SVF FLOW CONTROLS

Quad*4* Pneumatic Actuator

IOM-Quad*4*

Quad*4* INSTALLATION, OPERATION & MAINTENANCE MANUAL

!!!CAUTION! Safety Precautions!!!

Before carrying out any repair or maintenance on the actuator, make sure that the pressure supply lines and electrical connections have been safely isolated, removed or disconnected by authorized personnel. The actuator must not be pressurized at any time during installation as injury may result.

Never put any part of your body in the opening or port of the controlled valve or device.

Special attention and precautions should be observed of the stored energy contained in the spring return pneumatic actuators.

Before installing onto a valve make sure that the rotation of the valve and the actuator are the same and that the position indicator orientation is also correct.

For correct operation, a pneumatic actuator must be sized adequately and with sufficient safety margins of torque output for the correct operating conditions of the valve.

***Authorized and skilled personnel should only perform maintenance of these actuators.**

PRINCIPLE OF OPERATION:

The Quad*4* actuator is a pneumatic quarter-turn Rack & Pinion actuator. Air pressure applied to the piston surface area generates thrust which transforms linear motion to rotary motion of the pinion. The Quad*4* has four pistons centrally located around one pinion.

OPERATING MEDIA:

- Clean, dry and lubricated compressed air
- Light hydraulic oil
- Any other inert and non corrosive gas (consult SVF)

SUPPLY PRESSURE:

- Minimum: 40 psig (3 bar)
- Maximum: 120 psig (8 bar)

OPERATING TEMPERATURE:

- -4°F～+175°F (-20°C～+80°C)

LUBRICATION:

The actuator is supplied ready-lubricated. No further lubrication is required.

- Do not operate the actuator by using flammable, oxidizing, corrosive, explosive or unstable gases.
- Operating the actuator beyond its stated maximum operating limits of temperature, pressure or recommended operating media, can cause personal safety risks, including death or injury, and/or damage to internal components and to actuator housing.

Quad*4* INSTALLATION, OPERATION & MAINTENANCE MANUAL

AIR CONNECTIONS:

The actuator air connections are 1/4" NPT located on a NAMUR manifold and are marked A & B (Figure 2.1).

Sizes Q15 to Q45 - air connections are horizontal:
Port A is to the right and Port B to the left.

Sizes Q60 to Q75 - air connections are vertical:
Port A is above Port B.

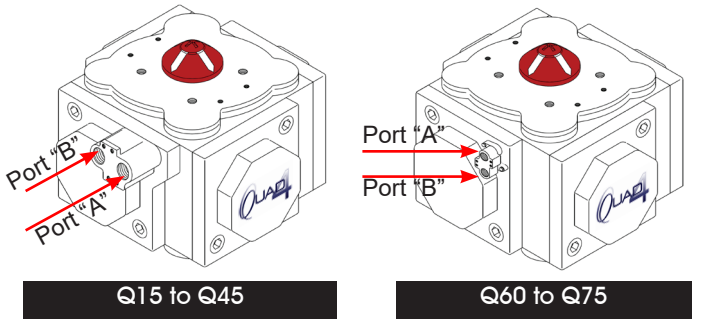


Figure 2.1 - AIR CONNECTIONS

Pressure entering port A into the center chamber pushes the pistons outward and rotates the pinion counter clockwise (CCW), normally the opening direction for valves.

Pressure entering port B into the outer chambers pushes the pistons inward and rotates the pinion clockwise (CW).

DOUBLE ACTING MODELS (QD)

Pressure entering Port A to open:
Center chamber pressurized. Pistons move outward and the pinion rotates CCW.

Pressure entering Port B to close:
Outside chambers pressurized. Pistons move inward and the pinion rotates CW.

SPRING RETURN MODELS (QS)

Pressure entering Port A to open:
Center chamber pressurized. Pistons move outward and the pinion rotates CCW. Springs are compressed.

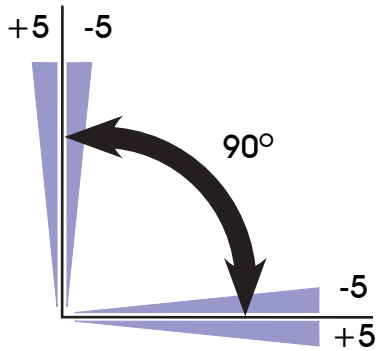
Pressure exiting Port A to close:
Air is released from center chamber. Springs drive pistons inward. Pinion rotates CW.

NAMUR SOLENOID MOUNTING:

Air supply connection is done by mounting a solenoid directly onto the NAMUR cover which has a mounting pad conforming to the NAMUR standards.

BI-DIRECTIONAL STROKE ADJUSTMENT:

Quad*4* actuators feature bi-directional pinion travel stops. These stops allow for true ±5° for valve travel adjustment to ensure precise positioning with all types of valves.



The Quad*4* travel stops are designed to absorb the maximum rated torque of the actuator and the maximum impact loads associated with the recommended stroke speed.

IDENTIFICATION:

Quad*4* actuators are supplied with a nameplate which is located on the side of the body. The information includes actuator model, type (Spring Return or Double Acting), spring set, serial number, CE mark, pressure and temperature (Figure 2.2).

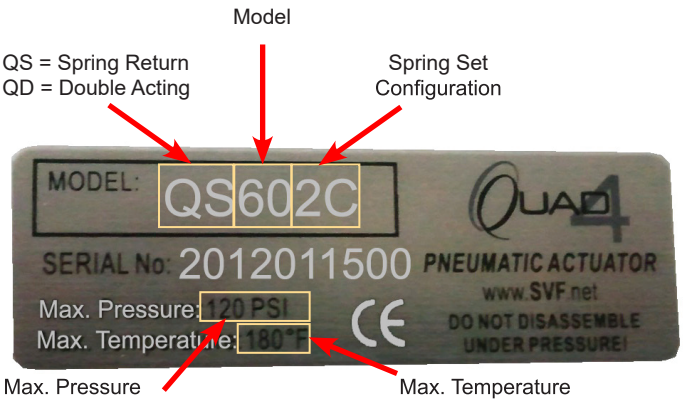
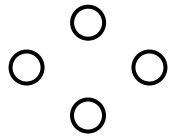
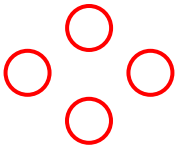
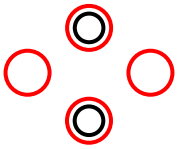
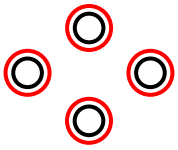
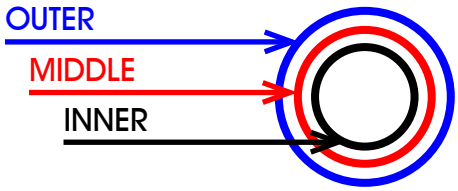


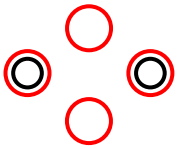
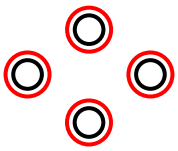
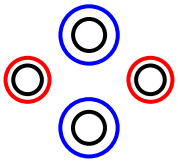
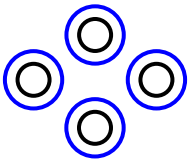
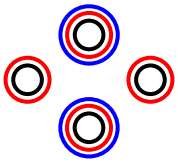
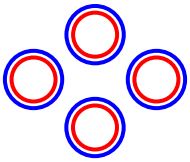
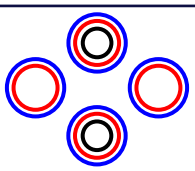
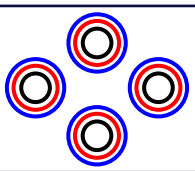
Figure 2.2

SPRING COMBINATIONS

MODEL Q15	
CODE	SPRING COMBINATIONS
1A	
1B	
1B2	
2	



Colors shown for illustration purposes only.

MODEL Q20 - Q75	
CODE	SPRING COMBINATIONS
2AB	
2A	
2A2B	
2B	
2A3	
2C	
2C3	
3	

Quad4 INSTALLATION, OPERATION & MAINTENANCE MANUAL

DISASSEMBLY OF THE ACTUATOR: (Refer to Page 9 for part numbers indicated in the procedure)
CAUTION!! If the actuator is a Spring Return unit, make sure pressurized air is completely exhausted.

1. Safely disconnect all electric power and supply lines connected to the actuator and or accessories.
2. Disassemble all the accessories of the actuator (solenoid, limit switch box, etc.).
3. Remove the actuator from the valve.
4. Remove indicator screw (#12), lift position indicator (#13) off shaft.

NOTE: Place the actuator on a coupler, and secure it in a vice to facilitate the disassembly and assembly procedures! (Figure 4.1)

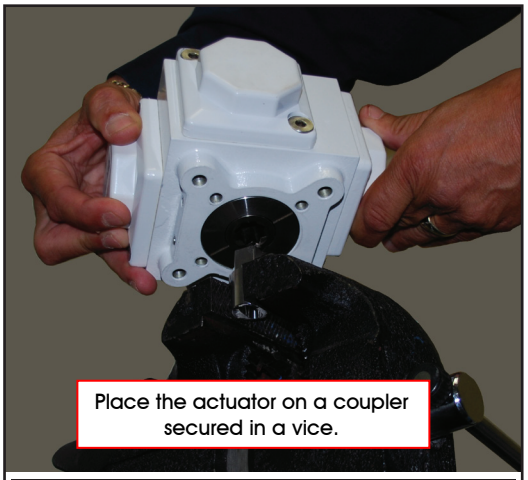


Figure 4.1

A. DISASSEMBLY OF DOUBLE ACTING COVERS:
1. Mark the covers with the body before disassembly.
2. Remove the cover screws (#10).
3. Remove the covers making sure not to damage the Cover O-Rings (#21). When removing the NAMUR cover (#9) make sure the NAMUR Cover O-Ring (#11) connecting to the inner chamber is secure in its slot.

B. DISASSEMBLY OF SPRING RETURN COVERS:
Caution!! Springs in the actuator are under tension.
1. Prior to disassembly, mark each of the covers with the body.
2. Remove the cover screws in sequence by turning each opposing screw two rotations at a time. When there are 4 screws in the cover (sizes Q60, Q75), remove the two opposing screws first and then on the second set.
3. Remove the covers making sure not to damage the Cover O-Rings (#21).
4. Remove the springs (#5, #6, #7) from the cylinder and place them together in their covers.
5. Follow the same procedure on all four cylinder covers.

C. PISTON DISASSEMBLY:
1. Remove the left of each Adjustment Screws (#18) 1/4" (6-10mm) outward (Figure 4.2). This will allow the stop to rotate pass the 90° limit so the pistons can come out.
2. Hold the actuator body with both hands and rotate it in the CW direction to eject the pistons.
3. Carefully remove the Piston O-Rings (#4). Do not use a sharp object to pry them out.

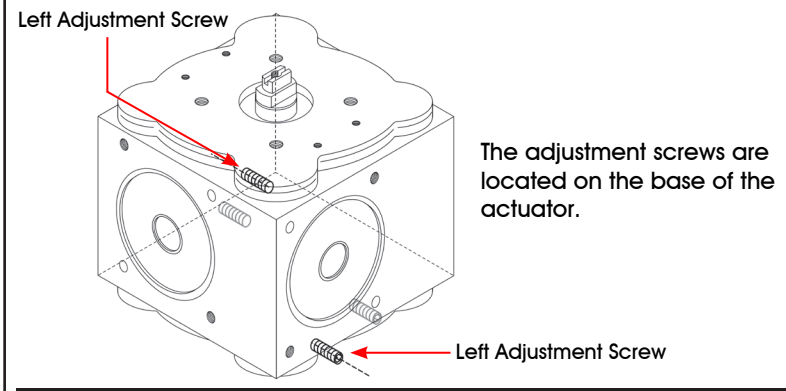


Figure 4.2

D. PINION DISASSEMBLY - (Models Q15 - Q30): For Models Q45 - Q75 See Page 8

Note - The pinion is removed through the bottom of the actuator - opposite of the indicator.

1. Remove the Indicator Screw (#12), Indicator (#13). Slide a smooth flat tool between the bottom of the indicator and the top of the actuator and carefully pry up the indicator, working your way around the indicator.
2. Remove the Circlip/Snap-ring (#14).
3. Push the pinion (#19) down and remove it from the body.
4. The Stroke Adjustment Stop (#20), Thrust Washer (#15) and Pinion O-ring (#17) will drop out with the pinion. The Stop and the Pinion should remain assembled.

E. ASSEMBLY- (Models Q15 - Q30): For Models Q45 - Q75 See Page 8

CAUTION!! Prior to assembly, clean the cylinders and all the actuator parts, making sure to remove all grease. The surfaces should be smooth, without scratches or debris. Apply Type B grease to all the parts prior to assembly.

1. If you have removed the pads (#2), push them back into their holes (Figure 5.1).
2. If the Stroke Adjustment Stop (#20) has been removed from the Pinion (#19), insert it back into place. Make sure the Stop Protrusions are at 45° to the NAMUR slot (Figure 5.2). There are two grooves on the bottom of the Stop which will help identify the stop orientation.
3. Once the Stroke Adjustment Stop (#20) is in place, fit the Thrust Washer (#15) and Pinion O-Ring (#17) on the Pinion (#19).
4. Insert the Pinion assembly into the body, from the bottom. Confirm that the tongue of the Thrust Washer (#15) engages into the groove in the body.
5. Insert the Pinion into the body by bringing the grooves of the Stroke Adjustment Stop (#20) perpendicular to the Adjustment Screws (#18) to ensure correct angle of rotation (Figure 5.3a). Next, rotate the Pinion CCW until the protrusion flats contact the Adjustment Screws and the grooves in the Stroke Adjustment Stop are aligned with the threaded holes (Figure 5.3b).

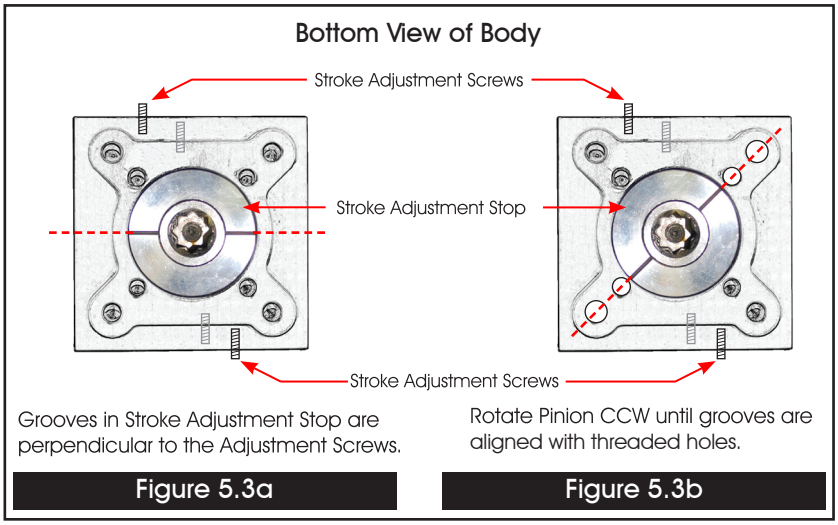


Figure 5.3a | Figure 5.3b

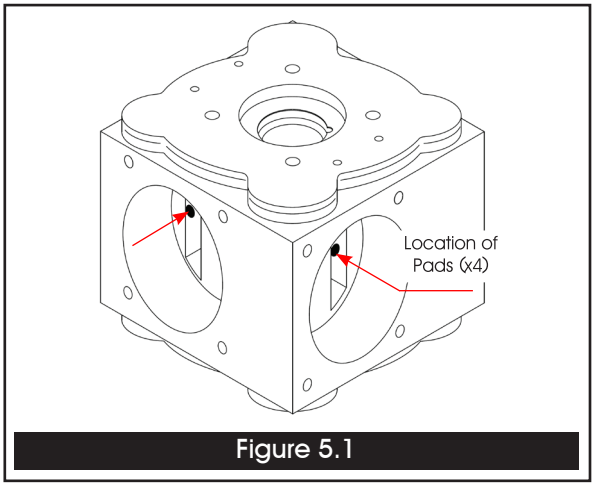


Figure 5.1

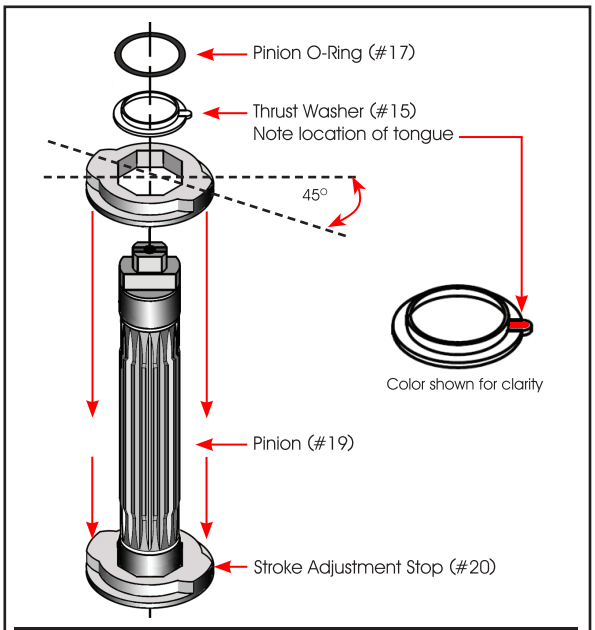


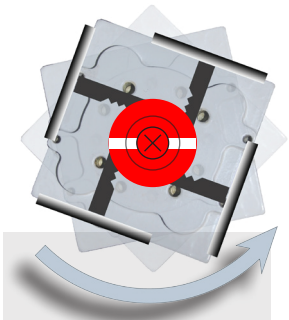
Figure 5.2

E. ASSEMBLY continued - **(Models Q15 - Q30): For Models Q45 - Q75 See Page 8:**

6. Fit the top Pinion O-Ring (#17), Thrust Washer (#15), Bearing (#16) over the top of the Pinion. Confirm that the tongue of the Thrust Washer (#15) engages into the groove in the actuator body.
7. Insert a NEW Circlip/Snap-Ring (#14) on the Pinion. (NOTE: Always use a new Circlip/Snap-Ring!).
8. Slide the Indicator (#13) on the top of the Pinion and tighten with the Indicator Screw (#12).
9. Place the assembled actuator body on the coupler in the vice (Page 4 - Figure 4.1).
10. Rotate the body of the actuator 90° CW plus another 35° to 40° to bring it to the proper position for inserting the Pistons (#3).
11. Fit the Piston O-Rings (#4) on the Pistons (#3).
12. Apply Type B grease to the grooves and rack on the Pistons, the Piston O-Rings and inside the body cylinders.
13. Insert the four Pistons into the cylinders. The teeth of the racks must engage with the grooves on the Pinion. The Pistons will protrude slightly outside the actuator body (Figure 6.1).
14. Grasp the body of the actuator firmly with both hands and rotate the body CCW until it stops against the Adjustment Screws (#18) and all four pistons are drawn inside (Figure 6.2). Confirm that all four pistons are in the same position inside the cylinder.
15. Rotate the body back 90° CW to the open position so the outside face of the Pistons are almost flush with actuator body (Figure 6.3).
16. Using the Stroke Adjustment Screws (#18), adjust them until the Pinion flats are parallel with the outside plane of the actuator body (Figure 6.4).

Top View of Actuator

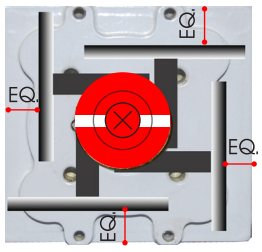
13. Pistons Slightly Out



Rotate CCW to draw Pistons into cylinders

Figure 6.1

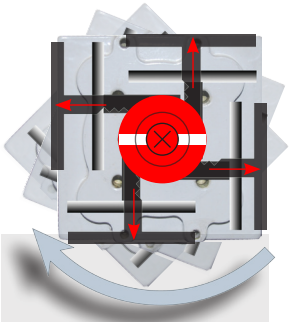
14. Pistons Drawn Inside



All four Pistons set in equally

Figure 6.2

15. Rotate CW 90°



Rotate CW to draw the Pistons out

Figure 6.3

16. Adjustment

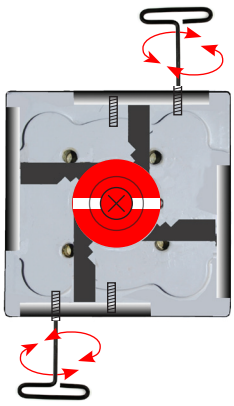


Figure 6.4

Figures 6.1 - 6.4

E. ASSEMBLY continued - **(Models Q15 - Q30): For Models Q45 - Q75 See Page 8:**

17. Rotate the body freely back and forth to get the Pistons running smoothly.
18. Rotate the body to get the Pistons back in to the closed (drawin inside) position and once again apply Type B grease inside the cylinders, behind the pistons.
19. Apply grease to all of the Springs (#5, #6, #7 as applicable to your Quad4 Model).
20. Insert the three Cover O-Rings (#21) into the groove on the inside of the three Covers (#22) and the NAMUR Cover O-Ring (#8) into the groove on the inside of the NAMUR Cover (#9).
    NOTE: If the O-Rings are damaged, replace them with a new set.
22. Insert the Air Supply O-Ring (#11) into the groove on the inside of the NAMUR Cover (#9).
23. Apply Type B grease to Cover Screws (#10).
24. Install the NAMUR Cover (#9) first. If this is a Spring Return actuator (QS Model), place the Spring Set(s) in the NAMUR Cover (#9) and then install the NAMUR Cover.
25. Place the Spring Set(s) in the three remaining Covers (#22) and install them, matching their original location prior to disassembly.
26. Tighten the Screws (#10) - NOTE: Always tighten in sequence and only two turns at a time!
27. Torque the Screws to the to the torque values listed in the table to the right (Table 7.1 - Listed per specific Quad*4* Model numbers).

Table 7.1

Quad*4* Cover Screws Torque Values

Quad*4* Model	Screw Size	Torque (in-lbs)
Q15 - Q20	M5	30
Q25 - Q30	M8	80
Q35	M10	160
Q45 - Q75	M12/M16	360

Quad4 Models Q45 thru Q75:
Sizes Q45 thru Q75 have a slightly different Pinion assembly. The top Bearing (#16) and top Pinion O-Ring (#17b) are smaller in diameter than those on the Pinion bottom assembly and are installed on the Pinion (#19) BEFORE the Pinion is inserted into the actuator body (Figure 8.1).

PINION DISASSEMBLY

Quad4 Models Q45 thru Q75:

1. Remove the Circlip/Snap-Ring (#14) and the Bearing (#16).
2. Carefully push the Pinion (#19) down and remove it from the body.
3. The Thrust Washer (#15b) is inserted in the body of the actuator and the top O-Ring (#17b) is fitted to the Pinion. Both of them come out with the Pinion at the bottom of the body.
4. The Stroke Adjustment Stop (#20), Thrust Washer (#15) and Pinion O-Ring (#17) will come out with the Pinion. Make sure the Stroke Adjustment Stop (#20) remains on the Pinion in the same orientation that it was in when the Pinion was removed. Model Q75 has an integral Stroke Adjustment Stop.

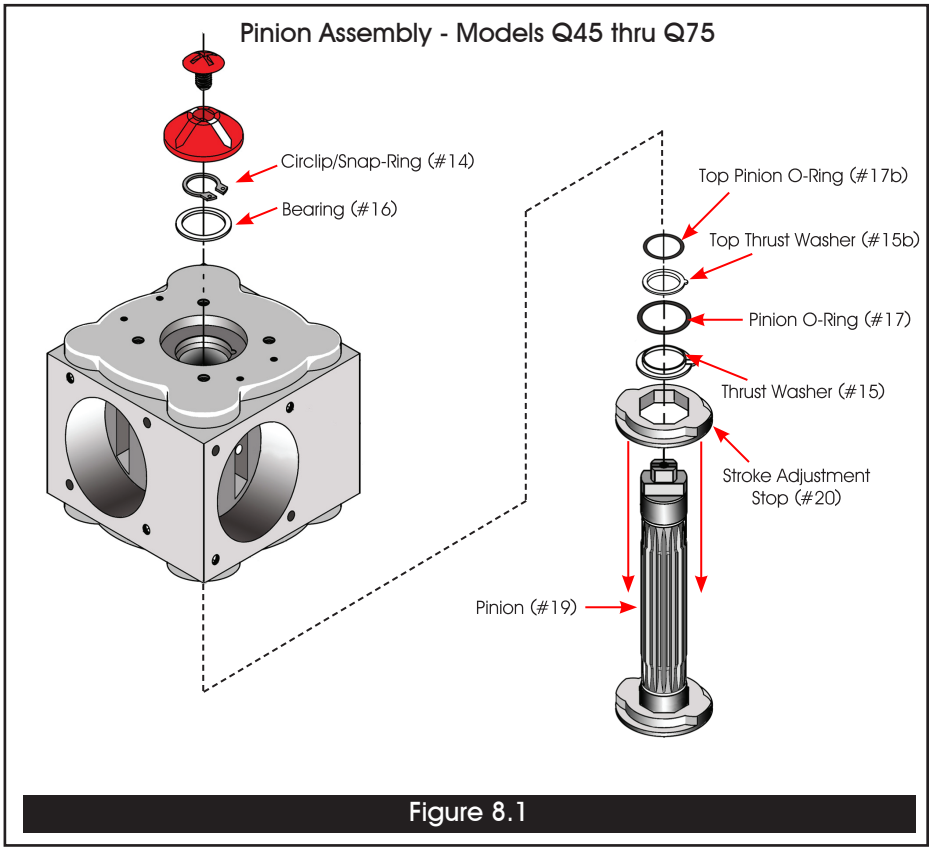


Figure 8.1

PINION ASSEMBLY - Quad4 Models Q45 thru Q75:

1. If the Stroke Adjustment Stop (#20) was removed, place it over the Pinion #19) followed by the bottom Thrust Washer (#15) and bottom Pinion O-Ring (#17).
2. Assemble the top Thrust Washer (#15b) on the shoulder of the Pinion (#19).
3. Fit the top Pinion O-Ring (#17b) in the groove on the Pinion. Apply grease to the Pinion assembly.
4. Insert the Pinion assembly into the body from the bottom. Confirm that the tongue of the Thrust Washer (#15) engages into the corresponding groove in the body. Be careful not to damage the top Pinion O-Ring (#17b).
5. Insert the Pinion into the body by bringing the grooves of the Stroke Adjustment Stop (#20) perpendicular to the Stroke Adjustment Screws (#18) to ensure correct angle of rotation (Figure 5.3a).
   Next, rotate the Pinion CCW until the protrusion flats contact the Adjustment Screws.

MATERIALS OF CONSTRUCTION FOR Quad4 ACTUATORS

Item #	Part Name	Materials
1	Body	AL 356
2	Pad	POM(Plastic)
3	Piston	AL 356
4	Piston O-Ring	BUNA "N", Viton®
5	Inner Spring	Spring Steel
6	Middle Spring	Spring Steel
7	Outer Spring	Spring Steel
8	NAMUR Cover O-Ring	BUNA "N", Viton®
9	NAMUR Cover	Q15 - Q35: AL 356, Q45 - Q75: AL 380
10	Cover Screw	Stainless Steel
11	Air Supply O-Ring	BUNA "N", Viton®
12	Indicator Screw	Stainless Steel
13	Indicator	Plastic (ABS)
14	Circlip/Snap-Ring	Stainless Steel
15	Thrust Washer	POM(Plastic)
16	Bearing	POM(Plastic)
17	Pinion O-Ring	BUNA "N", VITON
18	Stroke Adjustment Screw	Stainless Steel
19	Pinion	Carbon Steel with Nickel Chemical Coating
20	Stroke Adjustment Stop	Stainless Steel
21	Cover O-Ring	BUNA "N", Viton®
22	Cover	Q15 - Q35: AL 356, Q45 - Q75: AL 380