

XOMOX®

**brands you trust.**

## Installation, Maintenance & Repair Instructions

CRANE ChemPharma, Xomox®  
XRP Rack & Pinion Actuator

**CRANE**®

ChemPharma Flow Solutions

[www.cranepharmaceutical.com](http://www.cranepharmaceutical.com)

## CONTENTS

<b>1.0</b>	<b>Introduction</b> .....	3
<b>2.0</b>	<b>Construction</b> .....	4
2.1	Construction: Models XS001 through XS006 .....	5
2.2	Construction: Models XS012 through XS180 .....	6
2.3	Construction: Models XS205 through XSH15 .....	7
<b>3.0</b>	<b>Principles of Operation</b> .....	8
3.1	Recommended tubing size for compressed air lines .....	8
3.2	Air Connections for double acting actuators .....	8
3.3	Air Connections for spring return actuators .....	9
3.4	Travel Stop Adjustment: Models XS012 through XS180 .....	10
<b>4.0</b>	<b>Assembly</b> .....	12
4.1	Installation of Xomox XRP Actuator .....	13
<b>5.0</b>	<b>Disassembly</b> .....	15
5.1	Before Starting .....	15
5.2	Removing endcaps, Models XS012 - XS180 .....	15
5.3	Removing endcaps, All Models .....	16
5.4	Removing Pistons and Shaft .....	17
<b>6.0</b>	<b>Reassembly</b> .....	18
6.1	Part Preparation .....	18
6.2	Installation of Shaft, Bearings and Seals .....	18
6.3	Installation of Pistons, Bearings and Seals .....	18
6.4	Spring Return Actuators: Re-installing Springs .....	19
6.5	Installing Endcaps: Double Acting .....	19
6.6	Installing Endcaps: Spring Return .....	21
<b>7.0</b>	<b>Converting Fail CW (FCW) Actuator to Fail CCW (FCCW) or FCCW to FCW.</b> .....	22

For technical information not contained in this manual about these Xomox actuators, request the "Xomox XRP Actuator" catalog from the nearest Xomox or Tuflin valve sales office (see back cover for locations) or contact your local Xomox representative.

## 1.0 INTRODUCTION

### 1.1 Identification

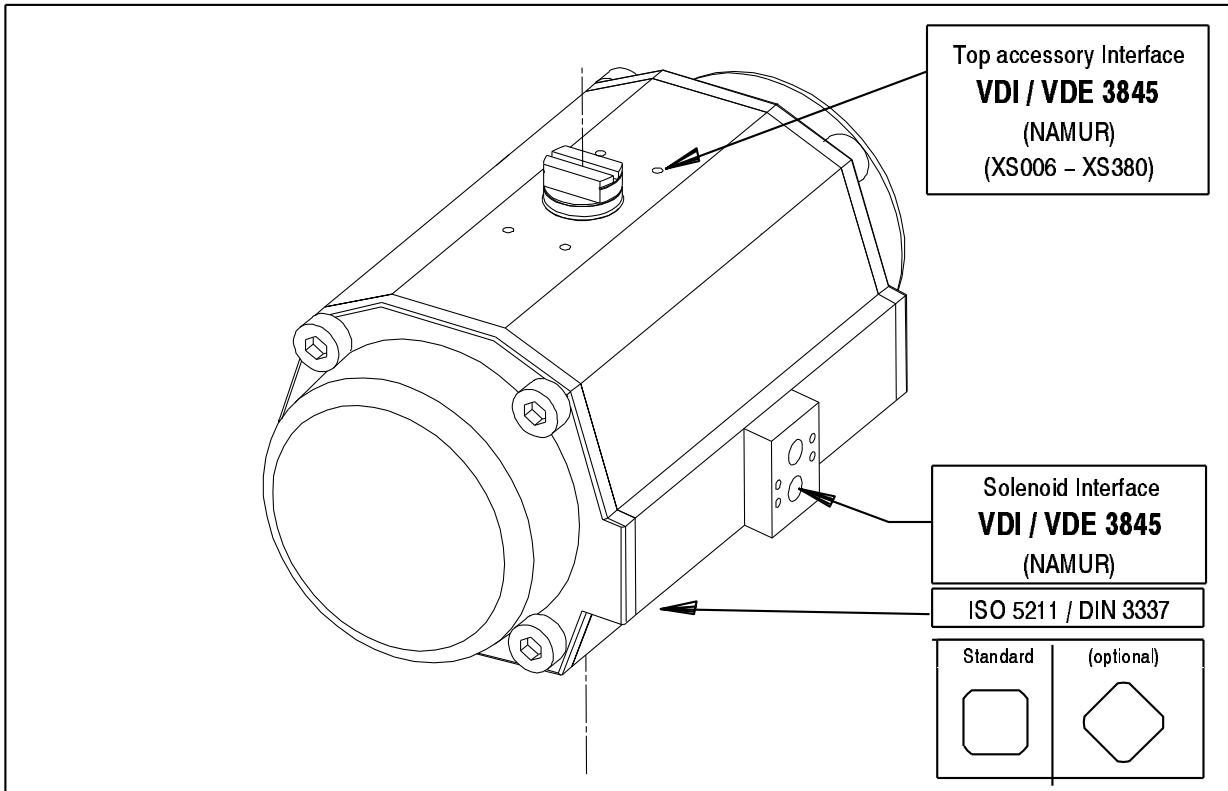





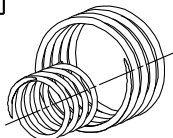
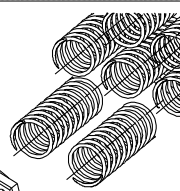
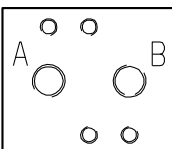
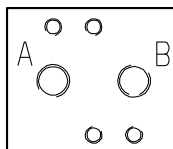
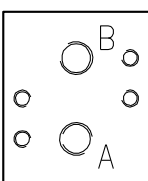
Figure 1.1 Description of rack & pinion pneumatic actuators.



### WARNING

Disconnect actuator both pneumatically and electrically before disassembling or assembling. Before mounting, disassembling or assembling the actuator, consult the relevant sections of this manual. Before removing any accessories, consult the relevant sections of the accessory manufacturer's manual(s). Failure to read and follow the instructions contained in these manuals could result in death, serious personal injury or severe property damage.

## 2.0 CONSTRUCTION

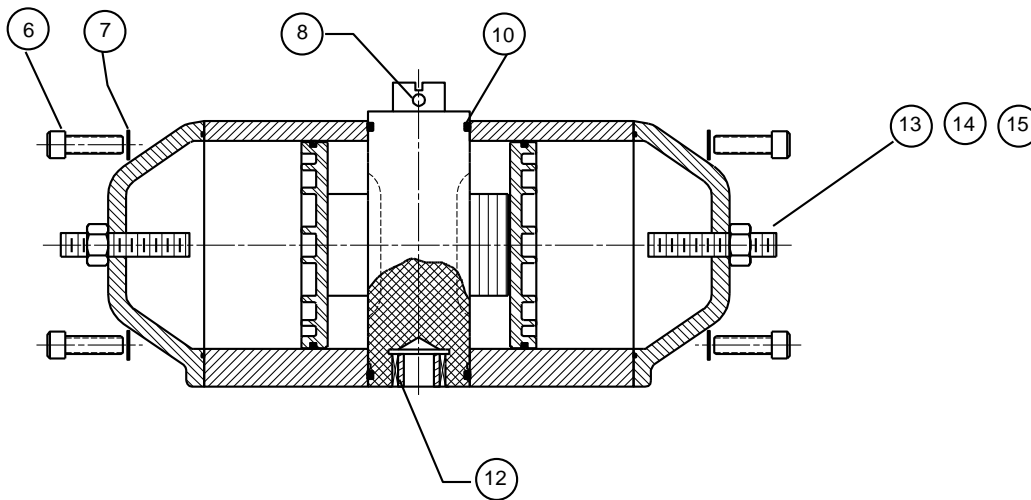
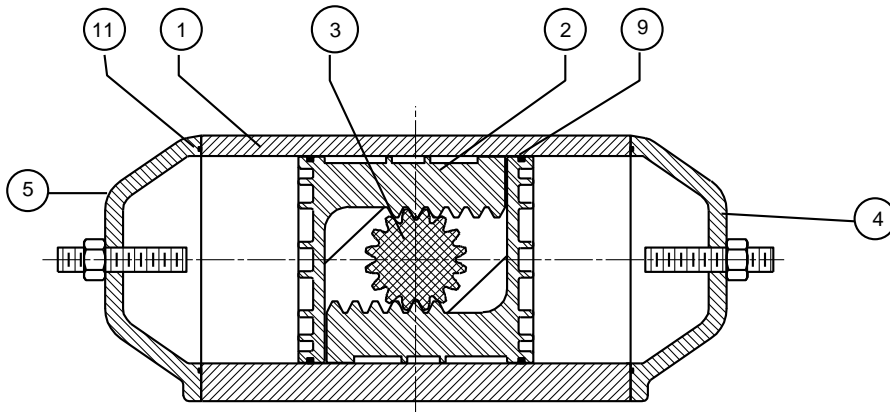
XRP SERIES			
<b>MODEL</b> Double Acting	XS001	XS002 - XS006	XS012 - XSH15
<b>MODEL</b> Spring Return	<i>Not Available</i>	XS002 - XS006	XS012 - XSH15
<b>Drive</b> ISO			
<b>Maximum Springs on each piston</b>	<i>Not Available</i>	2 	7* 
<b>Namur Solenoid Pad Orientation</b>			

**NOTE:** All fasteners used are *metric* threaded.  
 All tapped holes are *metric* threaded  
 All air supply ports are 1/4" NPT with use of the adaptor plate.  
 The actuator body is tapped for 1/4" GAS threads.

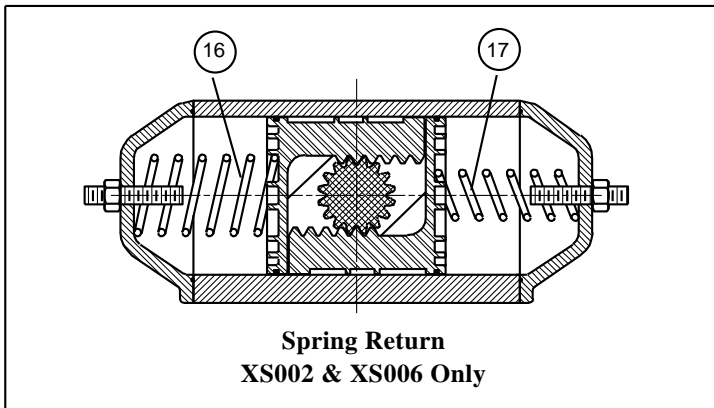
# Xomox XRP Actuator Installation, Operation & Maintenance Manual

## 2.1 Construction: Models XS001 through XS006

Model	Air Volume used per 90° stroke for both CW & CCW operation
XS001	7.3 cubic inches (.12 L)
XS002	10.4 cubic inches (.17 L)
XS006	15.3 cubic inches (.25 L)



**Double Acting**  
**XS001, XS002 & XS006**



**Spring Return**  
**XS002 & XS006 Only**

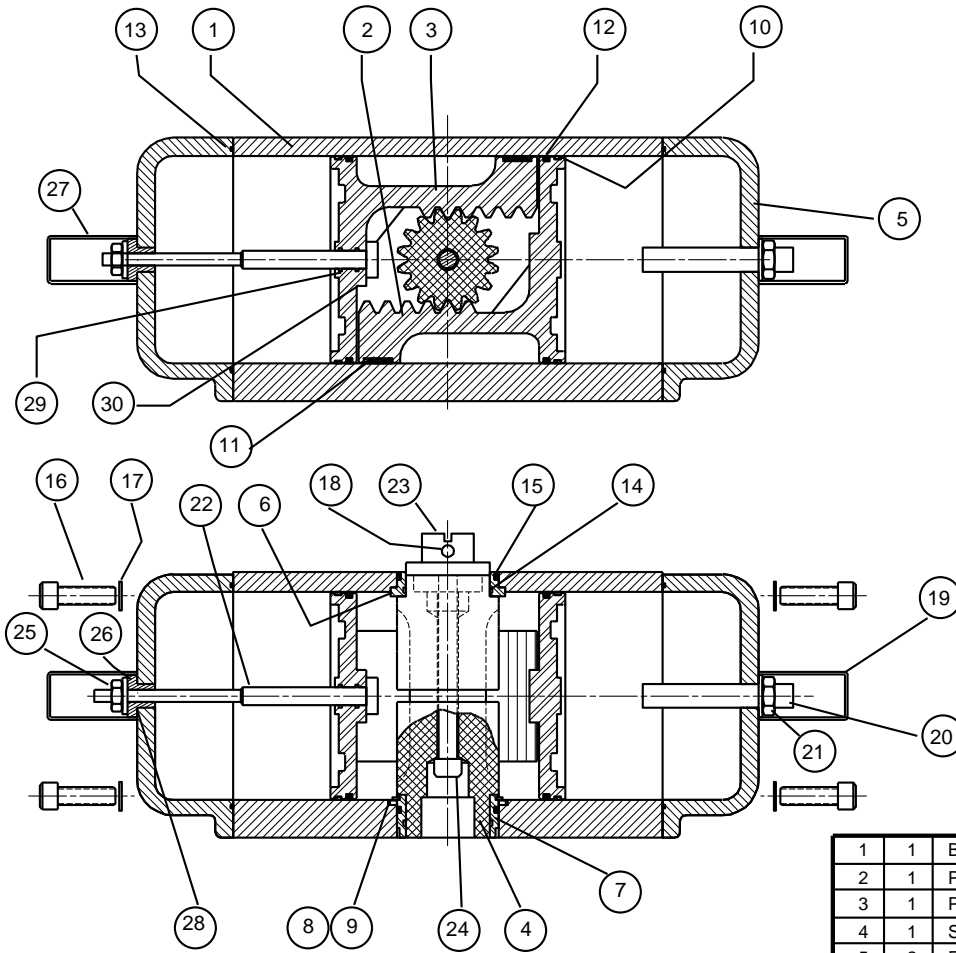
Item	Qty	Description	Material
1	1	Body	Aluminum / Anodized
2	2	Piston	POM
3	1	Shaft	Aluminum / Anodized
4	1	Right End Cap	Polyamide w/ Stainless Steel Insert
5	1	Left End Cap	Polyamide
6	8	Screw	Stainless Steel
7	8	Washer	Stainless Steel
8	8	Indicator	Polyamide *
9	2	O-ring - Piston	NBR *
10	2	O-ring - Shaft	NBR *
11	2	O-ring - Endcap	NBR *
12	1	Insert	Aluminum / Anodized
13	2	Stop Screw Seal	NBR
14	2	Stop Screw	Stainless Steel
15	2	Nut	Stainless Steel
16	2	Spring - Outer	CrSi Alloy / Coated
17	2	Spring - Inner	CrSi Alloy / Coated

\* Recommended Spare Parts (contained in Repair Kit)

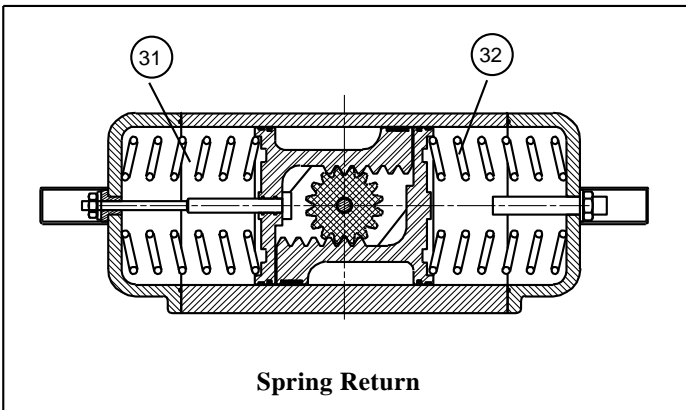
# Xomox XRP Actuator Installation, Operation & Maintenance Manual

## 2.2 Construction: Models XS012 through XS180

Model	Air Volume used per 90° stroke for both CW & CCW operation
XS012	21 cubic inches (.35 L)
XS025	61 cubic inches (1.0 L)
XS050	98 cubic inches (1.6 L)
XS090	122 cubic inches (2.0 L)
XS130	183 cubic inches (3.0 L)
XS180	244 cubic inches (4.0 L)



**Double Acting**



**Spring Return**

**Repair Kit Part Numbers:**

XS012	.....	XSRE301205
XS025	.....	XSRE302505
XS050	.....	XSRE305007
XS090	.....	XSRE309010
XS130	.....	XSRE313012
XS180	.....	XSRE318012

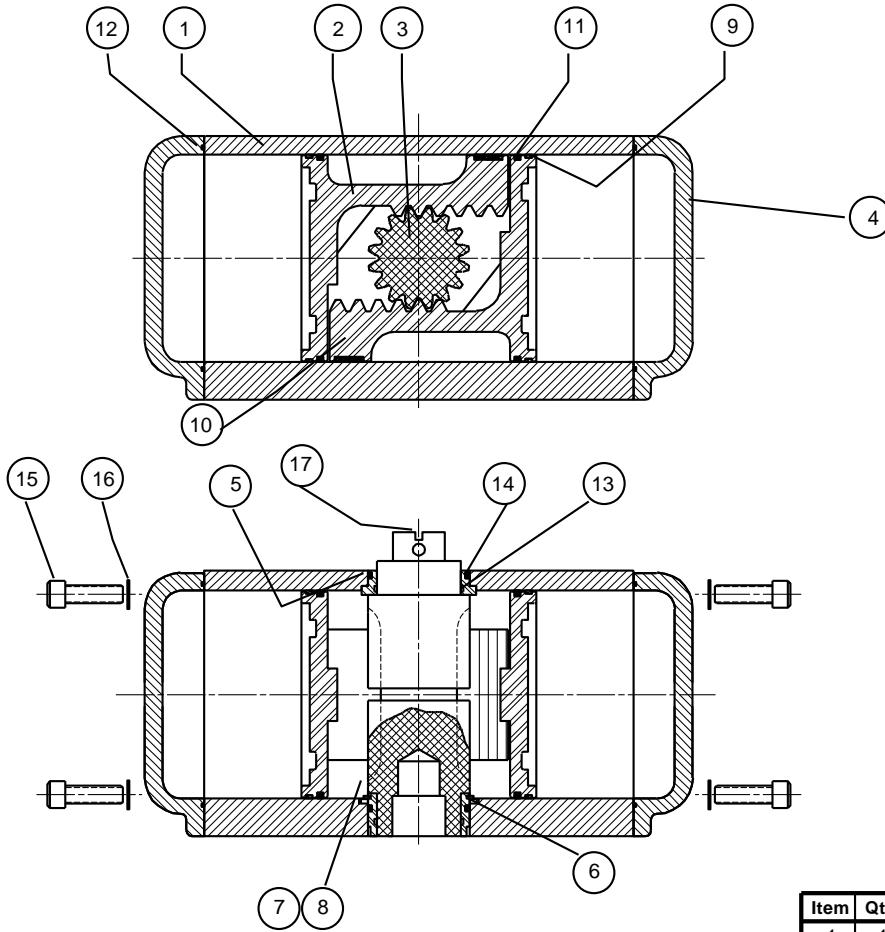
1	1	Body	Aluminum / Anodized
2	1	Piston "Open"	Aluminum
3	1	Piston "Closed"	Aluminum
4	1	Shaft	Aluminum / Anodized
5	2	End Cap	Aluminum / Painted
6	1	Bearing	POM *
7	1	Bearing	POM *
8	1	Bearing	POM *
9	1	Retaining Ring	Spring Steel
10	2	Piston Bearing	PTFE, Carbon Filled *
11	2	Piston Bearing	PTFE, Carbon Filled *
12	2	O-ring - Piston	NBR *
13	2	O-ring - Endcap	NBR *
14	2	O-ring - Shaft	NBR *
15	2	O-ring	NBR *
16	8	Screw	Stainless Steel
17	8	Washer	Stainless Steel
18	2	Indicator	Polyamide *
19	1	Protective Cap	Polyethylene
20	1	"Open" Stop Screw	Stainless Steel
21	1	Sealing Nut	Stainless Steel
22	1	"Closed" Stop Screw	Steel/ Nickel Plated
23	1	Shaft - Top	Aluminum / Anodized
24	1	Shaft Screw	Steel/ Zinc Plated
25	1	Sealing Nut	Stainless Steel
26	1	Threaded Insert	Stainless Steel
27	1	Protective Cap	Polyethylene
28	1	O-ring	NBR
29	1	Stop Screw Bearing	PTFE, Carbon Filled
30	1	Stop Screw O-ring	NBR
31	7	Spring - CW Wound	CrSi Alloy / Coated
32	7	Spring - CCW Wound	CrSi Alloy / Coated

\* Recommended Spare Parts (contained in Repair Kit)

# Xomox XRP Actuator Installation, Operation & Maintenance Manual

## 2.3 Construction: Models XS205 through XSH15

Model	Air Volume used per 90° stroke for both CW & CCW operation
XS205	366 cubic inches (6.0 L)
XS380	519 cubic inches (8.5 L)
XS630	1037 cubic inches (17.0 L)
XS960	1404 cubic inches (23.0 L)
XSH15	1953 cubic inches (32.0 L)



**Double Acting**

**Spring Return**

Repair Kit Part Numbers:

XS205 ..... XSRE220514  
 XS380 ..... XSRE238014  
 XS630 ..... XSRE263016  
 XS960 ..... XSRE296016  
 XSH15 ..... XSRE2H1525

Item	Qty	Description	Material
1	1	Body	Aluminum
2	2	Piston	Aluminum
3	1	Shaft	Steel / Nickel Plated
4	2	Double Acting End Cap	Aluminum / Painted
5	1	Bearing	POM *
6	1	Bearing	POM *
7	1	Bearing	POM *
8	1	Retaining Ring	Spring Steel
9	2	Piston Bearing	PTFE, Carbon Filled *
10	2	Piston Bearing	PTFE, Carbon Filled *
11	2	O-ring - Piston	NBR *
12	2	O-ring - Endcap	NBR *
13	2	O-ring	NBR *
14	2	O-ring - Shaft	NBR *
15	8 @	Screw	Stainless Steel
16	8 @	Washer	Stainless Steel
17	2	Indicator	Polyamide *
↓ Spring Return Parts ↓			
18	2	Spring ReturnEnd Cap	Aluminum / Painted
19	7 **	Spring - CW Wound	CrSi Alloy / Coated
20	7 **	Spring - CCW Wound	CrSi Alloy / Coated

\* Recommended Spare Parts (contained in Repair Kit)

\*\* Qty. of Springs is 9 of each type for XS960

@ XS630 ⇔ XSH15: Qty is 12 Screws & Washers

## 3.0 PRINCIPLES OF OPERATION

### 3.1 Recommended tubing size for compressed air lines:

Models XS001 through XS050: 1/4" OD

Models XS090 through XSH15: 3/8" OD

### 3.2 Air connections double acting.

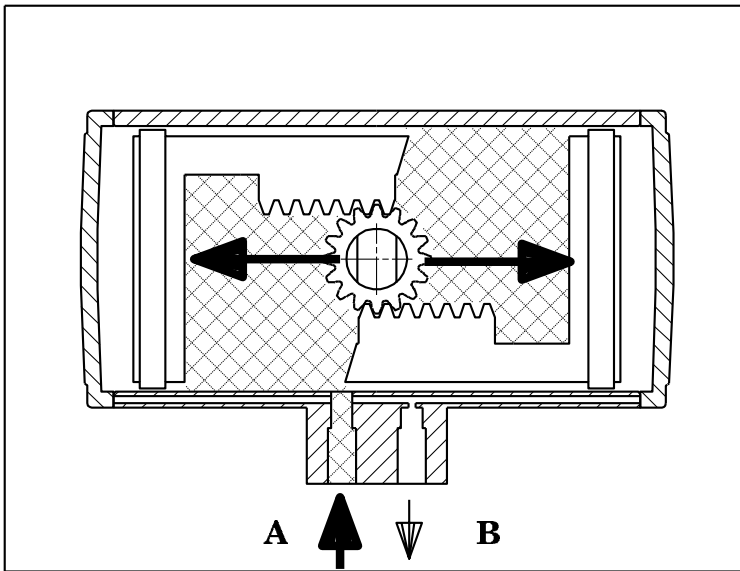


Figure 3.2.1  
Air to port A: counter-clockwise/open  
(CCW)

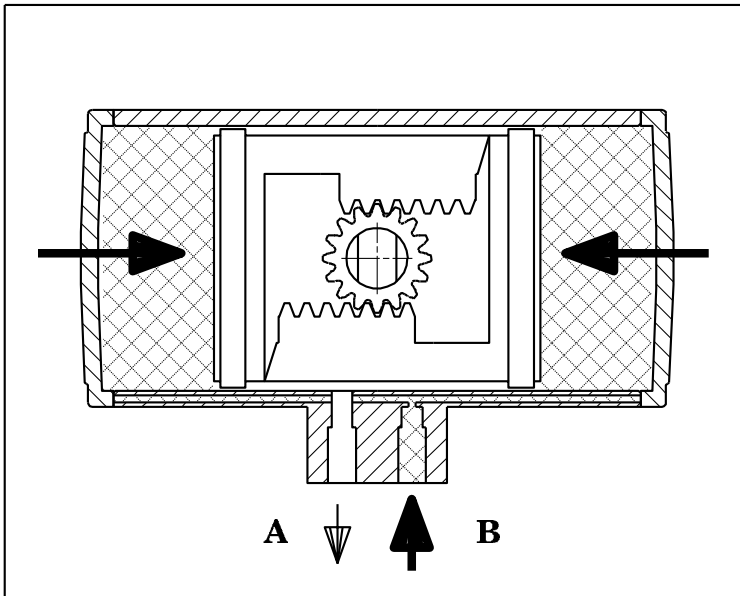


Figure 3.2.2  
Air to port B: clockwise/close  
(CW)



3.3 Air connections spring return.

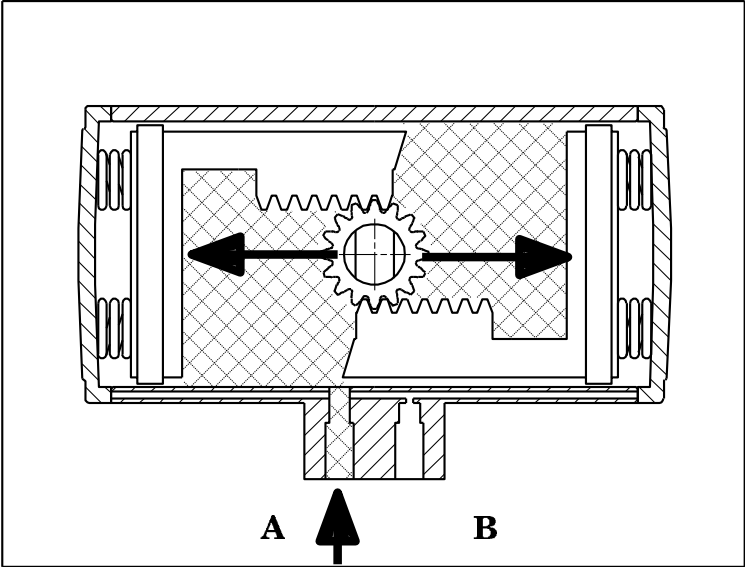


Figure 3.3.2  
Air to port A: counter-clockwise/open (CCW)

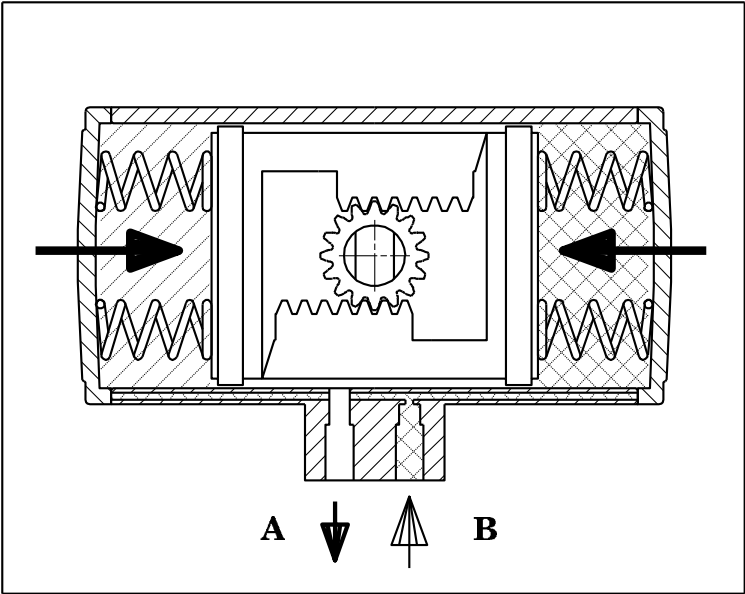


Figure 3.3.2  
Air at port A is released.  
Air from the exterior of the actuator is drawn into port B: clockwise/close (CW)

## 3.4 Travel Stop Adjustment

### Adjustment of End Positions

(CCW indicates counter-clockwise rotation, CW indicates clockwise rotation)

On valves with actuators delivered from the factory the end positions are adjusted so that the valve is tightly closed in CW (CLOSED) position.



### WARNING

#### Compressed Media:

Actuator end cap removal and adjustment work on the end cap bolts must be performed without connection to the compressed air supply. Otherwise, the end cap may be propelled forward and may cause property damage and/or personal injury. A test with compressed air should only be carried out after the adjustment has been made. On spring return actuators, the load on the travel stop screw must be relieved by compressed air before the adjustment. Contact with compressed media can cause serious injury or death.

3.4.1 The travel stop set screws for CCW and CW position are located in the end caps under the plastic coverings. Looking at the ports A & B of the actuator, see figure 3.4B, the travel stop set screw for the CCW position is incorporated in the right end cap and the travel stop set screw for the CW position is in the left end cap.



### CAUTION

#### Actuator Damage:

Do NOT use travel stop screw as the force to change the position of the actuator. Doing this can cause damage to internal actuator components.

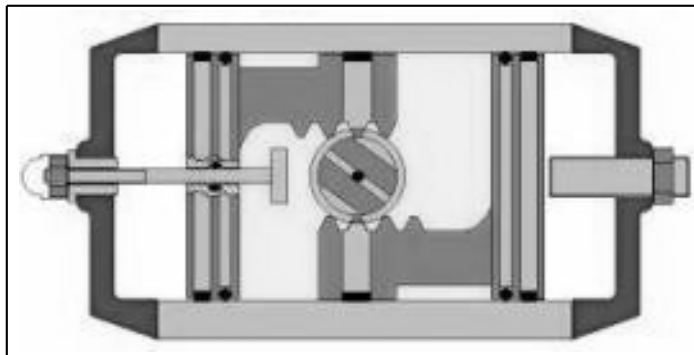
### 3.4.2 Adjustment of CCW End Position for Double acting and Fail CW Spring Return Actuators (Also, the CW position for Fail CCW actuators)

Remove the protection cap, if attached, and loosen the fastening nut. Turn set screw clockwise to reduce the stroke ( $90^\circ$  to approx.  $78^\circ$ ), turn the set screw counter-clockwise to increase the stroke ( $90^\circ$  to  $94^\circ$ ).

After completing the adjustment, tighten the fastening nut and push the protection cap back on the actuator.

( For Models XS001, XS002 & XS006, repeat this step for the other stop screw. These 3 models do not have CW travel adjustment.)

CW  
Travel Stop  
(3.4.3)



CCW  
Travel Stop  
(3.4.2)

Fig. 3.4A

### 3.4.3 Adjustment of CW End Position for the Double Acting Actuator: Models XS012 thru XS180

Remove the protection cap off the end cap screw and loosen the fastening nut. Turn set screw clockwise to increase the stroke ( 0° to minus 4° ), turn set screw counter-clockwise to decrease the stroke ( 0° to approx. 12° ).

After adjusting the set screw, tighten the fastening nut and push the protection cap back on the actuator.



#### CAUTION

##### **Actuator Damage:**

Do NOT use travel stop screw as the force to change the position of the actuator. Doing this can cause damage to internal actuator components.

### 3.4.4 Adjustment of CW End Position for the "Fail CW" Spring Return

**Actuator: Models XS012 thru XS180** (Also, the CCW position of the Fail CCW Actuator.)

In this case the same applies as described under Step 3.4.3. The only difference is that the set screw must not be turned counter-clockwise against the spring load or valve torque in order to avoid excessive strain and possible travel stop damage. With the air supply connected to port "A", use only the amount of compressed air necessary to allow the set screw to be rotated easily

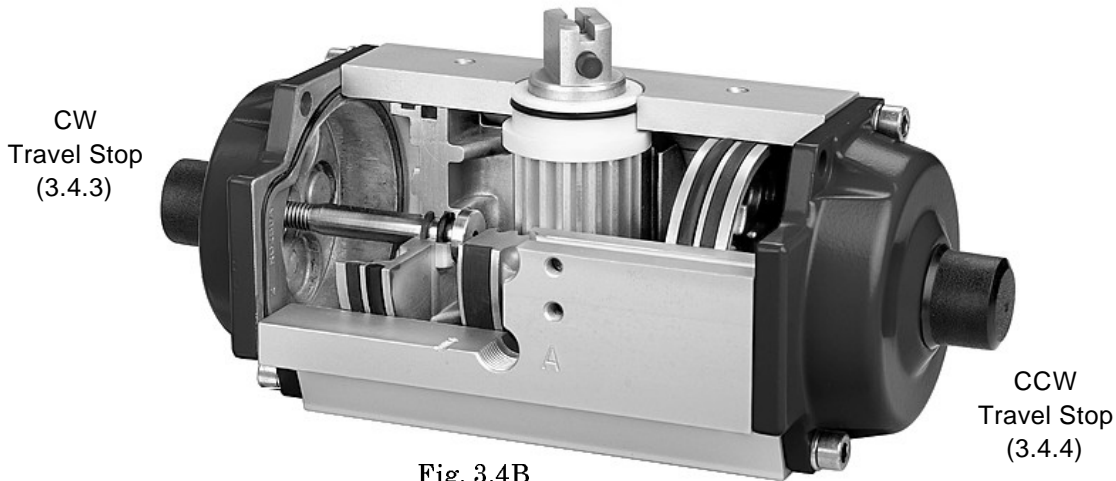


Fig. 3.4B



#### WARNING

##### **Compressed Media:**

Actuator end cap removal and adjustment work on the end cap bolts must be performed without connection to the compressed air supply. Otherwise, the end cap may be propelled forward and may cause property damage and/or personal injury. A test with compressed air should only be carried out after the adjustment has been made.

On spring return actuators, the load on the travel stop screw must be relieved by compressed air before the adjustment. Contact with compressed media can cause serious injury or death.

## 4.0 ASSEMBLY

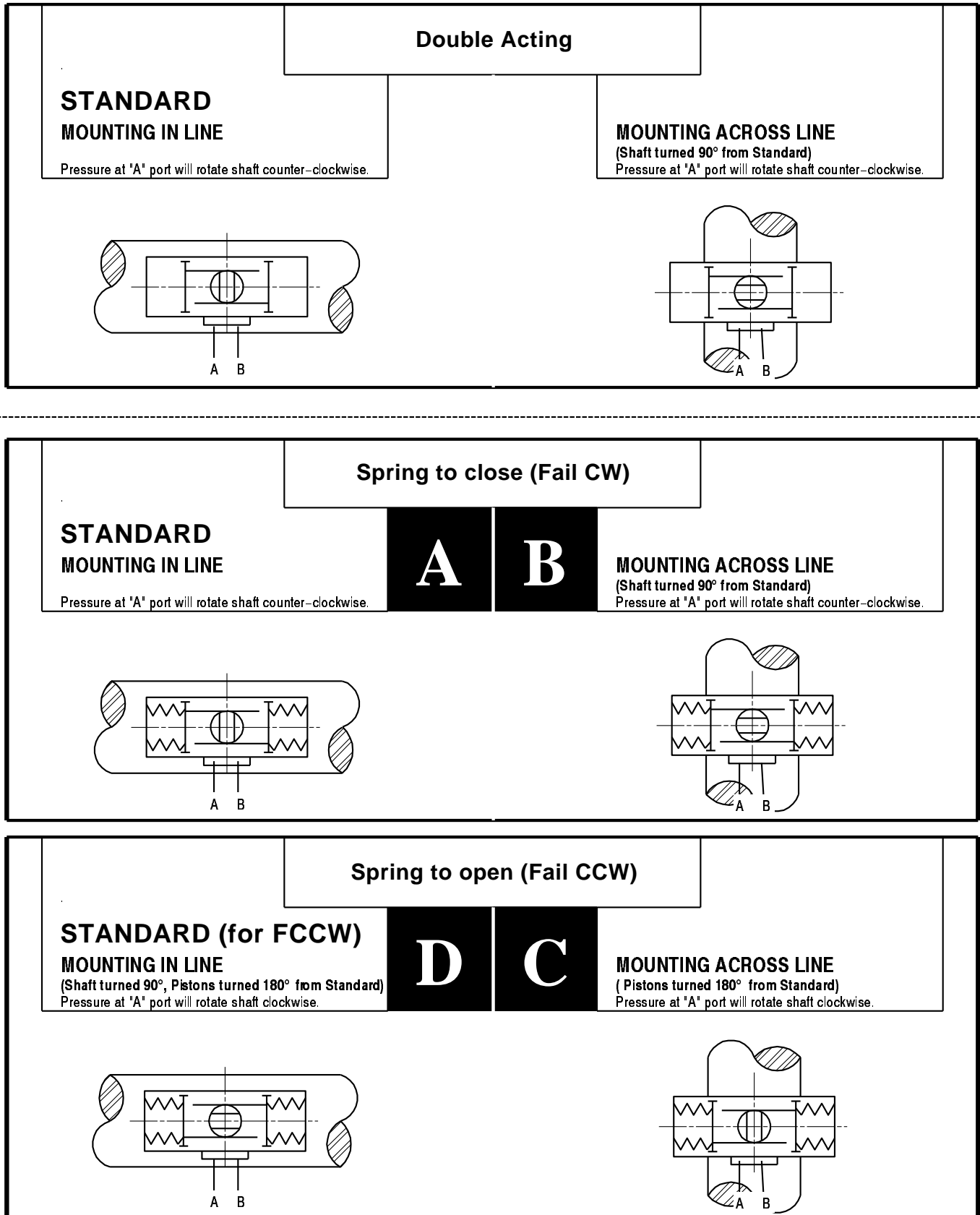


Figure 4.0.1 Actuator Assembly Variations (Spring to open (counter-clockwise rotation))

## 4.1 INSTALLATION OF XOMOX XRP ACTUATOR.

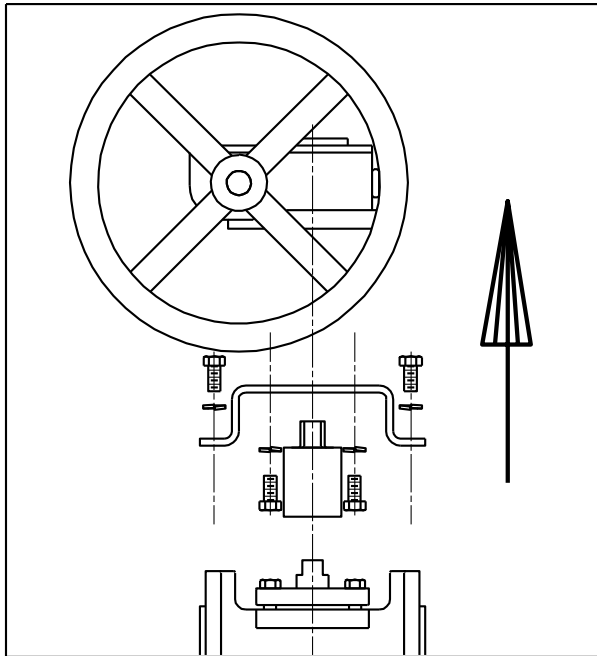


Figure 4.1.1

### 4.1.1 Before starting

Disconnect all power supplies, including air, hydraulic and electric, before removal of operator, if any, from the valve\*.

Remove current operator from valve, if any.

\* In addition to the valves shown, the actuator can be installed on other quarter turn devices such as dampers.



### WARNING

#### Massive Leakage:

Do not disassemble a valve that is under pressure. Massive leakage could result in death, serious personal injury or severe property damage.



### WARNING

#### Media Spray:

Ball valves and plug valves can trap pressurized media in their cavities. Isolate the piping system in which the actuator valve assembly is mounted and relieve any pressure on the valve. Contact with media under pressure could result in death, serious personal injury or severe property damage.

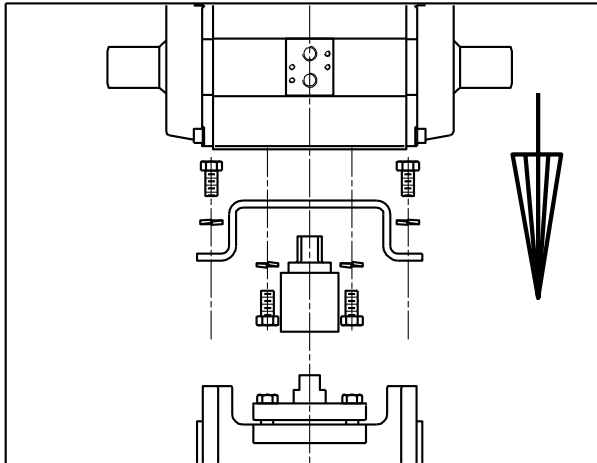


Figure 4.1.2

4.1.2 Install actuator with bracket\*\*, valve/actuator coupling. The actuator should be mounted for counter-clockwise rotation to open and clockwise to close the valve unless otherwise specified in the installation instructions provided by manufacturer of the valve. Most valves are manufactured so that they operate in only one 90° quadrant.

Do **not** tighten mounting fasteners.

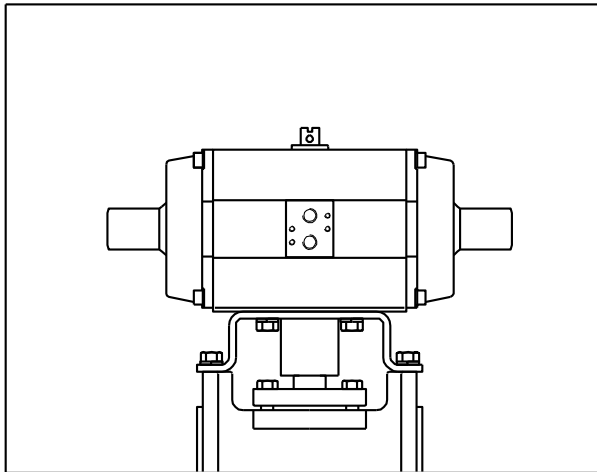


Figure 4.1.3

4.1.3 Align actuator shaft to the valve stem/shaft. This will allow the maximum performance of the actuator in operating the valve.

Tighten mounting fasteners.

Connect required power supplies.

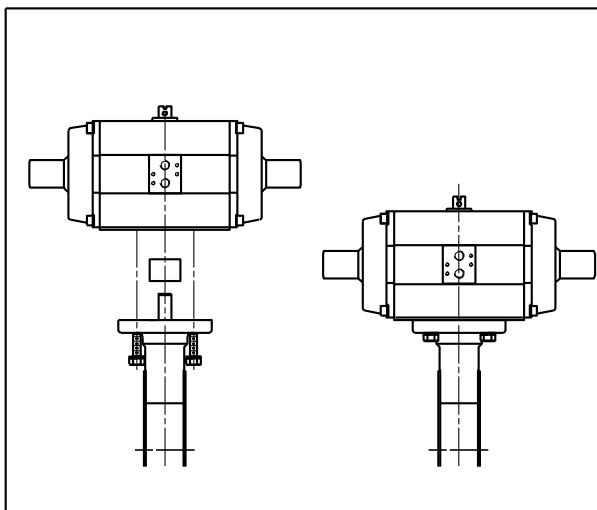



Figure 4.1.4

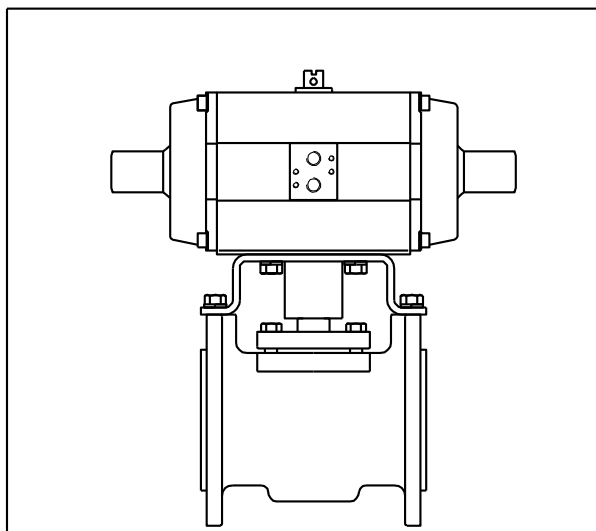
A valve that does not require a bracket to install the actuator.

*Make sure that the actuator position indicator is indicating the current valve position.*

\*\* Some valves allow the actuator to be installed without a bracket and/or valve/actuator coupling.

	<b>CAUTION</b>
<b>Actuator Damage:</b> Do NOT strike the end of actuator pinion with hammer or similar device or shaft bearing damage will occur.	

## 5.0 DISASSEMBLY



### 5.1 Before starting:

#### **Spring Return Actuators:**

Rotate actuator to "Fail" position.


#### **All Actuators:**


Disconnect all power supplies, including air, hydraulic and electric, before removal or disassembly of valve actuator. Remove all accessories such as limit switches, solenoid valves, positioners, etc.


### 5.2 Removing Endcaps:

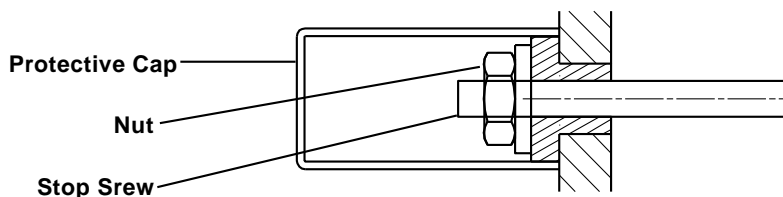
#### **Models XS012 - XS180:**

Remove protective caps from the endcaps. Rotate nut on the travel stop clockwise until it is disengaged from endcap.

	<b>WARNING</b>
<b>Massive Leakage:</b> Do not disassemble a valve that is under pressure. Massive leakage could result in death, serious personal injury or severe property damage.	

	<b>WARNING</b>
<b>Media Spray:</b> Ball valves and plug valves can trap pressurized media in their cavities. Isolate the piping system in which the actuator valve assembly is mounted and relieve any pressure on the valve. Contact with media under pressure could result in death, serious personal injury or severe property damage.	

	<b>CAUTION</b>
<b>Actuator Damage:</b> Do NOT strike the end of actuator pinion with hammer or similar device or shaft bearing damage will occur.	



## 5.3 Removing endcaps, All Models

Be careful not to damage the endcap O-rings.

On spring return actuators, note the position of the two types of springs, clockwise wound and counter-clockwise wound.

**Models XS002 & XS006 Spring Return Actuators:** Place actuator in a press before removing endcap bolts. The springs in these units are still compressed when the endcap bolts are disengaged from body.

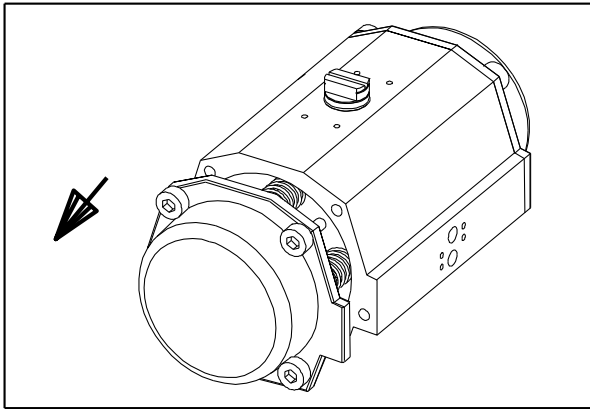



Figure 5.3.1

	<b>WARNING</b>
<p><b>Flying Debris:</b> This actuator contains springs in compression. Be sure the actuator is in the "FAIL" position, pistons together, before removing endcaps. Flying debris could result in death, serious personal injury or severe property damage.</p>	

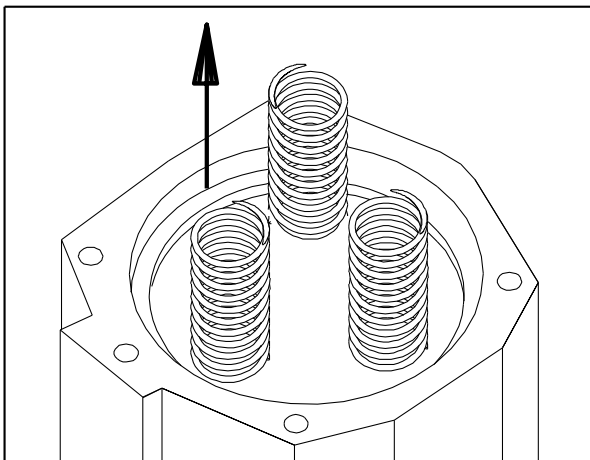



Figure 5.3.2

	<b>CAUTION</b>
<p><b>Endcap Damage:</b> If the actuator is a "spring return" model, remove the screws identified as "1" in the figure 5.3.1.1. Then uniformly loosen the remaining endcap screws, identified as "2", two to three turns at a time, in sequence, to relieve the pre-load on the springs and prevent damage to the endcap.</p>	

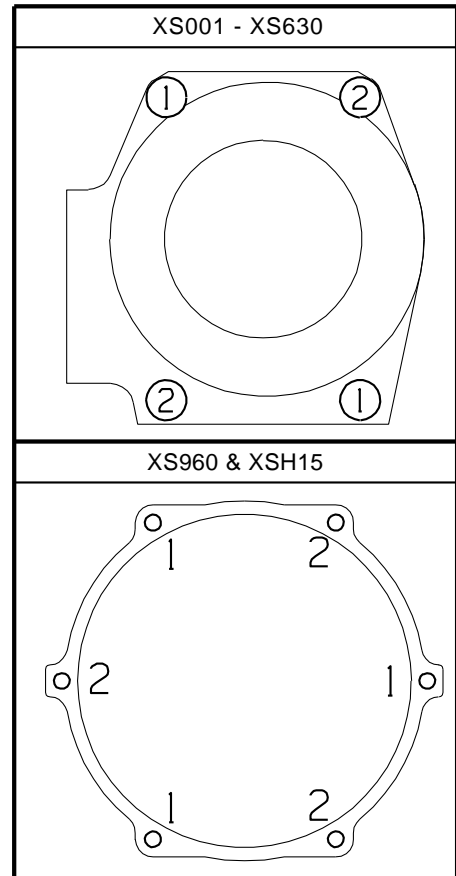


Figure 5.3.1.1



## 5.4 Removing Pistons and Shaft.

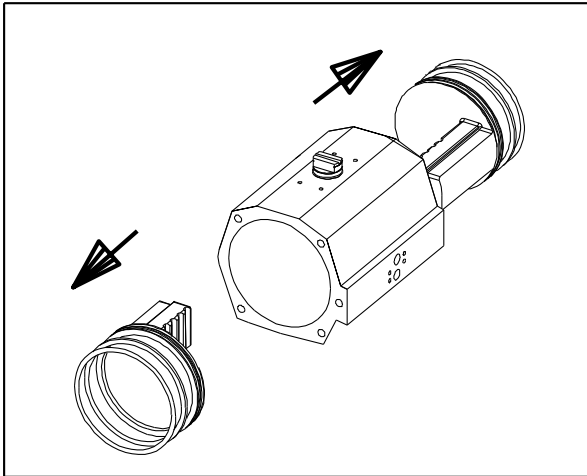


Figure 5.4.1

### 5.4.1

The two pistons can now be removed by rotating the actuator shaft. Remove parts, such as o-rings and bearings, from pistons that are being replaced. Note the orientation of shaft flats and piston gear racks for reassembly.

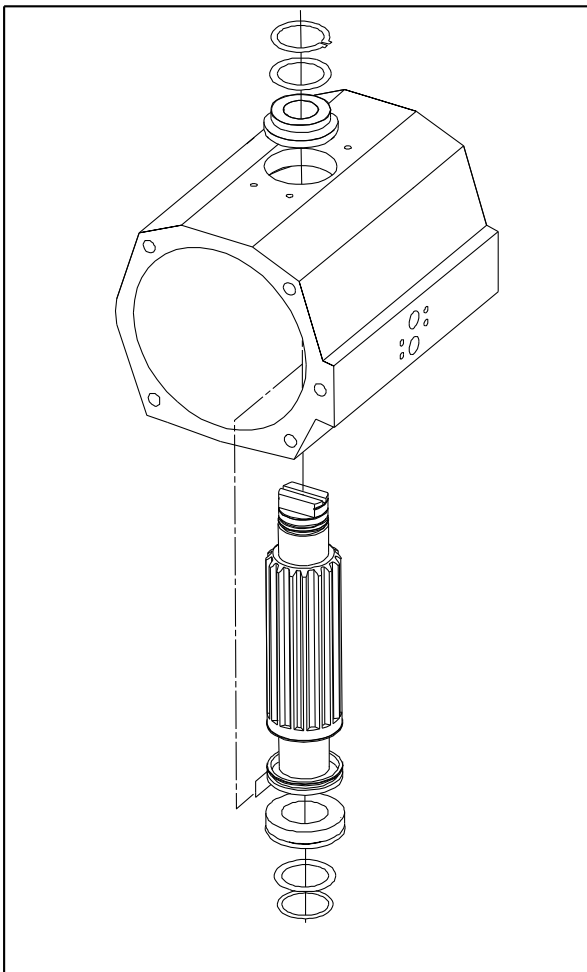


Figure 5.4.2

### 5.4.2

Remove shaft from body by removing spring clip. Remove parts from body and shaft that are being replaced. The shaft may have to be removed through the piston bore on some sizes.

## 6.0 REASSEMBLY of Double acting and Spring Return Models

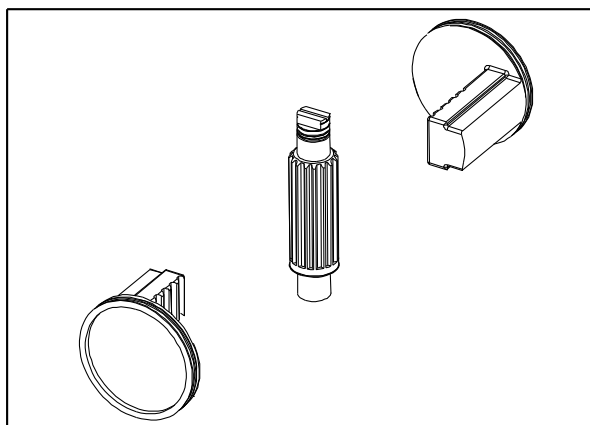


Figure 6.1

### 6.1 Part Preparation

Apply a light film of grease to all o-rings and on the gear teeth.

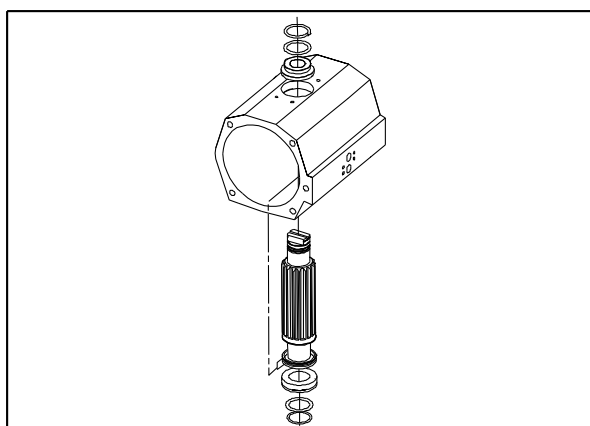



Figure 6.2

### 6.2 Installation of Shaft, Bearings and Seals

Insert top bearing. Install shaft o-rings. Insert shaft into the body. (Models XS380, XS630 & XSH15 the shaft goes in to piston bore before going into the shaft hole in the body.) Install retaining ring on the shaft.

	<b>CAUTION</b>
<p><b>Actuator Damage:</b> Do NOT strike the end of actuator pinion with hammer or similar device or shaft bearing damage will occur.</p>	

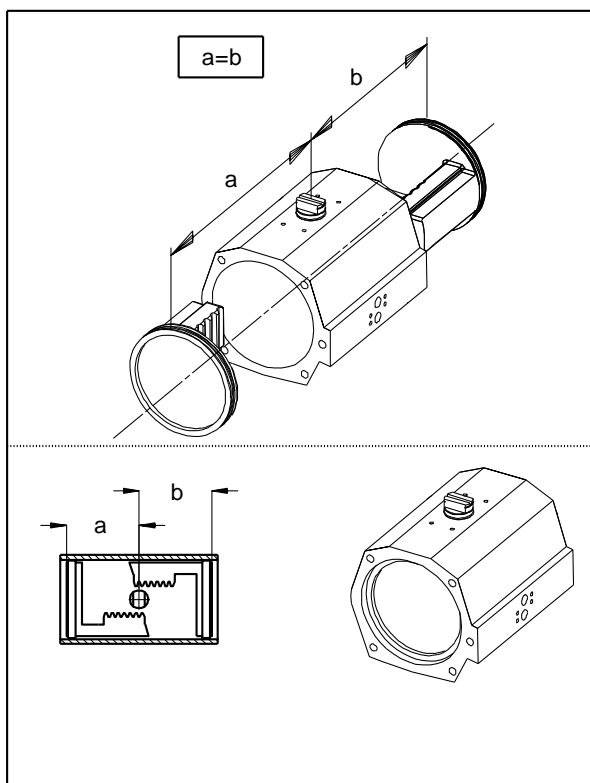


Figure 6.3

### 6.3 Installation of Pistons, Bearings and Seals

Align the actuator shaft so that the teeth on the shaft will "pick-up" the pistons' rack teeth when turning the shaft clockwise (CW).

Ensure that smooth movement and 90° operation can occur without moving the pistons out of the actuator body.

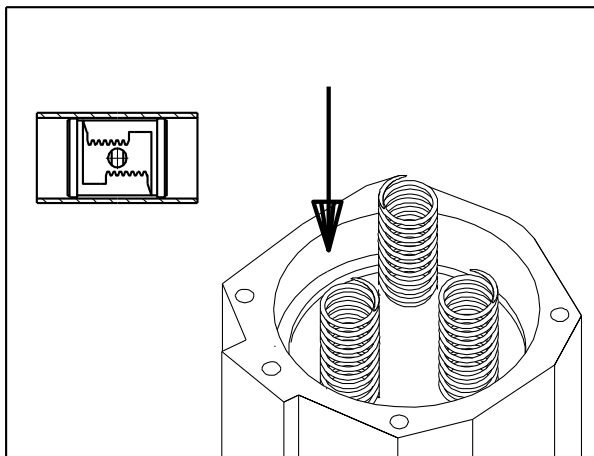


Figure 6.4

## 6.4 Spring Return Models: Re-installing Springs

Rotate the shaft to bring the pistons all the way inside the actuator.

When installing springs in the actuator, ensure that the springs are placed in the same position they were before. See page 20 for spring chart.

There are two types of springs in these actuators, clockwise wound and counter-clockwise wound. When possible, do not place same type of spring next to each other.

There will be equal amount of springs on each piston except XS002, XS006 and XS960)

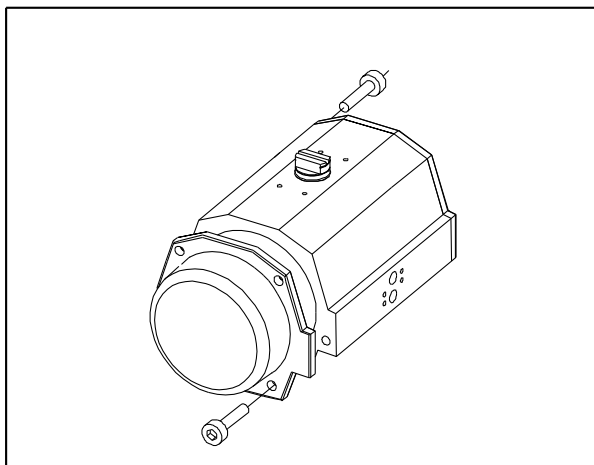


Figure 6.5

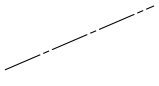
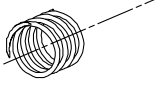
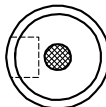
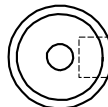
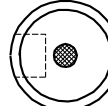
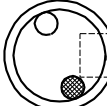
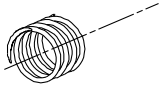
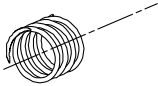
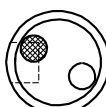
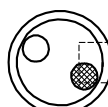
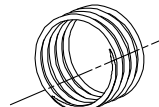
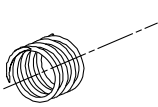
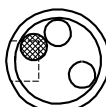
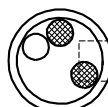
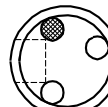
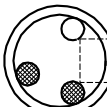
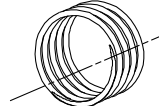
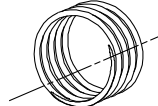
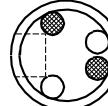
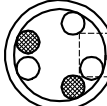
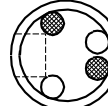
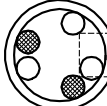
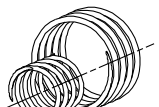
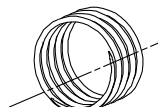
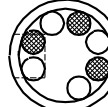
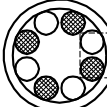
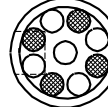
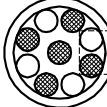
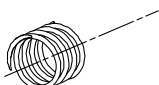

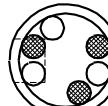
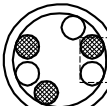
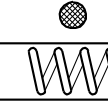
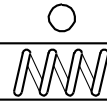
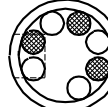
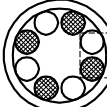
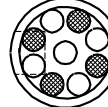
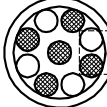
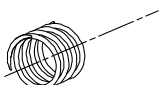

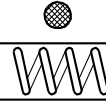
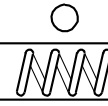
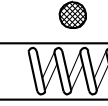
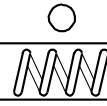
## 6.5 Installing Endcap: Double Acting Models

Ensure that endcap O-rings are in place on both sides in the groove. Uniformly tighten all endcap screws.

**Models XS012 - XS180:** Turn the CW travel stop screw clockwise through the endcap. See Section 3.4 for adjusting the travel stops. Tighten nut on travel stop. Push on the protection cap

Install required accessories on actuator.  
Install actuator on valve.

## Spring Arrangement Chart: Xomox XRP

	XS002, XS006		XS012, XS025, XS050, XS090, XS130, XS180, XS205, XS380, XS630, XSH15		XS960	
	1st Piston	2nd Piston	1st Piston	2nd Piston	1st Piston	2nd Piston
<b>S02</b>						
<b>S03</b>						
<b>S04</b>						
<b>S06</b>						
<b>S08</b>						
<b>S09</b>						
<b>S10</b>						
<b>S12</b>						
<b>S14</b>						
<b>S15</b>						
<b>S18</b>						
<b>Spring Legend</b>						
	Inner	Outer	CW Wound	CCW Wound	CW Wound	CCW Wound

This chart is showing the number of springs on each Piston, not the exact position

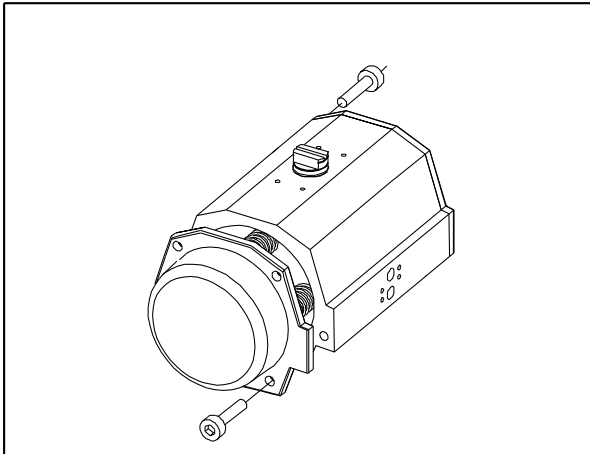


Figure 6.6



## CAUTION

### Endcap Damage:

Uniformly tighten all endcap screws identified as "2" in the picture 6.6.1, two to three turns at a time, in sequence, to place required pre-load on the springs and prevent damage to the endcap. Then, tighten the remaining screws, identified as "1".

## 6.6 Installing Endcap: Spring Return Models

Ensure that endcap O-rings are in place in the groove. Engage the bolts with the tapped holes in the actuator body by forcing down slightly on the endcap.

**Models XS002 & XS006:** The endcap must be pushed down using a press to engage bolts into the body.

Uniformly tighten each endcap screw in small and equal turns.

**Models XS012 - XS180:** Turn the CW travel stop set clockwise through the endcap. See Section 3.4 for adjusting the travel stops. Tighten nut on travel stop. Push on the protection cap.

Install required accessories on actuator.  
Install actuator on valve.

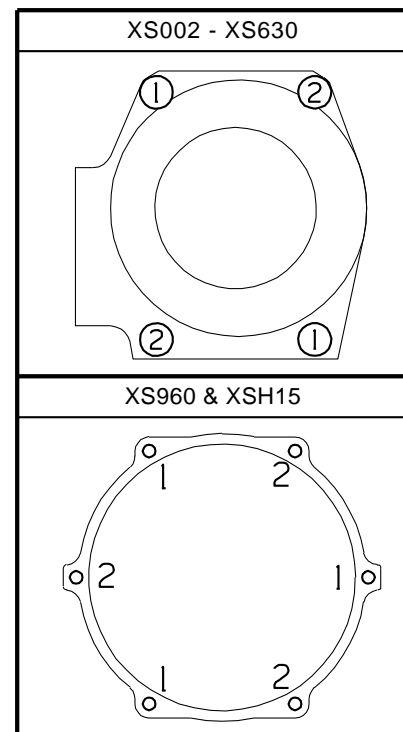


Figure 6.6.1

## 7.0 Converting Fail CW (FCW) Actuator to Fail CCW (FCCW) or FCCW to FCW.

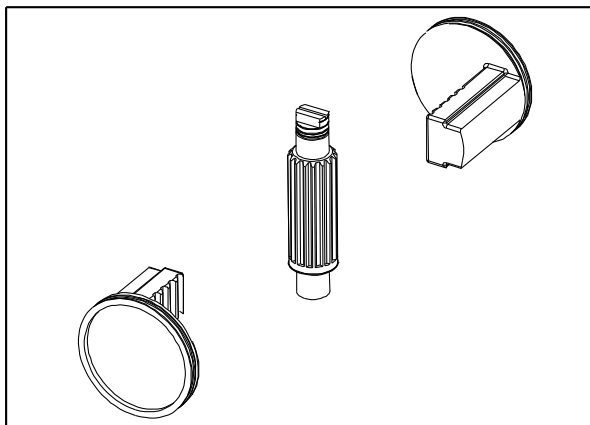


Figure 7.1

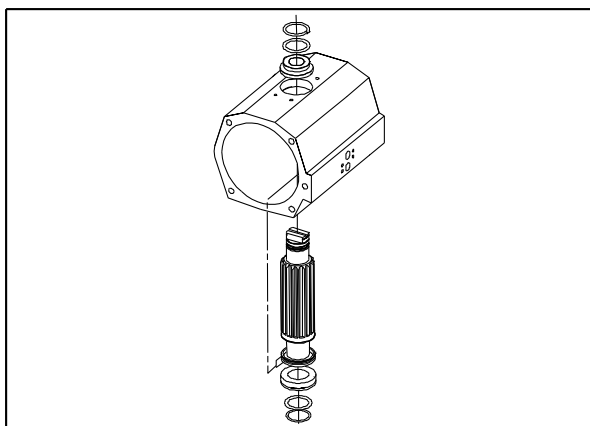


Figure 7.2

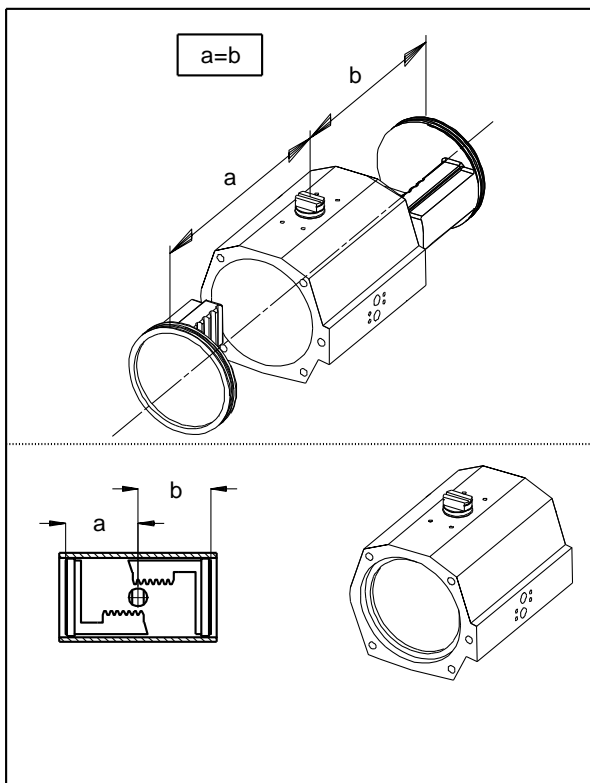


Figure 7.3

### 7.1 Special Parts required

#### Models XS012 thru XS180:


These models require a different shaft. Order it from the factory (be sure to have the *new* fail direction when ordering).

#### Models XS205 thru XSH15 Fail CCW:

These models require a position indicator. Order it from the factory.

### 7.2 Disassembly

Follow instructions Section 5.0 (page 15). Note position of shaft flats after the pistons are removed.

	<b>CAUTION</b>
<p><b>Actuator Damage:</b> Do NOT strike the end of actuator pinion with hammer or similar device or shaft bearing damage will occur.</p>	

### 7.3 Reassembly of Actuator

Follow instructions 6.1 & 6.2 using the new shaft, if required.

### 7.4 Changing Fail direction

**Models XS002 & XS006:** Rotate shaft 90° from noted position.

#### All Models:

Rotate the piston 180° on its centerline from the position it was when it was disassembled. Continue reassembly with step 6.3.

### 7.5 Actuator Identification

Mark actuator label to indicate FCCW (or FCW).

### 7.6 Models XS205 - XSH15 Position Indicator

For FCCW, install position indicator to indicate flow (the shaft flats are 90° out of position).

For FCW, do not reinstall the position indicator ring. Insert red indicators in the shaft.

NOTES:

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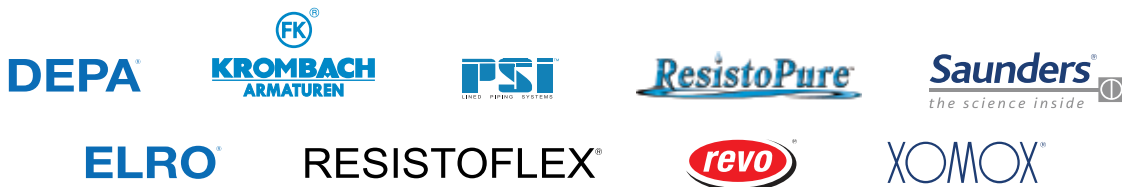
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