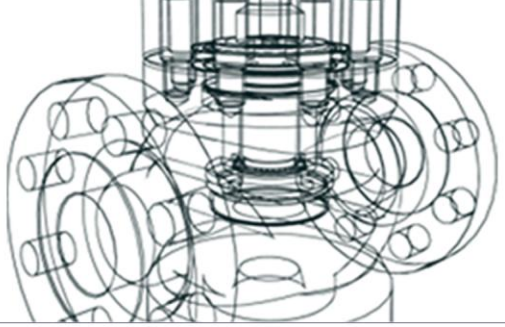

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Caution

1. Pressure relief valves to be used for high pressure piping.
2. Use explosion proof valves/accessories for hazardous applications.
3. Use fire safe valves where fire hazards can occur.
4. Use seismic proof valves where earthquakes are inevitable.
5. Ensure valve mounting is for the specified service/application.

General Information

This purpose of this manual is to assist in unpacking, installing & perform maintenance on Severn 'B' Series Rotary Actuators. It is highly recommended that the users and personnel responsible for maintenance read this manual before proceeding to install, operate or perform any procedures on the actuator. Ensure instructions as per the manual are followed to avoid mishaps and injuries.

Warning: Standard industry safety practices to be strictly followed.

Spare Parts

It is highly recommended that original parts from the manufacturer are used for servicing Severn Actuators.

Unpacking

1. The initial step in unpacking would be to cross verify the received parts against the packing list. A list containing the details of the actuator, and accessories are supplied along with every shipping container.
2. Ensure to lift the actuator from the packing with utmost care and caution. Use of slings, lifting lugs is strictly recommended to position them precisely and not to damage the other mounted accessories.
3. Contact respective shipper if any fatal damage.
4. For further enquiries & assistance contact the manufacturer.

Installation

Warning: Ensure the air supply pressure does not exceed the maximum permissible design pressure of the actuator indicated on the respective label.

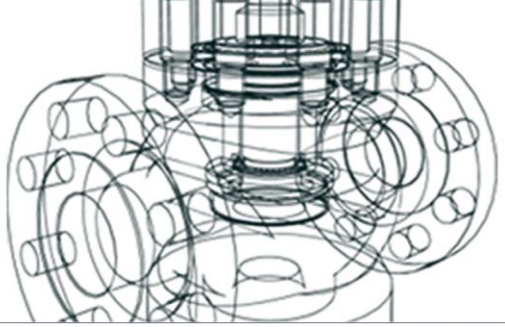
Caution: Ensure to provide adequate overhead space facilitating easy removal of the actuator from the set up.

1. The name plate has details about the air supply pressure, ensure to connect lines accordingly. Although actuators are designed for 100 PSI (7 bar) sometimes it must be limited based on the valve application. (Ensure to cross verify with respective valve data sheet)
2. Ensure to facilitate overhead clearance of 200 mm for actuator of all sizes. Refer table 1.
3. Utilize lifting straps for lifting the actuator. Make sure the actuator is supported at its centre of gravity.
4. It's highly recommended to have an air filter regulator on the line.
5. Leak free connections are to be installed and inspected.
6. Table 1 indicates the various available rotary actuators and their applicable overhead clearances.
7. Table 2 indicates the various scotch yoke rotary conversion units available and their compatible assemblies.
8. Go through preventive measures mentioned in Table 3 before installation.

Quick-Check

The rotary actuator* to be visually inspected for and visible wear or damage.

1. The piston rod should have a smooth linear motion. The rotary movement of the actuator valve set up has to be checked.
2. Ensure appropriate working of the positioner by subjecting the valve set up to various positioner ranges like (4-20 mA).



Installation, Operation Maintenance Instructions for 'B' – Series Rotary Actuator

3. Ensure leak free connections. Ensure proper tightening of the bolts and all-important connections.

4. Ensure the fail open and close conditions of the actuator are attained. Reassure valve fail condition is attained by subjecting the valve to open and close position by connecting an external air supply and based on fail condition mentioned for the particular valve, fail position as required is attained respectively i.e. for AFC valves, when the supply is cut the valve should close, Likewise for AFO valves when the supply is cut off the valve should open.

5. Retightening of the tension nuts, nuts and bolts are done to make sure no leakage and proper rugged assembly is attained.

6. The rotary movement of the valve to be observed with caution.

7. The mounting set up, the scotch yoke rotary conversion unit box - pneumatic actuator assembly and valve - actuator assembly to be retightened.

Table 1: Actuator Types & Overhead Clearance

Actuator Size	Minimum Clearance
Size 25 – P25 - A	200
Size 50 – P50 - B	
Size 100 – P100 - C	
Size 200 – P200 - D	

Table2: Scotch Yoke Rotary Conversion Unit Range

Scotch Yoke Rotary Conversion Unit – Type -Size	Compatible Combinations
SY1	P25, P50
SY2	P100
SY3	P100, P200

Actuator Maintenance

Preventive measures are the primary steps for ensuring the proper working of the actuator on a periodic basis of six months. Preventive measures are taken without interrupting the service.

Caution: In case of internal problem refer section "Actuator Disassembly and Reassembly" for respective actuator available.

1. The actuator is inspected for damage due to process drippings and hazardous fumes.

2. Entire valve-actuator package requires cleaning and repainting in case of severe oxidation.

3. Ensure to check proper functioning of the actuator by stroking the valve to the fully closed and open positions. (valve disc rotation)

4. Mounted parts to be checked more than once.

5. Bolting the actuator parts to be checked with caution. Maintain constant tightening torque throughout the bolt ranges on the circular tightening region.

6. Disconnect the air supply and observe if the actuator attains the respective fail-safe position required. Ensure proper positioning based on fail condition or reassemble the entire set up.

7. Ensure the actuator stem is free from grit, dirt and foreign material.

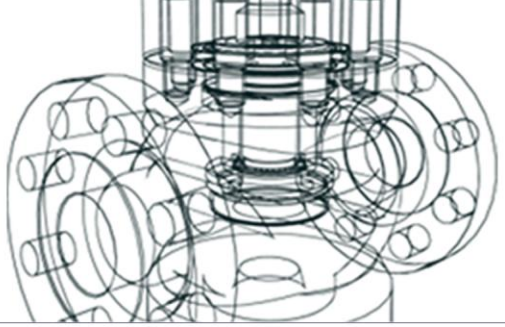
8. All the accessories attached to the actuator are tested individually for their proper function using respective manuals.

Note: All parts to be serviced with caution & care and to be assembled back without any change unless requested or required by the application.

Actuator Disassembly & Reassembly (P25, P50, P100, and P200)

Warning: Depressurize lines and drain respective fluids before the disassembly procedure. Failure to depressurize the line causes major mishaps and injury.

An actuator available on the assembly could be any one of the first 4 types indicated in table 1 and rotary box attached is any one the first three types indicated in table 2. Refer figures 1 and 2.



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Disassembly of Rotary Actuator (P25, P50, P100, P200)

1. The actuator is disassembled from the valve or any other mounting attachments.
2. Disconnect the tubing and other accessories attached to the actuator.
3. The rotary actuator assembly comprises of two major subassemblies, they are the pneumatic actuator and the rotary conversion unit.
4. Using a sling the rotary actuator assembly (pneumatic actuator and the scotch yoke rotary conversion unit) set up is located facing the actuator in the upright posture.
5. The grub screws and washers linking the actuator base plate to the rotary box unit are removed and the scotch yoke rotary conversion unit is removed of the actuator assembly.

Disassembly of the Rotary Conversion Unit - Rotary Box (SY1, SY2, SY3)

The conversion unit refers to the scotch yoke rotary conversion setup which enables linear to rotary conversion. Refer to figure 1&2 for installation purposes. The conversion unit, which's sole purpose is intended to enable conversion of linear to rotary movement, follows the simple scotch yoke mechanism as the principle and hence the name.

The various types and compatible actuator combinations are put forth in table no 2.

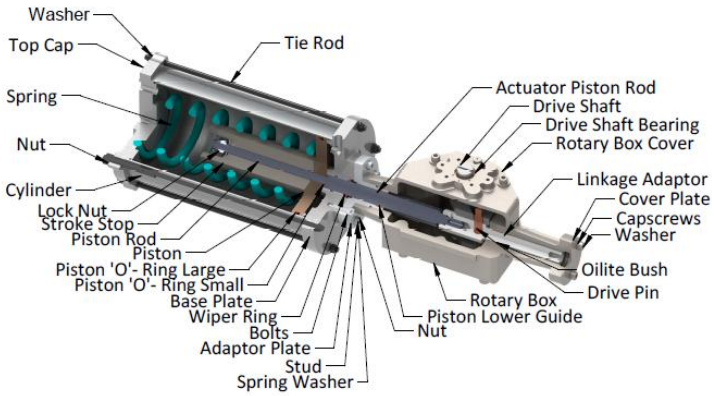


Figure 1: Rotary Actuator (P25, P50, P100, P200) Cross Sectional Layout

1. The scotch yoke rotary conversion unit is placed on to a horizontal position and then the fasteners, screws and washers coupling the rotary linkage box and linkage box cover are removed. There by enabling removal of the cover from the box.
2. Then the hand wheel unit is disassembled if available or likewise the cover placed on the hand wheel location is removed.
3. The drive pin is then pried from the position where it pins the shaft and the linkage adaptor.

   Caution: The drive pin will be firmly located in assembly unit; it is taken of its position using required force and required tools (thin rod).
4. After the drive pin is removed ensure to move the linkage adaptor away from the drive shaft enabling the removal of the drive shaft.
5. The linkage adaptor is then removed from the set up.
6. After the drive shaft and linkage adaptor are removed the oilite bushes and thrust washers in the linkage box are removed enabling disassembly of the scotch yoke rotary conversion unit.

   Caution: Scoring of the bush to be avoided.

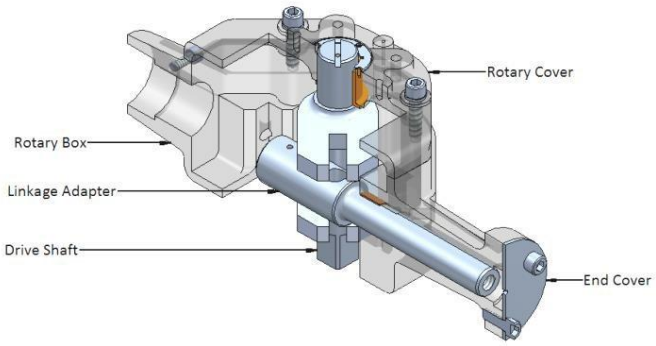
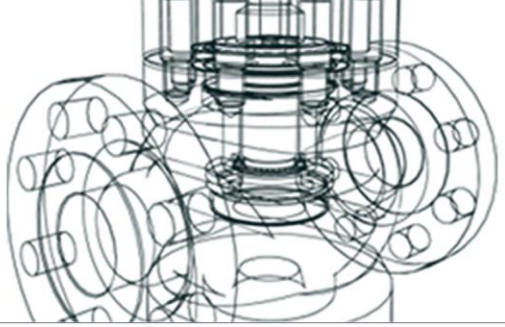


Figure 2A: Rotary Conversion Unit (SY1, SY2, SY3) Cross sectional Layout



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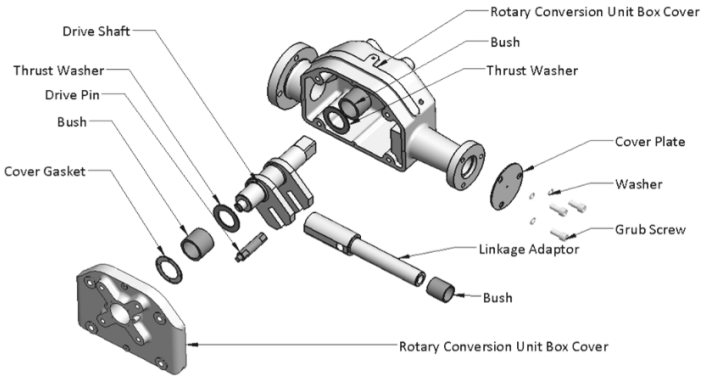


Figure 2B: Rotary Conversion Unit (SY1, SY2, SY3) Exploded View

Disassembly of the Linear Pneumatic Actuator

The pneumatic actuator in the assembly is a direct acting actuator (AFC). The spring within the actuator is supposed to be in the retracted state before disassembly.

1. The tension nuts are loosened to relieve the spring's compression.

   Warning: Spring compression should be relieved before any further disassembly to avoid any fatal mishaps and injuries.

2. After ensuring the spring is in the retracted state, the tie rods and adjusting rods are removed first, followed by the tension nuts to safely relieve the spring force.

3. The top cap is then separated from the assembly followed by the respective O- ring.

4. Since the actuator is always direct acting the following sequence of disassembling the parts within the actuator is done. The piston rod assembly is removed, followed by the spring, cylinder and finally the base plate.

5. Respectively each sub assembly is dismantled, for instance in the base plate assembly, it comprises of wiper rings upper and lower oilite guide bushes and 'O' rings. All parts are visually checked for any external defects. They are pressed into the base plate, so they don't have to be removed unless any visible damage.

Caution: Reuse of seals O-rings and gaskets may cause major assembly issues like leakage and improper function of the valve and actuator.

The 'O' rings available in the entire assembly are to be replaced to ensure the integrity and performance of the actuator.

6. In the piston rod assembly, the parts namely the stroke stop, lock nut and piston rod have to be checked for any damage.

7. The top cap, base plate and piston assembly comprise of 'O' rings. They should be replaced.

Reassembly of the Actuator

Refer figures 1&2 for reassembling the actuator.

Reassembly of the Scotch Yoke Rotary Conversion Unit: (Rotary Box- (SY1, SY2, SY3))

1. Locate the rotary linkage cover box on a horizontal surface.

2. Apply grease on to the surfaces to enhance lubrication and free movement of mating parts.

3. Locate the bushes (flanged bush for B) on the provided bore on the linkage box and then place the thrust washer (C, D). Refer figure 2 A & B.

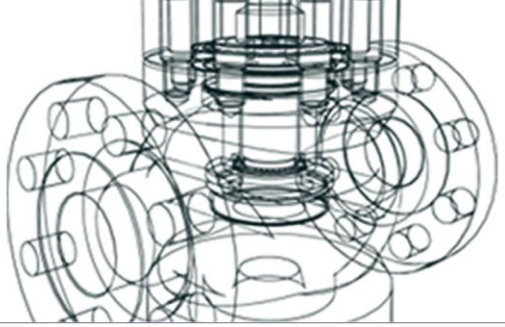
4. Locate the drive shaft in such a way it can be rotated in the bore provided in the linkage box.

5. On the other bores present in the scotch yoke rotary conversion unit box, the smaller one is meant for mounting the hand wheel and the other one is the actuator bore respectively.

6. Respectively place the bushes on the bore provided for the hand wheel. Grease the surface to ensure free movement.

7. Locate the linkage adaptor in the bore provided (hand wheel side). If hand wheel is not provided close the hand wheel bore with a cover plate and screw them with respective washers and screws.

8. Position the linkage adapter and drive shaft in such a position that the drive pin can be positioned on to the set up coupling the drive shaft and linkage adapter.



Installation, Operation Maintenance Instructions for 'B' – Series Rotary Actuator

Caution: The drive pin is ensured to be of different material from the drive shaft and linkage adaptor.

9. The linear movement of the linkage adapter should initiate the rotary movement to be adapted by the drive shaft. Thus, serving the purpose of the entire scotch yoke mechanism of converting the linear motion of the linkage adapter to rotary movement on the drive shaft. The process within the scotch yoke rotary conversion unit should be smooth and void of friction. Ensure to grease and reassemble the set up repeatedly till smooth operation of the parts is attained.

10. After positioning the drive pin ensure to tap it a little ensuring its immovable.

11. Locate the oilite bushes and thrust washers on the linkage box cover. Position the linkage box cover on the linkage box. Respectively couple the linkage box and linkage box cover and position the screws & washers and tighten them.

12. All cap screws are tightened uniformly ensuring rigid assembly of the rotary box unit.

Reassembly of Linear Pneumatic Actuator

1. All parts to be free from dirt and grit. Ensure to replace all the 'O' rings in the entire actuator assembly with new ones. Refer figure 1.

2. Initially the parts are to be cleaned and respectively. lubricated with respective lubricants.

3. Position the base plate on a flat surface. Now place the wiper ring and then position the oilite bushes and 'O' rings as in figure which comprises the base plate assembly.

4. The piston assembly comprises of a piston rod, piston, 'O' rings stroke stops and lock nut. These are assembled based on the fail action and assembled. Respectively the top cap 'O' ring is placed on to the top cap.

5. Since the actuator is a direct acting actuator, ensure to position the cylinder followed by the spring and then the piston assembly and then locate the top cap. Refer figure 1.

Caution: Spring will be in the pre-compression (retracted) state with a visible space between the cylinder and the top cap.

6. By use of a torque wrench the space between the cylinder and top cap is eliminated and respectively the tension nuts are fastened, and torque tightened. Then respectively the tie rods are positioned and tightened respectively with the tie rod nuts and washers.

Reassembly of Rotary Actuator (P25, P50, P100, P200)

7. The scotch yoke rotary conversion unit and the actuator base plates are connected by means of grub screws and washers. The linkage adaptor and the actuator stem are thus coupled. The P- series rotary pneumatic actuator assembly is done with caution and care which comprises of the rotary conversion unit and a direct acting pneumatic actuator.

Assembly based on Air Action & Reversing the Air-Action - Rotary Box (SY1, SY2, SY3)

Refer figure 3 & 4 for mounting details and orientation.

8. Based on the fail action of the valve the face of the rotary conversion unit to be mounted on to the valve is considered.

9. For AFO conditioned valves, the rotary conversion unit cover is mounted on to the valve mounting provided and respectively screwed on to the mounting.

10. For AFC conditioned valves, the linkage box face is mounted on to the valve mounting provided and respectively screwed on to the mounting.

11. Required orientations can be attained. Refer figure 3 & 4. Thus, the above can be incorporated for reversing the fail action of the valves.

Caution: After assembly of the Valve-Actuator assembly ensure to reassure valve fail condition is attained by subjecting the valve to open and close by connecting an external air supply and based on fail condition mentioned for respective valve it is attained i.e. For AFC valves, when the supply is cut off the valve

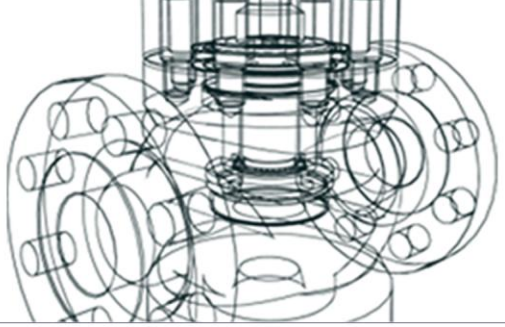


Table 3: Actuator Troubleshooting

Problem & troubleshoot	Possible Cause	Corrective Action	Preventative Measure
Valve Shaft Rotation Failure But Actuator Operates	Actuator Stem Damage	Replace actuator stem.	Actuator stem to be inspected before assembly
	Driver Pin Damage	Replace driver pin.	Driver pin to be inspected with caution
	Linkage Adaptor-Actuator Stem Coupling Failure	Coupling to be done with caution.	Recheck linkage connection
Jerky Shaft Movement	Lubrication Failure	Grease and lubricants to be applied in surplus along cylinder walls and parts	Recheck application of grease before reassembly
	Galling on cylinder walls	Replace all damaged parts	Ensure smooth frictionless movement of parts
	Worn thrust bearings bushes and packing follower	Replace worn parts with new spares	Inspect individual parts before reassembly
Drastic Air Consumption / Excess Leakage	Leakage in the air supply or instrumentation problems	Replace leaky lines	Tighten connection before use of the actuator
	Positioner malfunction	Refer Positioner IOM	Assemble positioner based on the applicable manuals
	Leakage through O-ring / gasket seating surfaces	Replace gaskets & O-rings	Ensure new gaskets & O-rings are issued for reassembly before the assembly procedure
Short Stroke	In-correct stroke positioning	Reassemble the entire actuator	Check valve opening and closure and required stroke are attained prior to installation to the pipe
	Hardened grease	Clean off the hardened grease and reassemble the set up	Grease selected to be accurate and applicable for the respective application and material
	Debris blocking movement	Disassemble parts, clean lubricate and assemble as required	Cleaning all parts individually before reassembly and applying grease could prevent the occurrence of this problem

Installation, Operation Maintenance Instructions for 'B' – Series Rotary Actuator

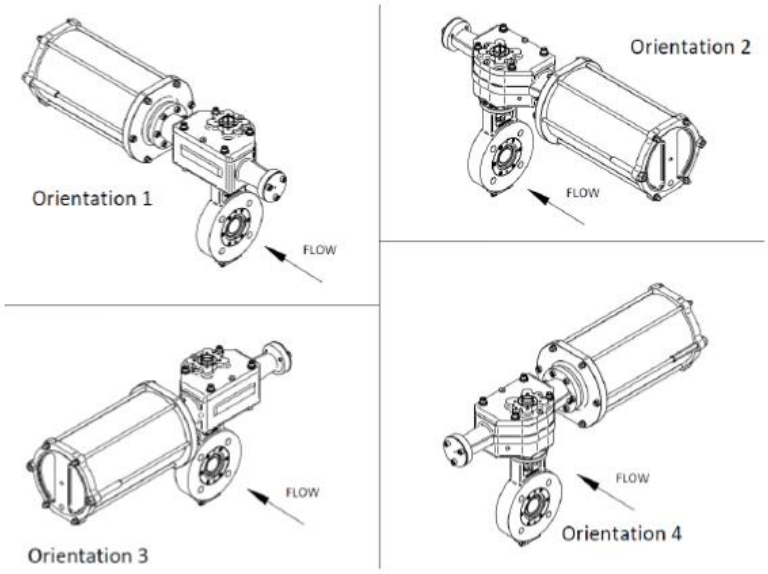


Figure 3: Possible Orientations

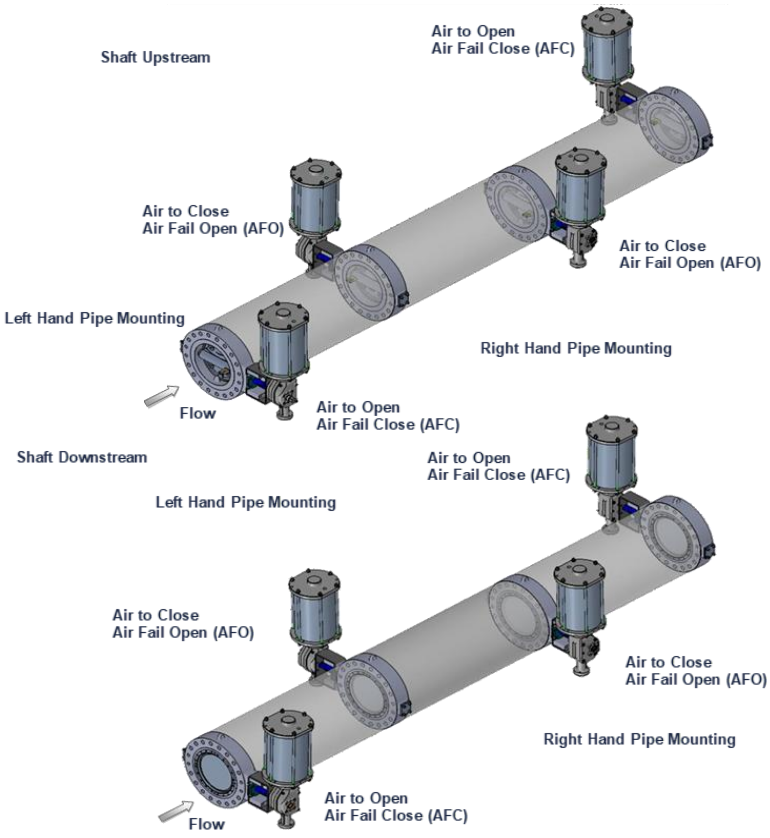
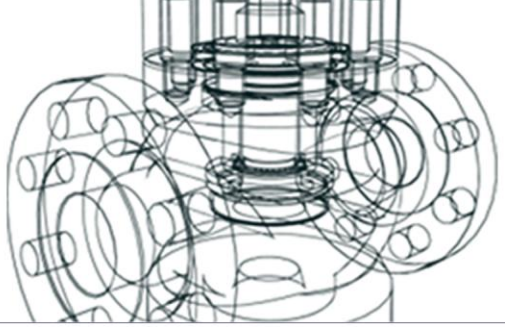


Figure 4: Mounting Types



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RETURNING PRODUCTS

Customers are reminded that under EC Health, Safety and Environment Law when returning products to Severn, they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

Note: This manual is to be read in conjunction with Severn's "Supplementary Installation, Erection, Maintenance, and Operating Procedures" document specific conditions of use (SCofU) any other related O&M instructions relating to any accessories fitted to the Valve.

If any other maintenance work is required, please contact an approved service center for a quotation.

Disclaimer*:* Neither Severn or any of its affiliated entities assumes responsibility for the selection, use, or maintenance of any product.

Responsibility for the proper selection, use, and maintenance of any product remains solely with the purchaser and the end user.

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