

Pressure Relief Valve

Maintenance Manual

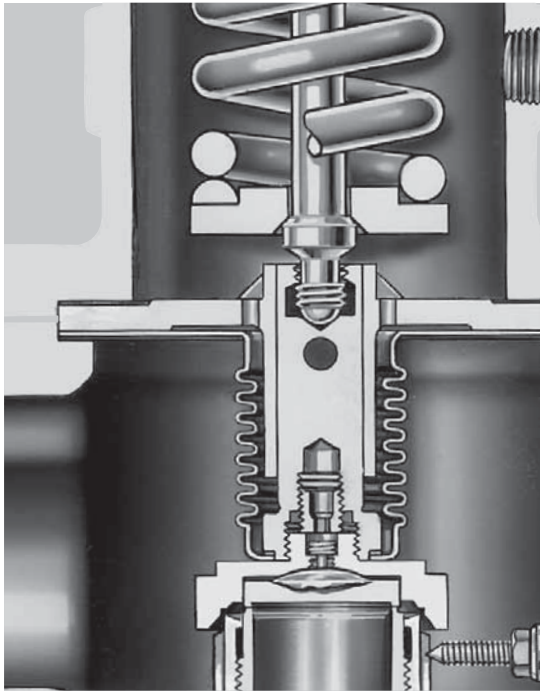
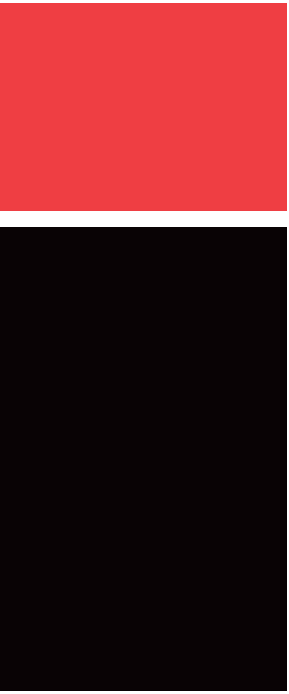




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1. Introduction

This Maintenance Manual is intended to present information you will require to keep your Farris valves in proper working order. Generally, maintenance becomes necessary as a result of dirt or scale in the lines, exposure to service conditions, or improper installation.

This manual is designed to provide basic maintenance and repair information for all Farris spring loaded ASME Section VIII Pressure Relief Valves. In all cases, repairs should only be performed by personnel who have received proper training. Training programs designed to meet your needs can be arranged by contacting the Farris Factory.

If a valve repair requires replacement parts, only Farris manufactured components should be used. Use of parts from other than the original manufacturer will lead to potentially dangerous operating conditions.

When following these instructions refer to the drawing for your specific product.

2. Safety Tips

- Make sure that the Pressure Relief Valve is isolated from the pressure source before it is removed.
- Wear protective clothing when removing valves from service in order to prevent coming in contact with any toxic or corrosive fluids which may be trapped inside the valve.
- Stand clear of the discharge side of a Pressure Relief Valve when testing.
- Pressure Relief Valves should always be installed upright in the vertical position as the internal parts are designed to operate in this position.
- Do not carry valves by the test levers.
- Make sure all piping is properly supported to avoid placing excessive stress on the body or bonnet.

3. Inspection

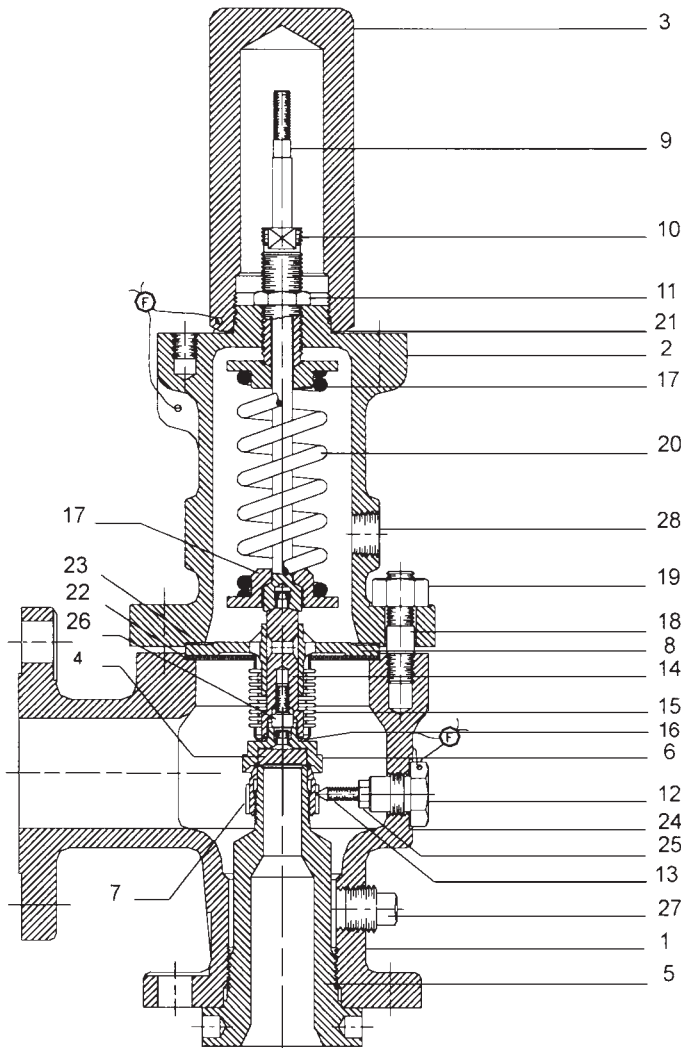
Upon receipt of the valve at the repair facility, a detailed examination should be made prior to disassembly. Flange facings and threaded connections should be examined for signs of damage or corrosion. If possible the valve should be tested to verify its as-received set pressure. The valve should be examined to determine if the wire seals are still in place. These seals are designed to prevent unauthorized tampering with external adjustments.

4. 2600, 2600L, & 2600S Series Valves

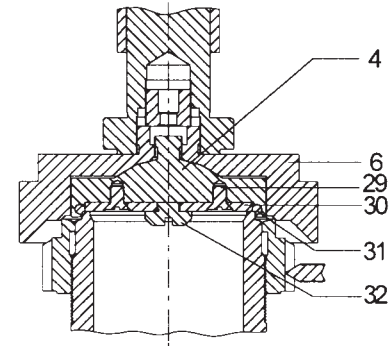
The disassembly of all valves follows the same basic procedure. This section pertains to 2600, 2600S, and 2600L Series Valves. Please refer to Figure 1.

1. Place the valve at a suitable height. The work surface should be clean and strong enough to handle the weight of the parts and the forces required during disassembly and assembly.
2. Valves should be secured to the work surface to prevent them from falling over.
3. Remove all wire seals from external adjustments.
4. Unscrew the cap by turning counterclockwise. For valves with open or packed lever assemblies see Section 6. Remove the cap gasket.
5. Remove the blow down ring lock screw and gasket. Rotate the blow down ring up on the nozzle and record the number of notches and/or turns required for it to hit the disc holder. This number will be used during assembly to place the blow down ring in the proper location.
6. Measure the distance from the top of the spring adjusting screw to the top of the bonnet. Use this measurement when reassembling the valve to approximately duplicate the original set pressure.
7. Using a smooth jaw wrench, hold the spring adjusting screw and remove the spring adjusting screw jam nut.
8. While holding the stem, remove the spring adjusting screw by turning counterclockwise.
9. Remove the body hex nuts and lift the bonnet (yoke) off the body.
10. Remove spring and buttons. Note: on some valves the upper and lower spring buttons are different.
11. Pull up on stem and lift out the trim assembly consisting of the sleeve guide, stem retainer, disc holder, disc and bellows (if so equipped).
12. Hold the top of the stem retainer and pull up on stem and turn counterclockwise to remove from the stem retainer. Remove the sleeve guide.
13. Remove the disc from the disc holder by holding the assembly with the disc facing down and rotating the disc clockwise with the tip of your finger. The disc will then drop free of the disc holder. See Figure 1 for details on O ring seat valves.
14. On all but the "D" and "E" orifice bellows valves, the disc holder and stem retainer are held together by the disc holder lock screw. Insert the proper size allen wrench into the opening in the disc holder. Turn the allen screw into the stem retainer clockwise. Mount the disc holder in a vise using the machined flats on the side. Insert a rod in the hole in the stem retainer and unscrew the two parts. On bellows valves the bellows and gasket can now be removed.
15. Turn the body over and remove the nozzle from the body. Remove the blow down ring from the nozzle.
16. Remove any body drain plugs and bonnet vent plugs.
17. Proceed to Section 7 for instructions on cleaning and lapping.
18. Reassemble valve in reverse order, making sure that lapped nozzle and disc seating surfaces are not damaged. All threaded connections should be coated with an appropriate lubricant. Gaskets and O rings should be replaced.
19. Proceed to Section 8 for testing procedures.

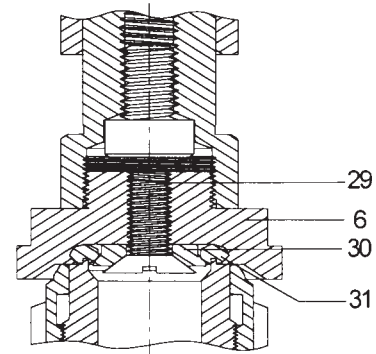
Figure 1: 2600, 2600S & 2600L



Details - Optional O Ring Seats



L through T orifice



D through K orifice

Figure 1: 2600, 2600L & 2600S Series Parts List

1	Body	12	Lock Screw (B.D.R.)	23	Bonnet Gasket
2	Bonnet or Yoke	13	Lock Screw Stud	24	Lock Screw Gasket
3	Cap	14	Stem Retainer	25	Hex Nut (B.D.R.L.S.)
4	Disc	15	Bellows*	26	Lock Screw (Disc Holder)
5	Nozzle	16	Bellows Gasket*	27	Pipe Plug (Body)
6	Disc Holder	17	Spring Button	28	Pipe Plug (Bonnet)*
7	Blow Down Ring (B.D.R.)	18	Body Stud	29	Flat Head Machine Screw
8	Sleeve Guide	19	Hex Nut (Body)	30	O Ring Retainer
9	Stem	20	Spring	31	O Ring Seat Seal
10	Spring Adjusting Screw	21	Cap Gasket	32	Jack Screw Plug
11	Jam Nut (Spr. Adj. Scr.)	22	Body Gasket		

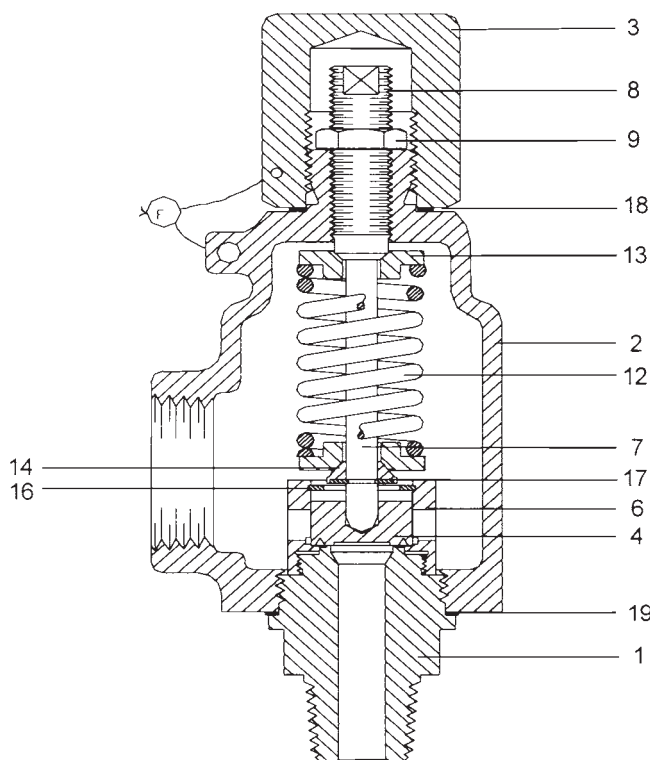
*Conventional design does not use bellows and bellows gasket, but does have bonnet pipe plug. Bellows valves do not come with a bonnet pipe plug.

5. Threaded Valves

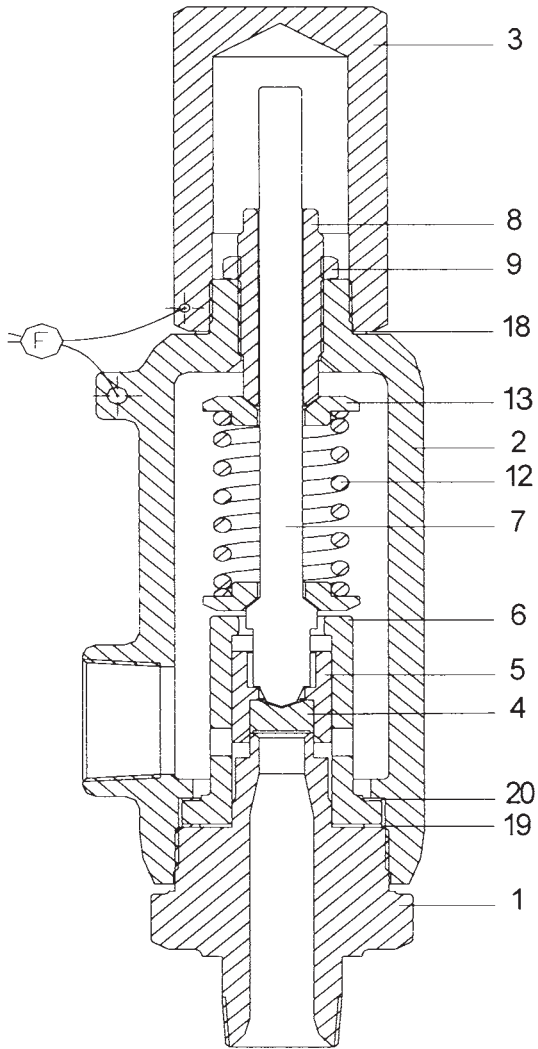
The disassembly of all valves follows the same basic procedure. This section pertains to 2700, 2850, 2856, 1890, and 1896M Series Valves. Please refer to the appropriate drawings.

1. Place the valve at a suitable height. The work surface should be clean and strong enough to handle the weight of the parts and the forces required during disassembly and assembly.
2. Mount valve vertically in a vise using the flats on the body.
3. Remove all wire seals from external adjustments.
4. Unscrew the cap by turning counterclockwise. Remove the cap gasket. For valves with open or packed lever assemblies, see Section 6.
5. Measure the distance from the top of the spring adjusting screw to the top of the bonnet. Use this measurement when reassembling the valve to approximately duplicate the original set pressure.
6. Using a smooth jaw wrench, hold the spring adjusting screw and remove the spring adjusting screw jam nut.
7. While holding the stem with a smooth jaw pliers, remove the spring adjusting screw by turning counterclockwise.
8. On 2850 & 2856 Series, remove the blow down ring lock screw and gasket.
9. Thread a pipe into the outlet and turn the bonnet counterclockwise, removing it from the body.
10. Remove the stem with spring and buttons attached. On Series 2850 and 2856 valves, the upper and lower spring buttons are different.
11. Remove the spring and buttons from the stem.
12. On the 2850 and 2856 Series, the disc is held to the stem with a pin. The disc will come off when the pin is removed.
13. 2700 Series Only: Remove the body from the vise and invert assembly, carefully removing the guide which contains the disc and disc holder. The disc and disc holder may now be removed from the guide.
 - 2850 & 2856 Series Only: Unscrew the blow down ring from the body.
 - 1890 & 1896M Only: Remove the lift stop ring from the guide. Remove the body from the vise and carefully invert it, allowing the disc to fall free. Unscrew the guide from the body.
14. Proceed to Section 7 for instructions on cleaning and lapping.
15. Reassemble valve in reverse order making sure that lapped body and disc seating surfaces are not damaged. All threaded connections should be properly coated with an appropriate lubricant.
16. Proceed to Section 8 for testing procedures.

Figure 2: Series 1890 & 1896M



Series 2700



Series 2850 & 2856

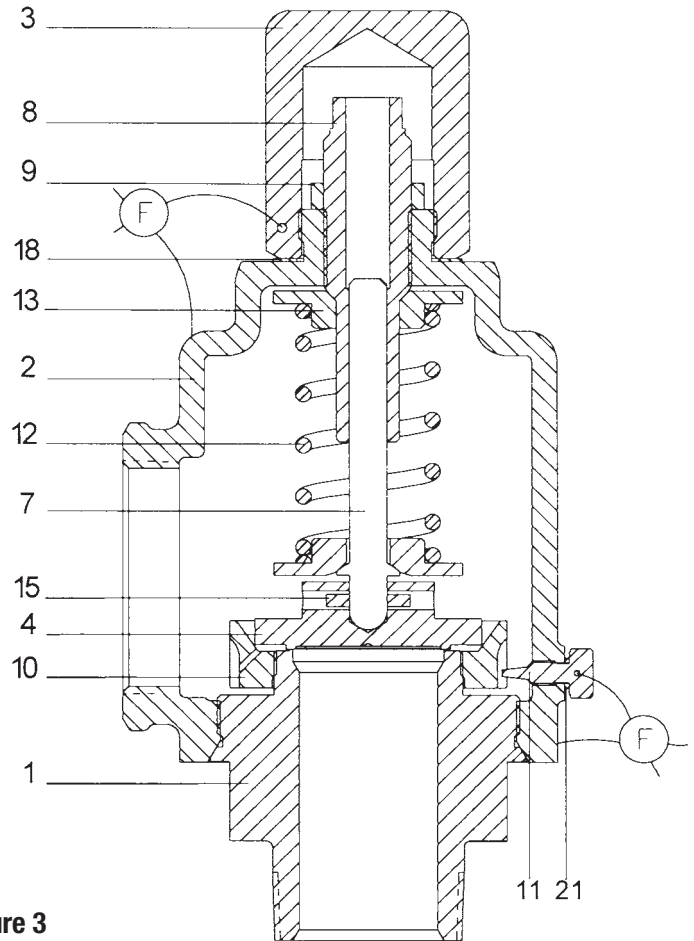


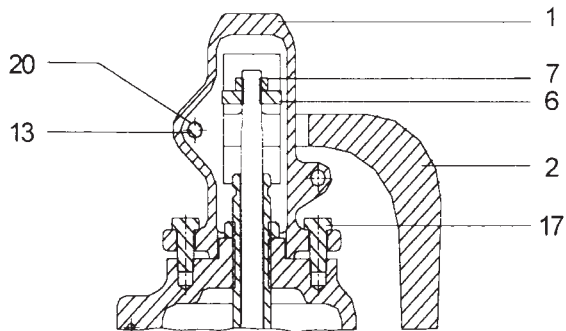
Figure 3

Figure 3: Parts List - Threaded Valves

1	Body	8	Spring Adjusting Screw	15	Grooved Pin
2	Bonnet	9	Jam Nut (Spr. Adj. Scr.)	16	Lift Stop Ring
3	Cap	10	Blow Down Ring	17	Retaining Ring, Stem Shoulder
4	Disc	11	Lock Screw (B.D.R.)	18	Cap Gasket
5	Disc Holder	12	Spring	19	Body Gasket
6	Guide	13	Spring Button	20	Guide Gasket
7	Stem	14	Stem Shoulder	21	B.D.R. Lock Screw Gasket

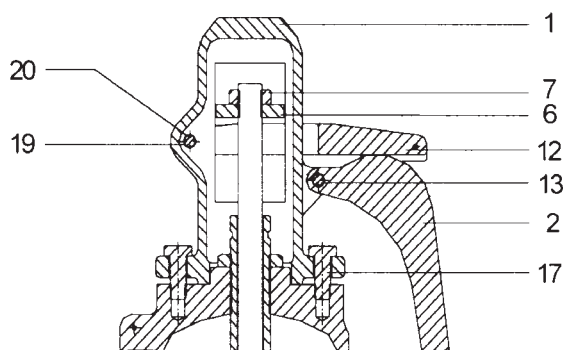
6. Lever Assemblies - Figure 4

A. 2600 & 2600S Series



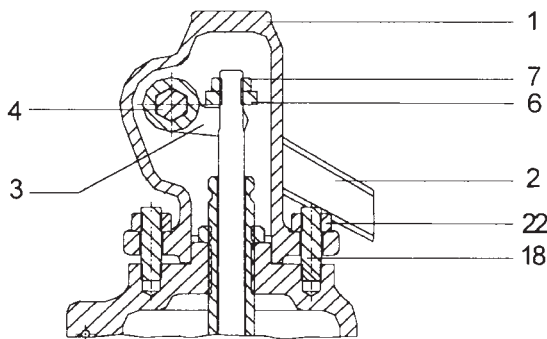
Open Lever: Single Acting

150# & 300#LW Flanges
All Sizes Except 8 x 10



Open Lever: Double Acting

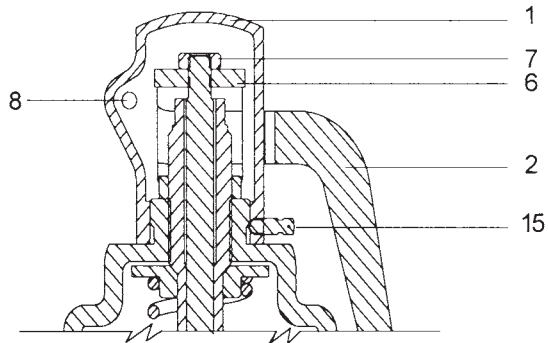
1 x 2 thru 6 x 10 300# thru 2500# Flanges
Sizes 8 x 10, All Types



Packed Lever

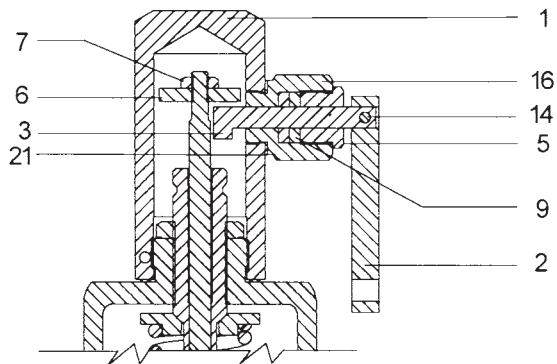
All Sizes

B. Threaded Valves



Open Lever

Threaded Valves



Packed Lever

Threaded Valves

Parts List - Lever Assemblies

Item	Part Name	Item	Part Name
1	Cap	12	Test Lever Fork
2	Test Lever	13	Lever, RD. HD. Rivet
3	Cam	14	Groove Pin
4	Cam Shaft	15	Set Screw
5	Gland	16	Gland Nut
6	Stem Test Washer	17	Cap Screw
7	Stem Jam Nut	18	Cap Stud
8	Button Head Rivet	19	Fork, RD. HD. Rivet
9	Packing Ring	20	Cotter Pin
10	Plain Washer*	21	Gland Nut Gasket
11	Lever hex Jam Nut*	22	Cap Hex Nut

*These Items used on 2600 with packed lever are not shown.

7. Cleaning & Lapping

Each part should receive a visual examination for signs of wear and corrosion. Parts that show signs of excessive corrosion or wear should be replaced with genuine Farris Factory supplied parts.

All parts should be thoroughly cleaned with an appropriate solvent. Particular attention should be paid to guiding surfaces such as stems, stem retainers, and guides. These surfaces should be free of corrosion or signs of pitting.

Stems should be examined to determine if they are straight. The nozzle (body on screwed valves) should be examined to ensure there is no foreign matter that could restrict the valve's flow. All threads should be examined to make sure there is no damage that will interfere with assembly or operation of the valve.

Flange facings should be examined for signs of damage that would inhibit proper sealing. Gaskets and soft goods, such as O ring seals should always be replaced. Never perform a repair using the old gaskets and O rings.

To ensure proper valve performance, the nozzle (seat) and disc must be lapped flat to a mirror finish. This can be accomplished using cast iron lapping blocks, Pyrex lapping glasses or on a lapping machine. These devices are used in conjunction with special lapping compounds (See Table 1).

Lapping Procedure:

1. Use a cast iron lapping block or Pyrex lapping glass that is perfectly flat.
2. Select the appropriate compound from Table 1 and place a small amount on the lap. When lapping the disc, use a light figure eight motion (Figure 5). Frequently lift the disc away from the glass or block to get a new bite on the compound.
3. Follow the same procedure when lapping nozzles or screwed valve bodies except that the lapping block should be placed on the nozzle. Use the same figure eight motion, frequently lifting the glass or block to get a new bite on the compound.

4. Lap to a mirror finish. When done, make sure all compound is completely removed from the parts using a suitable solvent. Handle the parts with care to avoid scratching the seating surfaces.

Table 1

Part No.	Grade	Finish	Size
18632X1 (055)	3F	Roughing	1/2 oz. tube
18633X1 (075)	38-500	Medium	1/2 oz. tube
18634X1 (105)	38-1200	Final	1/2 oz. tube

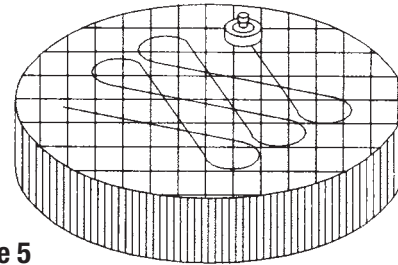


Figure 5

8. Testing Procedures

Testing consists of adjusting the valve set pressure, performing a seat leakage test, and a back pressure test. The set pressure test is always performed first.

Set Pressure Test:

1. Set pressure testing must always be performed using the appropriate test fluid shown below.

Table 2

Pressure Relief Valve Test Fluids	
Service Fluid	Test Fluid
Air, gas & vapor	Air or gas
Steam	Steam*
Liquid	Water

*Air may be used for ASME Code Section VIII valves.

2. Mount the valve on the test stand making a note of the set pressure and cold differential test pressure (CDTP). The valve will be set at the CDTP. On valves with blow down rings, set the ring two notches down from contact with the disc holder (2600 Series) or disc (2850 & 2856 Series).
3. Hold the stem tightly and tighten (turn clockwise) the spring adjusting screw to increase the set pressure. Make sure the stem does not rotate while tightening the adjusting screw as this can damage the seat and disc.
4. Slowly raise the test drum pressure and observe the opening (set) pressure. The set pressure on air and steam is the point at which it makes an audible pop. For water, the set point is the first continuous flow of liquid that forms a stream perpendicular to the outlet approximately 1/16" thick.
5. If necessary, reduce the test drum pressure 25% below the opening pressure and adjust the spring adjusting screw. Repeat this until the valve opens at the required pressure, designated as the cold differential test pressure (CDTP). The set pressure tolerance is equal to +3% of the set pressure.

6. Lock the jam nut in place and pop the valve once more to ensure the set pressure adjustment was not disturbed.
7. On 2600 Series valves, run the blow down ring down to the original position recorded during disassembly. For the 2850 & 2856 Series, set the ring at the following position down from contact with the disc: 3/4" inlet - 6 notches, 1" & 1 1/2" inlets - 22 notches, and 2" & 3" inlets - 33 notches. Install the cap or lever assembly and wire seal the cap and blow down ring lock screws to prevent tampering.

Back Pressure Testing:

1. The back pressure test applies to all valves designed to discharge to a closed system. This includes valves with plain caps and packed lever assemblies. Open lever valves and valves with exposed springs (open bonnet) do not require this test.
2. The secondary pressure zone of all valves exceeding 1" inlet size shall be tested with air or other suitable gas at a pressure of at least 30 psi. A suitable leak detection solution will be used to verify tightness of all gasket joints and vent/drain plugs.
3. If leakage is detected at any location, the valve should be reworked to eliminate the leak path.

8. Testing Procedures (continued)

Seat Leakage Test:

1. Next perform a seat leakage test. With the valve mounted on the test stand, attach a blind flange test fixture as shown in Figure 6 (air, gas, & vapor service valves only). For steam and water seat leakage testing, see paragraphs 4 and 5.
2. For metal and soft seated valves the pressure is held at 90% of cold differential test pressure when the CDTP is greater than 50 psig. For CDTP 50 psig and below, the pressure should be held 5 psig below the CDTP.
3. Bring the pressure up and hold it for one minute for valves up to 2" inlet size, 2 minutes for valves from 2 1/2" to 4" inlet size, and 5 minutes for valves with inlet sizes 6" and larger. Then count the number of bubbles for one minute. The acceptance criteria for metal seat valves are per the following table. For O ring and soft seat valves, there should be no leakage (zero bubbles per minute).

Seat Tightness: Air, Gas & Vapor Service			
Set Pressure		Leakage Rate in Bubbles Per Minute	
psig	barg	Orifice Size \leq 0.307 Sq. In (200 mm ²)	Orifice Size < 0.307 Sq. In (200 mm ²)
15 to 1000	1.03 to 68.9	40	20
1500	103	60	30
2000	138	80	40
2500	172	100	50
3000	207	100	60
4000	276	100	80
5000	345	100	100
6000	413	100	100

Table 3

4. Steam: Test pressure per paragraph 2 shall be applied for 3 minutes before the seat tightness test. The valve should be observed for leakage for at least one minute. There should be no visible sign of leakage at the valve outlet when viewed against a black background.

Where the Code allows ASME Section VIII steam valves to be tested on air, seat leakage may be verified using the procedure for air, gas, and vapor service valves as listed in paragraphs 1 to 3.

5. Water: Liquid valves are tested on water. Test pressures per paragraph 2 should be applied for a period of two minutes. There should be no visible sign of leakage.

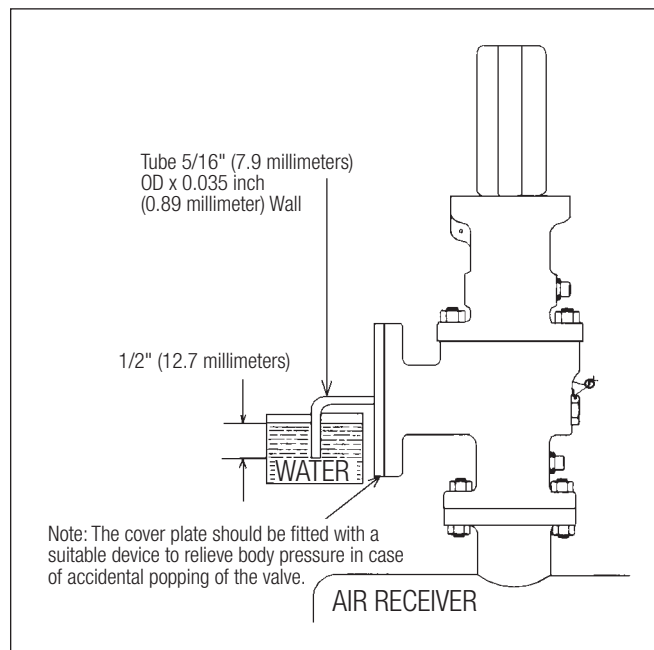


Figure 6

Note: When performing the seat leakage test on valves with open levers, a plain screwed test cap must be used. This will prevent the venting of the test pressure through the top of the bonnet.

Farris Aftermarket Services

FAST Track Turnaround

Farris Engineering is dedicated to making our FAST Program work for you, which is why we have the FAST Track Center at our headquarters in Brecksville, OH. For urgent service requirements, our FAST Track Center has a large inventory of spare parts, finished valves, and dedicated machining and material resources. Farris can provide quick turnaround on inventory and machined parts for both current and obsolete valve designs.

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