

SARTELL Valves, Inc.

Actuators For:

DeZURIK Water
Controls

SARTELL Valves &
Controls

SPRING RETURN CYLINDER OPERATOR FOR G-SERIES ACTUATORS

Instruction **D10071**
May 2008

SARTELL Valves, Inc.

Spring Return Cylinder Operator

Instructions

These instructions provide information about Spring Return Cylinder Operators. They are for use by personnel who are responsible for installation, operation and maintenance of Spring Return Cylinder Operators.

Safety Messages

All safety messages in the instructions are flagged with an exclamation symbol and the word Caution, Warning or Danger. These messages indicate procedures that must be followed exactly to avoid equipment damage, personal injury or death.

Safety label(s) on the product indicate hazards that can cause equipment damage, personal injury or death. If a safety label becomes difficult to see or read, or if a label has been removed, please contact SARTELL Valves, Inc. for replacement label(s).



WARNING!

Personnel involved in the installation or maintenance of valves should be constantly alert to potential emission of pipeline material and take appropriate safety precautions. Always wear suitable protection when dealing with hazardous pipeline materials. Handle valves which have been removed from service with the assumption of pipeline material within the valve.

Inspection

Your Spring Return Cylinder Operator has been packaged to provide protection during shipment, however, it can be damaged in transport. Carefully inspect the unit for damage upon arrival and file a claim with the carrier if damage is apparent.

Parts

Recommended spare parts are listed on the assembly drawing. These parts should be stocked to minimize downtime.

Order parts from your local SARTELL Valves, Inc. sales representative, or directly from SARTELL Valves, Inc.. When ordering parts, please include the 7-digit part number, the part name, the assembly drawing number, the balloon number and the quantity stated on the assembly drawing.

SARTELL Valves, Inc. Service

SARTELL Valves, Inc. service personnel are available to install, maintain and repair all SARTELL Valves, Inc. products. SARTELL Valves, Inc. also offers customized training programs and consultation services.

For more information, contact your local SARTELL Valves, Inc. sales representative or visit our website at www.sartellvalves.com.

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Spring Return Cylinder Operator

Description This is a Spring Return Cylinder Operator intended for pneumatic service.



WARNING!

THIS IS A PRESSURE CONTAINING VESSEL. RELEASE THE PRESSURE FROM THE CYLINDER BEFORE ATTEMPTING ANY DISASSEMBLY OR REPAIR.

THIS VESSEL ALSO CONTAINS A COMPRESSED SPRING, THE POTENTIAL FOR PERSONAL INJURY EXISTS DURING DISASSEMBLY. FOR SAFE DISASSEMBLY, FOLLOW THESE INSTRUCTIONS CAREFULLY.

Supply Maximum cylinder supply pressure is 100 psi. For maximum cylinder life, the air should be filtered and dry.

Lubrication If the cylinder is disassembled, lubricate the cylinder wall, piston seal, O-ring and O-ring groove with Dow Corning Molykote No. 44 grease or equivalent.

**Cylinder
Inspection
Procedure**



WARNING!

Never begin disassembling this cylinder until you have inspected the snap ring and have checked for piston rod movement. These inspections will tell you if the compressed spring is properly retained or if the piston rod is stuck. If piston rod is not retained, the spring could be released on disassembly, possibly causing injury.

1. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.
-



WARNING!

Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

2. Remove the actuator cover so you can see the piston rod and snap ring. To remove the actuator cover:
 - a. Remove the lock nut, spring washers, pointer, wrenching square, and cover screws.
 - b. Pry off the cover.
3. Pressurize the cylinder. Inspect the snap ring on the end of the piston rod. (See Figure 1.)

**Cylinder
Inspection
Procedure**
(Continued)



WARNING!

If the snap ring is missing or damaged, do not disassemble the cylinder. Remove the cylinder assembly from the actuator and return the cylinder to SARTELL Valves, Inc.

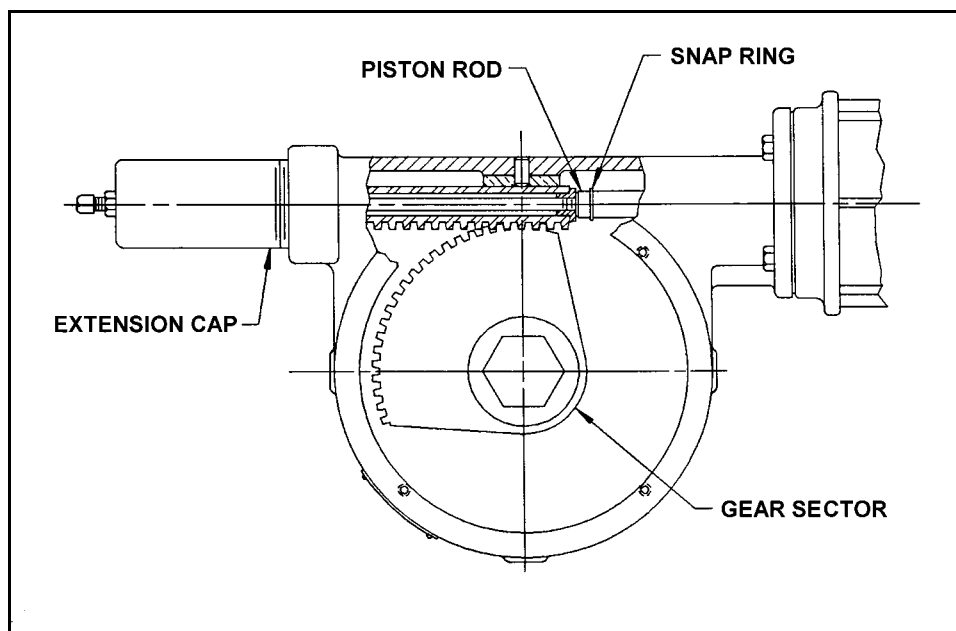


Figure 1 – Actuator Shown with Cylinder Pressurized

4. While watching the piston rod, relieve the cylinder pressure.



WARNING!

If the piston rod does not move, do not disassemble the cylinder. Remove the cylinder from the actuator and return the cylinder to SARTELL Valves, Inc.

5. Assemble the cover, pointer and wrenching square. Place the spring washers on the stud as shown in Figure 2, tighten the lock nut until the spring washers are completely compressed, and then loosen the lock nut until the spring washers return to their normal shape.

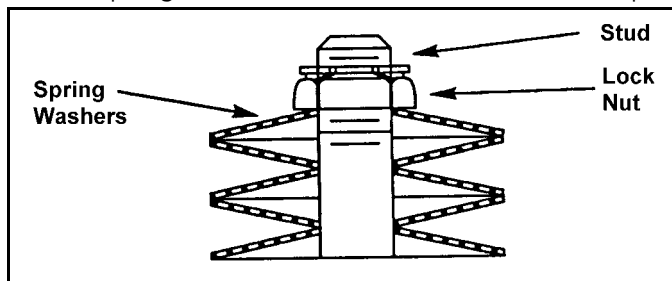


Figure 2 – Spring Washer Arrangement

**Cylinder
Disassembly**



WARNING!

Never begin disassembling this cylinder until you have inspected the snap ring and have checked for piston rod movement.

See the CYLINDER INSPECTION PROCEDURE on Page 2 in this Instruction before disassembling the cylinder.

1. Relieve pipeline pressure, discontinue flow.
 2. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.
-



WARNING!

Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

3. Relieve cylinder pressure. Remove the extension cap from the actuator housing.
4. Pressurize the cylinder, then remove the nuts and spring washers from the rack rod. (On spring-to-open cylinders, the spring washers are located on the cylinder end of the rack rod, they will be removed with the cylinder assembly.)
5. Relieve the cylinder pressure, then remove the four screws that fasten the cylinder to the actuator housing.
6. Pull the cylinder, complete with rack rod, from the actuator housing. (On spring-to-open cylinders, the spring washers will be on the rack rod.)
7. Clamp the rack rod in a soft-jawed vise.
8. Loosen the jam nut and remove the set screw in the cylinder cap. See Figure 3 for parts identification.
9. Remove the nuts and lockwashers from the tie rods.
10. Remove the cylinder cap.
11. Remove the tie rods.
12. Rotate the cylinder tube while pulling it off the piston.
13. Remove the locknut from the piston rod.
14. Unscrew the piston from the piston rod.
15. Remove the spring.
16. Pull the cylinder head off the piston rod.

**Cylinder
Reassembly**

1. Replace the O-rings in the cylinder head and cylinder cap if necessary.
2. Replace the piston seal and piston O-ring if worn.
3. Replace the rod seal in the cylinder head.
4. Clamp the rack rod with the piston rod in a soft jawed vise.
Note: Make sure the snap ring is secure in groove of the piston rod.
5. Lubricate the rod seal then slide the cylinder head onto the piston.
6. Set the spring in place then install the piston. Screw the piston on until the dimension shown in Figure 4 is reached.
7. Install the seal and locknut and lock the piston in place with the locknut.
8. Slide the cylinder tube over the piston. Coat the piston seal and the inside of the cylinder tube with Dow Corning Molykote 44 grease. It will be easier to start the cylinder tube at a 45° angle then rotate the cylinder tube onto the piston. See Figure 5.
9. Install the tie rods and cylinder cap then secure them in place with the washers and nuts. Make sure the tag is under one of the nuts. Tighten the nuts on the tie rods to the torque specified in Table A.
10. Install the thread seal, jam nut and set screw.
11. Place a new gasket on the housing, slide the cylinder assembly into the housing and thru the rack and secure the cylinder assembly to the housing with screws.

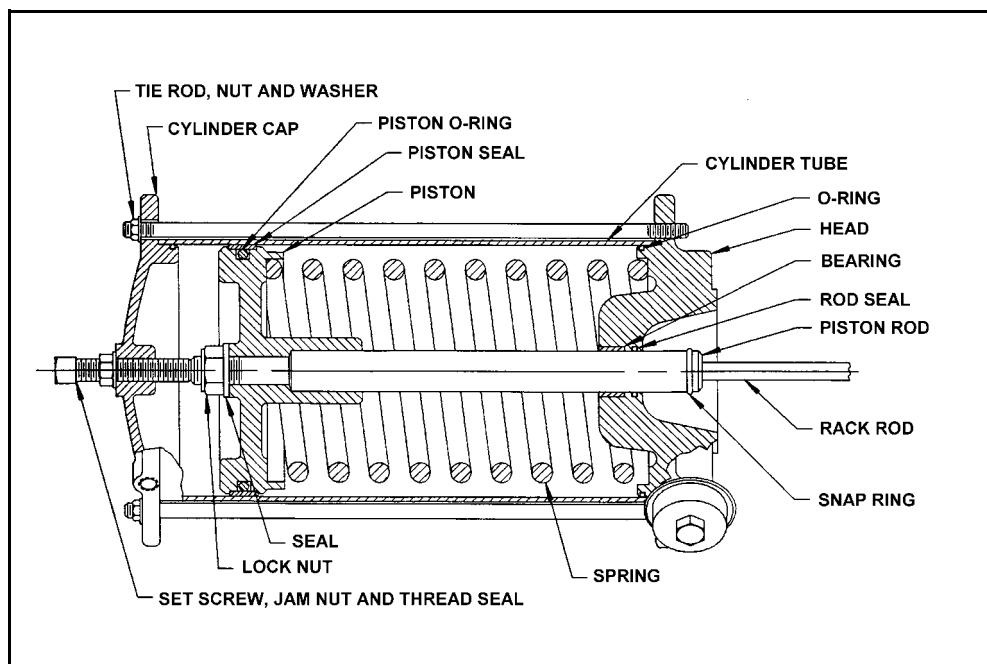


Figure 3— Cylinder Parts Location

**Cylinder
Reassembly**
(Continued)

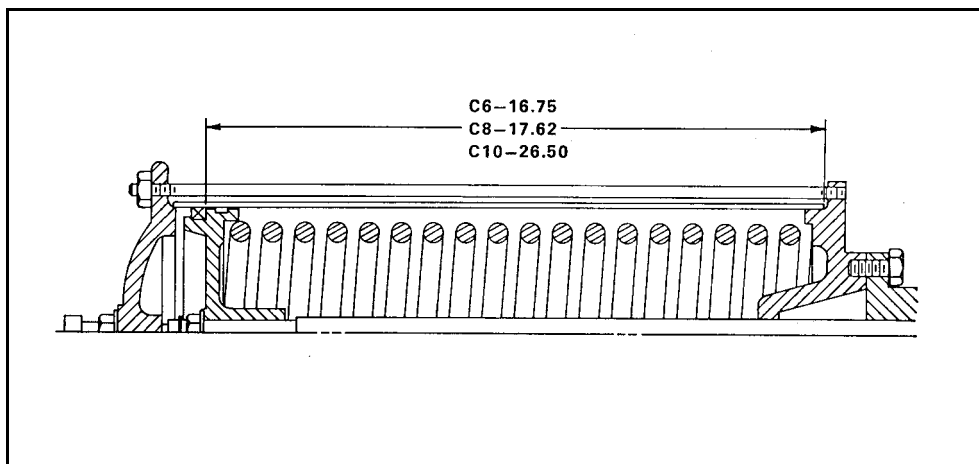


Figure 4— Installed Piston Location

12. Position the spring washers as shown in Figure 6. The spring washers go on the cylinder end of the rack rod for spring to open applications and on the other end for spring to close cylinders.
13. Tighten the lock nut until the spring washers are completely compressed. Then loosen the lock nut until the spring washers return to their normal shape. Lock the nut in place with the other locknut.
14. If the actuator is a powered actuator, reconnect power to the actuator.
15. Adjust the open and closed position stops as described in the STOP ADJUSTMENTS Section of this manual.

Cylinder Reassembly
(Continued)

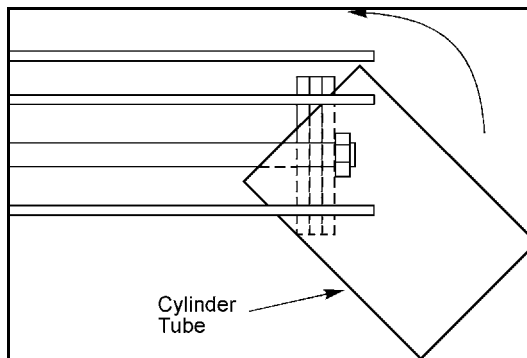


Figure 5— Cylinder Tube Installation

Stack washers as shown in A except on 8" thru 12" valves with G12 actuators, stack as shown in B.

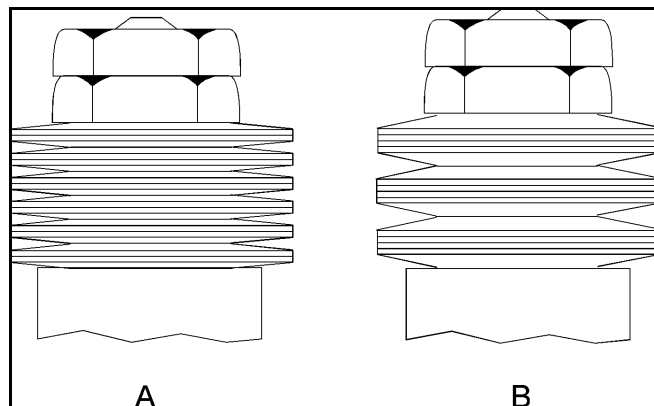


Figure 6— Washer Stacking for Different Valve Sizes

Table A: Tie Rod Nut Torque

Cylinder Size	Torque ft. lbs.
C6 & C8	16
C10	20

Stop Adjustments

Cylinder mounted for spring-to-close

1. Open Position Stop
 - a. Pressurize the far end of the cylinder.
 - b. While maintaining the pressure, adjust the set screw in the extension cap so the plug is in the open position.
 - c. Lock the set screw in place with the jam nut.
2. Closed Position Stop
 - a. Relieve the cylinder pressure.
 - b. Turn out the set screw in the end of the cylinder until there is no pressure on it. Then turn it back in until it just contacts the piston rod.
 - c. Lock the set screw in place with the jam nut.

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Stop Adjustments (Continued)

Cylinder mounted for spring-to-open

1. Open Position Stop
 - a. Relieve the cylinder pressure.
 - b. Adjust the set screw in the end of the cylinder so the plug is in the open position.
 - c. Lock the set screw in place with the jam nut.
2. Closed Position Stop
 - a. Pressurize the cylinder.
 - b. Remove the extension cap, and remove the nuts on the rack rod.
 - c. Relieve the cylinder pressure.
 - d. Close the valve with the torque specified in Table B. This is accomplished by using a torque wrench on the manual nut. Mark the location of the arrow on the cover when this torque is applied. If valve is for dry service, seat must be dry. For wet service, seat must be wet.

Table B: Closing Torques

Valve Size	Wet Seat		Dry Seat	
	ft. lbs.	NM	ft. lbs.	NM
4	24	33	42	57
6	28	38	67	80
8	34	46	200	271
10	44	60	250	339
12	55	75	350	475

- e. Pressurize the cylinder and install the nuts on the rack rod. To be sure the spring washers are properly tightened, count the number of turns required to fully tighten them from the point where the nut contacts the flange bearing. Loosen the nut one turn less than that number.
- f. Install the extension cap and turn the set screw in or out until the pointer lines up with the mark on the cover. Lock the set screw in place with the jam nut.
- g. Connect power to the actuator.

Changing the Action



WARNING!

When the actuator is removed, be careful of moving parts. The Spring in the cylinder is compressed when air pressure is supplied to the cylinder. Relieving cylinder pressure allows the spring to pull the piston rod and the rack.

Relieve pipeline pressure whenever possible.

If the valve is in a pressurized pipeline, be sure the valve is in the closed position when the gear sector is removed. This prevents water hammer that could result if pipeline pressure slams the valve closed.

In the spring-to-close cylinder, the spring force must cause clockwise rotation of the plug.

In the spring-to-open cylinder, applying cylinder air pressure must cause clockwise rotation of the plug.

Changing the cylinder action requires changing the orientation of the rack and gear. The location of the spring washers on the rack rod is also changed. To change from spring-to-close to spring-to-open, see Section A below. To change from spring-to-open to spring-to-close, see Section B.

Section A

See Figure 7.

From Spring-to-Close to Spring-to-Open

1. Discontinue flow and relieve pipeline pressure.
 2. Close the valve by shutting off the supply pressure to the cylinder.
 3. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.
-



WARNING!

Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

4. Remove the lock nut, spring washers, pointer, wrenching square and the cover screws.
5. Remove the actuator cover. This is a press fit; it is necessary to pry it off.
6. Remove the gear sector. If the teeth of the gear sector and the rack are binding, turn the set screw located in the cylinder cap in enough to move the rack a small amount.
7. Disconnect the air line to the cylinder, if not already done.

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Changing the Action *(Continued)*

8. Remove the four screws that fasten the actuator housing to the adaptor and remove the actuator housing complete with the cylinder.
9. Turn the actuator over, but do not rotate it. Install it on the adaptor. In this position, rotation of the plug is clockwise when the cylinder is pressurized.
10. Remove the extension cap from the gear housing.
11. Connect the air line to the cylinder and pressurize the cylinder. Cylinder pressure must be maintained for Steps 12 thru 17.
12. Maintain the cylinder pressure and remove the jam nuts, spacer and spring washers from the end of the rack rod.
13. Carefully slide the rack off the rack rod.
14. Slide the spring washers onto the rack rod in the arrangement shown in Figure 6.
15. Slide the rack onto the rack rod making sure the rack lines up on the rack bearing in the gear housing. The rack must be slid on until it contacts the spring washers.
16. Install the spacer and one of the jam nuts onto the rack rod. Tighten the nut until the spring washers start to compress, then back the nut off until the washers return to their normal shape.
17. Lock the jam nut in place with the other nut.
18. Install the extension cap on the gear housing. It may be necessary to relieve the pressure on the cylinder until the extension cap is in place.
19. If cylinder pressure was relieved to perform step 18, pressurize the cylinder again until the rack rod contacts the stop screw in the extension cap.
20. Place the gear sector on the plug stem. It must be positioned so the gear will engage the rack for 90 degrees rotation.

For G6 actuators (6" diameter gear), the 3rd tooth on the rack, counting from the cylinder end, should engage between the 4th and 5th teeth on the gear sector, counting clockwise.

For G12 actuators (12" diameter gears), the 3rd tooth on the rack, counting from the cylinder end, should engage between the 5th and 6th teeth on the gear sector, counting clockwise.

If the teeth do not mesh, turn the screw in the extension cap to move the rack until the teeth mesh as indicated.

21. Relieve cylinder pressure.
22. Assemble the cover, pointer and wrenching nut. Place the spring washers on the stud as shown in Figure 2, and tighten the lock nut until the spring washers are completely compressed. Then loosen the lock nut until the spring washers return to their normal shape.
23. Connect power to the actuator.
24. Adjust the closed and open position stops as described in the STOP ADJUSTMENTS section of this manual.

**Changing the
Action**
(Continued)

Section B

See Figure 7.

From Spring-to-Open to Spring-to-Close

1. Discontinue flow and relieve pipeline pressure.
2. Open the valve by shutting off the supply pressure to the cylinder.
3. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



WARNING!

Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

4. Remove the lock nut, spring washers, pointer, wrenching square and the cover screws.
5. Remove the actuator cover. This is a press fit, it will be necessary to pry it off.
6. Remove the gear sector. If the teeth of the gear sector and the rack are binding, turn the set screw located in the extension cap in enough to move the rack a small amount.
7. Remove the four screws that fasten the actuator housing to the adaptor and remove the actuator housing complete with the cylinder.
8. Turn the actuator over, but do not rotate it. Install it on the adaptor. In this position, rotation of the plug is counterclockwise when the cylinder is pressurized.
9. Remove the extension cap from the gear housing.
10. Connect the air line to the cylinder and pressurize the cylinder. Cylinder pressure must be maintained for steps 11 thru 16.
11. Maintain the cylinder pressure and remove the jam nuts and spacer from the end of the rack rod.
12. Carefully slide the rack and the spring washers off the rack rod.
13. Slide the rack back onto the rack rod making sure the rack lines up on the rack bearing in the gear housing.
14. Slide the spring washers onto the rack rod in the arrangement shown in Figure 6.
15. Install the spacer and one of the jam nuts onto the rack rod. Tighten the nut until the spring washers start to compress, then back the nut off until the washers return to their normal shape.
16. Lock the jam nut in place with the other nut.

Changing the Action
(Continued)

17. With the plug in the open position, place the gear sector on the plug stem. It must be positioned so the gear will engage the rack for 90 degrees rotation.

For G6 actuators (6" diameter gears), the 3rd tooth on the rack, counting from the cylinder end, should engage between the 16th and 17th teeth on the gear sector, counting clockwise, for valves with the cylinder parallel with the pipeline (the 20th and 21st teeth on the gear sector, counting clockwise, for valves with the cylinder perpendicular to the pipeline).

For G12 actuators (12" diameter gears), the 2nd tooth on the rack, counting from the cylinder end, should engage between the 21st and 22nd teeth on the gear sector, counting clockwise, for valves with the cylinder parallel with the pipeline (the 26th and 27th teeth on the gear sector, counting clockwise, for valves with the cylinder perpendicular to the pipeline).

If the teeth do not mesh, turn the screw in the cylinder cap to move the rack until the teeth mesh as indicated.

18. Shut off the cylinder supply pressure. The spring should move the rack toward the cylinder.
19. Assemble the cover, pointer and wrenching nut. Place the spring washers on the stud as shown in Figure 2, and tighten the lock nut until the spring washers are completely compressed. Then loosen the locknut until the spring washers return to their normal shape.
20. Connect power to the actuator.
21. Adjust the closed and open position stops as described in the STOP ADJUSTMENTS Section of this manual.

Removing Cylinder from Actuator

If you need to return the cylinder to DeZURIK Water Controls, follow these instructions to remove the cylinder from the actuator.

1. Relieve pipeline pressure.
2. Shut off the cylinder supply pressure and disconnect the air line to the cylinder.
3. If the actuator is powered, disconnect and lock out the pneumatic, hydraulic, or electrical power to prevent accidental operation of the actuator.



WARNING!

Moving parts from accidental operation of power actuator can cause personal injury or equipment damage. Disconnect and lock out power to actuator before servicing.

4. Unscrew the extension cap from the actuator housing.
5. Remove the nuts and spring washers from the rack rod. (On spring-to-open cylinders, the spring washers are located on the cylinder end of the rack rod.)

**Removing
 Cylinder from
 Actuator
 (Continued)**

6. Remove the four screws that fasten the cylinder head to the actuator housing and pull the cylinder, complete with the rack rod, from the actuator housing.
7. Contact your DeZURIK Water Controls representative for instructions for returning the cylinder to DeZURIK Water Controls.

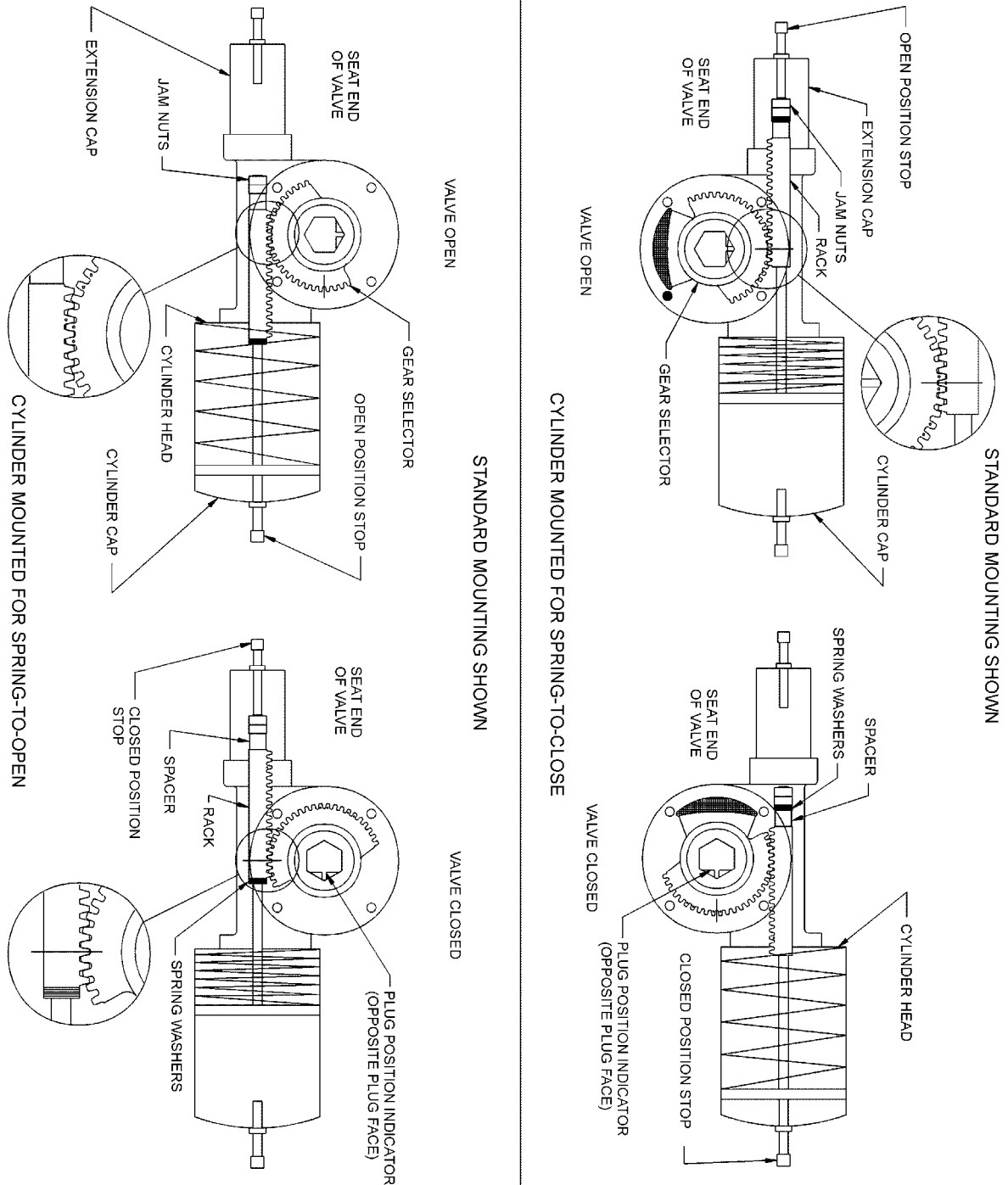


Figure 7 – Component Identification - G6 Actuator Shown