maximum allowable differential pressure rating, based on ANSI Class ratings, and they are molded in a number of different rubber compounds to meet different applications. The Core has two sets of openings or slots arranged around the outer circumference of the Core. The inlet slots are separated from the outlet slots by a metal barrier. The volume enclosed by the Body sleeve and the outside surface of the Liner is a pressure chamber known as the Jacket space. A ported metal Liner is located around the Tube and prevents over expansion of the Tube. The volume between the tube and the Liner is known as the Annular volume. The Jacket and the Annular volume are connected by the ports in the Liner, and together make up the Total Volume, which is charged with compressed, dry gas (not with liquid).

## Principles of Operation

(Refer to Figure 1 to identify parts).

When the inlet pipeline pressure (upstream of the Surge Reliever) plus the added pressure required to overcome the Tube material's natural resistance to expand (the Tube's Minimum Differential pressure or DF Minimum) exceeds the Jacket Pressure Set Point of the Flexflo Surge Reliever, the Flexflo will start to open and start to relieve the line pressure upstream of the Flexflo Surge Reliever.

## Surge Reliever Markings



**Figure 1** - Partial Cutaway of Flexflo Surge Reliever

When the pressure at the inlet of the exceeds the Jacket Pressure Set Point pressure by the Tube's DF Minimum pressure, the valve will start to open. Fluid at the inlet will be directed up through the upstream slots in the Core, between the inner surface of the Tube and around the outside surface of the Core's Barrier, down into the downstream slots into the downstream surge line. Minor surges may be absorbed by just the action of the Tube expanding slightly relieving line pressure without releasing fluid from the upstream pipeline. Reaction time for the Surge Reliever is very rapid, in the range of milliseconds. The additional volume of compressible gas in the Jacket space allows rapid expansion of the Tube.

### NOTE

Temperature variations will cause the Jacket pressure to vary. See temperature changes Page 2.

## Installation

- 1) The Flexflo Surge Reliever may be installed in either a vertical or horizontal line. Flow must be in the direction of the flow arrows.
- 2) The pressure source for charging the Jacket and Annular volume must be dry nitrogen, natural gas, or compressed air at a pressure higher than the desired pressure in the Jacket Space (the Jacket Pressure Set Point)

### CAUTION

**DO NOT USE OXYGEN or liquids to pressurize the Flexflo's Jacket Space.**

- 3) All connections for the Jacket supply gas must have no leaks.
- 4) The range of the Jacket Pressure gauge should be approximately twice the desired Set Point Pressure.
- 5) Allow sufficient space for accessing and servicing the Flexflo Surge Reliever with lifting equipment.

### Methods to adjust and hold pressure in the jacket

- A. Bottle assembly (See Figure 2). The bottle assembly provides a convenient method to hold pressure in the jacket See adjusting pressure with a bottle assembly on page 3.

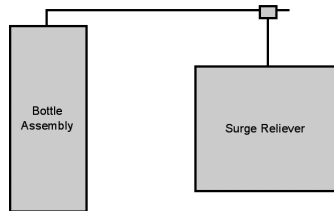


Figure 2

- B. See figure 3. With a pressure source at a higher pressure a pressure regulator can regulate pressure to the jacket. See instruction W-887-15LH-B00-1 if this method is chosen.

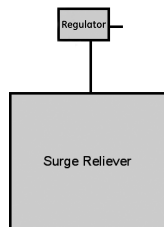


Figure 3

## Temperature changes

Temperature changes in the jacket will change the pressure when the surge reliever will open. This is important to consider because the surge reliever could open at a higher pressure than desired. A few things should be considered for the day to night and week to week changes in temperature around the surge reliever.

Ways to deal with temperature changes:

1. Chosen Jacket pressure could be low enough that even with temperature and pressure changes the surge reliever will open when needed.
2. A method could be provided by the customer to keep the temperature around the surge relieve constant
3. Bottle assembly can be buried in the ground
4. Shade the surge reliever and bottle assembly
5. Method B with a hard adjustable regulator could be used. The pressure regulator can remove excess pressure or add pressure as needed to the jacket however it also will change pressure over time so adjustments will be needed. See instruction W-887-15LH-B00-1 if this method is chosen.

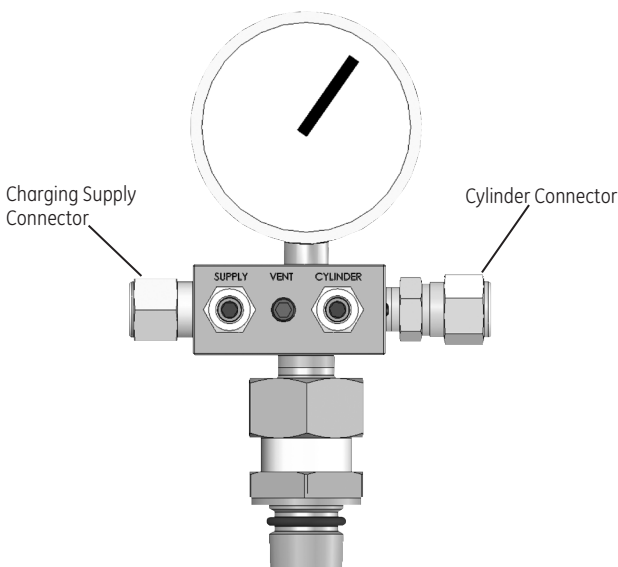
### Adjusting pressure with a bottle assembly Installation:

1. Bottles assemblies are coated to allow them to be buried in the ground with only the top of the bottle(s) exposed. The purpose of embedding the bottles in the ground is to support the bottles and to stabilize the temperature of the bottles. If the Bottles are not buried, the Bottle Assembly should be secured properly and protected from damage to the bottle(s) or the pressurized lines.
2. The 1/2" MNPT end, the end with the O-ring, of the Jacket Connector Assembly, see Figure 4, will be threaded into the 1/2" FNPT Jacket Port of the surge reliever.
  - a. Clean and inspect the mating surfaces, the O-ring, and O-ring sealing surfaces for any damage, debris, or packing material that may interfere with proper installation or with a pressure tight seal.
  - b. Thread the 1/2" MNPT end of the Jacket Connector Assembly into the Jacket Port until it just bottoms out. Do not tighten. Position the three 5/32 hex head valves (labeled Supply, Vent, and Cylinder) so they can easily be adjusted, but will not collect water; and position the pressure gauge (if equipped) so that it can be easily read and will not collect water. Tighten the 1-1/4" Lock Nut with a 1 1/4" wrench against the body of the surge reliever while holding the body of the Jacket Connector Assembly. Maintain the proper position of the gauge and valves.

3. A separate pressure supply source will be required to charge the Jacket chamber/recharge the Bottle Assembly. When not in use, insert a 1/4" MNPT pipe plug into the Charging Supply Connection. The Pipe plug is recommended but not required.
4. Install the tubing from the Cylinder Connection to the open tube fitting of the Bottle Assembly. Secure the tubing so that it is protected from damage and vibration.
5. Visually inspect the system for any open ports, loose connections, or damaged tubing. Plug or tighten any open ports or loose connections. Replace any damaged tubing.
6. Loosen the supply and cylinder lock nuts and back out the threaded nut collars approximately 1 turn.

**Pressurize/Charge the 888 Bottles:**

1. Using an external pressure source to charge/recharge the Bottle system.
  - a. Remove plug if needed from Charging supply connection. Connect an external pressure source with either very dry air or Nitrogen Gas to the Charging Supply connection.
  - b. Open the valve to the external pressure source.
  - c. Slowly open the Cylinder Valve and the Supply Valve to pressurize the Bottles and the Jacket Space.
  - d. Allow the Pilot Bottle system and the Jacket to charge up to the desired set point pressure, if no leaks in the system are detected. Close only the Supply Valve once the desired Jacket pressure and the Bottles are pressurized to the desired set point.
  - e. Snug the two threaded Collars and tighten the two Lock Nuts to 8 ft-lbs (10.8 Nm).



**Figure 4 - Jacket Assembly**

**Flexflo Surge Reliever Adjustment Procedure:**

Gauges must be rated for higher than the maximum pressures required at both the Inlet and the Jacket Loading ports of the Flexflo Surge Reliever.

1. Increase the pressure in the Jacket Loading port to a pressure slightly (approximately 50 psig or 3.45 barg) above the desired Relief Set Point pressure (the Line pressure where the Flexflo Surge Reliever will start to open and relieve the upstream pipeline pressure). If necessary increase the Line pressure at the same time as the Jacket pressure.

**CAUTION**

**Do not exceed the maximum rated differential pressure of the Tube at any time. Refer to the nameplate for the maximum differential pressure rating for the Flexlo tube.**

2. Gradually apply and maintain the desired Line pressure to the inlet of the Flexflo Surge Reliever.
3. From the Tube Differential Pressure Table obtain:
  - a. the full open differential pressure DF Maximum for the size and tube material in use at the applications coldest temperature.
  - b. The differential pressure where the Flexflo Surge Reliever tube begins to flow DF Minimum for the size and tube material in use at the applications coldest temperature.

**NOTE**

**The Tube Differential Pressure Table information shows average values and variations of +/- 5% can be expected.**

Jacket Pressure Set Point pressure for a required flow rate can now be determined by either of two methods:

**CAUTION**

**Do not exceed the maximum rated differential pressure of the Tube at any time.**

**A. Tube Differential chart adjustment method:**

Example:

1. A 12", ANSI Class 600, 887 Surge Reliever, with a Nitrile 846 Tube is connected into a pipeline where the fluid (water) is just above freezing, 32 degrees Fahrenheit.
2. The pipeline pressure that is to be protected is approximately 800 psig.
3. The Maximum Allowable Operating Pressure (MAOP) is 1440 psig.
4. The 887 is to start opening and relieve pipeline pressure at 900 psig, this is the Designed relief pressure.
5. Refer to the REDQ Tube Differential Pressure Chart to select the DF Min and DF Max. values using the valve size, the Tube/Durometer, the ANSI Class, and the lowest estimated operational temperature of the tube:
  - i. DF Min = 23 psid (1.6 barg)
  - ii. DF Max = 41 psid (2.8 barg)
6. Determine the Jacket Pressure Set Point: Subtract DF Min from the pressure determined in item 4. of this example, the Designed Relief Pressure...  
 $900 \text{ psig} - 23 \text{ psid} = 877 \text{ psig}$   
 $(62 \text{ barg} - 1.6 \text{ barg} = 60.4 \text{ barg})$   
This is the Jacket Pressure Set Point pressure reading for the pressure gauge connected to the Jacket Port connection.
7. Determine the pressure the 887 Surge Reliever will be fully open: Add DF Max to the Jacket Pressure Set Point pressure...  
 $41 \text{ psid} + 877 \text{ psig} = 918 \text{ psig}$   
 $(2.8 \text{ barg} + 60.4 \text{ barg} = 63.2 \text{ barg})$   
This is the approximate pipeline pressure where the 887 surge reliever will be fully open (918 psig).
8. Verify the Jacket Pressure Set Point pressure will remain constant enough for the application.

**B. Direct flow adjustment: Jacket pressure is directly adjusted to attain the required flow rate at the desired set point.**

Example:

1. Desired relief point is 900 psig (62 barg) at a flow rate of 1000 GPM (0.063 m<sup>3</sup>/s).

**CAUTION**

**Do not exceed the maximum rated differential pressure of the Tube at any time.**

2. Introduce Jacket pressure of 950 psig (65.5 barg) with a dry gas.
3. Introduce inlet line pressure of 900 psig (62 barg)
4. Reduce the Jacket pressure slowly until flow just begins; record the Jacket pressure (assume 877 psig or 60.4 barg)... Inlet pipeline pressure - Jacket Pressure Set Point pressure just flowing or -  $900 \text{ psig} - 877 \text{ psig} = 23 \text{ +/- psid} = \text{DF Min.}$  ( $62 \text{ barg} - 60.4 \text{ barg} = 1.6 \text{ barg +/- barg} = \text{DF Min.}$ )
5. Continue to reduce the Jacket Pressure Set Point pressure slowly until flow of 1000 GPM (0.063 m<sup>3</sup>/s) is attained; record the Jacket Pressure Set Point pressure (assume 870 psig /60 barg), approximately  $900 - 870 = 30 \text{ +/- psig}$  ( $62 - 60 = 2 \text{ +/- barg}$ ).
6. With the Jacket Pressure Set Point pressure set at 870 psig/60 barg. The 887 valve will flow 1000 GPM (0.063 m<sup>3</sup>/s) when the pipeline pressure reaches approximately  $900 \text{ psig} = (870 \text{ psig} + 30 \text{ psig})$  or  $62 \text{ barg} = (60 \text{ barg} + 2 \text{ barg})$

## Tube Differential Pressure – Flexflo Surge Reliever

The following is a listing of the expected “Roll Up” pressures for the various tube materials. These differential pressures should be used as a guide in setting the jacket pressure. Variations in part machining, tube characteristics and fluids may cause the “Roll Up” to change +/- 5%.

**DF Minimum: Minimum differential pressure to begin to open tube**

**DF Maximum: Maximum differential pressure to fully open tube**

Table 1						
Valve Size inches (mm)	Tube/Durometer	ANSI Class	DF Minimum 75° F (23.9° C) psid (barg)	DF Maximum 75° F (23.9° C) psid (barg)	DF Minimum 0° F (-17.8° C) psid (barg)	DF Maximum 0° F (-17.8° C) psid (barg)
4 (100)	ECO 725/40	150	3 (0.2)	7 (0.48)	17 (1.17)	23 (1.58)
4 (100)	ECO 893/50	150	5 (0.34)	13 (0.90)	20 (1.38)	27 (1.86)
4 (100)	ECO 878/65	300	12 (0.83)	30 (2.07)	27 (1.86)	48 (3.31)
4 (100)	NBR 846/75	600	20 (1.4)	51 (3.52)	30 (2.07)	66 (4.55)
6 (150)	ECO 725/40	150	3 (0.2)	6 (0.41)	17 (1.17)	21 (1.45)
6 (150)	ECO 893/50	150	5 (0.34)	12 (0.83)	19 (1.31)	26 (1.79)
6 (150)	ECO 878/65	300	11 (0.76)	28 (1.93)	26 (1.79)	43 (2.96)
6 (150)	NBR 846/75	600	19 (1.31)	46 (3.17)	24 (1.65)	60 (4.14)
8 (200)	ECO 725/40	150	2 (0.14)	5 (0.34)	16 (1.10)	20 (1.38)
8 (200)	ECO 893/50	150	4 (0.17)	9 (0.62)	18 (1.24)	23 (1.58)
8 (200)	ECO 878/65	300	9 (0.62)	22 (1.52)	23 (1.58)	38 (2.62)
8 (200)	NBR 846/75	600	10 (0.69)	23 (1.58)	13 (0.90)	40 (2.76)
10 (250)	ECO 725/40	150	2 (0.14)	5 (0.34)	16 (1.10)	20 (1.38)
10 (250)	ECO 893/50	150	4 (0.17)	9 (0.62)	18 (1.24)	24 (1.65)
10 (250)	ECO 878/65	300	9 (0.62)	23 (1.58)	23 (1.58)	39 (2.69)
10 (250)	NBR 846/75	600	10 (0.69)	24 (1.65)	23 (1.58)	41 (2.83)
12 (300)	ECO 725/40	150	2 (0.14)	5 (0.34)	14 (0.96)	20 (1.38)
12 (300)	ECO 893/50	150	4 (0.17)	9 (0.62)	18 (1.24)	23 (1.58)
12 (300)	ECO 878/65	300	9 (0.62)	23 (1.58)	23 (1.58)	39 (2.69)
12 (300)	NBR 846/75	600	10 (0.69)	24 (1.65)	23 (1.58)	41 (2.83)
4 (100)	HNBR 740/85	600	30 (2.07)	66 (4.55)	39 (2.69)	86 (5.93)
6 (150)	HNBR 740/85	600	24 (1.65)	65 (4.48)	31 (2.13)	83 (5.72)
8 (200)	HNBR 740/85	600	15 (1.03)	31 (2.13)	20 (1.38)	40 (2.76)
10 (250)	HNBR 740/85	600	15 (1.03)	30 (2.07)	20 (1.38)	39 (2.69)
12 (300)	HNBR 740/85	600	14 (0.96)	30 (2.07)	19 (1.31)	39 (2.69)
4 (100)	HNBR 744/75	300	20 (1.4)	51 (3.52)	35 (2.41)	66 (4.55)
6 (150)	HNBR 744/75	300	19 (1.31)	46 (3.17)	33 (2.27)	60 (4.14)
8 (200)	HNBR 744/75	300	12 (0.83)	28 (1.93)	26 (1.79)	42 (2.89)
10 (250)	HNBR 744/75	300	11 (0.76)	25 (1.72)	25 (1.72)	39 (2.69)
12 (300)	HNBR 744/75	300	11 (0.76)	24 (1.65)	25 (1.72)	41 (2.83)
4 (100)	HNBR 745/65	150	13 (0.90)	33 (2.27)	27 (1.86)	48 (3.31)
6 (150)	HNBR 745/65	150	12 (0.83)	30 (2.07)	26 (1.79)	45 (3.10)
8 (200)	HNBR 745/65	150	10 (0.69)	28 (1.93)	25 (1.72)	42 (2.89)
10 (250)	HNBR 745/65	150	9 (0.62)	23 (1.58)	23 (1.58)	37 (2.55)
12 (300)	HNBR 745/65	150	8 (0.55)	22 (1.52)	22 (1.52)	37 (2.55)

**NOTE:** NBR rubber increases in hardness with decrease in temperature. 40-70 durometer may increase by 14-16 points from 80°F (26.6° C) to 0° F (-17.8° C). 85 durometer may increase by 6-9 points from 80°F (26.6° C) to 0° F (-17.8° C).

## Field Disassembly and Reassembly

The following procedure is recommended for replacing the internal soft goods for the Flexflo Surge Reliever.

NOTE: The diagrams in this procedure show the 6" Class 300 Surge Reliever. Actual appearance may vary.

1. Remove the top studs and nuts as shown in Figure 5.

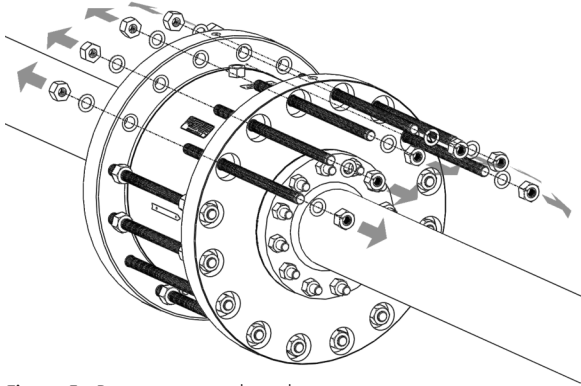


Figure 5 - Remove top studs and nuts.

Proper arrangement of jacking nuts and studs to be removed for each size and class of Flexflo Surge Reliever is found in Table 1 at the end of this procedure.

2. Turn the nuts on each remaining tie stud counter-clockwise until the face of the nut is flush with the end of the stud as shown in Figure 6 below.

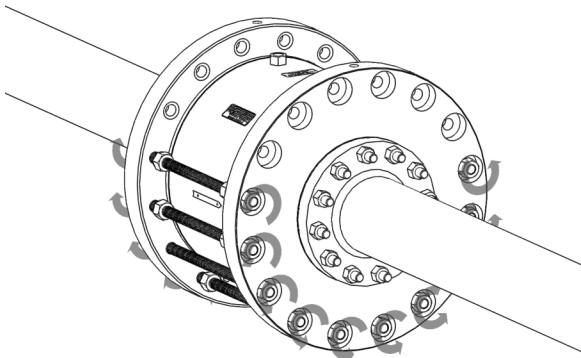


Figure 6 - Turn all tie stud nuts counter-clockwise

3. Turn each jacking nut so that the face of the washer is flush with the face of the line flange as shown in Figure 7 below.

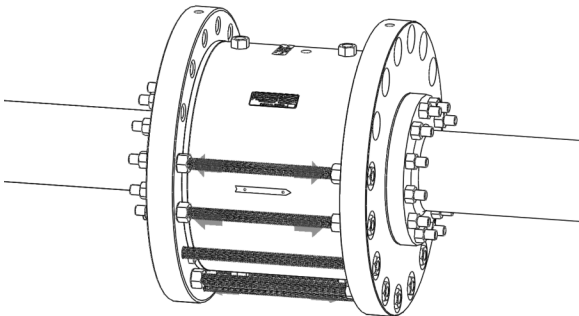


Figure 7 - Jacking nuts flush with line flange face.

4. Rotating each jacking nut  $\frac{1}{4}$  turn at a time, spread the line flanges apart so that each flange is tight against the remaining tie nut washers as shown in Figure 8 below.

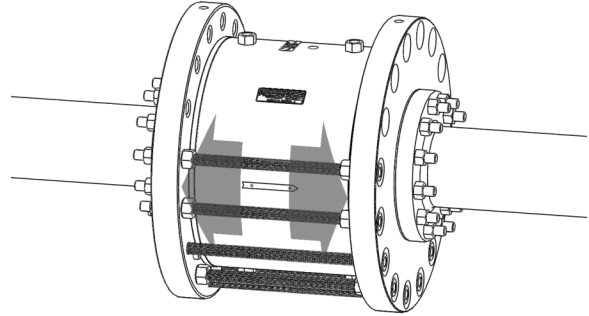


Figure 8 - Spread line flanges using jacking nuts.

5. Using the lifting lugs in the Surge Reliever body, lift the body assembly out of the line as shown in Figure 9 below.

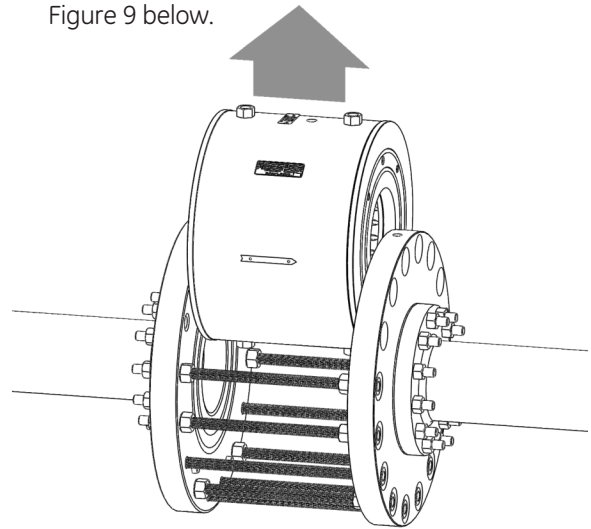


Figure 9 - Lift body assembly out of line.

### CAUTION

Verify that the crane used has the appropriate load capacity for the body assembly prior to lifting. Weights for each size and class of Flexflo Surge Reliever can be found in Table 2 at the end of this procedure.

6. Remove the cover plate O-rings as shown in Figure 10 below.

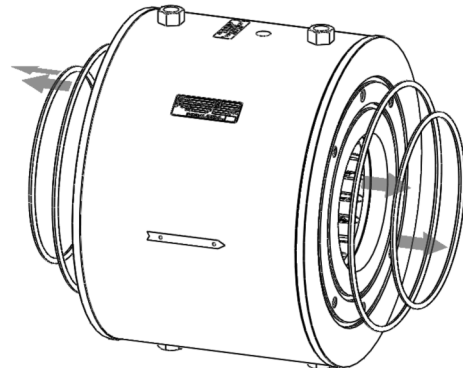


Figure 10 - Remove all 4 cover plate O-rings.

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- Place the body assembly on the ground or other supporting surface in the vertical position with the inlet side down as shown in Figure 12 below.



Figure 11 - Place body assembly inlet side down

- Remove the outlet cover plate as shown in Figure 12 below.

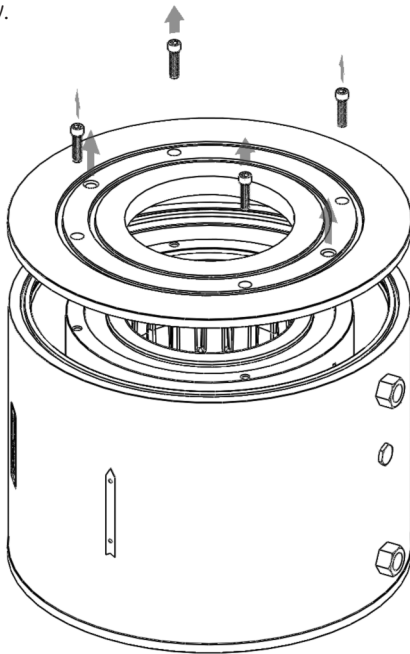


Figure 12 - Remove the outlet cover plate.

- Remove the outlet body sleeve O-ring as shown in Figure 13 below. Depending on the assembly, the O-ring may come out with the cover plate or may remain inside the Surge Reliever body.

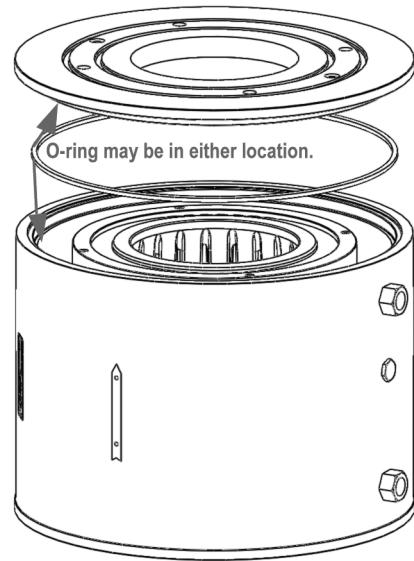


Figure 13 - Remove outlet body sleeve O-ring.

- Remove the body sleeve and inlet body sleeve O-ring as shown in Figure 14 below. Depending on the assembly, the O-ring may come out with the body sleeve or remain on the inlet cover plate.

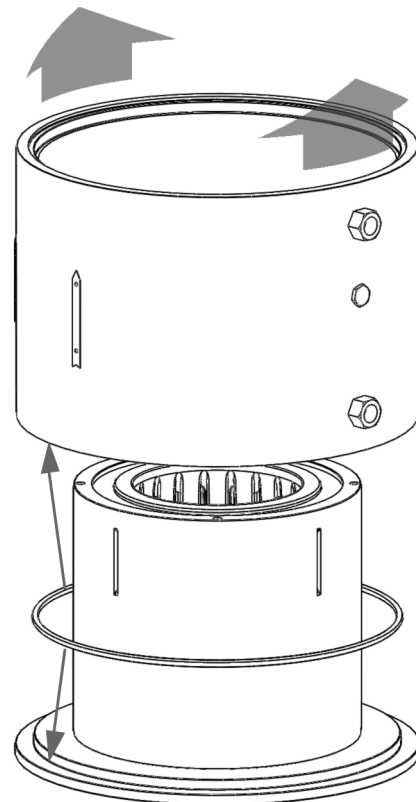


Figure 14 - Remove body sleeve and inlet body sleeve O-ring.  
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- Remove the core and tube from inside the liner as shown in Figure 15 below.

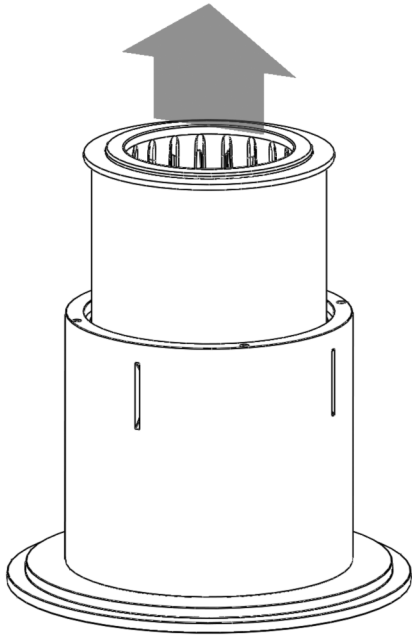


Figure 15 - Remove core and tube.

**NOTE:** With the body assembly placed inlet side down, it is not necessary to remove the inlet cover plate from the body liner.

- Remove the tube as shown in Figure 16 below and replace it with a new tube. The inner face of the replacement tube should be thoroughly lubricated with glycerin, dish soap, or similar non-caustic lubricant prior to installation.

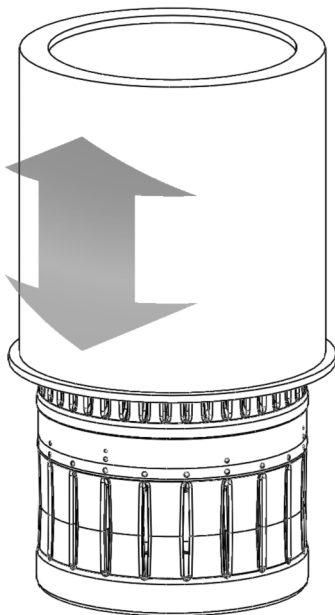


Figure 16 -Remove tube from core and replace.

**NOTE:** A hydraulic press is recommended for removal and installation of the tube. If a press is not available, it may be preferable to cut the old tube off of the core rather than attempt to remove it intact.

- Replace the tube and core into the liner as shown in Figure 17 below.

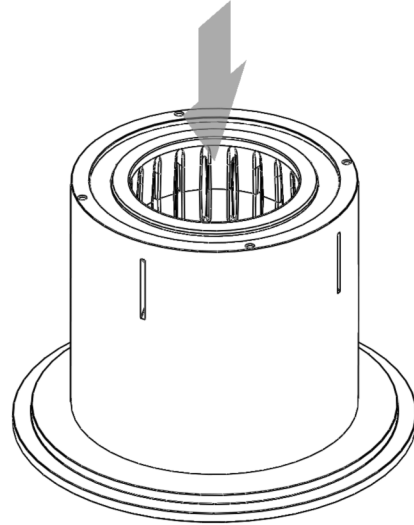


Figure 17 - Replace tube and core in liner.

- Replace the body sleeve O-rings, body sleeve, outlet cover plate, and outlet cover plate cap screws as shown in Figure 18 below. O-rings should be evenly covered with a light coat of O-ring lubricant prior to installation. Verify that the thru holes in the cover plate are properly aligned with the threaded holes in the liner before installing the cap screws.

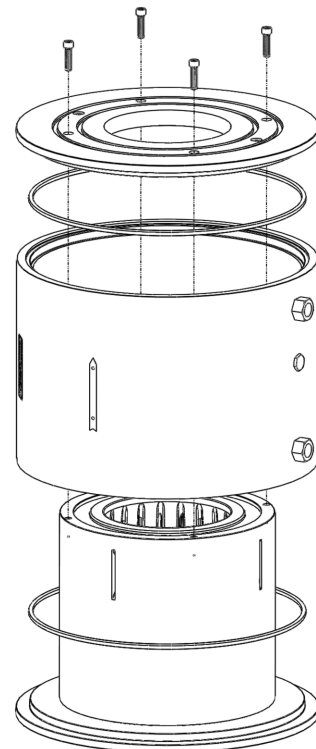


Figure 18 - Reassemble body components.

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15. Torque the outlet cover plate cap screws to the appropriate torque value as shown in Figure 19 below. Proper torque values for each size and class of Surge Reliever are found in Table 2 at the end of this procedure.



Figure 19 - Torque cover plate cap screws.

16. Return the body assembly to horizontal position (if the Surge Reliever is installed horizontally) and replace the cover plate O-rings as shown in Figure 20 below. O-rings should be evenly covered with a light coat of O-ring lubricant prior to installation.

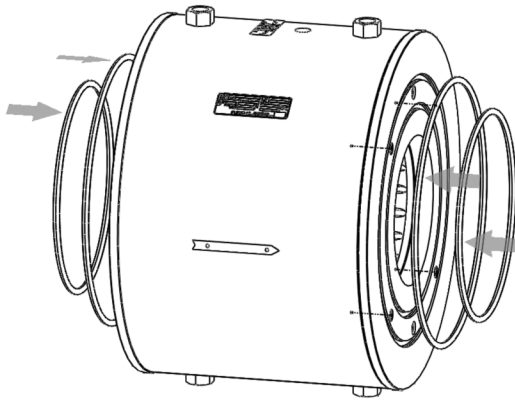


Figure 20 - Re-install cover plate O-rings.

17. Replace the body assembly in the line as shown in Figure 21 below. Use caution to avoid O-ring damage as the body assembly slides between the line flanges.

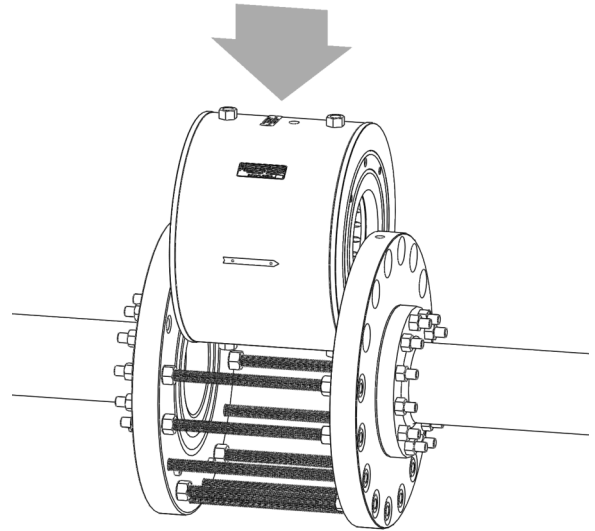


Figure 21 -Replace body assembly in line.

18. Relax the jacking nuts away from the line flanges as shown in Figure 22 below. Recommended minimum distance of the washer face from the line flange face is 1 inch (25.4 mm).

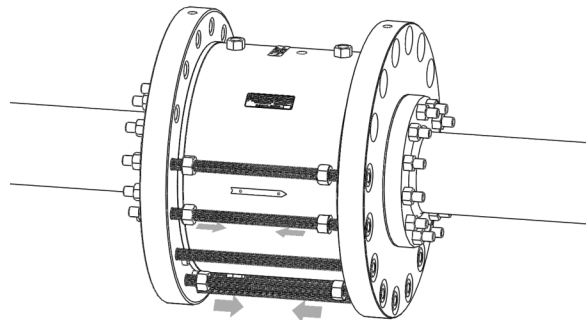
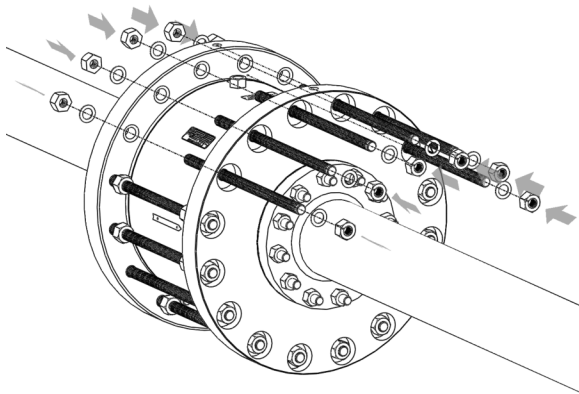


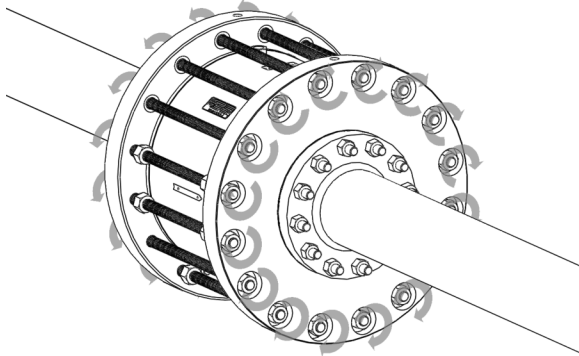
Figure 22 - Relax jacking nuts.

19. Replace the top tie studs, nuts, and washers as shown in Figure 23 below. Thread the nuts onto the studs so that the face of the nut is flush with the end of the stud.



**Figure 23** -Replace top tie studs, nuts, and washers.

20. Tighten the tie nuts to the appropriate torque value as shown in Figure 24 below. Nuts should be tightened in a criss-cross or star pattern in a three-step process to avoid unbalanced torquing. Recommended torque patterns and intermediate and final torque values are found in Table 4 at the end of this procedure.



**Figure 24** -Tighten tie nuts to appropriate torque value.

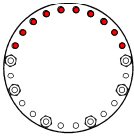
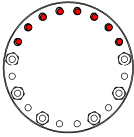
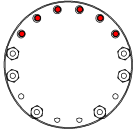
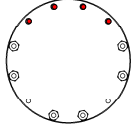
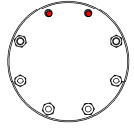
21. Replace the jacket loading connections and other fittings and reset the jacket pressure as per the original installation procedure. The Flexflo Surge Reliever is ready for use.

## PRODUCT SUPPORT

Local support is available through our manufactures representative and distributor network. Contact the factory or refer to our web site for your support representative contact information. Factory support is available from 8:00 AM to 4:30 PM MST Monday through Friday. Limited after hours support is also available. Complete product specifications, parts lists, and flow calculation software is available on our website [www.geoilandgas.com](http://www.geoilandgas.com) +1 801-487-2225 USA.

## Field Disassembly and Reassembly Tables

Table 2 - Jacking Nut and Stud Removal Layout

Jacking Nut Pattern Layout	N.D.	Class	N.D.	Class	N.D.	Class
	12"x12"x12"	600	14"x12"x14"	600	16"x12"x16"	600
	10"x10"x10"	600	12"x10"x12"	600		
	8"x8"x8"	600	10"x8"x10"	600		
					16"x12"x16"	400
	12"x12"x12"	300	14"x12"x14"	300	16"x12"x16"	300
	10"x10"x10"	300	12"x10"x12"	300	14"x10"x14"	300
	8"x8"x8"	300	10"x8"x10"	300	12"x8"x12"	300
	6"x6"x6"	600	8"x6"x8"	600	10"x6"x10"	600
	12"x12"x12"	150	14"x12"x14"	150	16"x12"x16"	150
	6"x6"x6"	300	8"x6"x8"	300	10"x6"x10"	300
	10"x10"x10"	150	12"x10"x12"	150	14"x10"x14"	150
	8"x8"x8"	150	10"x8"x10"	150	12"x8"x12"	150
	6"x6"x6"	150	8"x6"x8"	150	10"x6"x10"	150
	4"x4"x4"	150				

**NOTE:** Positions of Jacking Nuts are indicated by hex nut locations. Studs for removal are indicated by shaded circles.

**Table 3 - Component Weights for Flexflo Surge Relievers**

Size	Class	Component Weight											
		Complete Reliever		Body Assembly		Cover Plate		Body Sleeve		Tube & Core*		Core	
		lbs	kg	lbs	kg	lbs	kg	lbs	kg	lb	kg	lbs	kg
12"	150	2875	1304	1627	738	145	66	602	273	436	198	418	190
	300	4081	1851	1784	809	167	76	606	275	453	206	423	192
	600	6436	2919	2485	1127	174	79	937	425	592	269	562	255
10"	150	1871	849	912	414	100	45	297	135	220	100	210	95
	300	2883	1308	1189	539	121	55	409	185	237	108	212	96
	600	3837	1740	1465	665	128	58	557	253	270	123	245	111
8"	150	1390	630	746	337	76	35	299	136	157	71	151	68
	300	1834	832	796	361	89	41	321	146	167	76	152	69
	600	2591	1175	925	419	89	41	321	146	198	90	183	83
6"	150	891	404	457	207	52	24	165	75	72	33	68	31
	300	1124	5510	525	238	59	27	203	92	78	35	69	31
	600	1803	818	739	335	68	31	330	149	124	56	109	49
4"	150	491	223	180	82	28	13	36	17	25	11	23	10
	300	505	229	164	74	28	13	32	15	27	12	24	11
	600	729	331	214	97	27	12	62	28	38	17	33	15

**Table 4 - Torque Specifications for Flexflo Sure Reliever Tie Studs**

Size	Class	Stud Size	Initial Torque (ft-lbs)	Intermediate torque (ft-lbs)	Final torque (ft-lbs)
12"	150	1"-8	85	169	254
	300	1 1/4"-8	249	498	747
	600	1 5/8"-8	576	1153	1729
10"	150	1"-8	81	161	242
	300	1"-8	140	280	420
	600	1 3/8"-8	344	688	1033
8"	150	7/8"-9	68	136	204
	300	1"-8	104	208	311
	600	1 1/4"-8	224	447	671
6"	150	7/8"-9	35	70	104
	300	7/8"-9	72	143	215
	600	1 1/4"-8	146	293	439
4"	150	3/4"-10	22	44	67
	300	7/8"-9	68	136	204
	600	1 1/4"-8	188	375	563

NOTE: Applies only to properly lubricated contact face and threads.



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## Flexflo® Top Entry Model 900TE OPERATIONS AND MAINTENANCE MANUAL

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### Scope

This instruction covers field assembly, disassembly, and maintenance of Model 900TE Flexflo's.

### General Description

The Flexflo Model 900 TE consists of 4 major parts, the housing, the closure, the core and the tube. The tube fits over the core and inside the body. The closure holds the core and tube in the body, and allows access to the tube and core without removal of the valve from the pipeline.

The opening of the Flexflo occurs when the tube lifts off the core, allowing flow between the tube and the core. The closing of the Flexflo happens in the opposite manner with the tube sealing on the core. The position of the tube is determined by four variables; the upstream pressure; the downstream pressure; the jacket pressure; and the tube characteristics. The jacket pressure is the pressure which is in the sealed annular space between the tube and the housing. When the jacket pressure equals the upstream pressure the valve will shut bubble tight; but if the jacket pressure is lower than the upstream pressure the valve will open as determined by the four variables.

### Installation on Pipeline (Suggestion)

1. Place valve with gasket in pipeline, with arrow on body pointing in direction of flow. Lubricate gaskets prior to installation on valves and piping. Support valve.
2. Replace and tighten evenly line flange bolting. Torque.
3. Replace pilot and associated tubing as required. (Ref. Document W-900TE-829S1-BOO-1 for pilot hook up).

### Removal from Pipeline

**CAUTION**

**Before starting removal, isolate Flexflo from pipeline pressure and release all pressure from body and jacket.**

1. Disconnect sense tubing from pilot. Disconnect any piping that will inhibit removal of the valve from the pipeline. If the pilot does not inhibit removal or disassembly it may be left on the valve.
2. Support valve and loosen line flange bolting so that the valve will clear from bolting.
3. Lift valve from pipeline.

### Dissassembly (See Figure 1)

**CAUTION**

**Before disassembly, isolate Flexflo from pipeline pressure and release all pressure from body and jacket.**

1. Remove hex head bolts that hold the closure to the housing. Remove closure.
2. Pull core and tube from housing. A tapped hole is provided to facilitate removal of the core by using a standard capscrew or eyebolt as a puller tool, (not provided). The capscrew or eyebolt should have threads as given below.

Core	Thread Sizes
1.5"	1/4-20 UNC
2"	1/4-20 UNC
3"	3/8-16 UNC
4"	3/8-16 UNC
6"	3/8-16 UNC

- Remove the tube from the core, either by cutting off or by prying with a screwdriver.

**CAUTION**

**Take care not to scratch sealing surface on core barrier when removing tube.**

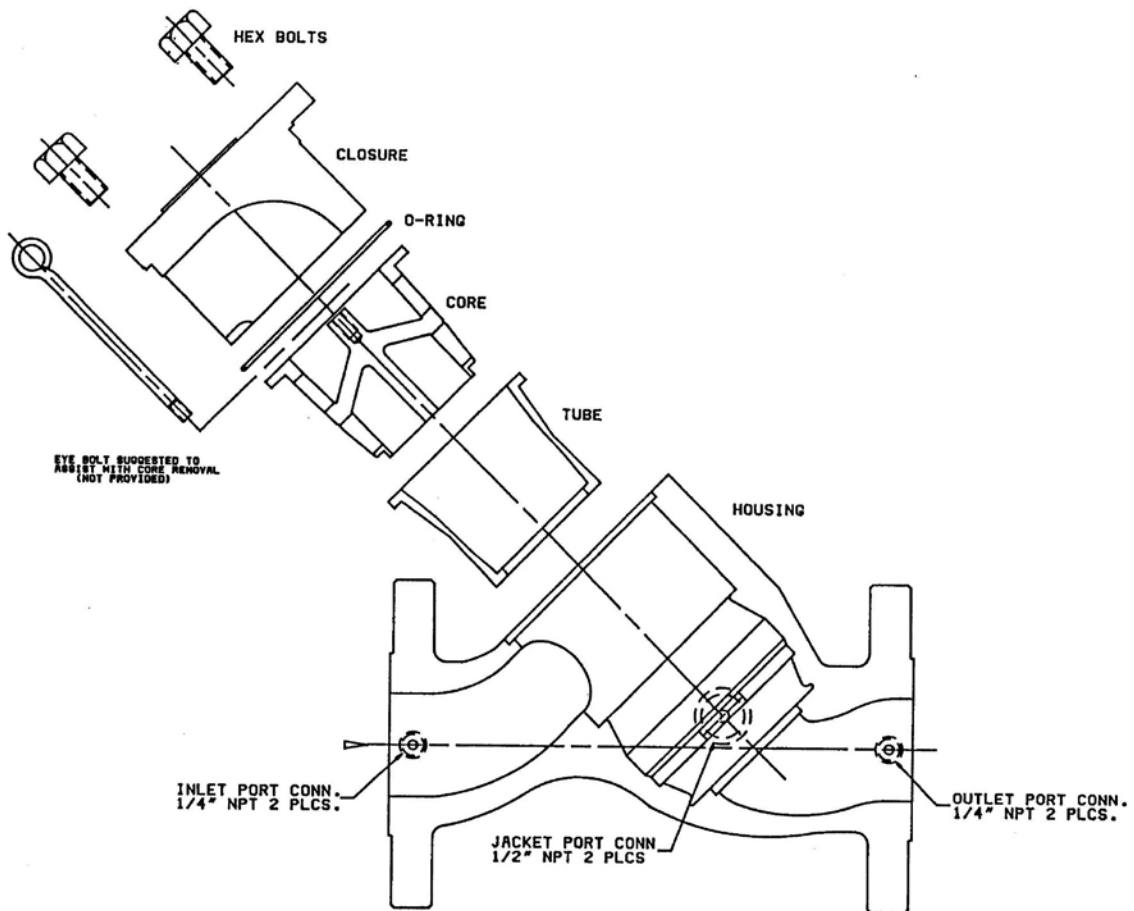
**Cleaning and Inspection**

- All parts should be thoroughly cleaned before inspection.
  - Inspect tube for blisters, tears or cracks. Replace if damaged.
  - Examine o-rings and replace if damaged.
  - Examine all hex head bolts and corresponding tapped holes in housing for damage. Replace or repair if damaged.
  - Examine the core for damage. Replace if damaged.
- See **Table 2** for standard replacement part numbers.

**Assembly (See Figure 1)**

- Lubricate interior surface of the tube and exterior surface of the core with silicone grease (Dow Corning Molykote 55M or equal) or glycerine.
- Press tube on core.
- Clean and inspect o-ring. Replace as necessary. Install in body.
- Clean hex head bolts and mounting holes in housing. Lubricate threads with an anti-seize grease.
- Seat tube and core firmly in the housing cavity. Install closure.
- Install hex head bolts. Tighten bolts evenly to torque values specified in Table 1.

**Figure 1**



**Table 1**

Valve Size ANSI Class	Bolt (Lubed)	Torque (ft-lbs) +5% allowed
6" CL600	7/8" – 9 NC	155-160
6" CL300	7/8" – 9 NC	50-55
6" CL150	7/8" – 9 NC	50-55
4" CL600	1/4" – 10 NC	90-95
4" CL300	1/4" – 10 NC	50-55
4" CL150	1/4" – 10 NC	50-55
3" CL600	5/8" – 11 NC	73-75
3" CL300	5/8" – 11 NC	50-55
3" CL150	5/8" – 11 NC	50-55
2" CL600	1/4" – 13 NC	41-45
2" CL300	1/4" – 13 NC	41-45
2" CL150	1/4" – 13 NC	41-45
1.5" CL600	3/8" – 16 NC	21-25
1.5" CL300	3/8" – 16 NC	21-25
1.5" CL150	3/8" – 16 NC	21-25

**Table 2**

Size	O-Ring	Tube <sup>1</sup>	Core		Hex Bolt <sup>2</sup>
			100% Capacity	50% Capacity	
1-1/2"	N95-01001-XXX	355-01004-XXX	364-01001	364-01002	N20-56122
2"	N95-61576	355-02001-XXX	364-02001	364-02002	N20-58122
3"	025-05408-615	355-03001-XXX	364-03001	364-03002	N20-60162
4"	025-06706-615	355-04001-XXX	364-04001	364-04002	N20-62202
6"	N91-61545	355-06001-XXX	364-06001	364-06002	N20-64262

**NOTES:**

1 For tube material, specify material code,-XXX from Flexflo brochure.

2 Standard trim (Non-NACE).

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