



# 1450 Control Valve

## General Instructions

The 1400 series control valves are designed to be used in rugged, demanding applications like those found in the oil and gas industry. These valves are time tested to deliver increased reliability in the most demanding applications around the world. Each model is designed to provide superior performance and solve industry specific challenges.



***NOTE: If you suspect that a product is defective, contact the factory or the SOR Representative in your area for a Return Material Authorization number (RMA). This product should only be installed by trained and authorized personnel.***

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*Design and specifications are subject to change without notice.*

*For latest revision, go to **SORInc.com***

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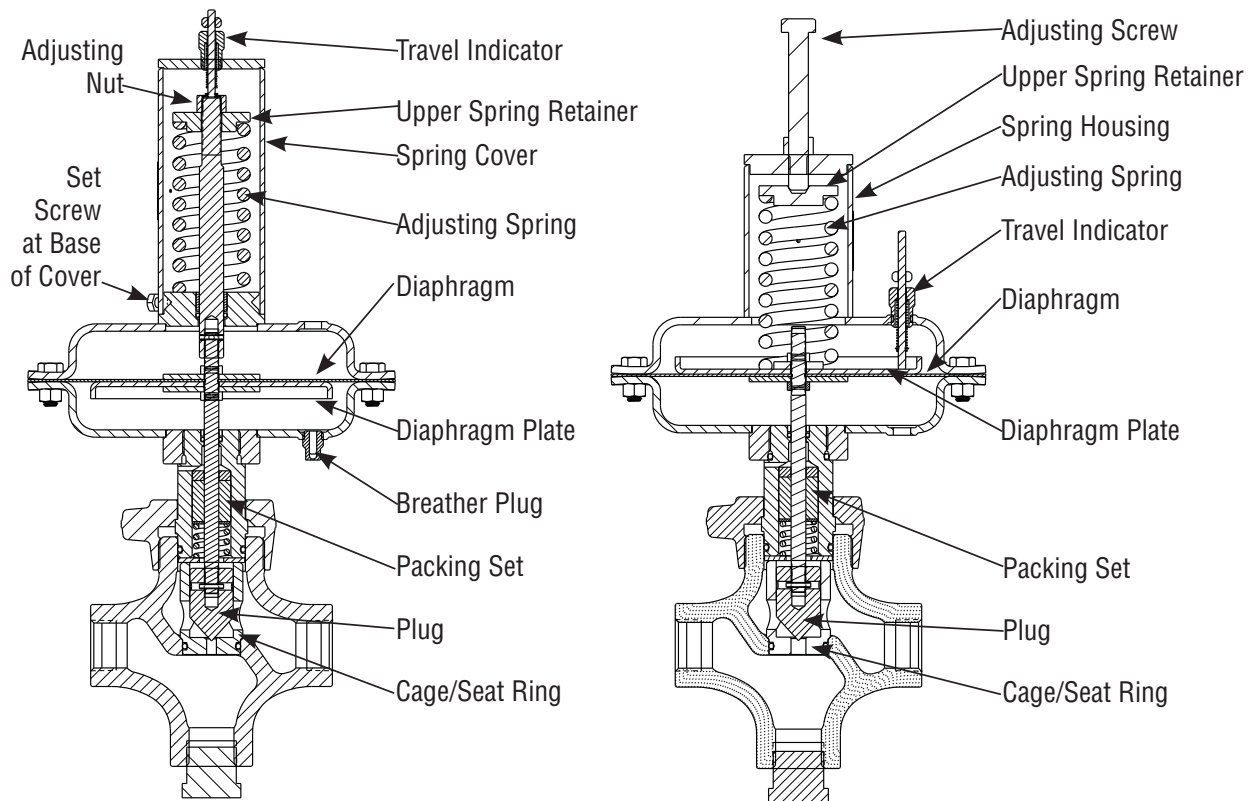
## Installation

- ① Before testing or installing the valve, a visual inspection should be done to insure no damage has been done to the valve during shipping.
- ② Make sure all debris is removed from the internal valve body to insure no damage to the threads and operation of the valve.
- ③ Proper piping practices should be followed for installing valve with flange and NPT connections. Thread sealants should be used for NPT connections.
- ④ Use the diagram on the outside of the valve body to determine which direction is flow over and flow under. The direction of flow will be determined by the pressure specifications of the application. Consult the SOR 1400 series catalog for exact specification.
- ⑤ Once the valve is installed in line with the process fluid, attach piping for pneumatic supply pressure.
- ⑥ Note the orientation of the input pneumatic supply port on the diaphragm housing. If the orientation is not in a convenient spot, the diaphragm housing can be rotated by:
  - a. First, remove all spring tension by turning the spring adjustment screw located on the top of the housing. Failure to do this may cause damage to trim.
  - b. Next, loosen hammer union.
  - c. Once the hammer union is loosened, the diaphragm housing can be rotated to allow the pneumatic supply port to be in the proper location.
- ⑦ Depending on the vessel pressure and the pneumatic supply pressure, the spring may need to be adjusted.
  - a. Fail Close Valves (Reverse Action) – To change the spring force of the actuator, first loosen the lock nut to allow turning of the adjustment screw. If the valve is not shutting off completely when no supply pressure is applied, tighten the adjustment screw to increase the spring force. If the valve is not opening up all the way, the supply pressure can either be increased or the spring can be loosened.
  - b. Fail Open Valves (Direct Action) – To adjust the spring, the two screws holding the spring housing must be taken off. If the valve is not fully closing, the spring tension should be loosened. If the valve is not able to fully open, then the spring tension should be tightened to increase the spring force.



***The spring adjustment screw should be easy to turn with little effort. If there is much resistance in turning the adjustment screw, this may mean the spring is fully compressed. Do not continue to try and tighten the adjustment screw. This will result in damage to trim and the stem.***

## Reference Diagrams



**FAIL-OPEN**

**FAIL-CLOSED**

## Maintenance

Routine maintenance will be required for the 1450 valves due to normal wear and tear that the valves are subjected to from abrasion of the trim, corrosive process material overtime, and wearing parts from high cycle rates. These valves are meant to be worked on and repaired and are specifically designed to allow easy field replacement of trim, packing and other parts.



***All pressurized process lines should be vented and isolated before making any repairs or inspections.***

## INSPECTION

Regular inspection should be conducted to evaluate if the valve will need to be repaired. The main items to inspect will be:

Item	Signs of Required Maintenance	Inspection Instructions
Trim (Plug and Seat)	Valve is no longer sealing fully	Loosen the hammer union to visually inspect the trim. This should be done at least every 6 months under moderate pressure drop and low abrasion applications.
Stem Packing	Process leaking out of weep hole on bonnet	Visually identify the weep hole located on the bonnet just above the hammer union. If process material is leaking out of the weep hole, this means that the packing has failed and needs to be repaired.
Actuator	Pneumatic supply gas leaking through indicator	If gas is leaking through the indicator, this could indicate either a bad diaphragm or loose nuts on the stem of the diaphragm. Inspect both determine what needs to be repaired.
Seals	Process leaking out of weep hole in hammer union	If process material is leaking out of the weep hole in the hammer union, this means the hammer union o-ring needs to be replaced.

## ACTUATOR DISASSEMBLY

### FAIL-CLOSED ACTUATORS

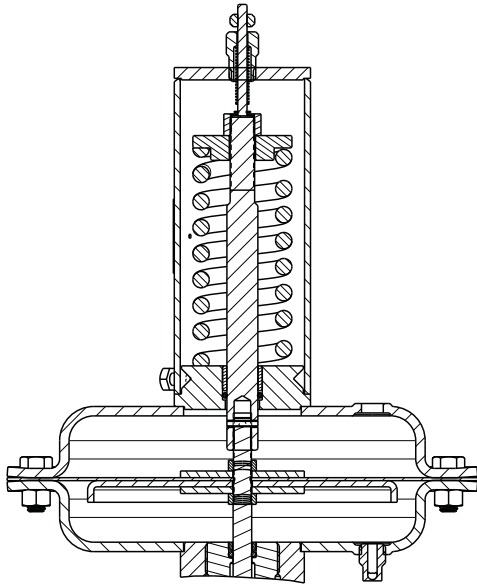
- ① Remove all spring tension by turning the spring adjustment screw located on the top of the housing. Failure to do this may cause damage to trim.
- ② Loosen and remove nuts and bolts from the diaphragm housing.
- ③ Remove upper diaphragm housing, spring and cap.
- ④ Loosen and remove the nut on the top of the stem.
- ⑤ The diaphragm and diaphragm plate can now be removed for replacement or repair.
- ⑥ To re-assemble the actuator, complete the prior steps in reverse order. Make sure to properly lubricate all rings replaced. Also, when tightening the diaphragm bolts, tighten in a star pattern.

### FAIL-OPEN ACTUATORS

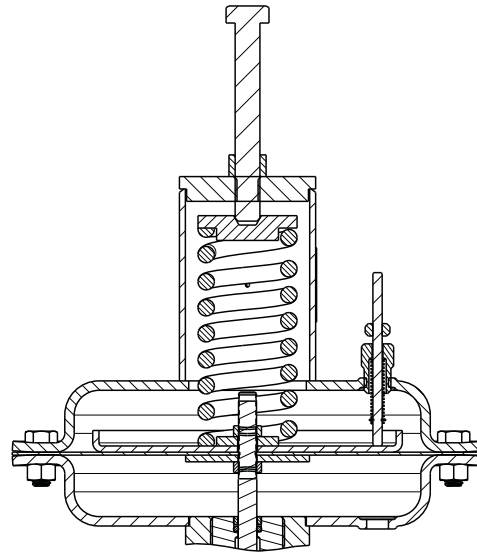
- ① To remove the spring cover, the set screws located at the bottom of the spring cover need to be removed.
- ② Remove all spring tension by turning the spring adjustment screw. Failure to do this may cause damage to trim.
- ③ Loosen and remove nuts and bolts from the diaphragm housing.
- ④ The upper diaphragm housing can now be removed by raising it upwards off the stem.
- ⑤ The pin can now be removed to allow unscrewing of the top stem from the bottom stem.
- ⑥ The diaphragm and diaphragm plate can now be removed for replacement or repair.
- ⑦ To re-assemble the actuator, complete the prior steps in reverse order. Make sure to properly lubricate all rings replaced. Also, when tightening the diaphragm bolts, tighten in a star pattern.

## ACTUATOR RE-ASSEMBLY

To re-assemble the actuator, lubricate the o-rings and simply reverse the steps of the disassembly procedure above for the appropriate actuator (direct or reverse).



**1450 Close-Coupled  
Direct-Acting  
Fail-Open**



**1450 Close-Coupled  
Reverse-Acting  
Fail-Closed**

## TRIM REPLACEMENT

- 1 Remove all spring tension by turning the spring adjustment screw located on the top of the housing. Failure to do this may cause damage to trim. For a Fail-Open valve, reference the Fail-Open Actuator Disassembly instructions.
- 2 Hit the hammer union with a hammer in the counterclockwise direction to free the top works from the valve body.
- 3 Once the hammer union is completely unscrewed, lift directly upwards to separate the actuator from the valve body.
- 4 The plug is held in place by a roll pin. Remove the roll pin by using a punch. Once the roll pin is removed, unscrew the plug from the stem.



***Properly support the stem and plug when removing roll pin in order to not bend or damage stem assembly.***

- 5 Remove the cage assembly from the valve body. This can be done by hand however it may sometimes require a hook to grab the flow openings on the side of the cage to remove the cage.
- 6 Thoroughly clean the threads of the stem to insure no debris is on the stem.
- 7 Thread the new plug onto the stem until the hole on the stem and plug line up.
- 8 Take the new roll pin and push in with a hammer and punch. Make sure to properly support the stem and plug to avoid damaging the stem.

- ⑨ Apply ample amount of lube to the o-ring on the cage. Push the cage seat back into the valve body until you feel the cage pop into place.
- ⑩ Install the top works back on top and tighten hammer union.

## **PACKING REPLACEMENT**

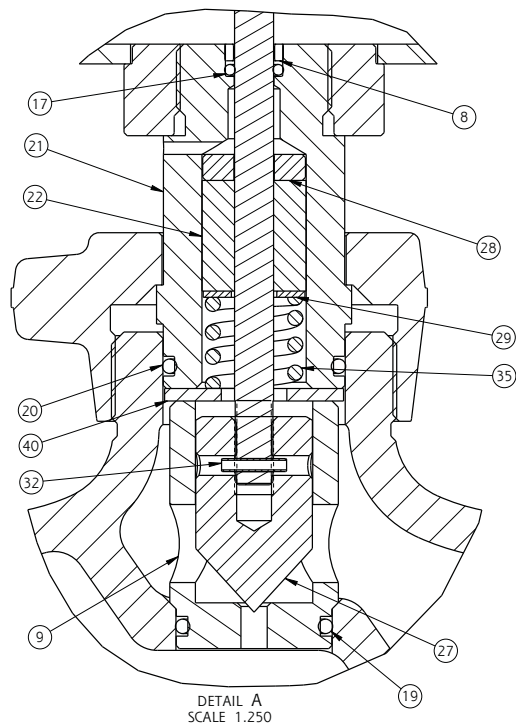
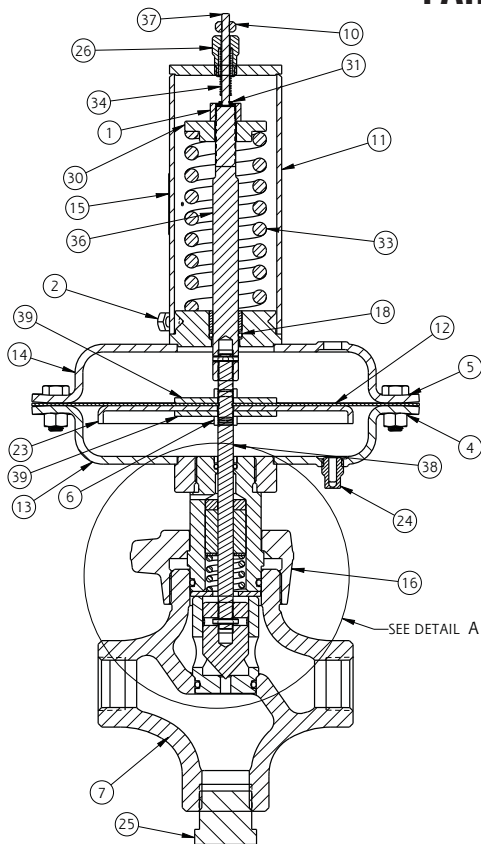
- ① Remove all spring tension by turning the spring adjustment screw located on the top of the housing. Failure to do this may cause damage to trim. For a Fail-Open valve, reference the Fail-Open Actuator Disassembly instructions.
- ② Disassemble the actuator according to the steps above.
- ③ Hit the hammer union with a hammer in the counterclockwise direction to free the top works from the valve body.
- ④ Loosen the hammer union and lift the top works out of the valve body.
- ⑤ Grabbing the plug, packing spring and washer, remove the stem from the packing plug.
- ⑥ From the diaphragm side, push down on the packing retainer with flat tool such as a flat head screwdriver to remove the packing. Make sure to not scrape the inside of the packing plug.
- ⑦ After the packing is removed, clean all metal surfaces of debris and buildup including the stem, packing plug, and upper and lower packing retainers.
- ⑧ Install the items back into the packing plug from the bottom in the following order
  - a. Upper packing retainer
  - b. Packing cap (Position so that the V cut out facing the valve body).
  - c. V-Ring Packing
  - d. Lower packing retainer
  - e. Packing spring
  - f. Stem (make sure the stem is well lubricated)
- ⑨ Reassemble the actuator using the steps for actuator disassembly
- ⑩ Insert the top works into the valve body and tighten the hammer union.

# Parts List

REFERENCE ASSEMBLY		
ITEM	QTY	DESCRIPTION
1	1	1/2-20 HEX NUT
2	2	1/4-20 X 1/2 HEX HEAD BOLT
3	2	2 X 1/8 ROUND HEAD METALLIC DRIVE SCREW
4	12	3/8-16 HEX NUT
5	12	3/8-16 X 7/8 HEX CAP SCREW
6	2	3/8-24 HEX JAM NUT
7	1	BODY TEE 1" NPT CS
8	1	BUSHING O-RING
9	1	CAGE/SEAT 17-4SST 1/4" ID
10	1	CAP INDICATOR TRAVEL
11	1	COVER SPRING WELD
12	1	DIAPHRAGM NEOPRENE 9-1/2
13	1	HOUSING LOWER DIAPHRAGM WELD ASSY
14	1	HOUSING UPPER DIAPHRAGM WELD ASSY
15	1	NAMEPLATE DUMP VALVE
16	1	NUT HAMMER CS
17	1	O-RING 110 BUNA-N 70D
18	1	O-RING 114 BUNA-N 70D
19	1	O-RING 218 BUNA-N 90D

20	1	O-RING 222 BUNA-N 75D
21	1	PACKING PLUG
22	1	PACKING TEFLON
23	1	PLATE DIAPHRAGM
24	1	PLUG BREATHER 1/4 NPT
25	1	PLUG HEX 1 IN NPT A105
26	1	PLUG INDICATOR TRAVEL
27	1	PLUG VALVE 1/4 THRU 1.00
28	1	RETAINER PACKING BRASS
29	1	RETAINER PACKING LOWER
30	1	RETAINER SPRING UPPER CS
31	1	RETAINING RING 3/16" EXT E-STYLE
32	2	ROLL PIN 1/8 OD X 5/8 LONG
33	1	SPRING ACTUATOR #35 3-15
34	1	SPRING INDICATOR TRAVEL
35	1	SPRING PACKING 302SST
36	1	STEM ACTUATOR UPPER
37	1	STEM INDICATOR
38	1	VALVE STEM
39	2	WASHER BEARING LOWER
40	1	WASHER PACKING

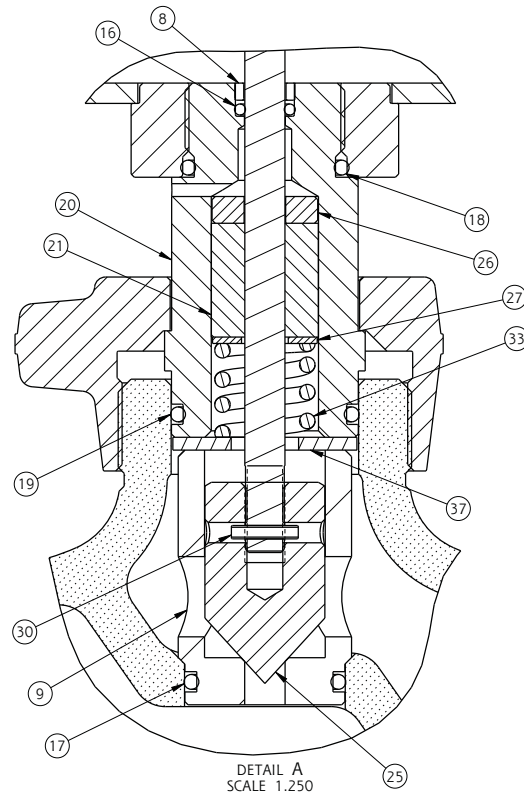
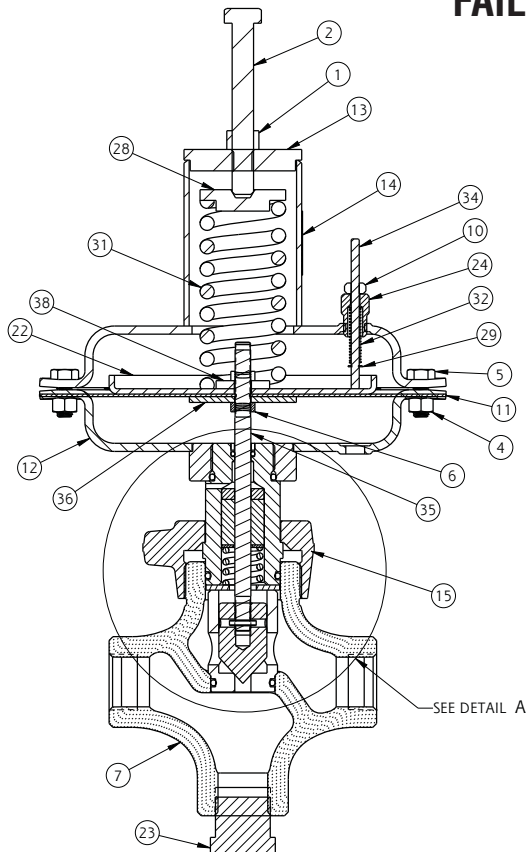
## FAIL-OPEN



REFERENCE ASSEMBLY		
ITEM	QTY	DESCRIPTION
1	1	1/2-13 HEX NUT A194 GR 2H
2	1	1/2-13 X 4" HEXHD SCR PLD
3	2	2 X 1/8 ROUND HEAD METALLIC DRIVE SCREW
4	12	3/8-16 HEX NUT
5	12	3/8-16 X 7/8 HEX CAP SCREW
6	2	3/8-24 HEX JAM NUT
7	1	BODY TEE 1" NPT CS
8	1	BUSHING O-RING
9	1	CAGE/SEAT 17-4SST 3/8" ID
10	1	CAP INDICATOR TRAVEL
11	1	DIAPHRAGM NEOPRENE 9-1/2
12	1	HOUSING LOWER DIAPHRAGM WELD ASSY
13	1	HOUSING UPPER DIAPHRAGM WELD ASSY
14	1	NAMEPLATE DUMP VALVE
15	1	NUT HAMMER CS
16	1	O-RING 110 BUNA-N 70D
17	1	O-RING 218 BUNA-N 90D
18	1	O-RING 219 BUNA-N 70D
19	1	O-RING 222 BUNA-N 75D

19	1	O-RING 222 BUNA-N 75D
20	1	PACKING PLUG
21	1	PACKING TEFLON
22	1	PLATE DIAPHRAGM
23	1	PLUG HEX 1 IN NPT A105
24	1	PLUG INDICATOR TRAVEL
25	1	PLUG VALVE 1/4 THRU 1.00
26	1	RETAINER PACKING BRASS
27	1	RETAINER PACKING LOWER
28	1	RETAINER SPRING UPPER AL
29	1	RETAINING RING 3/16" EXT E-STYLE
30	1	ROLL PIN 1/8 OD X 5/8 LONG
31	1	SPRING ACTUATOR #35 3-15
32	1	SPRING INDICATOR TRAVEL
33	1	SPRING PACKING 302SST
34	1	STEM INDICATOR REVERSE
35	1	VALVE STEM
36	1	WASHER BEARING LOWER
37	1	WASHER PACKING
38	1	WASHER SPRING

## FAIL-CLOSED





## Repair Kits

Only genuine SOR replacement parts should be used to make repairs. Please contact your local representative for ordering information.

### Trim Replacement Kits

Quick Opening	1/4"	3/8"	1/2"	3/4"	1"
17-4PH SST (BUNA-N O-Ring)	5678400P	5678401P	5678402P	5678403P	5678404P
17-4PH SST (VITON O-Ring)	5678405P	5678406P	5678407P	5678408P	5678409P
Tungsten (BUNA-N O-Ring)	5678410P	5678411P	5678412P	5678413P	5678414P
Tungsten (VITON O-Ring)	5678415P	5678416P	5678417P	5678418P	5678419P
Throttling					
17-4PH SST (BUNA-N O-Ring)	5678420P	5678421P	5678422P	5678423P	5678424P
17-4PH SST (VITON O-Ring)	5678425P	5678426P	5678427P	5678428P	5678429P
Tungsten (BUNA-N O-Ring)	5678430P	5678431P	5678432P	5678433P	5678434P
Tungsten (VITON O-Ring)	5678435P	5678436P	5678437P	5678438P	5678439P

### Actuator Repair Kits

35 in <sup>2</sup> Actuator	
Direct Acting BUNA-N O-Rings	5678488P
Direct Acting VITON O-Rings	5678489P
Reverse Acting BUNA-N O-Rings	5678486P
Reverse Acting VITON O-Rings	5678487P
70 in <sup>2</sup> Actuator	
Direct Acting BUNA-N O-Rings	5678492P
Direct Acting VITON O-Rings	5678493P
Reverse Acting BUNA-N O-Rings	5678490P
Reverse Acting VITON O-Rings	5678491P

### Packing Kits

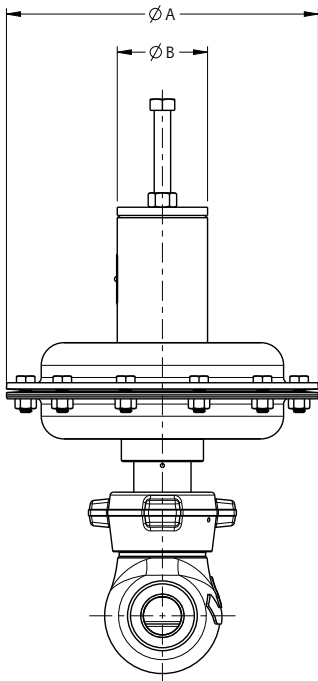
Direct Acting BUNA-N Packing	5678495P
Direct Acting VITON Packing	5678497P
Reverse Acting BUNA-N Packing	5678494P
Reverse Acting VITON Packing	5678496P

# Dimensions

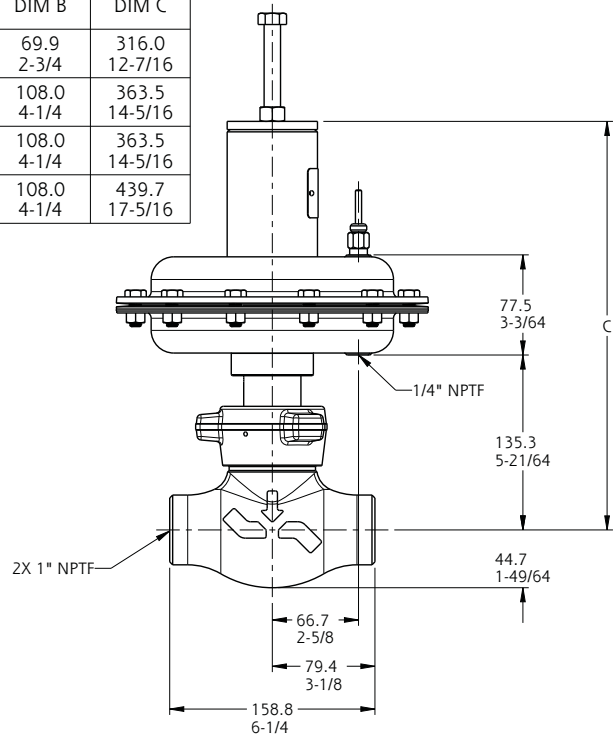
## 1 INCH GLOBE FAIL-CLOSED

Linear = mm/inches

**Drawing 5678455**

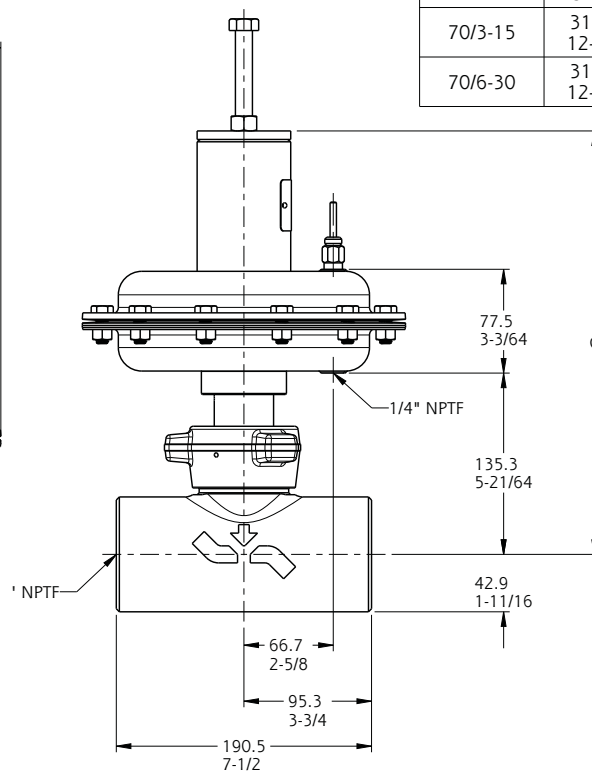
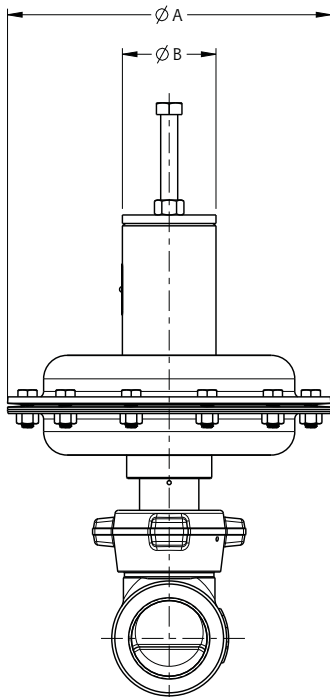


ACTUATOR SELECTION	DIM A	DIM B	DIM C
35/3-15	241.3 9-1/2	69.9 2-3/4	316.0 12-7/16
35/6-30	241.3 9-1/2	108.0 4-1/4	363.5 14-5/16
70/3-15	317.5 12-1/2	108.0 4-1/4	363.5 14-5/16
70/6-30	317.5 12-1/2	108.0 4-1/4	439.7 17-5/16



## 2 INCH GLOBE FAIL-CLOSED

ACTUATOR SELECTION	DIM A	DIM B	DIM C
35/3-15	241.3 9-1/2	69.9 2-3/4	316.0 12-7/16
35/6-30	241.3 9-1/2	108.0 4-1/4	363.5 14-5/16
70/3-15	317.5 12-1/2	108.0 4-1/4	363.5 14-5/16
70/6-30	317.5 12-1/2	108.0 4-1/4	439.7 17-5/16

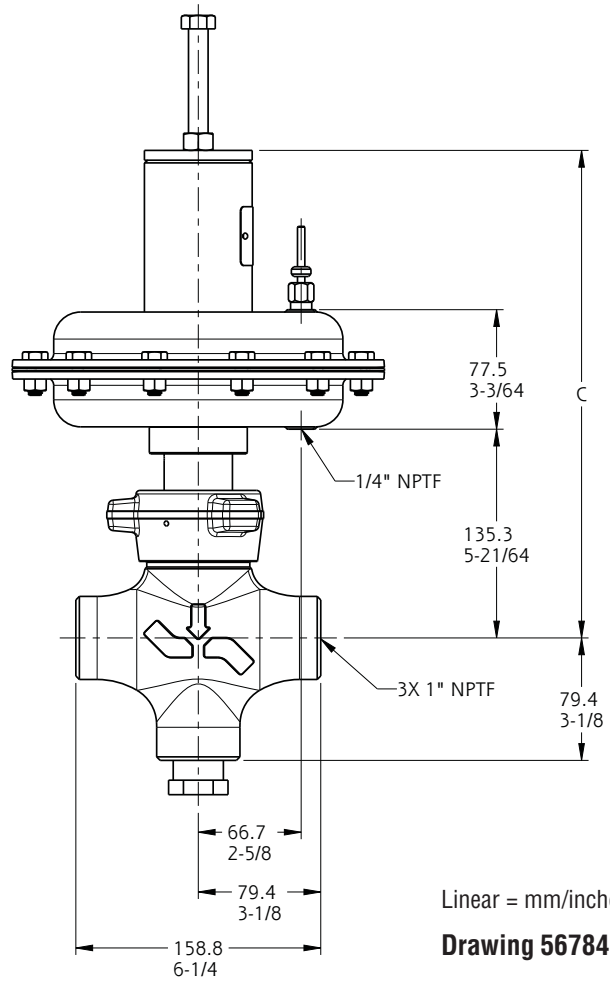
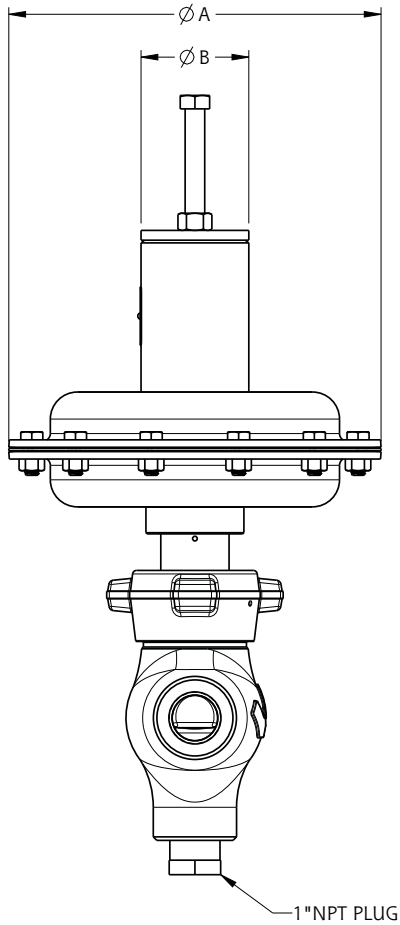


*Dimensions are for reference only. Contact the factory for certified drawings for a particular model number.*

Linear = mm/inches

**Drawing 5678456**

# 1 INCH TEE FAIL-CLOSED



Linear = mm/inches  
**Drawing 5678453**

ACTUATOR SELECTION	DIM A	DIM B	DIM C
35/3-15	241.3 9-1/2	69.9 2-3/4	316.0 12-7/16
35/6-30	241.3 9-1/2	108.0 4-1/4	363.5 14-5/16
70/3-15	317.5 12-1/2	108.0 4-1/4	363.5 14-5/16
70/6-30	317.5 12-1/2	108.0 4-1/4	439.7 17-5/16

*Dimensions are for reference only. Contact the factory for certified drawings for a particular model number.*

## Troubleshooting

Symptom	Potential Root Cause	Solution
Fluid is leaking past trim while the valve is in the closed position	Incorrect amount of spring tension is being applied.	For fail-closed actuators, increase the spring tension. For fail-open actuators, decrease the spring tension. Tighten until the leak stops. Do not tighten once a physical stop is felt, damage to stem and trim may occur if adjustment nut is forced past this point.
	Plug and seat assembly have been eroded or damaged.	Follow steps to replace trim earlier in general instructions to inspect the trim for damage.
	The pressure drop is exceeding the maximum allowable pressure drop for actuator.	Review the maximum allowable pressures drops in the SOR 1450 Catalog or contact your local SOR representative to verify the valve provided has the correct actuator for the application.
Fluid from the process is leaking from weep hole in the bonnet and/or the lower diaphragm housing	Packing assembly has failed.	See Packing Replacement section of the general instructions for how to inspect and repair the packing assembly.
Fluid from the process is leaking from the weep hole in the hammer union	O-ring underneath the hammer union has failed.	Loosen the hammer union and remove the top works from the valve body. Inspect O-ring and replace if necessary.
Supply gas is leaking from the indicator on the diaphragm housing.	The diaphragm has failed.	Remove all spring tension and remove upper spring housing. Inspect diaphragm for punctures or holes.
The valve is not ever able to open 100%	Spring tension may be too high or conversely gas supply pressure may be too low.	Decrease spring tension to the point where leaking past valve does not occur. If valve still does not open fully, increase supply pressure.



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