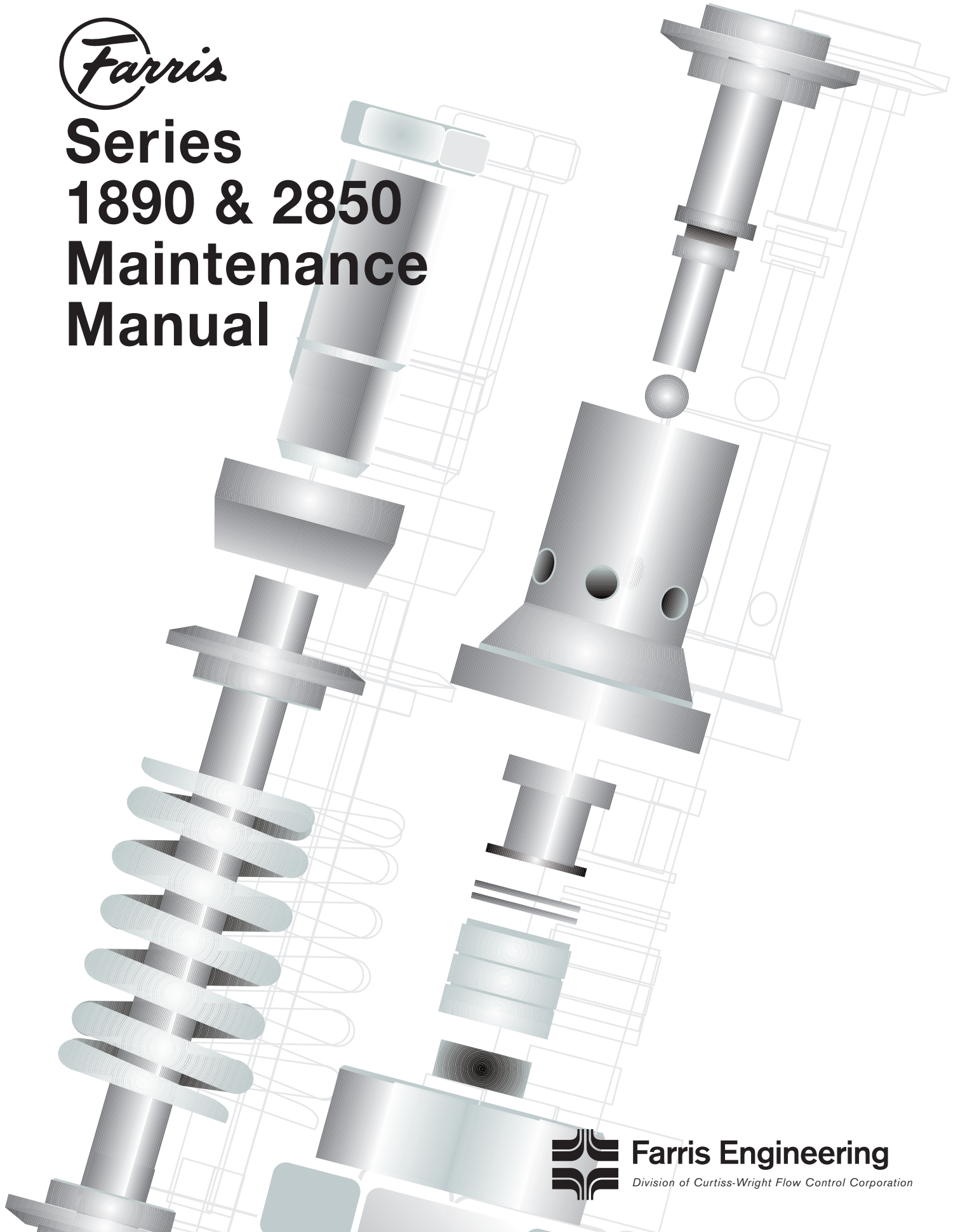




# Series 1890 & 2850 Maintenance Manual



**Farris Engineering**

*Division of Curtiss-Wright Flow Control Corporation*

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(Manual Revision 1, August 1998)

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## 1. Introduction

This manual contains sufficient information to allow trained maintenance personnel to properly repair types 1890, 1892, 2850, and 2852 pressure relief valves.

All of the assembly and disassembly instructions refer to types with plain screwed caps. When repairing types with either open or packed lifting levers, refer to Section 3 which describes the removal of the appropriate lever assembly.

If a valve repair requires replacement parts, only factory-supplied components shall be used. Use of parts from other than the original manufacturer will lead to potentially dangerous operating conditions. If faced with repairs exceeding the scope of this manual, contact the Farris Factory.



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## 2. Disassembly

When a valve is first received in the shop, it should be given a visual inspection to note its condition when removed from service. The valve should then be carefully dismantled. Proper facilities and tools should be available. At each stage in the dismantling process, visually inspect all parts of the valve for evidence of wear and corrosion. If parts are worn, replace them.

### Series 2850 and 2852 (Fig. 2.1)

1. Mount valve vertically in a vise utilizing the flats in the body.
2. Remove wire seal. Unscrew cap by turning counterclockwise. Remove cap gasket. (For open lever and packed lever cap construction, refer to the section on Lifting Lever Assemblies.)
3. 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.
4. Loosen the jam nut.
5. Relieve the spring compression by turning the spring adjusting screw counterclockwise.
6. Remove blowdown ring lock screw and gasket.
7. Thread a pipe into the outlet and turn the bonnet counterclockwise. Lift the bonnet off to expose internal subassembly.
8. Remove the upper spring button, spring and lower spring button from the stem.
9. Remove the stem shoulder. Stem shoulder ring may be a one-piece clip or split rings. Be careful during disassembly; split rings may fall free. Current valves do not use a stem shoulder and split ring. The stem shoulder is an integral part of the stem.
10. Lift the stem with the disc attached. If desired, remove the grooved pin and lift the stem from the disc.
11. Unscrew the blowdown ring from the body.
12. Clean all parts and threaded surfaces thoroughly. Replace all gaskets. Lap the body seat and disc surfaces. (See the section on Lapping for details.)

### Spring Table

Valve No.	Spring Material
2850	316 Stainless Steel
2852	Chrome Alloy, Rust Proofed
2850/S4	316 Stainless Steel
2852/S4	Chrome Alloy, Nickel Plated

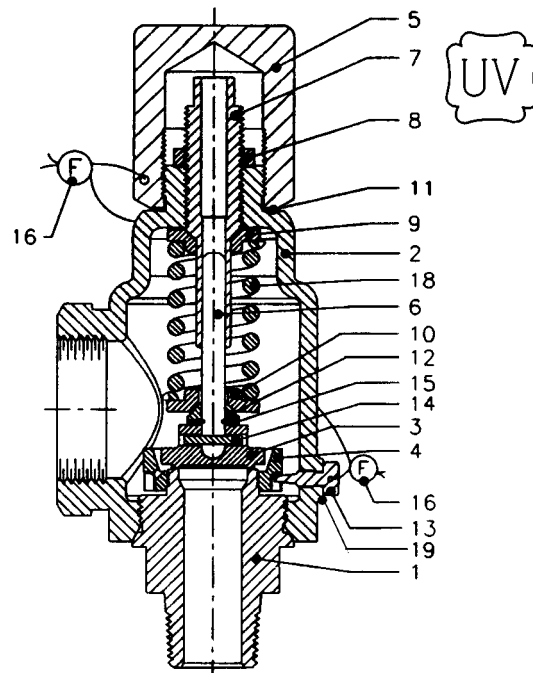


Fig. 2.1 2850 & 2852 Series

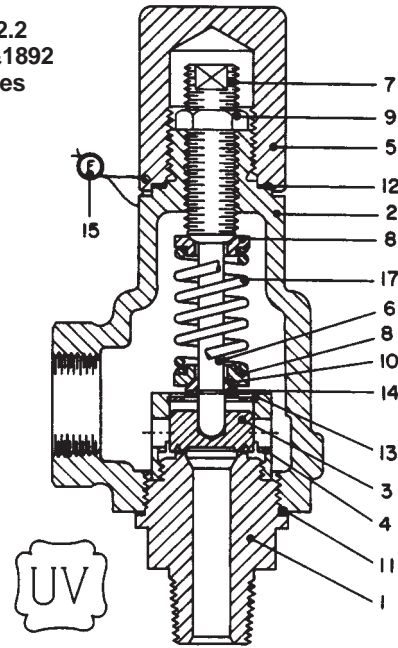
### Bill of Materials

Item	Part Name	Material	
		2850 & 2852	2850/S4 & 2852/S4
1	Body	SA-479 Type 316 St. St. or SA-351 Gr. CF8M St. St.	SA-479 Type 316 St. St. or SA-351 Gr. CF8M St. St.
2	Bonnet	SA-216 Gr. WCB Carbon Steel	SA-351 Gr. CF8M St. St.
3	Disc	316 St. St.	316 St. St.
4	Blowdown Ring	316 St. St.	316 St. St.
5	Cap	Carbon Steel	316 St. St.
6	Stem	316 St. St.	
7	Spring Adj. Screw	316 St. St.	
8	Jam Nut	316 St. St.	
9	Upper Spring Button	316 St. St.	
10	Lower Spring Button	316 St. St.	
11	Cap Gasket	316 St. St.	
12	Stem Shoulder	316 St. St.	
13	Blowdown Ring Lockscrew	316 St. St.	
14	Grooved Pin	316 St. St.	
15	Stem Shoulder Ring	St. St.	316 St. St.
16	Wire Seal	St. St. Wire/Lead Seal	
17	Nameplate (not shown)	Stainless Steel	
18	Spring	See Spring Table	
19	Blowdown Ring L/S Gasket	316 St. St.	

**Series 1890 and 1892 (Fig. 2.2)**

1. Mount valve vertically in a vise utilizing the flats in the body.
2. Remove wire seal. Unscrew cap by turning counterclockwise. Remove cap gasket. (For open lever and packed lever cap construction, refer to the section on Lifting Lever Assemblies.)
3. 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.
4. Loosen the jam nut.
5. Relieve the spring compression by turning the spring adjusting screw counterclockwise.
6. Thread a pipe into the outlet and turn the bonnet counterclockwise. Lift the bonnet off to expose internal subassembly.
7. Lift the stem with spring and buttons attached. Remove upper spring button, spring and lower spring button.
8. Remove the lift stop ring from the guide.
9. By inverting the assembly, remove the disc from the guide.
10. Unscrew the guide from the valve body. Remove body gasket.
11. Clean all parts and threaded surfaces thoroughly. Replace all gaskets. Lap the body seat and disc surfaces. (See the section on Lapping for details.)

**Fig 2.2  
1890 & 1892  
Series**



**Bill of Materials**

Item	Part Name	Material	
		1890 & 1892	1890/S4 & 1892/S4
1	Body	SA-479 Type 316 St. St.	SA-479 Type 316 St. St.
2	Bonnet	SA-216 Gr. WCB Carbon Steel	SA-351 Gr. CF8M St. St.
3	Disc	316 St. St.	316 St. St.
4	Guide	St. St.	316 St. St.
5	Cap, Plain Screwed	Carbon Steel	316 St. St.
6	Stem	St. St.	316 St. St.
7	Spring Adj. Screw	St. St.	316 St. St.
8	Spring Button	St. St.	316 St. St.
9	Jam Nut	St. St.	316 St. St.
10	Stem Shoulder	St. St.	316 St. St.
11	Body Gasket	Flexible Graphite	316 St. St.
12	Cap Gasket	Flexible Graphite	316 St. St.
13	Lift Stop Ring	St. St.	St. St.
14	Retaining Ring - Stem Shoulder	St. St.	St. St.
15	Wire Seal	St. St. Wire/Lead Seal	
16	Nameplate (not shown)	Stainless Steel	
17	Spring	See Spring Table	
N O T E	Lap Joint Stub End (Inlet)	SA-403 Gr. WP 316 St. St.	SA-403-Gr. WP 316 St. St.
	Lap Joint Stub End (Outlet)	SA-234 Carbon Steel	SA-403-Gr. WP 316 St. St.
	Lap Joint Flange (Inlet)	SA-181 or SA-105 Carbon Steel	SA-182-Gr. F316 St. St.
	Lap Joint Flange (Outlet)	SA-181 or SA-105 Carbon Steel	SA-182-Gr. F316 St. St.

**Note:** Items not shown are applicable to the F 1890 Series (Flanged)

**Spring Table**

Valve No.	Spring Material
1890	316 Stainless Steel
1892	Chrome Alloy, Rust Proofed
1890/S4	316 Stainless Steel
1892/S4	Chrome Alloy, Nickel Plated



### 3. Lifting Lever Assemblies

#### A. OPEN LIFTING LEVER (Fig. 3.1)

1. Remove wire seal and cotter pin. Slide out button head rivet to release lever from cap.
2. Remove set screw from base of cap and lift cap off bonnet.
3. Remove stem jam nut and stem test washer from the stem.
4. Clean all parts and reassemble in reverse order. Adjust stem test washer so there is 1/8" clearance between test lever fulcrum and stem test washer.

#### B. PACKED LIFTING LEVER

There are several designs of packed cap constructions. Refer to the appropriate section below for your particular cap construction.

##### (a) Fig. 3.2

1. Remove groove pin from lever and slide lever off the cam shaft.
2. Remove gland from gland nut. Unscrew gland nut from bonnet and remove packing ring and cam. If any signs of leakage exist, replace packing ring.
3. Break wire seal and unscrew cap from bonnet. Holding the stem with pliers, remove stem jam nut and stem test washer.

4. Reassemble in reverse order making sure the camshaft lobe is pointing down. The stem test washer should be adjusted to ensure the cam will make contact with the stem test washer and lift the stem when the lever is actuated.

##### (b) Fig. 3.3

1. Remove groove pin from lever and slide lever off the cam shaft.
2. Complete disassembly is only required if the packing ring is to be replaced or internal inspection is required. To remove assembly, rotate the lever down and unscrew the cap.
3. To complete disassembly, remove the gland, packing ring and retaining ring.
4. Pull the cam shaft from the cap. The cam can then be removed through the bottom of the cap.
5. Remove the stem jam nut and stem test washer.
6. Reassemble in reverse order, making sure the cam rests beneath the stem test washer.

##### (c) Fig. 3.4

1. Remove lever jam nut and washer. Slide lever off the cam shaft.
2. Follow steps 2 to 6 in section (b).

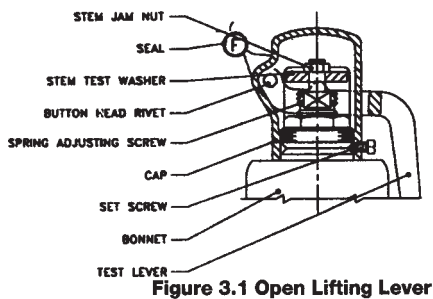


Figure 3.1 Open Lifting Lever

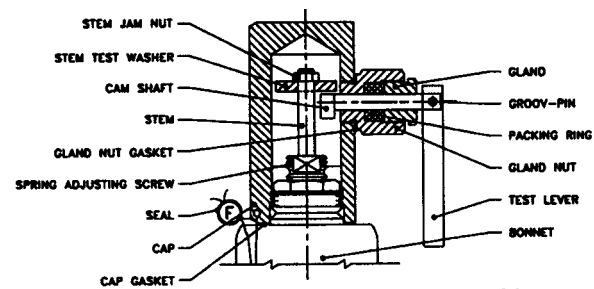


Figure 3.2 Packed Lifting Lever (a)

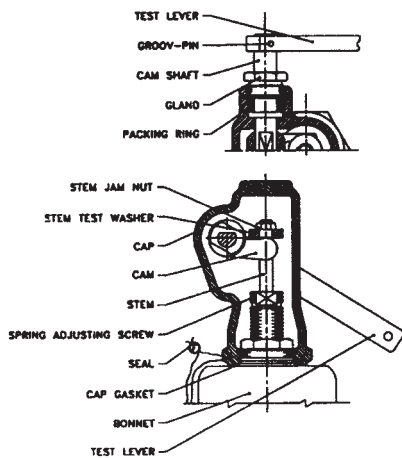


Figure 3.3 Packed Lifting Lever (b)

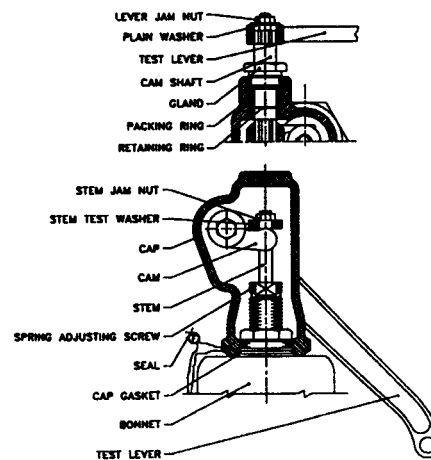


Figure 3.4 Packed Lifting Lever (c)



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## 4. Lapping Procedure

(For metal seats only; does not apply to O-ring seat seal valve)

1. The finish on the body seat and disc are critical to seat tightness. After the parts have been cleaned, both parts should be lapped to remove all blemishes and score marks. This can be done on an automatic lapping machine or by hand using a cast iron lapping block or Pyrex lapping glass which is known to have a perfectly flat surface.
5. (1890 and 1892 only) Measure and record the body seat height. Remove the same thickness of material from the bottom face of the guide as that has been lapped off from the body seat.

### PYREX LAPPING PLATES

PART NO.	MAT. CODE	SIZE	THICKNESS
7688	164	1-1/2"	1/4"
7689	164	2-1/4"	3/8"

2. Use Farris 1200 lapping compound. When lapping the disc, operate with a light figure eight motion over entire block surface. In this way complete contact will be made. With this motion the complete surface of the part will be evenly lapped and you will avoid wearing a groove in the block.
3. Lap the disc until all blemishes and score marks have been removed. As the figure eight motion is executed, frequently lift the disc away from the block to get a fresh bite on the compound. Most importantly, do not contaminate compounds with dirt. Store lapping blocks and lapping glass in a clean, dust-free area.
4. Follow the same procedure for lapping the body seat. When lapping bodies, the body can be placed on a table and a lapping block placed on the body. Be sure that the lapping block does not tip over the side of the body (which would cause rounding of the edges). Use a light, rapid figure eight stroke, lifting the block from the body occasionally.
6. Carefully clean compound from all parts. Failure to do so may foul the seat and disc surfaces. When reinstalling the parts in the valve and/or in assembling the disc in the guide, be careful not to scratch or score either surface.
7. Check Appendix A for critical seat dimensions. Replace any parts that have dimensions smaller than the minimum required.



## 5. Assembly

### Series 2850 and 2852

1. Refer to Figure 2.1 for construction details.
  2. Visually inspect all parts to be assembled. Replace gaskets, O-rings, and any parts that are worn. Lubricate all threaded and mating surfaces with *Bostik Never Seez* (or equivalent).
  3. Examine seat of body and disc for any marks that may cause leakage. Refer to the section on Lapping if relapping is necessary.
  4. (O-ring Seat Only) Refer to Fig. 5.1. Position the disc on a flat surface with the O-ring groove facing up. Insert O-ring into the disc groove. Insert the O-ring retainer on the disc, ensuring the O-ring is centered. Lock the O-ring and retainer to the disk with the hex nut.
  5. Screw blowdown ring onto the body.
  6. Place stem into the disc. Drive grooved pin through the disc into the stem if grooved pin has been disassembled.
  7. Place disc stem assembly over the body, making sure that the disc and body seats are aligned.
  8. Place stem shoulder over stem shoulder ring.
  9. Install lower spring button, spring and upper spring button on stem.
  10. Place bonnet over the assembled parts and screw down onto the body.
  11. Thread the jam nut onto the spring adjusting screw.
  12. Thread spring adjusting screw into bonnet to the position recorded during disassembly.
  13. With a screwdriver, turn blowdown ring up until it touches the disc. Then back off the number of notches indicated below.
- | INLET SIZE | # NOTCHES |
|------------|-----------|
| 3/4"       | 6         |
| 1, 1 1/2"  | 22        |
| 2, 3"      | 33        |
14. Screw blowdown ring lock screw into bonnet. Adjust blowdown ring lock screw to engage blowdown ring notches without jamming the ring in its tightened position.
  15. The valve is now ready to be removed for testing.

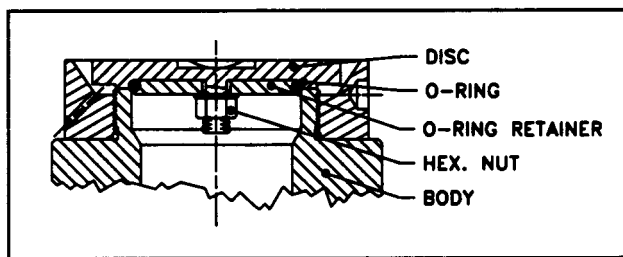


Fig. 5.1 2850 Series O-Ring Seat Construction

### Series 1890 and 1892

1. Refer to Figure 2.2 for construction details.
2. Visually inspect all parts to be assembled. Replace all gaskets. Lubricate all threaded and mating surfaces with *Bostik Never Seez* (or equivalent).
3. Examine seat of body and disc for any marks or surface imperfections that may reduce seat tightness. If relapping is necessary, refer to the section on Lapping.
- 4a. (Metal Seat Only) Loosely assemble body and guide. Insert disc in guide and verify that guide turndown from disc contact is 1/16 to 1/4 turn. For set pressure under 100 psig, 1/8 turndown maximum is required. Remove disc.
- 4b. (O-Ring Seat Only) It is recommended that O-ring/disc subassembly be replaced rather than attempt removal of retaining ring. Do not use a metal seat guide in O-ring seat seal valves.
5. Tighten guide to body with 1/4" dia. bar inserted through guide exit holes with approximate torque of 20 ft. lbs.
6. Insert disc and install lift stop. Verify that available disc lift is greater than .085".
7. Place stem shoulder over retaining ring. Install spring and spring buttons on stem and insert entire assembly into bonnet/spring adjusting screw subassembly. The lower subassembly with body gasket can then be assembled and tightened to approximately 40 ft. lbs. torque.
8. Hand tighten adjusting screw until slight spring compression occurs.

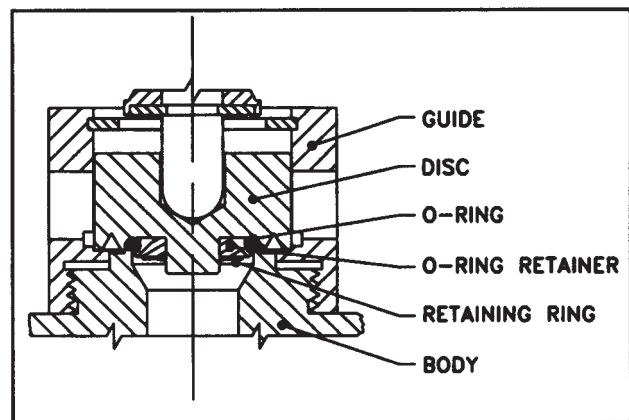


Fig. 5.2 1890 Series O-Ring Seat Construction

## 6. Setting & Testing

### TESTING AND SETTING PROCEDURE

1. Mount the valve on the test stand. Use air as the test medium for air, gas and vapor or flashing service applications. Set valves for saturated steam service on saturated steam. Valves for steam service set with air should include temperature compensation. The nameplate provides "Cold Differential Test Pressure." Set valves for liquid service on water.
2. Hold the stem tightly and tighten (turn clockwise) the spring adjusting screw to increase the spring force. Make sure the stem does not rotate while loading the spring.
3. Slowly raise the test drum pressure and observe the opening point. The set pressure on air or steam is the "pop point" while on water it is the first continuous flow.
4. If necessary reduce the test drum pressure and adjust the spring adjusting screw. Repeat this until the valve opens at the required pressure, designated as "Cold Differential Test Pressure." At the desired setting, torque the jam nut to 25 ft. lbs. and assemble cap and gasket for tightness testing. Check set point once more after locking jam nut.

**Never adjust the spring setting when the pressure under the valve is near its popping point, as the body seat and disc seat might score and/or gall. Always lower the pressure in the valve at least 25 percent below popping pressure before making adjustments. This will put a loading on the seat surfaces, and prevent rotation and damage.**

### SEAT TIGHTNESS TESTING

**⚠ WARNING:** The valve must be checked for seat leakage after the set pressure has been checked. Excessive leakage could lead to fouled or inoperable valves, serious product loss and could be hazardous to personnel and equipment.

1. The valve can be tested for tightness on the test stand by increasing vessel pressure to the required test pressure and observing the valve outlet for evidence of leakage. The following is an overview of the test procedures used.

### Metal Seated Valves:

Metal seated valves shall be tested at 90% of set pressure when the set pressure is greater than 50 psig; they shall be tested at 5 psig below set pressure when the set pressure is less than or equal to 50 psig.

**AIR** - A 5/16 O.D. x 0.035 wall thickness copper tube or equivalent immersed no more than 1/2 deep in water shall be connected to the valve outlet. See Figure 6.1. Seal all other potential leakage paths with suitable fixtures (i.e., cap, plugs) so that seat leakage can be detected at the outlet. Before starting the bubble count, test pressure shall be applied for a minimum of 1 minute. The valve shall then be observed for leakage for at least 1 minute. The leakage rate shall not exceed 40 bubbles per minute.

**STEAM** - Test pressure shall be applied for 3 minutes before the seat tightness test. The valve shall be observed for leakage for at least 1 minute. There shall be no visible or audible leakage at the valve outlet.

**WATER** - Before starting the seat tightness test, the outlet body bowl shall be filled with water, and the valve shall be allowed to stabilize with no visible flow from the valve outlet. The valve shall be observed for 1 minute at the test pressure. There shall be no visible leakage at the valve outlet.

### Soft Seated Valves:

Soft seated valves shall be tested at 95% of set pressure when set above 100 psig; they shall be tested at 5 psig below set pressure when the set pressure is less than or equal to 100 psig.

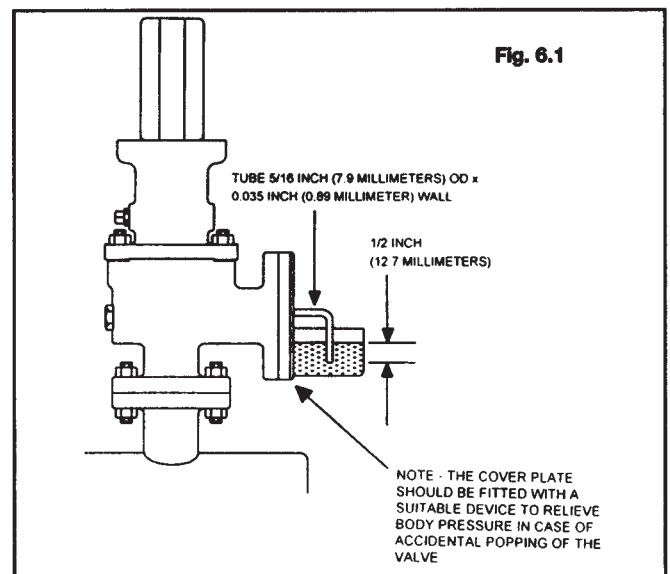
**AIR** - There shall be no leakage (zero bubbles) using the test method outlined above.

**STEAM** and **WATER** - There shall be no visible leakage at the valve outlet.

2. If any valve fails to meet leakage requirements, it shall be reworked.
3. Assemble appropriate cap construction after leak tightness has been verified. If valve type is open lever, no back pressure test is required. Plain cap and packed lever valves must be back pressure tested as outlined in the next section.

### BACK PRESSURE TEST

1. This test applies to all valves designed for discharge to a closed system (plain or packed lever cap construction) with inlet sizes larger than 1 nps.
2. The secondary pressure zone of the valve shall be tested with air or other suitable gas at a pressure of at least 30 psi. The valve should be pressurized at the outlet with shop air or other means. A soap solution or other suitable solution shall be applied to all connections which are potential leakage paths (i.e., body/bonnet connection, cap/bonnet connection, packed lever assembly/cap connection). No leakage is acceptable.
3. If leakage is detected at any location, the valve shall be reworked.



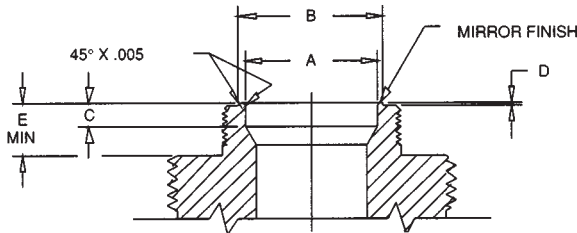


## Appendix A: Critical Seat Dimensions

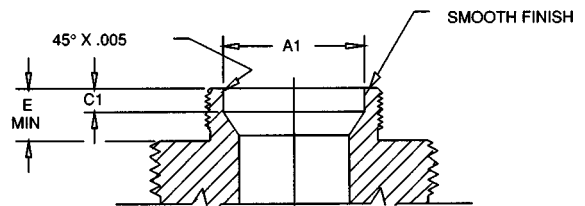
SERIES	SIZE	A	A1	B	C	C1	D	E	F	G	H	J	K	L
2850 & 2850R	3/4 X 1	.750 <sup>1</sup>	.785 <sup>2</sup>	.810 <sup>3</sup>	.125 <sup>4</sup>	.125 <sup>4</sup>	.015 <sup>1</sup>	.284	.700	.894	.459	—	—	—
	1 X 1 1/2	1.000 <sup>1</sup>	1.037 <sup>2</sup>	1.060 <sup>3</sup>	.125 <sup>4</sup>	.125 <sup>4</sup>	.015 <sup>1</sup>	.331	.950	1.125	.611	—	—	—
	1 1/2 X 2	1.500 <sup>3</sup>	1.539 <sup>2</sup>	1.560 <sup>3</sup>	.125 <sup>4</sup>	.375 <sup>4</sup>	.015 <sup>1</sup>	.456	1.440 <sup>2</sup>	1.630	.677	—	—	—
1890 & 1890R	1/2 X 1	.500 <sup>1</sup>	—	.560 <sup>3</sup>	.062 <sup>4</sup>	—	.015 <sup>1</sup>	.076	.450	—	.390	.590	.748	.685
	3/4 X 1	.500 <sup>1</sup>	—	.560 <sup>3</sup>	.062 <sup>4</sup>	—	.015 <sup>1</sup>	.076	.450	—	.390	.590	.748	.685

Unless otherwise specified, all dimensions are  $\pm .005$ . All dimensions are in inches.

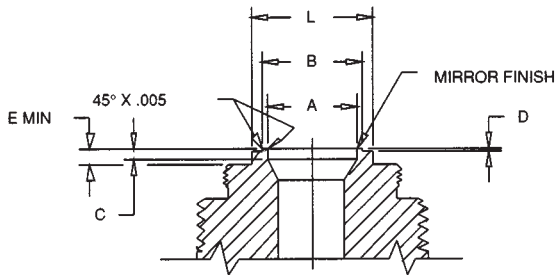
**Tolerance** 1  $\begin{matrix} +.000 \\ -.005 \end{matrix}$  2  $\begin{matrix} +.003 \\ -.000 \end{matrix}$  3  $\begin{matrix} +.005 \\ -.000 \end{matrix}$  4  $\pm .010$  5  $\begin{matrix} +.000 \\ -.010 \end{matrix}$  6  $\begin{matrix} +.010 \\ -.000 \end{matrix}$



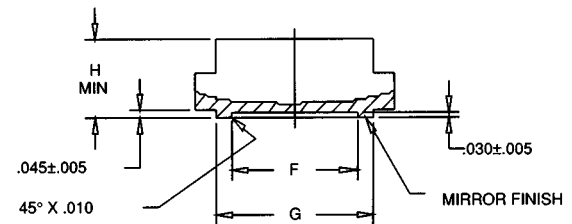
SERIES 2850-BODY



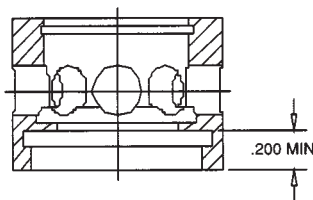
SERIES 2850R-O-RING BODY



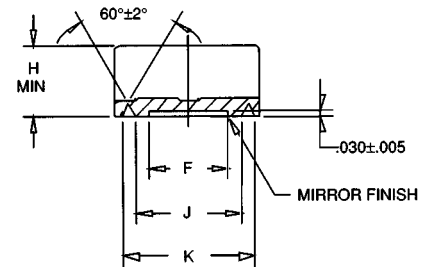
SERIES 1890 & 1890R-BODY, ALL TYPES



SERIES 2850-DISC



SERIES 1890-GUIDE



SERIES 1890-DISC



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