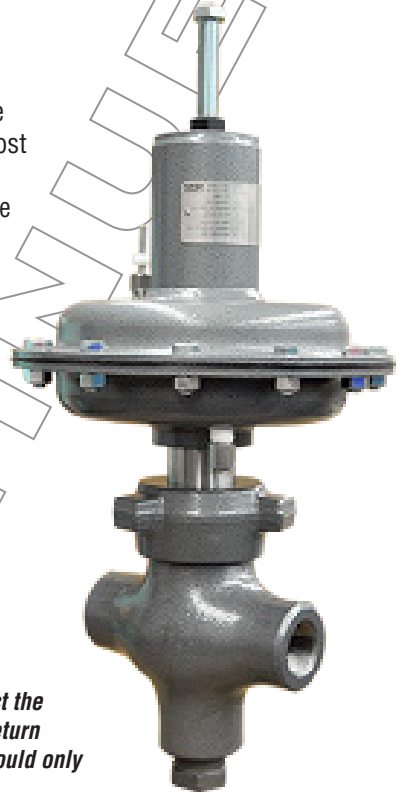




1450 Control Valve

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.

Design and specifications are subject to change without notice.

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

Table of Contents

Installation	2
Reference Diagrams	3
Maintenance	3
Parts List	7
Repair Kits	9
Dimensions	10
Troubleshooting	12

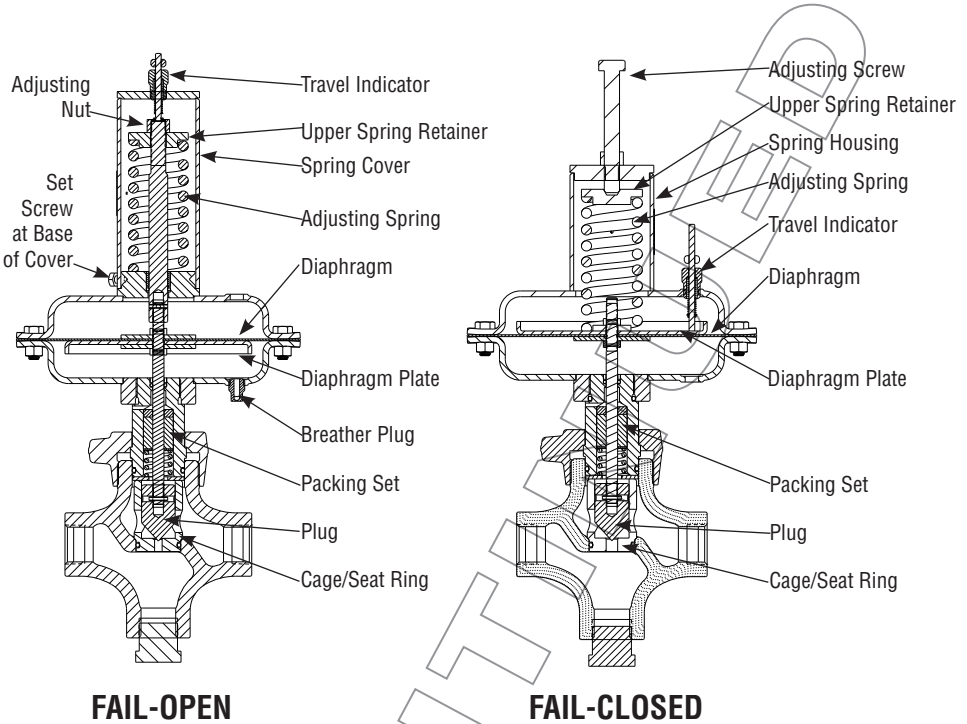
Installation

- ❶ Before testing or installing the valve, a visual inspection should be done to insure no damage has been done to the valve during shipping.
- ❷ Make sure all debris is removed from the internal valve body to insure no damage to the threads and operation of the valve.
- ❸ Proper piping practices should be followed for installing valve with flange and NPT connections. Thread sealants should be used for NPT connections.
- ❹ 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.
- ❺ Once the valve is installed in line with the process fluid, attach piping for pneumatic supply pressure.
- ❻ 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.
- ❼ 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



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

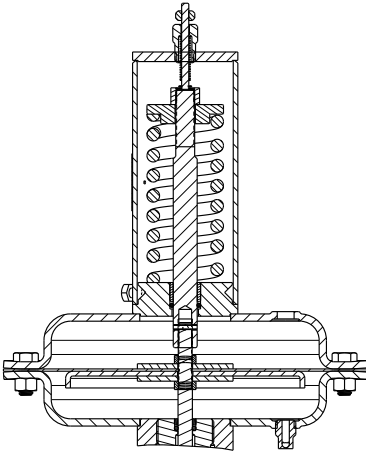
- ❶ Remove all spring tension by turning the spring adjustment screw located on the top of the housing. Failure to do this may cause damage to trim.
- ❷ Loosen and remove nuts and bolts from the diaphragm housing.
- ❸ Remove upper diaphragm housing, spring and cap.
- ❹ Loosen and remove the nut on the top of the stem.
- ❺ The diaphragm and diaphragm plate can now be removed for replacement or repair.
- ❻ 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

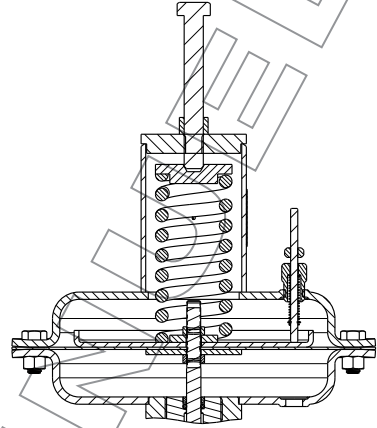
- ❶ To remove the spring cover, the set screws located at the bottom of the spring cover need to be removed.
- ❷ Remove all spring tension by turning the spring adjustment screw. Failure to do this may cause damage to trim.
- ❸ Loosen and remove nuts and bolts from the diaphragm housing.
- ❹ The upper diaphragm housing can now be removed by raising it upwards off the stem.
- ❺ The pin can now be removed to allow unscrewing of the top stem from the bottom stem.
- ❻ The diaphragm and diaphragm plate can now be removed for replacement or repair.
- ❼ 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

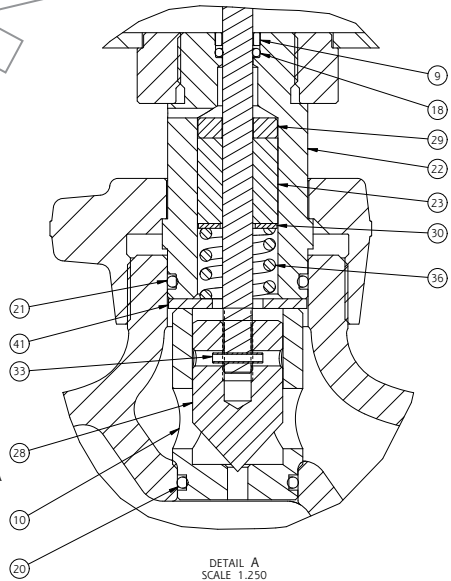
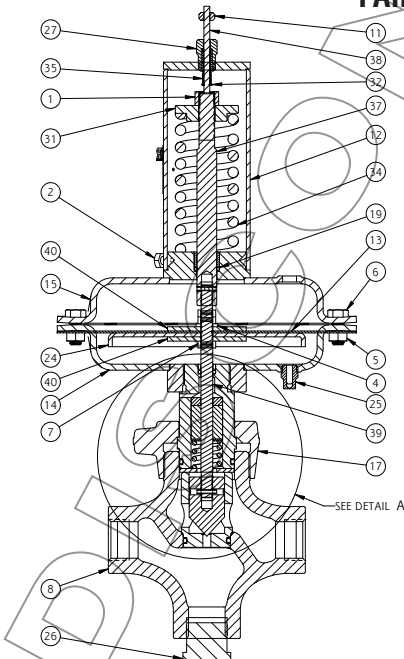
- ① Remove all spring tension by turning the spring adjustment screw located on the top of the housing. Failure to do this may cause damage to trim. For a Fail-Open valve, reference the Fail-Open Actuator Disassembly instructions.
- ② Disassemble the actuator according to the steps above.
- ③ Hit the 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 SCR PLD STL
3	2	2 X 1/8 ROUND HEAD METALLIC DRIVE SCREW
4	1	3/8 WASHER LOCK PLTD STEEL
5	12	3/8-16 HEX NUT
6	12	3/8-16 X 7/8 HEX CAP SCREW
7	3	3/8-24 HEX JAM NUT
8	1	BODY TEE 1" NPT CS
9	1	BUSHING O-RING
10	1	CAGE/SEAT 17-4SST 1/4" ID
11	1	CAP INDICATOR TRAVEL
12	1	COVER SPRING WELD
13	1	DIAPHRAGM NEOPRENE 9-1/2
14	1	HOUSING LOWER DIAPHRAGM WELD ASSY
15	1	HOUSING UPPER DIAPHRAGM WELD ASSY
16	1	NAMEPLATE DUMP VALVE
17	1	NUT HAMMER CS
18	1	O-RING 110 BUNA-N 70D
19	1	O-RING 114 BUNA-N 70D

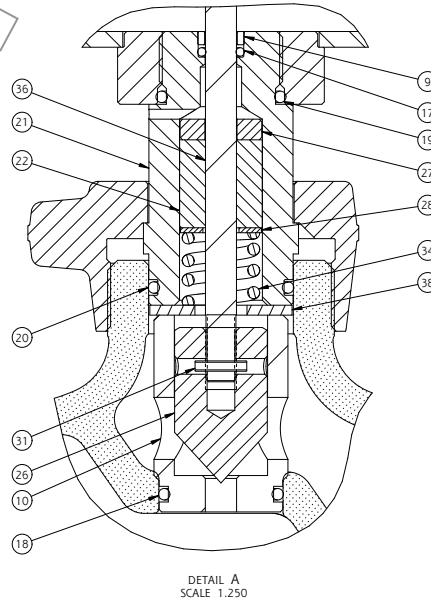
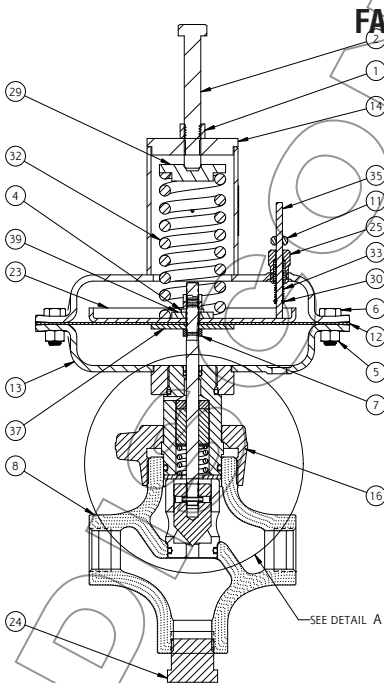
20	1	O-RING 218 BUNA-N 90D
21	1	O-RING 222 BUNA-N 75D
22	1	PACKING PLUG
23	1	PACKING TEFLON
24	1	PLATE DIAPHRAGM
25	1	PLUG BREATHER 1/4 NPT
26	1	PLUG HEX 1 IN NPT A105
27	1	PLUG INDICATOR TRAVEL
28	1	PLUG VALVE 1/4 THRU 1.00
29	1	RETAINER PACKING BRASS
30	1	RETAINER PACKING LOWER
31	1	RETAINER SPRING UPPER CS
32	1	RETAINING RING 3/16" EXT E-STYLE
33	2	ROLL PIN 1/8 OD X 5/8 LONG
34	1	SPRING ACTUATOR #35 3-15
35	1	SPRING INDICATOR TRAVEL
36	1	SPRING PACKING 302SST
37	1	STEM ACTUATOR UPPER
38	1	STEM INDICATOR
39	1	VALVE STEM
40	2	WASHER BEARING LOWER

FAIL-OPEN



REFERENCE ASSEMBLY		
ITEM	QTY	DESCRIPTION
1	1	1/2-13 HEX NUT ZINC PLTD
2	1	1/2-13 X 4" HEXHD SCR PLD
3	2	2 X 1/8 ROUND HEAD METALLIC DRIVE SCREW
4	1	3/8 WASHER LOCK PLTD STEEL
5	12	3/8-16 HEX NUT
6	12	3/8-16 X 7/8 HEX CAP SCREW
7	3	3/8-24 HEX JAM NUT
8	1	BODY TEE 1" NPT CS
9	1	BUSHING O-RING
10	1	CAGE/SEAT 17-4SST 3/8" ID
11	1	CAP INDICATOR TRAVEL
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 218 BUNA-N 90D
19	1	O-RING 219 BUNA-N 70D

19	1	O-RING 219 BUNA-N 70D
20	1	O-RING 222 BUNA-N 75D
21	1	PACKING PLUG
22	1	PACKING TEFLON
23	1	PLATE DIAPHRAGM
24	1	PLUG HEX 1 IN NPT A105
25	1	PLUG INDICATOR TRAVEL
26	1	PLUG VALVE 1/4 THRU 1.00
27	1	RETAINER PACKING BRASS
28	1	RETAINER PACKING LOWER
29	1	RETAINER SPRING UPPER AL
30	1	RETAINING RING 3/16" EXT E-STYLE
31	1	ROLL PIN 1/8 OD X 5/8 LONG
32	1	SPRING ACTUATOR #35 3-15
33	1	SPRING INDICATOR TRAVEL
34	1	SPRING PACKING 302SST
35	1	STEM INDICATOR REVERSE
36	1	VALVE STEM FAIL CLOSED
37	1	WASHER BEARING LOWER
38	1	WASHER PACKING



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

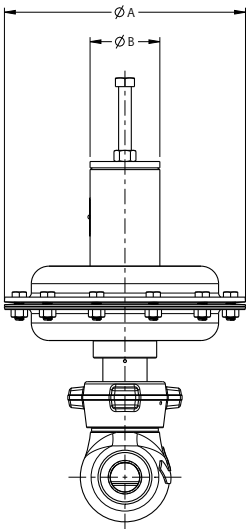
35 in ² Actuator	
Direct Acting BUNA-N O-Rings	5678488P
Direct Acting VITON O-Rings	5678489P
Reverse Acting BUNA-N O-Rings	5678486P
Reverse Acting VITON O-Rings	5678487P
70 in ² Actuator	
Direct Acting BUNA-N O-Rings	5678492P
Direct Acting VITON O-Rings	5678493P
Reverse Acting BUNA-N O-Rings	5678490P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

Packing Kits

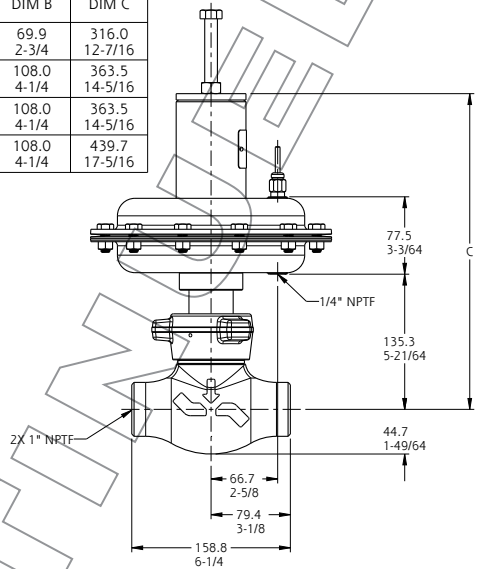
Direct Acting BUNA-N Packing	5678495P
Direct Acting VITON Packing	5678497P
Reverse Acting BUNA-N Packing	5678494P
Reverse Acting VITON Packing	5678496P

Dimensions

1 INCH GLOBE FAIL-CLOSED



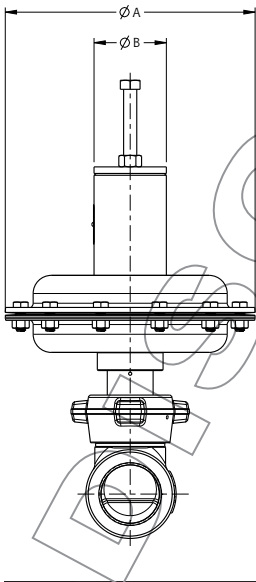
ACTUATOR SELECTION	DIM A	DIM B	DIM C
35/3-15	241.3 9-1/2	69.9 2-3/4	316.0 12-7/16
35/6-30	241.3 9-1/2	108.0 4-1/4	363.5 14-5/16
70/3-15	317.5 12-1/2	108.0 4-1/4	363.5 14-5/16
70/6-30	317.5 12-1/2	108.0 4-1/4	439.7 17-5/16



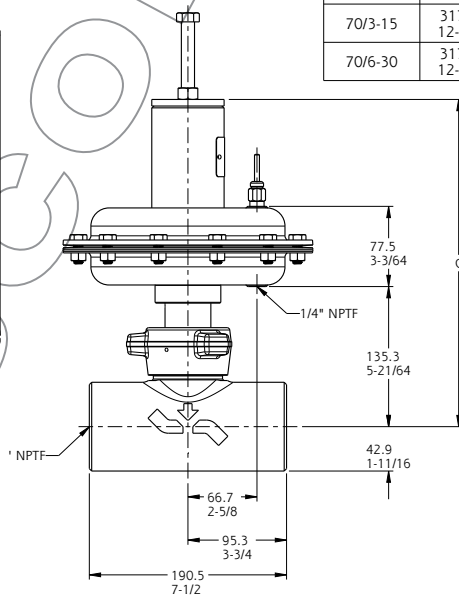
Linear = mm/inches

Drawing 5678455

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

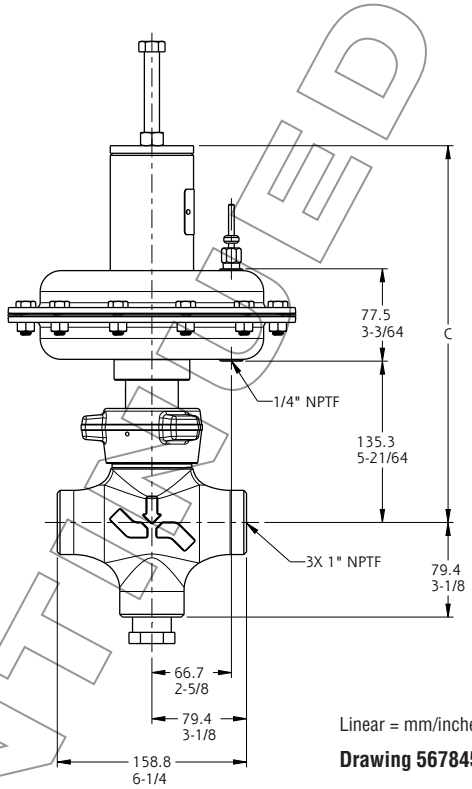
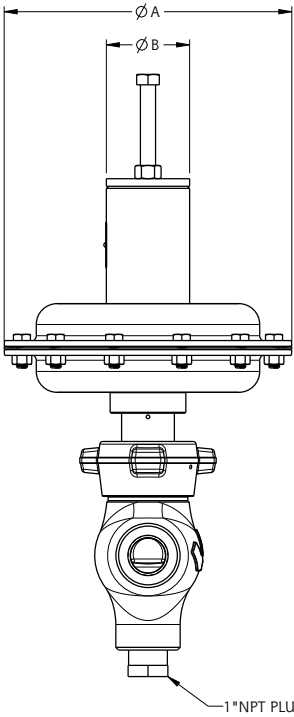


Dimensions are for reference only. Contact the factory for certified drawings for a particular model number.

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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