Model 887

INSTALLATION AND OPERATION INSTRUCTIONS

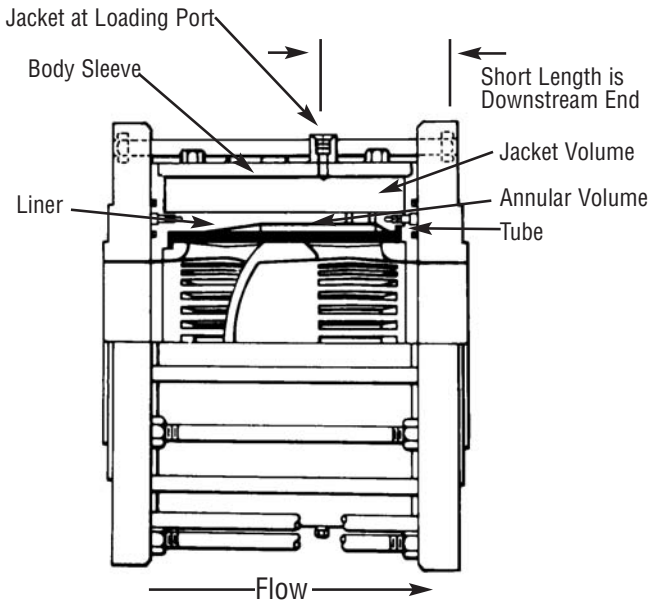
Scope

Instructions for installing and determining the Jacket Pressure Set Point (JPSP) for all sizes of REDQ Flexflo Model 887 Surge Relievers.

Construction

The Flexflo Surge Reliever consists of a slotted metal Core over which a flexible rubber tube is installed. REDQ 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).

Figure 1 - Partial Cutaway of 887 Reliever



Principles of Operation

(Refer to Figure 1 to identify parts).

When the inlet pipeline pressure (upstream of the 887) plus the added pressure required to over come 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 887.

When the pressure at the inlet of the 887 valve exceeds the Jacket Pressure Set Point pressure by the Tube's DF Minimum pressure, the 887 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 887 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/charge the 887 Flexflo's Jacket Space.

3) All connections for the Jacket supply gas must have no leaks.

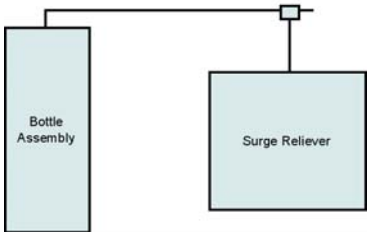
4) The range of the Jacket Pressure gauge should be approximately twice the desired Set Point Pressure.

5) Allow sufficient space for accessing and servicing the 887 Surge Reliever with lifting equipment.

Methods to adjust and hold pressure in the jacket

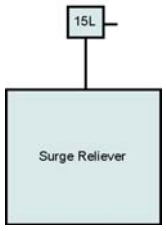
A Bottle assembly. See Figure 2. The REDQ bottle assembly provides a convenient method to hold pressure in the jacket See adjusting pressure with a bottle assembly on page 3.

Figure 2



B. REDQ 15L or 15LH. 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:

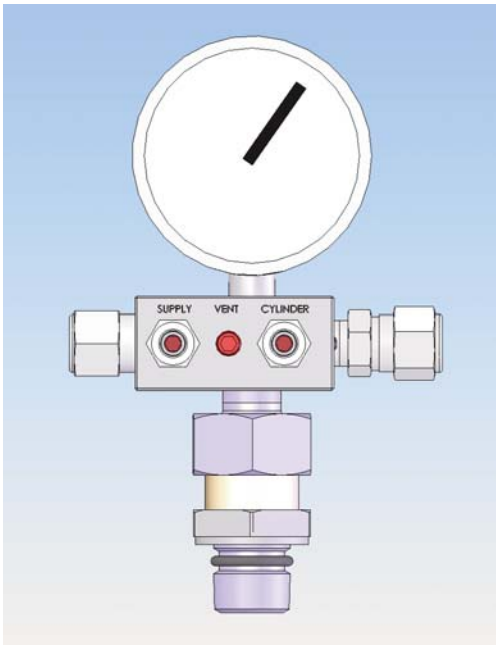
1. Chosen Jacket pressure could be low enough that even with temperature and pressure changes the surge reliever will open when needed.
2. A method could be provided by the customer to keep the temperature around the surge reliever constant
3. Bottle assembly can be buried in the ground
4. Shade the surge reliever and bottle assembly
5. Method B with a REDQ 15L or 15LH pressure 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.
   b. 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.
   c. Open the valve to the external pressure source.
   d. Slowly open the Cylinder Valve and the Supply Valve to pressurize the Bottles and the Jacket Space.
   e. 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 pres sure and the Bottles are pressurized to the desired set point.
   f. Snug the two threaded Collars and tighten the two Lock Nuts to 8 ft-lbs.



Jacket Assembly

Charging Supply Connector

Cylinder Connector

Lock Nut

Nut Collar

REDQ Model 887 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 887.

1 Increase the pressure in the Jacket Loading port to a pressure slightly (approximately 50 psig) above the desired Relief Set Point pressure (the Line pressure where the 887 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 887 tube.

2 Gradually apply and maintain the desired Line pressure to the inlet of the 887 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 887 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 informationshows 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:

A. REDQ Tube Differential chart adjustment method:

CAUTION Do not exceed the maximum rated diffential pressure of the Tube at any time.

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
   ii. DF Max = 41 psid
6. Determine the Jacket Pressure Set Point: Subtract DF Min from the pressure determined in item 4. of this example, the Designed Relief Pressure… 900psig – 23psid = 877 psig. 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…
   41psid + 877 psig = 918 psig.
   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 at a flow rate of 1000 GPM.
2. Introduce Jacket pressure of 950 psig with a dry gas.

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

3. Introduce inlet line pressure of 900 psig
4. Reduce the Jacket pressure slowly until flow just begins; record the Jacket pressure (assume 877 psig)… Inlet pipeline pressure – Jacket Pressure Set Point pressure just flowing or -
   900 psig - 877 psig = 23 +/- psid = DF Min.
5. Continue to reduce the Jacket Pressure Set Point pressure slowly until flow of 1000 GPM is attained; record the Jacket Pressure Set Point pressure (assume 870 psig), approximately 900 – 870 = 30 +/- psig.
6. With the Jacket Pressure Set Point pressure set at 870 psig. The 887 valve will flow 1000 GPM when the pipeline pressure reaches approximately 900 psig = (870 psig + 30 psig).

Tube Differential Pressure – REDQ Model 887

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

Valve Size	Tube / Durometer	ANSI Class	DF Minimum 75 F	DF Maximum 75 F	DF Minimum 0 F	DF Maximum 0 F
4	Hydrin 725/40	150	3 psid	7 psid	17 psid	23 psid
4	Hydrin 893/50	150	5 psid	13 psid	20 psid	27 psid
4	Hydrin 878/65	300	12 psid	30 psid	27 psid	48 psid
4	Nitrile 846/75	600	20 psid	51 psid	30 psid	66 psid
6	Hydrin 725/40	150	3 psid	6 psid	17 psid	21 psid
6	Hydrin 893/50	150	5 psid	12 psid	19 psid	26 psid
6	Hydrin 878/65	300	11 psid	28 psid	26 psid	43 psid
6	Nitrile 846/75	600	19 psid	46 psid	24 psid	60 psid
8	Hydrin 725/40	150	2 psid	5 psid	16 psid	20 psid
8	Hydrin 893/50	150	4 psid	9 psid	18 psid	23 psid
8	Hydrin 878/65	300	9 psid	22 psid	23 psid	38 psid
8	Nitrile 846/75	600	10 psid	23 psid	13 psid	40 psid
10	Hydrin 725/40	150	2 psid	5 psid	16 psid	20 psid
10	Hydrin 893/50	150	4 psid	9 psid	18 psid	24 psid
10	Hydrin 878/65	300	9 psid	23 psid	23 psid	39 psid
10	Nitrile 846/75	600	10 psid	24 psid	23 psid	41 psid
12	Hydrin 725/40	150	2 psid	5 psid	14 psid	20 psid
12	Hydrin 893/50	150	4 psid	9 psid	18 psid	23 psid
12	Hydrin 878/65	300	9 psid	23 psid	23 psid	39 psid
12	Nitrile 846/75	600	10 psid	24 psid	23 psid	41 psid
4	Tornac 740/85	600	30 psid	66 psid	39 psid	86 psid
6	Tornac 740/85	600	24 psid	65 psid	31 psid	83 psid
8	Tornac 740/85	600	15 psid	31 psid	20 psid	40 psid
10	Tornac 740/85	600	15 psid	30 psid	20 psid	39 psid
12	Tornac 740/85	600	14 psid	30 psid	19 psid	39 psid
4	Tornac 744/75	300	20 psid	51 psid	35 psid	66 psid
6	Tornac 744/75	300	19 psid	46 psid	33 psid	60 psid
8	Tornac 744/75	300	12 psid	28 psid	26 psid	42 psid
10	Tornac 744/75	300	11 psid	25 psid	25 psid	39 psid
12	Tornac 744/75	300	11 psid	24 psid	25 psid	41 psid
4	Tornac 745/65	150	13 psid	33 psid	27 psid	48 psid
6	Tornac 745/65	150	12 psid	30 psid	26 psid	45 psid
8	Tornac 745/65	150	10 psid	28 psid	25 psid	42 psid
10	Tornac 745/65	150	9 psid	23 psid	23 psid	37 psid
12	Tornac 745/65	150	8 psid	22 psid	22 psid	37 psid

NOTE: Nitrile rubber increases in hardness with decrease in temperature. 40-70 durometer may increase by 14-16 points from 80 F to 0 F 85 durometer may increase by 6-9 points from 80 F to 0 F

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