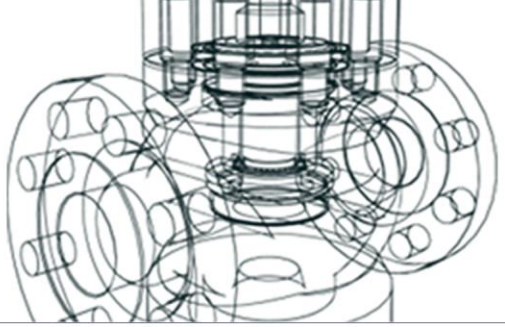

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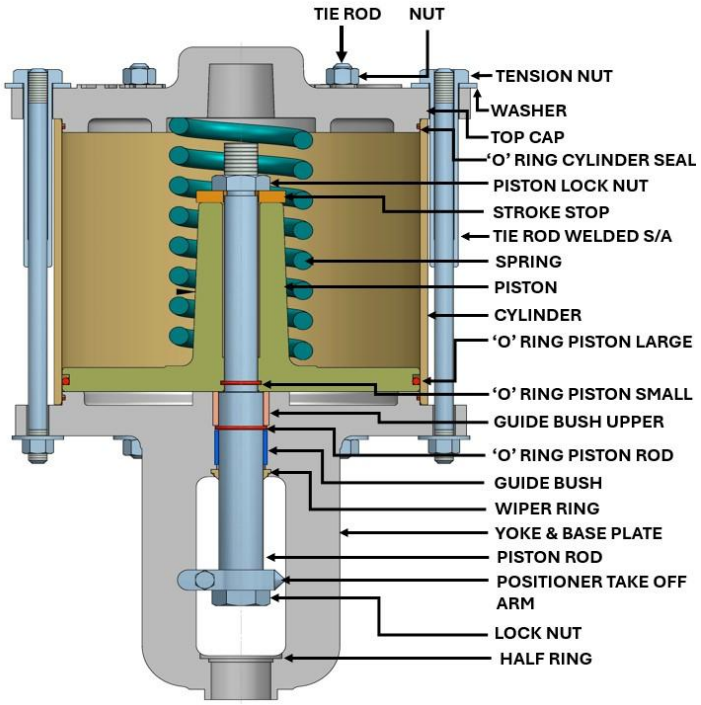
Installation, Operation Maintenance Instructions for 'P' – Series Piston Actuator

Typical Piston Actuator –List of Parts



General Inspection of parts

General inspection is for visual actuator condition only and a test to confirm smooth movement of the piston in operation.

Maintenance items:

Actuator 'O' ring seals, wiper ring and Piston rod guides **(Soft parts are available as an actuator repair kit)**

Advanced Inspection – (to be carried out by trained / experienced personnel only)

ACTUATOR 'O'RING SEAL'S - Not re-useable
ACTUATOR SPRING – If damaged contact Severn for advice on repair or whether replacement is needed
PISTON ROD GUIDES - Examine general condition; renew if necessary

USE OF THIS MANUAL, LEGAL DIRECTIVES, ENVIRONMENTAL AND OTHER SAFETY NOTICES

This manual to be read in conjunction with Severn "Supplementary Installation, Erection, Maintenance and Operating Procedures" documents and other related O & M instructions relating to accessories fitted to the Control Valve. All notices, warnings and guidance given in that manual are also applicable to this document.

INTENDED USE

Reference is to be made to the Control Valve Specification Sheet, Installation and Operation Instructions, nameplate to check product is suitable for the intended use / application.

See Installation, Operation and Maintenance Instructions for Severn Control and Choke valves information on the following (latest edition):

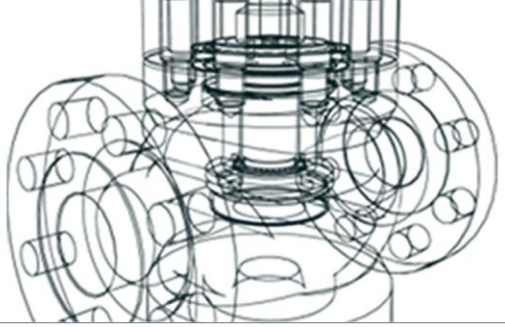
1. **MACHINERY DIRECTIVE INCORPORATED INTO A MACHINE**
2. **ATEX DIRECTIVE**
3. **PRESSURE EQUIPMENT DIRECTIVE PED**
4. **ENVIROMENTAL and OTHER LEGISLATION & IPPC DIRECTIVE**
5. **RETURNING PRODUCTS**

DISPOSAL

Unless otherwise stated in the Instructions, this product is recyclable, and no ecological hazard is anticipated with its disposal providing due care is taken

If any doubts exist, contact Severn quoting the valve serial number

Safety: Always ensure safe working practices are followed:



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Installation, Operation Maintenance Instructions for 'P' – Series Piston Actuator

Always wear appropriate PPE and ensure that the local lifting plan is followed

Always ensure a safe working environment when lifting

Always isolate valve before maintenance. Always use lockout methods to ensure safety

Poison risk: Do not incinerate PTFE. Do not smoke whilst handling PTFE.

Caution: Do not put hands inside yoke area

Always use correct tools. Do not over tighten. Do not use extension bars to force movement

Always read the manual. If any doubts exist, contact Severn quoting the valve serial number.

WARNING: When ordered, the actuator and or control valve configuration and materials of construction are selected to meet particular pressure, temperature, pressure drop and controlled fluid conditions. Personal injury, property damage, equipment damage, or leakage due to escaping gas or bursting of pressure containing parts may result if the actuator and or control valve or its ancillaries are over pressured or installed where service conditions exceed the actuator and control valve design limits.

To avoid such injury or damage, provide a relief valve for overpressure protection as required by accepted industry or local codes and good engineering practice. Do not apply other conditions to the valve without written approval from Severn.

WARNING: Before performing any maintenance operation: Isolate the actuator and or control valve from process pressure. Relieve process pressure from both sides of the control valve. Drain the process media from both sides of the valve. If the control valve is to be removed from the line decontaminate any process fluid remaining in the valve to make safe. Disconnect and isolate any operating lines providing air pressure, electric power, or a control signal to the actuator. Vent the air pressure from the actuator. Be sure that the actuator cannot suddenly open or close the valve (Note by disconnecting the air and or power lines the actuator will move the valve to its fail-safe position).
Ensure persons are a suitable distance from moving parts.

Use lock out procedures to be certain that the above measures stay in effect whilst work is carried out on the actuator or control valve.

Scope of this Manual – Installation - General

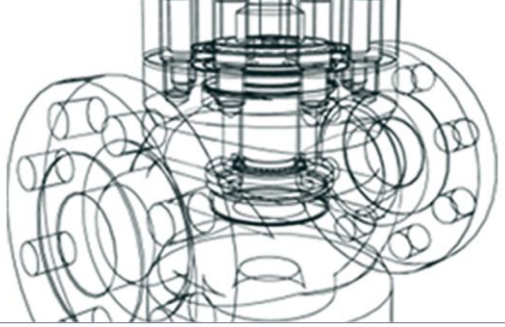
This manual includes installation, operating and maintenance information for Severn P Series actuators only. Please refer to separate manuals for instructions covering the valve, positioner, and any accessories. Where the valve is operated by electric, hydraulic, or electrohydraulic actuation, follow the IOM instructions provided by the actuator manufacturer.

Only persons qualified through training and or experience should install, operate and maintain this product. In case of questions about these instructions or the valves please contact the nearest Severn office before proceeding.

Instructions in the following paragraphs describe the installation procedures for the actuator. Instructions not included are to be performed in accordance with standard industry acceptable practises as may be required by local codes, specifications and or regulations. Users should refer to BS 6683 "Guide to installation and use of valves".

Storage

Unless specifically specified by the contract, the actuator (or valve and actuator) are packed for indoor storage at job site.
For short term storage the actuator or valve and actuator, should be installed in a fire-resistant weather tight and well-ventilated building. The equipment should be kept at a temperature of –20F (-29deg.C) to +120F (48deg.C). The area should be constructed and situated so that it will not be subjected to flooding; the floor should be similarly level, firm, protected and well drained. Actuators and valves should be on pallets or shoring to permit air circulation.



Installation, Operation Maintenance Instructions for 'P' – Series Piston Actuator

For longer storage, a corrosion preventative should be considered that is compatible with the process fluids. Further advice should be sought from Severn.

Handling

Applicable codes regulations and industry practices must be followed when handling or lifting valves. Care should be exercised to protect instrumentation / ancillary equipment. Severn lifting guidelines are available on request.

Installation

Make sure adequate overhead clearance exists when installing the actuator. Minimum clearance is 150mm. It is usual to use the actuator with a suitable valve positioner. If this is the case, the air supply and instrument signal connections must be connected as per the positioner manufacturer's instructions.

WARNING: Do not exceed the recommended air supply pressure shown on the Severn sheet, as injury to personnel or damage to equipment may occur.

The use of an air filter regulator on the air supply line is recommended. Instrument quality air is required for operation of the actuator and any ancillaries fitted.
The weight of the actuator valve assembly should be taken into consideration when mounting on to a valve. Supports may be required depending on the actuator orientation.

Unpacking

1. The initial step in unpacking would be to cross verify the received materials against the packing list. A list containing the details of the actuator and accessories that are supplied along with every shipping container.

2. Ensure to lift the actuator from the packing box 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.

Actuator Removal and Fitting to Valve

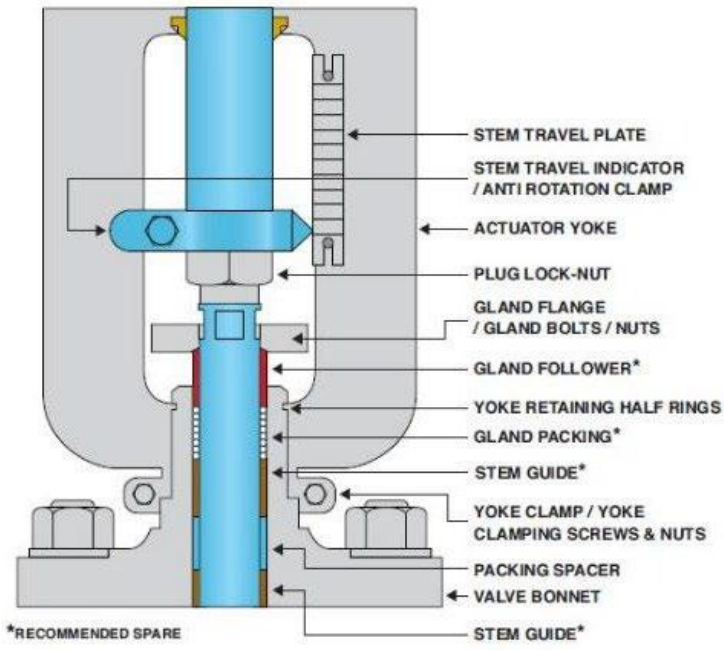
Two types of fitting arrangement for actuators are possible. Smaller actuators may be fitted by a half ring yoke design method with either lock nut or stem clamp between stem and actuator piston. Alternatively, all sizes of actuators may be fitted by a bolted yoke and stem clamp design method.

Actuator for Assembly (or) Disassembly Feasibility

IMPORTANT: See warnings on page 1 in regard to isolation of items to be worked on and carry out safe isolation before beginning work.

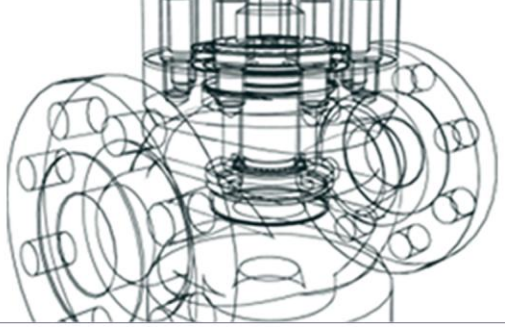
WARNING: Escaping air can cause personal injury, avoid skin contact and wear eye protection. Take care to correctly support any parts being lifted. Take care to remove any linkage mechanisms before starting work to avoid damage

Half Ring Yoke Design showing lock nut connection



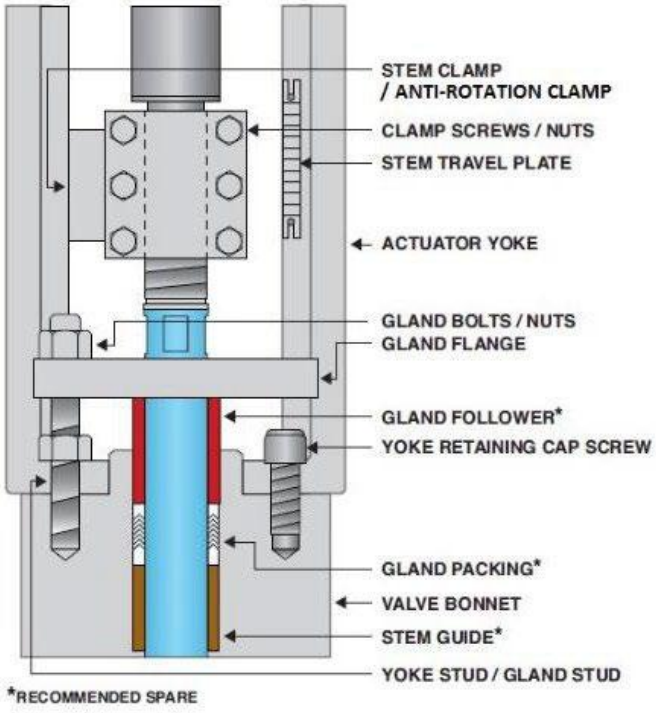
(Actuator sizes P25, 50 and 100)

Note: This design may be fitted with a stem clamp instead of the lock nut design. In this case read relevant sections of both design options for fitting



Installation, Operation Maintenance Instructions for 'P' – Series Piston Actuator

Bolted Yoke showing Stem Clamp Design



(All Actuator Sizes)

NOTE: Yoke Fixings and Gland Flange Studs shown 90 degrees out of position for clarity on Bolted clamp design

Actuator Removal (Half ring fixing method).

Connect suitable slings to support the actuator weight. For air fail actuators the valve plug/actuator stem should be moved to approx. 50% open by means of air. This can be achieved by using a temporary air line with a manually controlled pressure regulator and connected to the lower air port (spring close model) or the upper air port (spring open model) in the actuator. With the valve in this position, the plug locknut can be loosened, remove the yoke clamps and spin the actuator off the valve plug.

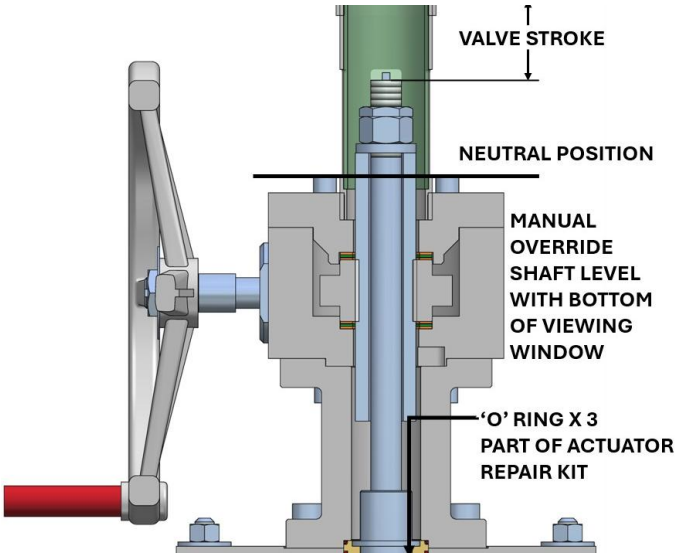
Caution: Do not allow plug to rotate during unscrewing. When the actuator disconnects from the plug, the plug may drop onto the seat position; take care not to trap fingers.

If the plug does not drop, push the plug to the closed position. Remove the plug lock nut, and gland flange. Push the actuator downwards towards the valve body to allow removal of the two-yoke retaining half rings from the groove in the top of the valve bonnet. The actuator can now be lifted clear of the valve and all air vented from the actuator.

Caution: This will cause the actuator piston rod to move to the air fail position.

Actuator Fitting (setting the correct plug position)

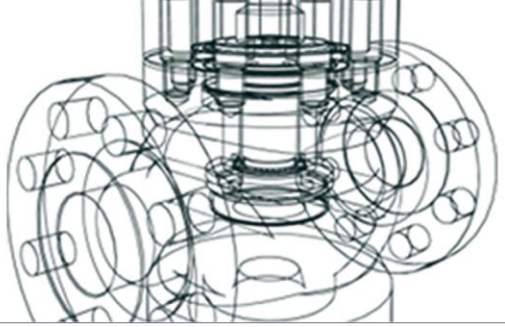
Before fitting the actuator, extend the piston rod to the maximum extended position and mark location on the yoke. Connect suitable slings to support the actuator weight for both air fail actions. For air fail close type lower the actuator on to the valve body; during this operation loosely fit the gland flange and plug lock nut.



By rotating the actuator onto the plug stem it will then be possible to fit the yoke retaining half rings. Once these have been fitted rotate the actuator in an anticlockwise direction until the half rings are a snug fit in the yoke. The yoke clamps, the gland bolts and nuts can now be fitted.

Caution: During this process ensure the plug is not driven hard into its seat or is allowed to rotate.

For air fail open type actuators use a temporary air line and manual regulator as above to move the actuator down slowly so as to be able to rotate the actuator onto the plug stem. **See prior caution notes**. Relieve all air pressure and disconnect. By screwing the actuator onto the plug, it will be possible to allow the yoke to be pushed down towards the valve body and the yoke retaining half rings can be fitted. Allow the actuator to rise after fitting



to hold these rings in place then fit the yoke clamps, gland bolts and nuts.

Setting the plug to its seating position.

With Actuator Piston Rod fully extended, (this can be seen by the marks made earlier on the yoke) and with the plug set fully on the seat, the actuator piston or piston rod should extend to a position short of the mark by approximately up to 3mm.

Adjust the plug to achieve this position by screwing the actuator in or out. **Do not rotate the plug**. Move the actuator up and down slowly to ensure smooth operation. Set the plug lock nut. This position may need to be adjusted again later depending upon the type of positioner when fitted.

Fully stroke the actuator to ensure smooth operation.

NOTE: When installing new or re-fitting the actuator, refer to valve IOM detail on appropriate tightening of packing gland.

Actuator Removal (Bolted Stem Clamp fixing method)

Set the actuator just off its valve seat by use of a temporary airline/regulator as above. Undo the clamp screws and nuts to separate the actuator piston from the plug stem (the piston may move up/down and in rare cases contact the plug stem). The plug position may have to adjusted slightly so as to allow the split clamp to release from its thread.

Air in the actuator can now be slowly released. Loosen the gland bolts and gland flange. Loosen the yoke retaining cap screws by approximately. 6mm to ensure spring force is fully relaxed (actuator rocks easily). The actuator can now be removed taking care not to damage the valve plug.

Actuator Fitting

(Setting the correct plug position to ensure proper seating force is applied during normal operation.)
Fitting follows the reverse methodology of removal, but plug should be set to its on-seat position. Operate the actuator piston down to its fully extended position (it should not hit the top of the plug stem). **Do not rotate the plug.** The piston should then be raised by approximately 6mm before fitting the clamp. Adjust the stem position to ensure the threads mesh fully and fit the other half of the clamp tightly. Fully stroke the actuator to ensure smooth operation.

Pre-Operation

The actuator and control valve positioner must be set to correctly close and seat the valve so as to not give rise to premature trim degradation. If a manual handwheel override is provided in the actuation system, ensure this is in the disengaged or neutral position. Clean the actuator shaft of any foreign matter. Always use correct tools including the use of torque wrenches to assure bolts are not over tightened during any checks carried out.

Operation

In operation, ensure that the actuator operates smoothly and that there is no juddering or unusual motion. If the actuator exhibits any strange behaviour, please contact your nearest Severn representative immediately.

IMPORTANT: For all valve adjustments refer to relative IOM instructions. If any doubts exist, contact Severn.

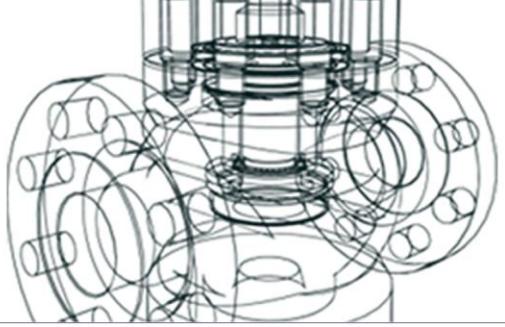
Maintenance

Actuator parts are subject to normal wear and tear and must be inspected and replaced as necessary. Inspection and maintenance frequency depends upon the severity and importance of the service.

WARNING: The actuator may be spring loaded. Use care to follow normal safety procedures when removing actuator casings and end caps. When turning off the air supply the actuator will move to its fail-safe position. Keep personnel away from the moving parts of the valve and actuator during this process to avoid personnel injury. The actuator may move very quickly during this process.

Spare Parts

Whenever an actuator is disassembled, it is recommended that all soft parts are replaced. These are consumable parts.



Installation, Operation Maintenance Instructions for 'P' – Series Piston Actuator

Troubleshooting

Jerking or sticky stem travel

	Possible Cause	Solution
1.	Insufficient air supply	Check air supply and any filters for blockage
2.	Unlubricated piston cylinder wall	Lubricate the cylinder and 'O' ring seals.
3.	Worn or damaged piston rod guide bushing	Check moving parts for damage. Replace if worn
4.	Incorrectly located air fail spring	Check actuator spring locations, refit if needed.
5.	Internal valve problem	Check the valve. Repair as required

High air consumption

1.	Leaks in the air supply	Check air connections. Tighten fittings and refit any leaking tube lines.
2.	Positioner Malfunction	Check and refer to positioner manufacturer's instructions
3.	Leaks through actuator 'O' rings	Use actuator repair kit to replace all 'O' rings and wiper rings
4.	Damaged Cylinder	Replace with New Cylinder

Actuator does not move to its fail-safe position

1.	Air pressure is not venting due to faulty positioner / ancillaries	Check and refer to positioner or ancillary manufacturer's instructions as needed
2.	Spring failure	Check and replace if needed
3.	Internal valve problem	Check the valve, repair as required.

AUXILIARY HANDWHEELS AND LIMIT STOPS

Top-mounted, Continuously Connected Handwheels

Fitted on Actuators Size P25, 50 and 100

Advanced Maintenance

The top-mounted, continuously connected hand-wheel is totally, enclosed, so only checking for general condition is required. However, disassembly may be necessary if the mechanism fails. When reassembling the handwheel, be sure to clean and lubricate the screw and drive nut with a multi-purpose grease and replace 'O' rings with new.

IMPORTANT: After operation of the override, it must be returned to the neutral position for automatic operation (shown by manual override shaft level with the bottom of the viewing window in the hand-wheel end cover tube (6).

Operation

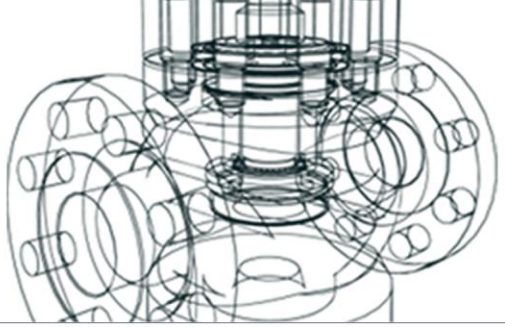
If a pneumatic failure occurs, or if manual control of the valve is desired, the unit can be operated as follows:

1. Set the three-way bypass valve (located on the pneumatic supply line to the positioner) to "Hand" to vent the air pressure from the actuator. NOTE: a three-way valve is installed in the supply line only when there is no lock-up system or volume tank. On volume tank or lock-in place systems, the bypass valve is located between the top and bottom cylinder ports. However, on some pneumatic circuits the single three-way bypass valve may be substituted by two two-way manual valves. Consult the pneumatic circuit supplied with the actuator documentation.

WARNING: By venting the air, the actuator will move to the failsafe position, this may be fast. Please keep away from moving parts including the positioner linkage to avoid injury.

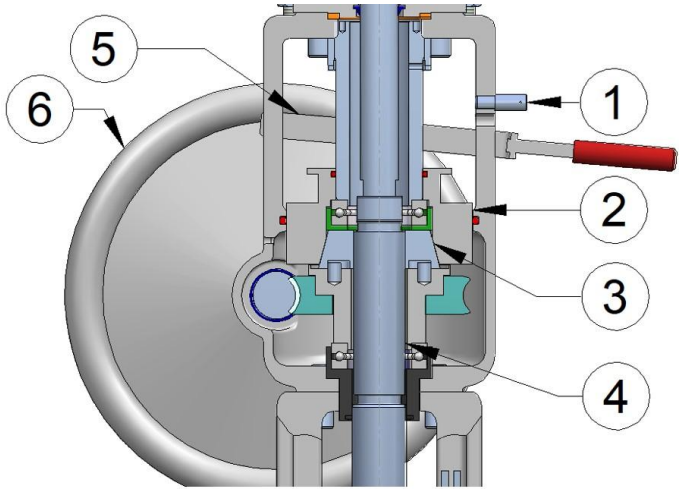
2. To open the valve, turn the hand-wheel counter-clockwise to retract the plug. To close the valve, turn the hand-wheel clockwise to extend the plug.

3. To return the valve to automatic control, return the hand- wheel nut to the 'neutral' as shown by the handwheel position indicator and set the three-way bypass valve (see previous NOTE) to 'auto'. The neutral position is indicated when the top of the screw aligns with the marked line on the cap liner (see diagram).
4. Adjusting the hand-wheel nut to a position other than neutral provides a limit open or close stop function



Installation, Operation Maintenance Instructions for 'P' – Series Piston Actuator

De-Clutchable Handwheels



Maintenance

This is an enclosed unit. For long life, it is important to keep a coating of multi-purpose grease on the acme threads and engaging collets at all times. A grease point is provided and a multi-purpose grease should be pumped into the unit periodically. Oil can be applied to the hinge pins, the operating lever and the bearings on handle mechanism.

WARNING: If the mechanism has been operated incorrectly it is possible to strip the acme threads on the actuator piston rod and replacement parts will be required.

Operation

If an air failure occurs, or if manual control of the valve is desired, the handwheel override can be operated as follows:

1. Turn off the pneumatic supply. This is carried out by operating the three-way bypass valve (located on the air supply line to the positioner) to "Hand" to vent the air pressure from the actuator. NOTE: three-way valves are installed in the supply line only when there is no lock-up system or volume tank. On volume tank or lock-in place systems, the bypass valve(s) is located between the top and bottom cylinder ports. However, on some pneumatic circuits the single three-way bypass valve may be substituted by two two-way manual valves. Consult the pneumatic circuit supplied with the actuator documentation.

WARNING: Venting air will move actuator to the fail-safe position, this may be fast & personnel must keep away from moving parts including the positioner linkage to avoid injury.

2. After isolating the pneumatic supply remove the operating lever locking pin (1), from its hole beneath the operating lever assembly (5). Do not lose this pin (it is normally held to the body of the unit by a chain). It is now possible to move the operating lever (5) down towards the valve body. This in turn moves the internal engaging piston (2) and pushes the split segments of a spring-loaded operating nut (3), which will engage onto the connecting rod (4) with its acme thread. It may be required to rotate the hand-wheel (6) at the same time to ease this process. Once the operating handle has moved and the operating nut fully engaged on the acme thread the locking pin (1) is used to hold the operating lever in position by inserting into the lower of the two holes.

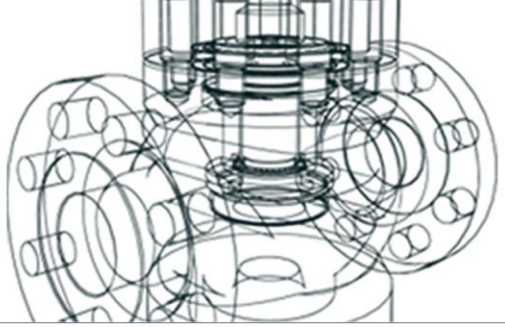
3. With the hand-wheel unit now fully engaged on the actuator piston rod thread, rotating the hand-wheel clockwise will close the valve and by rotating the hand-wheel counter-clockwise, the valve will open.

4. To return to automatic control, using the hand-wheel mechanism, firstly position the valve fully to the air fail position.

WARNING: Control valves must only ever be put back into automatic control mode once user has confirmed the valve is fully in its Fail-Safe mode position. Failure to do so can cause damage to equipment and severe injury to personnel.

5. Pull out the operating lever locking pin (1) from its locating hole above the operating lever assembly (5). To declutch the hand-wheel assembly move the operating lever (5) up away from the valve body. This moves the engaging piston (2) away from the operating nut and allows operating nut (3) springs to disengage operating nut from connecting rod (4). It may be necessary to rotate the hand-wheel (6) slightly to allow the acme threads to disengage. Confirm disengagement by checking the handwheel moves freely.

WARNING: At this point, just in case there is still a load on the actuating stem from the valve, meaning the



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actuator piston rod will move to the no load position, it is advised to keep personnel away from any moving parts.

6. When the acme thread is fully disengaged the operating lever will be in its fully up position and the locking pin (1) is used to hold the lever assembly in position by inserting this locking pin in the upper of the two holes.

7. To return to automatic control, turn on pneumatic supply by operating the three-way bypass valve (see previous NOTE) to 'auto'. This reconnects the air supply to the positioner.

Disclaimer: Neither Severn or any of its affiliated entities assumes responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and the end user.

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