

Model DF270 Control Valve

Operation, Parts, and Instruction Manual



Figure 1 *DF270 Control Valve*

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NOTICE

These instructions are meant to be used with the Dyna-Flo DF270 Technical Bulletin as they refer to Figures and Tables therein. If you do not have the Technical Bulletin, contact Dyna-Flo immediately, or visit www.dynaflo.com

Each control valve is factory checked. Check the calibration for the specific application, before a valve is put into service.

It is the intention of this document to provide users with an accurate guide for safe installation and maintenance of the DF270 Control Valve. Revisions and updates are available at above mentioned website.

GENERAL

The following instructions are to be thoroughly reviewed and understood prior to installing, operating or performing maintenance on this equipment. Work on this equipment should be performed by experienced personnel. Throughout the manual, safety and caution notes appear and must be strictly followed, to prevent serious injury or equipment malfunction.

SCOPE

The control valve configuration and construction materials were selected to meet particular pressure, temperature, and process conditions. Some material combinations are limited in their pressure and temperature ranges. Do not apply any other conditions to the valve without first contacting your Dyna-Flo sales office.

This manual is written to be a practical and useful guide maintaining the Dyna-Flo DF270 Control Valve.

SAFETY CAUTION

Only well trained experienced technicians should perform these procedures. Use safe work practices and lock out procedures when isolating valves and actuators. It is also important to wear the proper protective equipment when performing any installation or maintenance activity. Use only parts and materials rated for the process being used, operating conditions, and environmental conditions products will be used in.

To avoid personal injury or installation damage as a result of the sudden release of process pressure or damage to equipment, do not install the valve assembly where service conditions could exceed the limits stated in this manual, sales bulletin or on the equipment nameplates. Use government codes, accepted industry standards and good piping practices, and select proper pressure-relieving equipment for protection of your installation. Always be aware of flammable process and instrument gas.

Always be aware of the hazards of actuators, especially spring-loaded actuators. Be sure that the actuator is de-energized or in the failed position before performing any maintenance procedure.

These valves have dangerous pinch points. Never put your hands inside the valve unless you are certain that the plug and stem will not move.

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SPECIFICATIONS

Port Diameters

1/4", 3/8", 1/2", 3/4", and 1"
Refer to Table 1.

Sizes and Connection Styles

Size: 1 & 2 inch
Rating: ASME 150 / 300 / 600 / 900 / 1500
FNPT: 2,250 Psi (155 bar) CWP
Connections: FNPT / RF / RTJ
Refer to Table 1 for details and Port Diameters.

Maximum Pressure Drops

Refer to Tables 6 & 7 of the Sales Bulletin.

Standard Shut-off Classifications

Class IV Shut-off in accordance with ASME / FCI 70.2.

Dimensions

Fail Closed Valve Configuration Dimensions

Refer to Figure 4 of the Sales Bulletin.

Fail Open Valve Configuration Dimensions

Refer to Figure 5 of the Sales Bulletin.

Flow Characteristics

Equal Percentage.

Flow Direction

Up Only (Refer to Tables 6 & 7 of the Sales Bulletin).

Valve Plug Travel

3/4 inch (19 mm).

Approximate Valve Body and Actuator Weights

Refer to Table 1.

Material Temperature Capabilities

Body Assembly

HNBR O-Rings: -46 to 149°C (-50 to 300°F)
VITON O-Rings: -18 to 204°C (-0 to 400°F)

Actuator Assembly

-40 to 82°C (-40 to 180°F)

Body Style

Available in Globe style.

Bonnet/Body Connection

Threaded Hammer Nut.

Actuator Configuration

The DF270 utilizes a spring and diaphragm actuator suitable for modulating. Fail action is field-reversible.

Maximum Actuator Casing Pressure

50 Psig (3.45 bar).

Effective Actuator Diaphragm Area

69 inches² (452 cm²).

Actuator Pressure Connections

NPS 1/4 inch NPT.

For more information and other options contact your Dyna-Flo sales office.

Port Diameter inch (mm)	Connection Style						
	Threaded lb (kg)	Raised Face (RF) Flanged lb (kg)				Ring Type Joint (RTJ) Flanged lb (kg)	
1 Inch Valve 1/4 (6.40) 3/8 (9.50) 1/2 (12.7) 3/4 (19.1) 1 (25.4)	FNPT	Class 150	Class 300	Class 600	Class 900	Class 600	Class 900
	40 (18)	44 (20)	50 (23)	50 (23)	79 (32)	50 (23)	79 (36)
2 Inch Valve 1/4 (6.40) 3/8 (9.50) 1/2 (12.7) 3/4 (19.1) 1 (25.4)	FNPT	Class 150	Class 300	Class 600	Class 900/1500	Class 600	Class 900/1500
	46 (21)	50 (23)	70 (32)	70 (32)	110 (32)	70 (32)	110 (50)



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UNPACKING VALVE FROM SHIPPING CONTAINER

Special Tools Required:

- Properly Rated Lifting Straps (1 – 2 Straps) refer to Table 1 for valve weights.
- Lifting Device (Example: Crane)

Check the packing list, verify that the list includes all the materials in the shipping container before unpacking. Valve information can be found on the nameplate (Key 34). Refer to Figure 2 for nameplate location.

When lifting the valve from shipping container, place properly rated lifting straps securely around the neck of the actuator, refer to Figure 2 for strap placement. Straps should be placed to avoid damage to tubing and other mounted accessories.

Lift the valve/actuator assembly using proper lifting techniques.

INSTALLATION

Before You Begin:

- Read the General and Scope section of this manual (Page 2).
- Read Safety Caution (Page 2).
- Sudden movement of actuator can cause damage or injury. It helps to have the actuator de-energized.
- Use safe work practices and lock out procedures before placing valve in-line.

Parts Required:

- Appropriate Line Flange Nuts and Bolts
- Appropriate Line Flange Gaskets

Lubricants Required:

- Permatex® Nickel Anti-Seize or equivalent (Key A)

WARNING: Keep hands, hair and clothing away from all moving parts when operating the valve. Serious injury can result from failure to do so.

Installation Steps:

- 1 Inspect the flange mating surfaces on both the valve and the pipeline flanges. Clean dirt, welding chips, scale or other foreign material from the line and flange surfaces. Check the pipeline flanges for alignment and look for signs of gasket leakage through the line flanges.

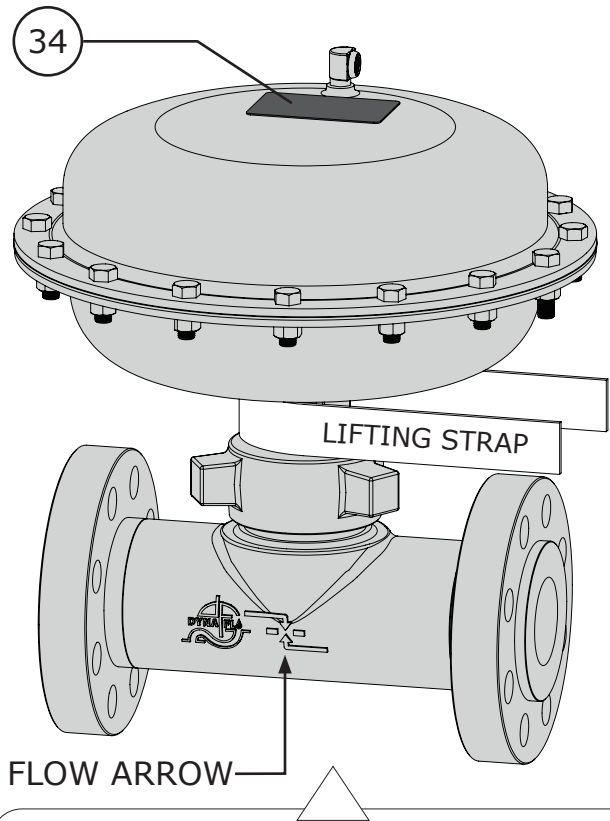


Figure 2 Lifting Strap Placement Suggestion

- 2 Check the hammer nut (Key 4) for proper tightness. Refer to VALVE ASSEMBLY on Page 27 Step 4 for proper tightening instructions.
- 3 The valve assembly may be installed in any position unless limited by vibration considerations, it is however recommended that the valve be installed with the valve stem (Key 15) perpendicular to the ground.
- 4 Install the valve with flow through the valve in the direction shown by the flow arrow on the valve body.
- 5 Install the appropriate line flange gaskets.
- 6 Apply Permatex® Nickel Anti-Seize to the threads of the flange studs and install.
- 7 When possible, before tightening the line bolting, stroke the valve and check for smooth operation through the full stroke. Unsteady valve stem movement could be an indication of an internal problem.
- 8 Tighten the line flange bolting in even increments in a crisscross pattern until the correct line bolt torque specification is reached.

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INSTALLATION (Continued)

AIR PIPING

WARNING: Property damage, environmental harm, and personal injury can result from the use of supply gas other than clean, non-corrosive, oil and moisture free air. Do not exceed the supply pressure indicated on the serial plate located on the actuator.

Before You Begin:

Note: Standard actuators accept 1/4" (6 mm) NPT connections.

- Refer to the appropriate actuator instruction manual when necessary.

Piping Installation Steps:

- 1 Use 3/8" (outside diameter) tubing (or equivalent) for air lines.
- 2 Install the required line vents, valves, drains, seals, and filters to the actuator.

PERIODIC INSPECTION

Special Equipment Required:

- Bypass or block valves.

Before You Begin:

- Read Safety Caution (Page 2).
- Use safe work practices and lock out procedures.
- Disconnect supply lines (air or gas), electric power, or control signal to the actuator. Sudden movement of actuator can cause damage or injury, make sure actuator will not operate.
- Vent any pneumatic actuator loading pressure and relieve any actuator spring preload if present.
- Relieve process pressure and drain the process fluid from up and down stream of valve.
- Be aware of potentially hazardous process material that may be present in-line and in-valve. Isolate the valve from process pressure. Use a bypass or block valve if necessary, or completely shut off the process.

Inspection Steps:

- 1 Check for visible signs of leakage around all seal and gasket areas.

- 2 Check the valve for damage, especially damage caused by corrosive fumes or process drippings.
- 3 Clean and repaint the areas as required.
- 4 Ensure all accessories, mounting brackets, and fasteners are secure.
- 5 Clean any dirt and foreign material from the valve stem (Key 15).

VALVE TRIM MAINTENANCE

NOTE: DF270 trim can be serviced while the valve remains in-line after all process pressure and fluid is released. Once the actuator has been separated from the valve body (Key 1)(refer to Page 6) it is recommended that the actuator be secured in a clamping device while the valve plug (Key 14) is serviced. If the valve has been taken out-of-line, it is recommended that the valve assembly be secured in a clamping device before proceeding.

For complete actuator and valve disassembly instructions refer to Page 9.

Special Equipment Required:

- Mechanic's pick set.

Before You Begin:

- Read Safety Caution (Page 2).
- Use safe work practices and lock out procedures.
- Disconnect supply lines (air or gas), electric power, or control signal to the actuator. Sudden movement of actuator can cause damage or injury, make sure actuator will not operate.
- Relieve process pressure and drain the process fluid from up and down stream of valve.
- Be aware of potentially hazardous process material that may be present in-line and in-valve. Isolate the valve from process pressure. Use a bypass or block valve if necessary, or completely shut off the process.

FOR FAIL OPEN ACTUATORS

Vent the pneumatic actuator loading pressure.

FOR FAIL CLOSED ACTUATORS (CAUTION)

It is necessary to apply pneumatic loading pressure to the actuator prior to separating the body (Key 1) from the bonnet (Key 6) in order to unseat the valve plug (Key 14). Failure to unseat the valve plug when removing the bonnet assembly could damage the valve plug and seat ring (Key 3).



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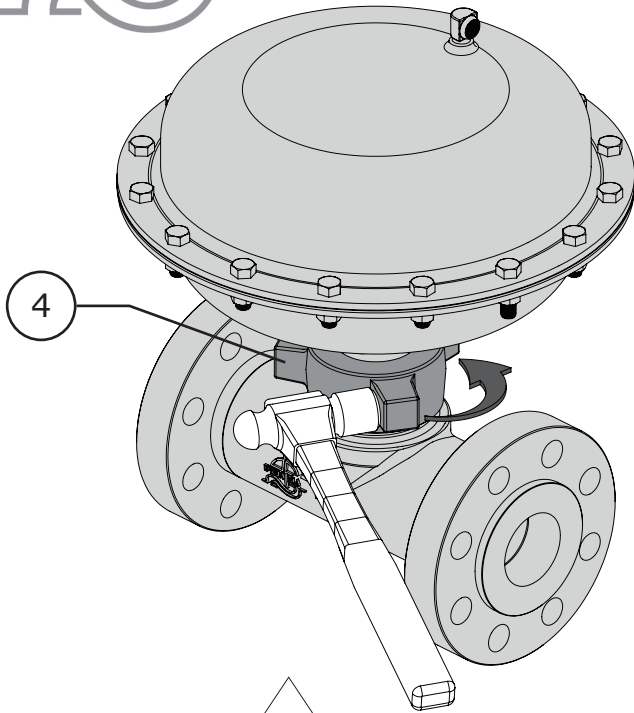


Figure 3 Hammer Nut Loosening

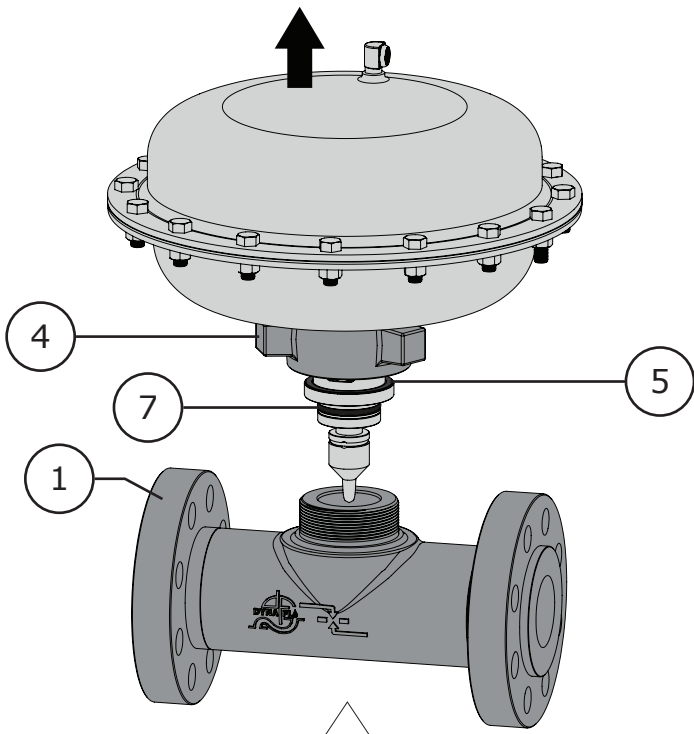


Figure 4 Actuator Removal

VALVE TRIM MAINTENANCE (Continued)

ACTUATOR REMOVAL

NOTE: If the valve assembly has been removed from the line, it is recommended that the valve be secured in a clamping device that will support the weight of the valve assembly.

- 1 Once the body (Key 1) is secured, verify that the plug (Key 14) is off the seat (Key 3) if you have a fail closed valve. Separate the body from the bonnet (Key 6). DF270 bonnets are held in place using a hammer nut (Key 4). A small sledge hammer is commonly used to loosen the hammer nut in a counterclockwise direction. Once the hammer nut is loosened it should move freely by hand. If the hammer nut or bonnet do not move freely be cautious of a build up of process pressure. Once the bonnet is disengaged from the body, carefully remove the actuator assembly with the plug (Key 14) and stem (Key 15) still attached.
- 2 Inspect the bonnet (Key 6) & hammer nut (Key 4) threads on the body for damage.
- 3 Inspect the washer (Key 5) between the hammer nut and bonnet for damage. If it is necessary to replace the washer, actuator disassembly must be done before removal.
- 4 Inspect the bonnet o-ring (Key 7) for damage, remove and replace as necessary. Refer to Page 22 for Re-Assembly.

CAGE AND SEAT RING REMOVAL

NOTE: For standard valve construction the cage and seat ring are one-piece (refer to Figure 5). Two-piece cage and seat ring designs were used in the past for optional trim materials but are considered one part (refer to Figure 6).

For Standard One-Piece Cage and Seat Ring:

- 1 Using a mechanic's pick carefully remove the cage/seat ring assembly (Key 3) using the cage window if necessary. **NOTE:** Be very gentle when removing the cage/seat ring assembly using the cage windows and avoid damaging the cage. Refer to Figure 5.
- 2 Using a mechanic pick set, remove and replace the seat ring o-ring (Key 2). **NOTE:** When possible, used o-rings should be replaced. Refer to Figure 5.
- 3 Inspect all parts for damage and wear. Replace or repair parts as necessary.
- 4 Refer to TRIM ASSEMBLY section on Page 19 for re-assembly instructions.

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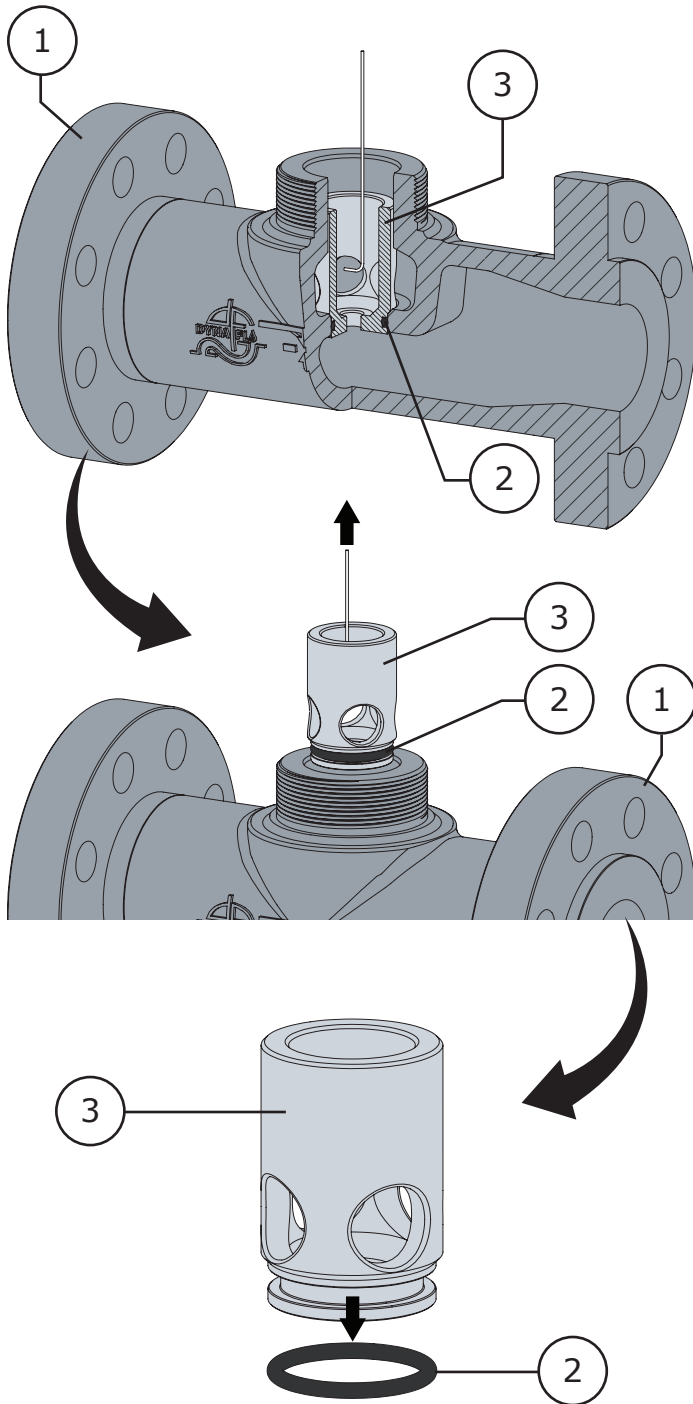


Figure 5 One-Piece Cage/Seat Ring Removal

VALVE TRIM MAINTENANCE (Continued)

CAGE AND SEAT RING REMOVAL (Continued)

For Discontinued Two-Piece Cage and Seat Ring:

- 1 Carefully remove the cage (Key 3A) as shown in Figure 6. The cage from a two-piece design is set on top of the seat ring (Key 3B) and easily removed.
- 2 If necessary use a mechanic pick set and remove the seat ring (Key 3B) as shown in Figure 6. **NOTE:** Seat rings from a two-piece design do not use an o-ring (Key 2) and are easily removed.
- 3 Inspect all parts for damage and wear. Replace or repair parts as necessary.
- 4 Refer to TRIM ASSEMBLY section on Page 19 for re-assembly instructions.

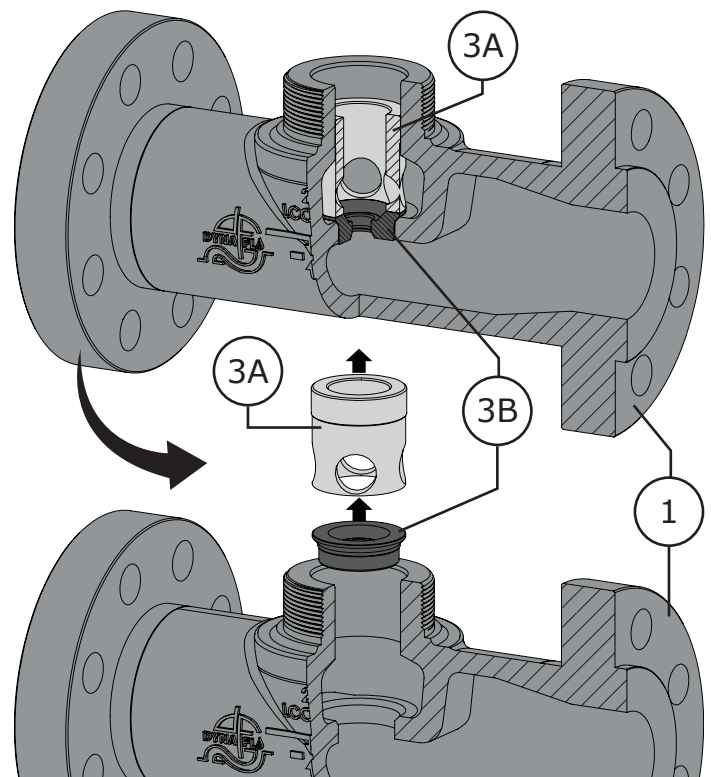


Figure 6 Discontinued Two-Piece Cage/Seat Ring Removal



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VALVE TRIM MAINTENANCE (Continued)

PLUG REMOVAL

CAUTION: If pneumatic loading pressure was applied to the actuator prior to separating it from the valve body, it is recommended that the pneumatic loading pressure be vented before servicing the valve plug (Key 14).

- 1 Using a mechanic pick, remove the pin o-ring (Key 17) from the valve plug (Key 14). Refer to Figure 7.
- 2 Remove the groove pin (Key 16), it may be necessary to use a punch to help with removal.
- 3 Once the groove pin (Key 16) is removed it will be possible to remove the valve plug (Key 14). Unscrew the valve plug from the valve stem (Key 15) by turning it clockwise. **NOTE:** It may be necessary to place a rod or screw driver through the hole in the valve stem in order to keep the valve stem from rotating during plug removal.
- 4 Inspect all parts for damage and wear. Replace or repair parts as necessary.
- 5 Refer to PLUG/STEM ASSEMBLY section on Page 21 for re-assembly instructions.

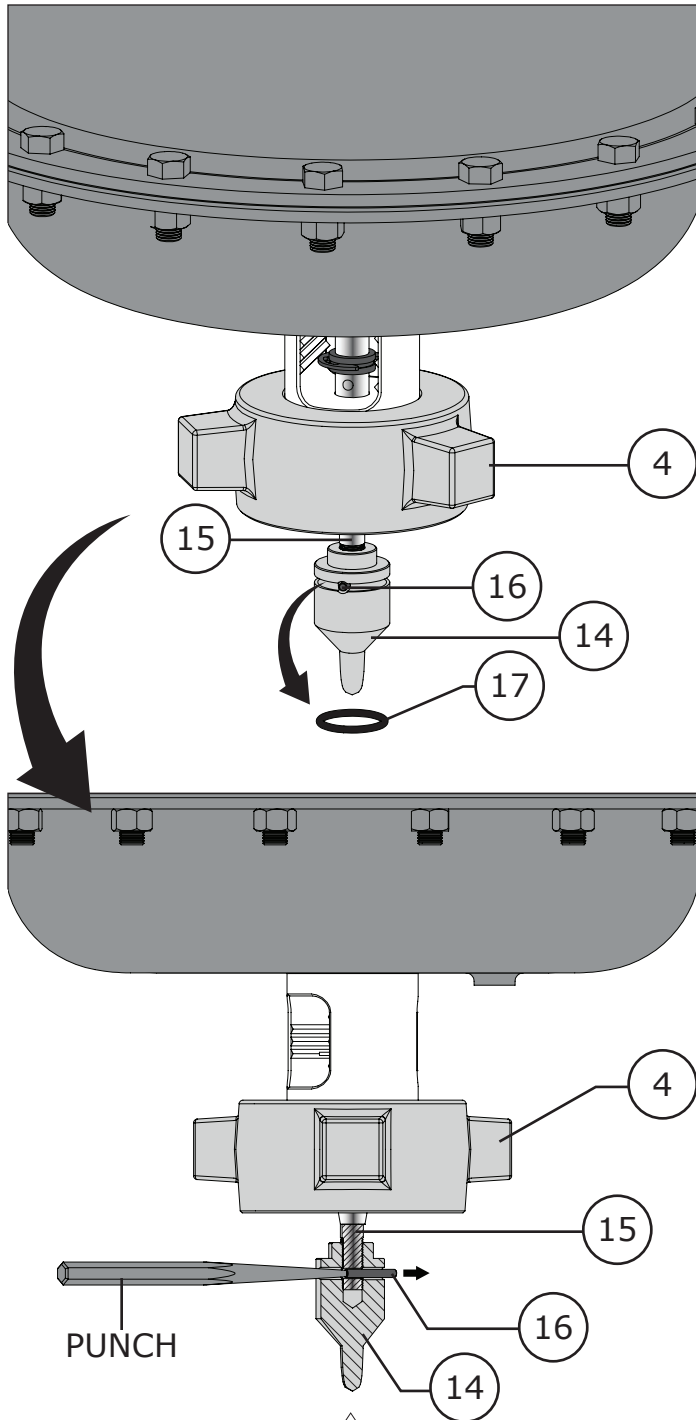


Figure 7 Plug Removal (Steps 1 and 2)

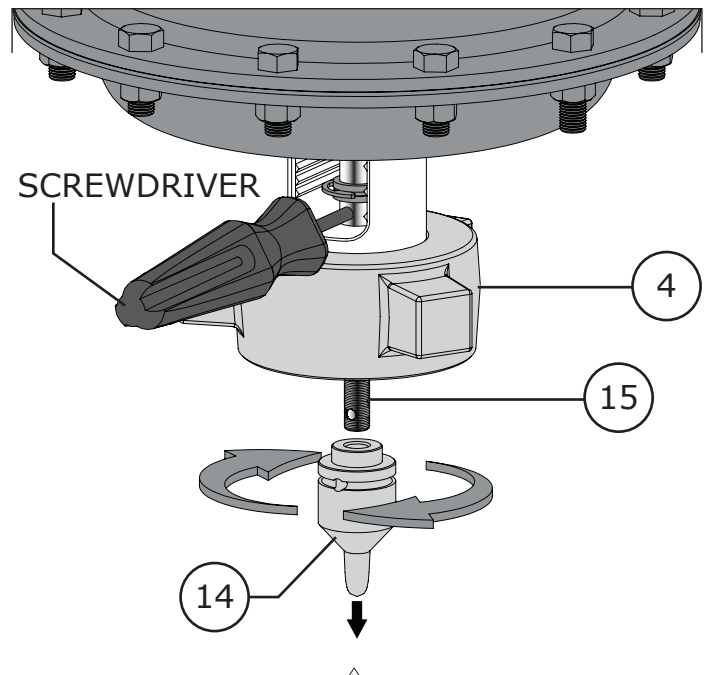


Figure 8 Plug Removal (Step 3)

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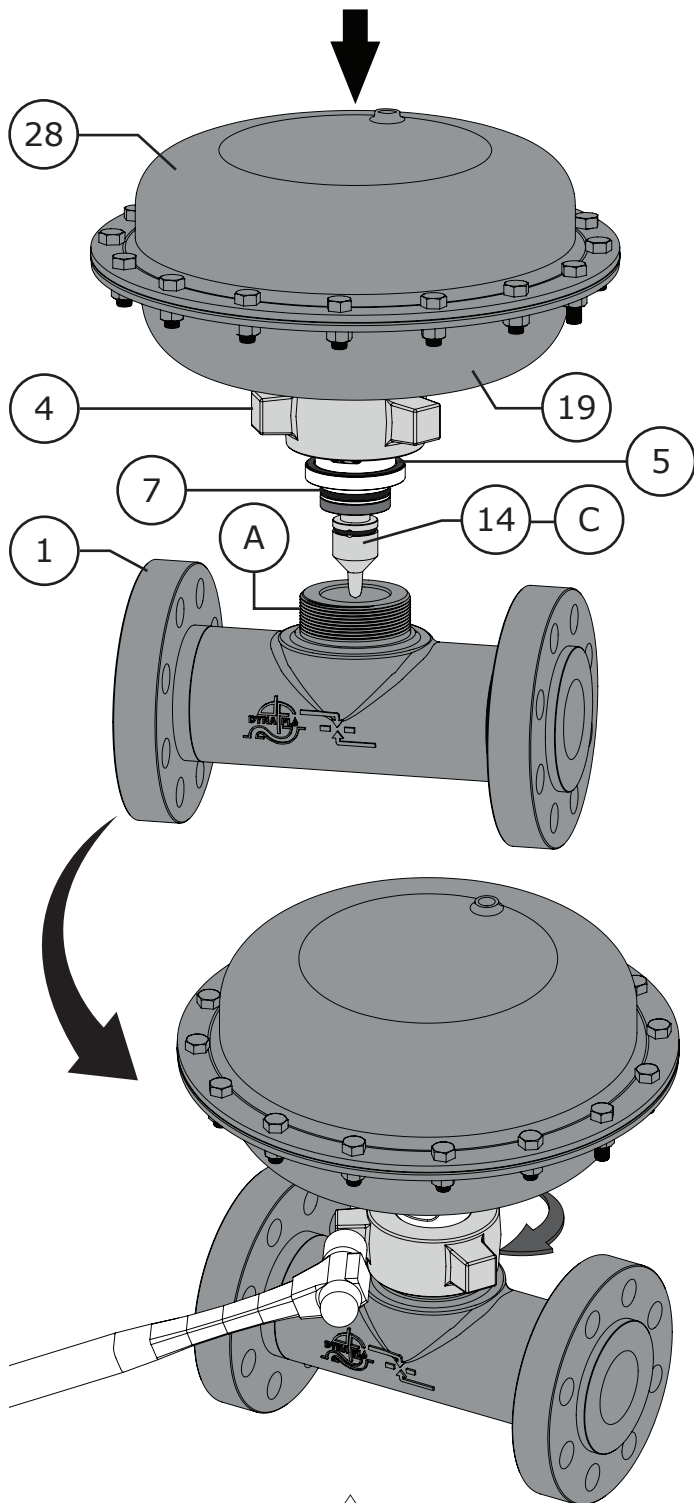


Figure 9 Actuator/Valve Assembly

VALVE TRIM MAINTENANCE (Continued)

VALVE ASSEMBLY

- 1 The configuration of the actuator assembly will effect the installation procedure, follow the appropriate steps below to connect the actuator assembly to the valve body:

FOR FAIL CLOSED ACTUATORS:

- A** It is necessary to apply pneumatic loading pressure to the actuator prior to connecting the bonnet/actuator assembly to the valve body (Key 1) in order to keep the valve plug (Key 14) from making contact with the seat ring (Key 3). Failure to keep the valve plug from making contact with the seat ring during assembly could damage the valve plug and seat ring.
- B** Carefully install the bonnet/actuator assembly into the valve (refer to Figure 9) and orientate the window of the bonnet (Key 6) so that it is perpendicular to the valve body (Key 1).
- C** Hold the actuator assembly in place during tightening so that it does not twist out of alignment. Tighten/torque the hammer nut (Key 4) to 200 lbs-ft. When the hammer nut is properly tightened the packing inside the bonnet will have reached the proper load.

FOR FAIL OPEN ACTUATORS:

- A** Carefully install the bonnet/actuator assembly into the valve assembly (refer to Figure 9) and orientate the window of the bonnet (Key 6) so that it is perpendicular to the valve body (Key 1).
- B** Hold the actuator assembly in place during tightening so that it does not twist out of alignment. Tighten/torque the hammer nut (Key 4) to 200 lbs-ft. When the hammer nut is properly tightened the packing inside the bonnet will have reached the proper load.

- 2 Stroke the valve a few times and look for smooth operation. Use liquid leak solution and check for leaks around the diaphragm casing. Reposition the travel indicator (Key 33) appropriately.



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DISASSEMBLY

NOTE: DF270 disassembly can proceed while the valve remains in-line after all process pressure and fluid is released. The following instructions assume that VALVE TRIM MAINTENANCE was not performed and that disassembly will proceed from a complete valve/actuator assembly. Actuator disassembly is not required for simple valve trim changes.

Before You Begin:

- Read Safety Caution (Page 2).
- Use safe work practices and lock out procedures.
- Relieve process pressure and drain the process fluid from up and down stream of valve.
- Be aware of potentially hazardous process material that may be present in-line and in-valve. Isolate the valve from process pressure. Use a bypass or block valve if necessary, or completely shut off the process.
- If the valve assembly has been removed from the line, it is recommended that the valve be secured in a clamping device that will support the weight of the valve assembly.
- Angle Body Valves assemble the same as Globe Body Valves.

Special Tools Required:

- Mechanics Pick Set
- Punch

ACTUATOR DISASSEMBLY

CAUTION: Before you begin be sure to vent all pneumatic actuator loading pressure, disconnect any supply lines, and disconnect/remove any instrumentation.

WARNING: Springs (Key 27) are under compression inside the actuator casing (Keys 19 & 28). Use caution and take necessary safety precautions.

- 1 Remove the 10 **short** (1") cap screws (Key 31) and nuts (Key 30) from the actuator casings (Key 19 & 28) using two 9/16" wrenches or an impact wrench with a 9/16" socket. Be sure not to remove the 2 **long** (1-1/4") cap screws (Key 29). Refer to Figure 10.
- 2 Slowly loosen the two **long** (1-1/4") cap screws (Key 29) and nuts (Key 30) in an alternating pattern. During removal, try to keep the upper casing (Key 28) level until the springs are no longer under compression, then completely remove the long cap screws, nuts, and upper casing. Refer to Figure 11.

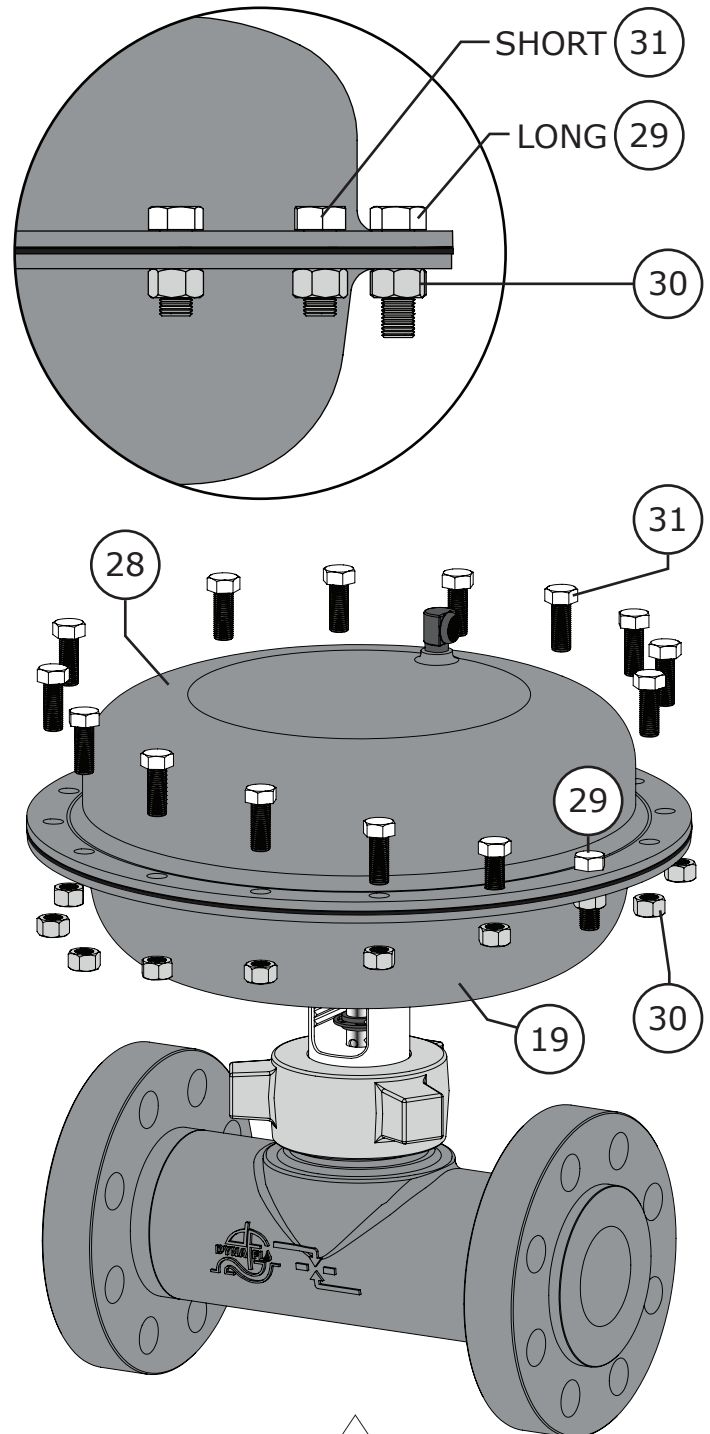
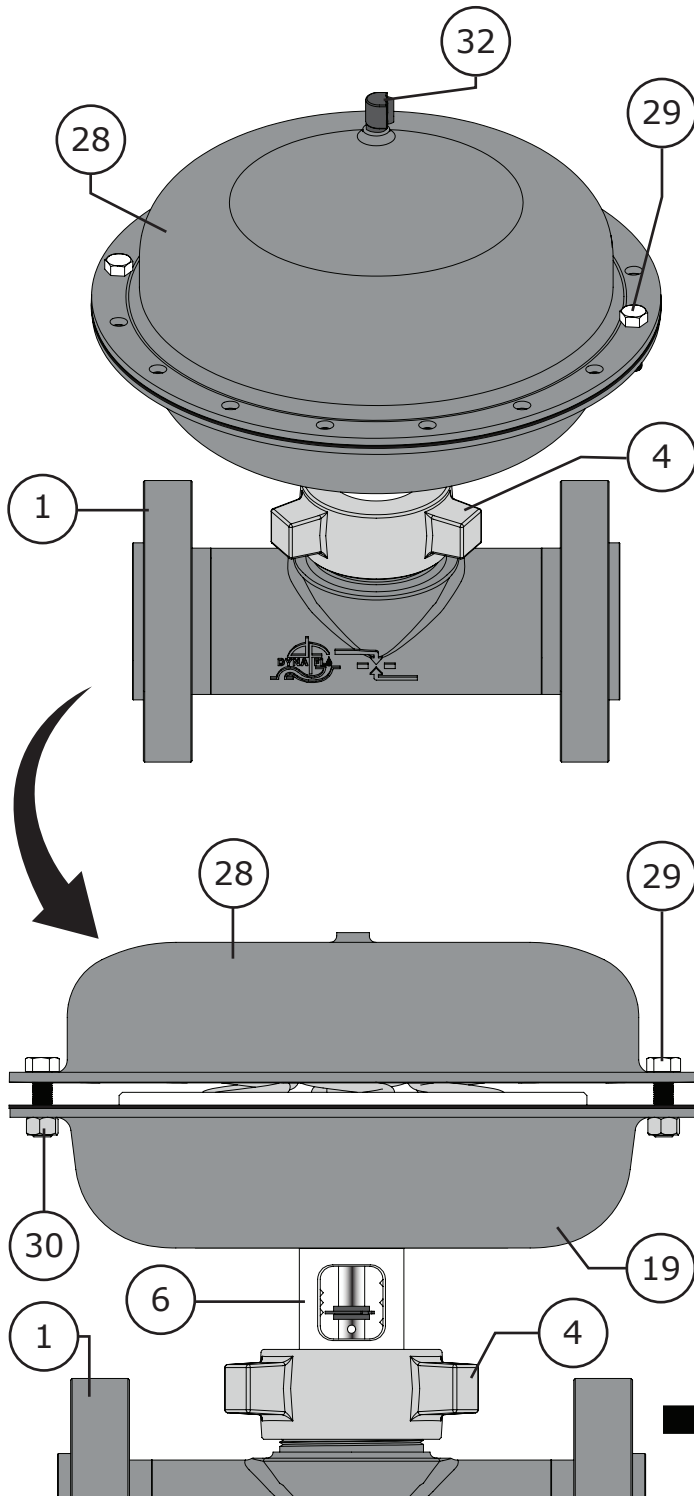


Figure 10 Short Cap Screw Removal (Step 1)

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DISASSEMBLY (Continued)

ACTUATOR DISASSEMBLY (Continued)

FOR FAIL CLOSED ACTUATORS:

- 1 Remove the actuator springs (Key 27) from the diaphragm plate (Key 24).
- 2 A 5/8" wrench will be required to remove the stem nut (Key 26). **NOTE:** It may be necessary to immobilize the valve stem (Key 15) using a screwdriver or rod to keep the valve stem from rotating while removing the stem nut. Refer to Figure 12.
- 3 Remove the diaphragm plate spacer (Key 25).
- 4 Remove the diaphragm plate (Key 24).
- 5 Carefully remove the diaphragm (Key 23) and inspect the surface for wear, stretching, and tears. Replace if necessary.
- 6 Remove the diaphragm plate washer (Key 22).

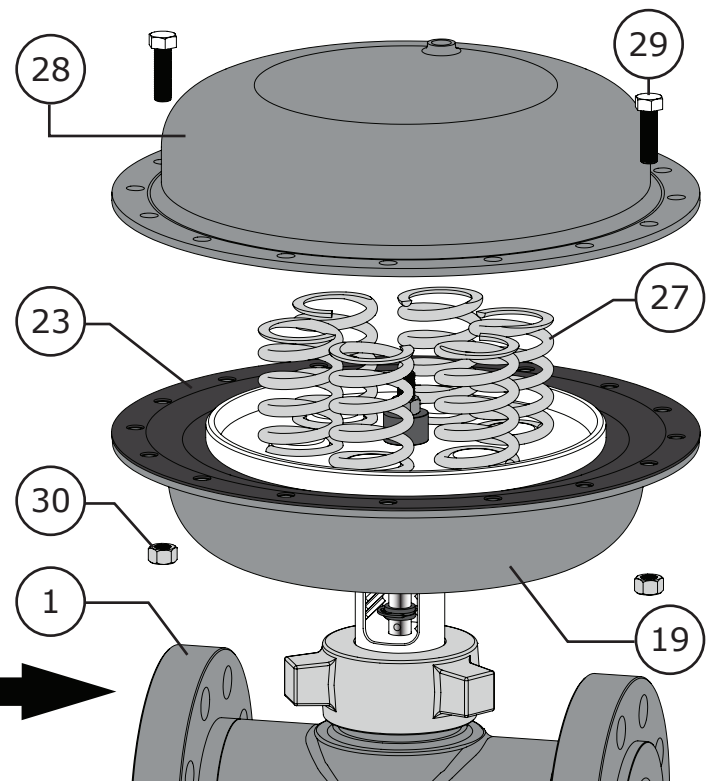


Figure 11 Actuator Disassembly (Steps 1 and 2, Page 10)



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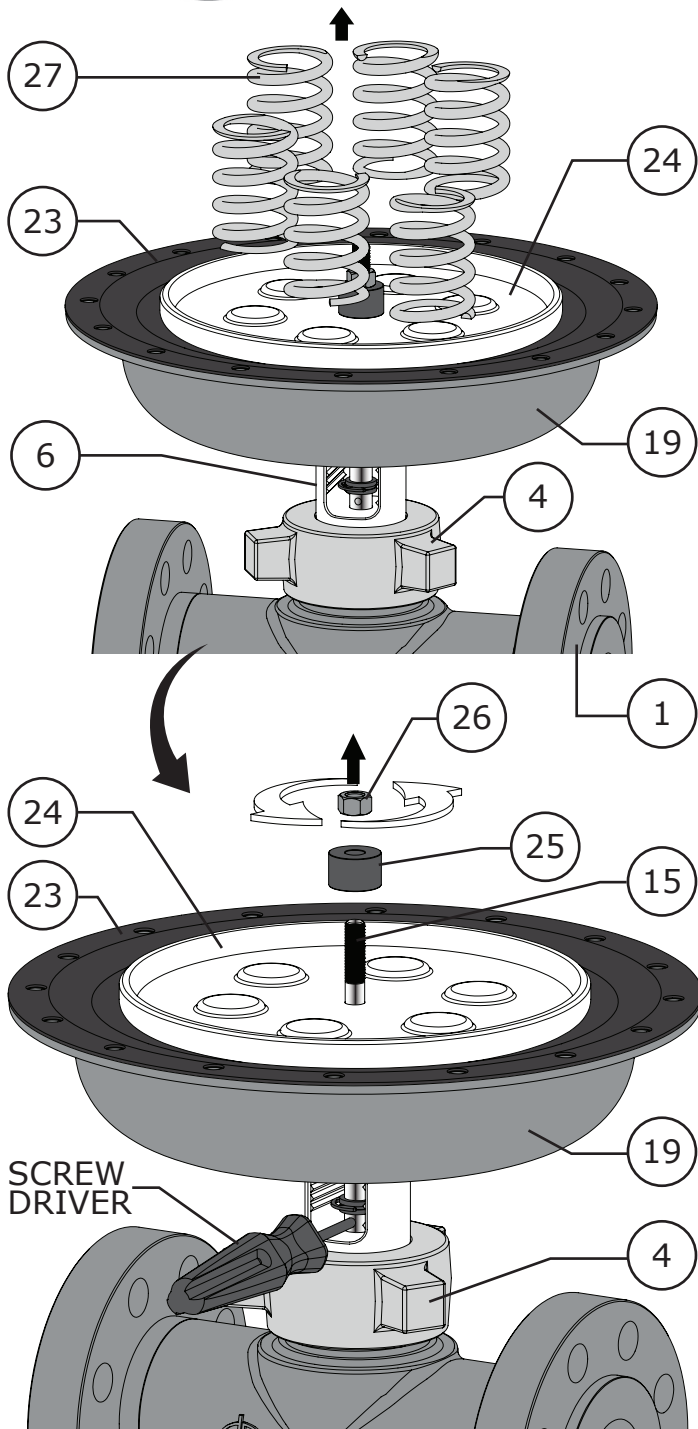


Figure 12 For Fail Closed Actuator (Steps 1 to 3)

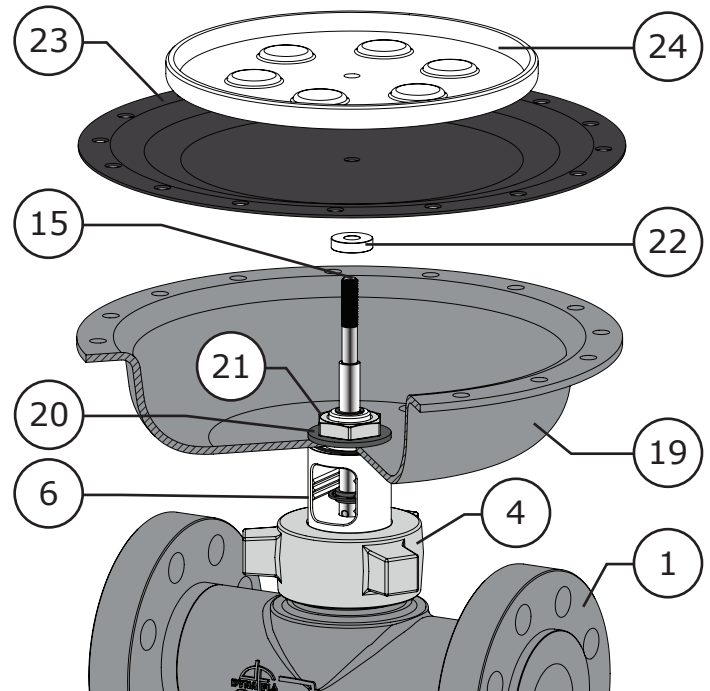


Figure 13 For Fail Closed Actuator (Steps 4 to 6)

DISASSEMBLY (Continued)

ACTUATOR DISASSEMBLY (Continued)

FOR FAIL CLOSED ACTUATORS (Continued):

NOTE: Complete disassembly of the rest of the actuator may be unnecessary as the stem (Key 15) and packing (Key 11) can be removed without separating the lower diaphragm casing (Key 19) from the bonnet (Key 6). If the casing o-ring (Key 18) needs to be replaced, proceed with the following disassembly steps.

- 7** Use a 1-1/2" deep socket or wrench to remove the bonnet lock nut (Key 21). Refer to Figure 14.
- 8** Remove the flat washer (Key 20).
- 9** Take note of the lower diaphragm casing (Key 19) before removing it, specifically the position of the NPT connection in relation to the valve body (Key 1). Remove the lower diaphragm casing.

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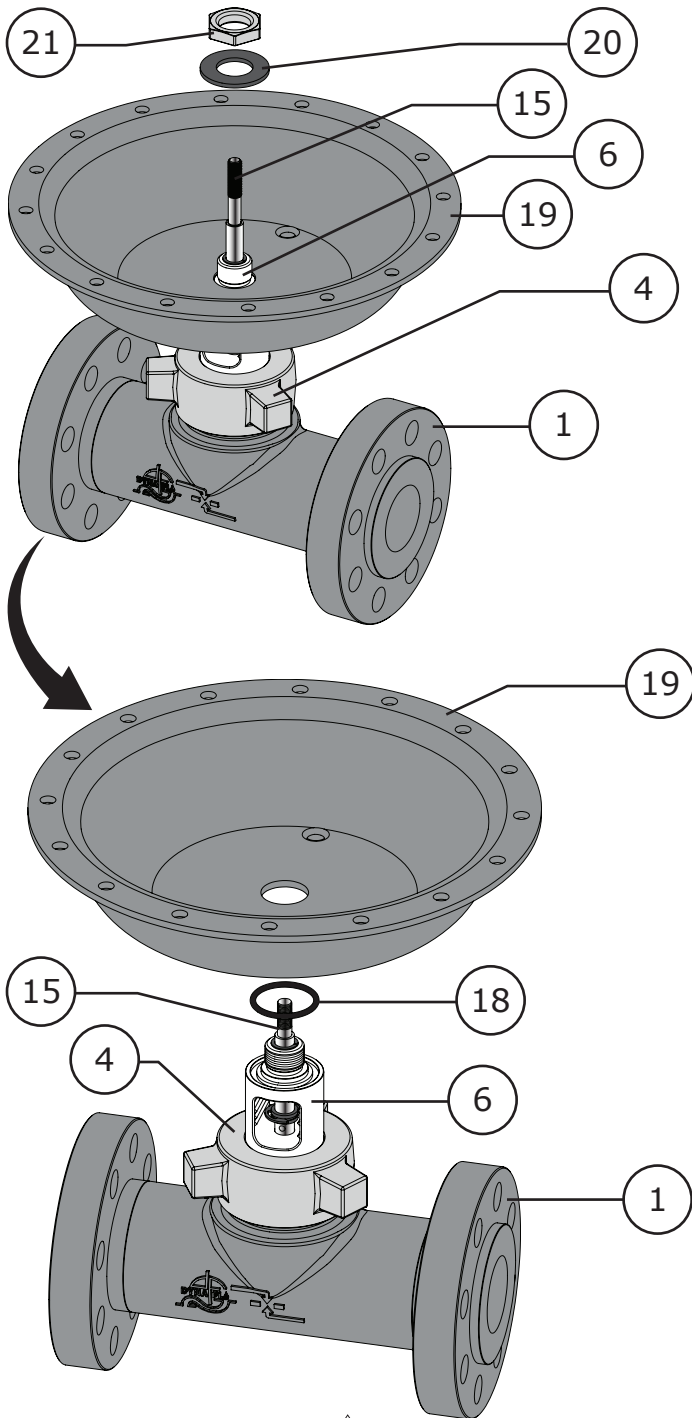


Figure 14 For Fail Closed Actuator (Steps 7 to 10)

DISASSEMBLY (Continued)

ACTUATOR DISASSEMBLY (Continued)

FOR FAIL CLOSED ACTUATORS (Continued):

- 10** Using a mechanic pick, remove the casing o-ring (Key 18) from the top of the valve bonnet (Key 6). Refer to Figure 14.
- 11** Inspect all parts. Repair and replace parts as necessary. Pay special attention to the diaphragm (Key 23) and check for wear and damage, soft parts such as o-rings should be replaced.
- 12** Proceed to the VALVE DISASSEMBLY section on Page 15 for the remainder of the disassembly instructions.

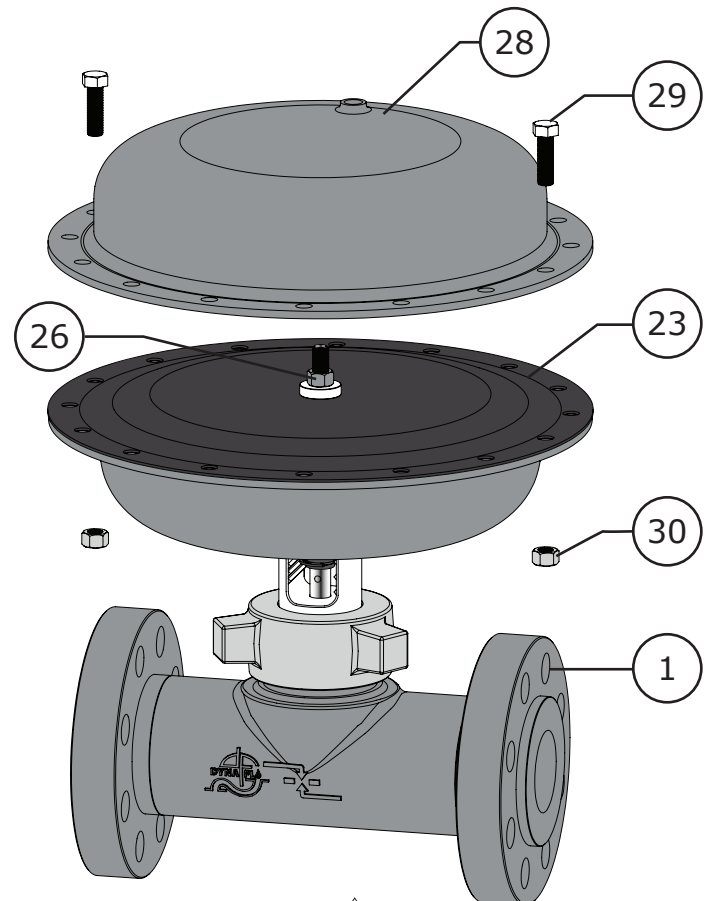


Figure 15 Upper Casing Removal (Fail Open Actuator)



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DISASSEMBLY (Continued)

ACTUATOR DISASSEMBLY (Continued)

FOR FAIL OPEN ACTUATORS:

- 1 A 9/16" wrench will be required to remove the stem nut (Key 26). **NOTE:** It may be necessary to immobilize the valve stem (Key 15) using a screwdriver or rod to keep the valve stem from rotating while removing the stem nut. Refer to Figure 16.
- 2 Remove the diaphragm plate washer (Key 22).
- 3 Carefully remove the diaphragm (Key 23) and inspect the surface for wear, stretching, and tears. Replace if necessary.
- 4 Remove the diaphragm plate (Key 24).
- 5 Remove the actuator springs (Key 27).
- 6 Remove the diaphragm plate spacer (Key 25).

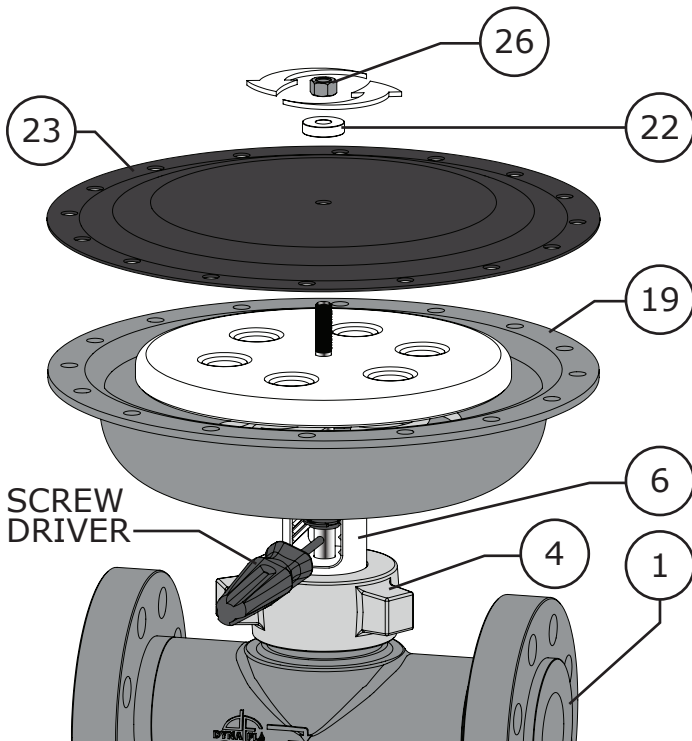


Figure 16 Fail Open Actuator Disassembly (Steps 1 - 3)

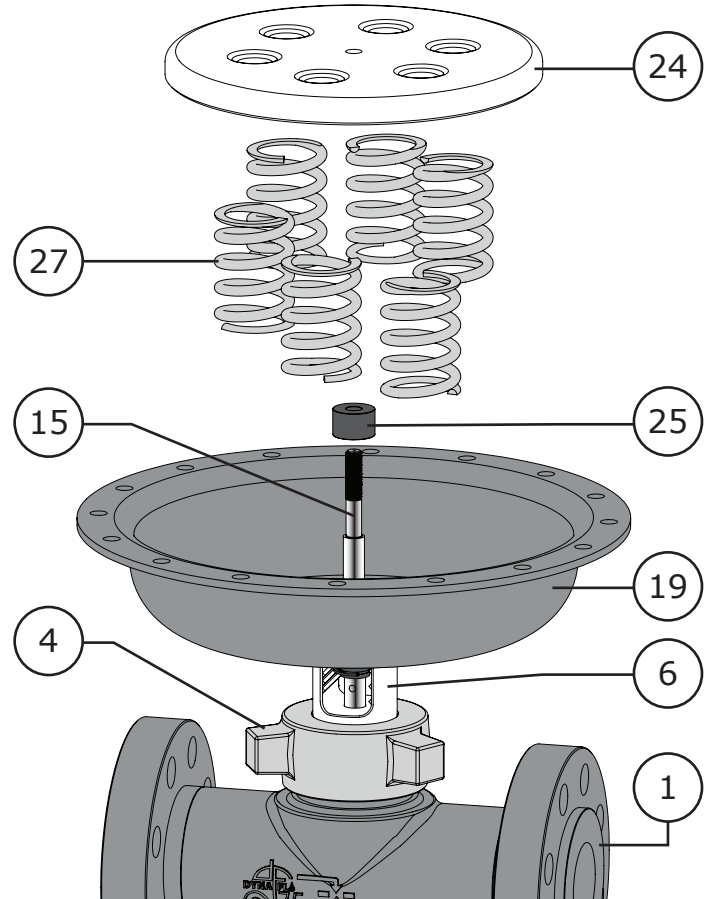


Figure 17 Fail Open Actuator Disassembly (Steps 4 - 6)

NOTE: Complete disassembly of the rest of the actuator may be unnecessary as the stem (Key 15) and packing (Key 11) can be removed without separating the lower diaphragm casing (Key 19) from the bonnet (Key 6). If the casing o-ring (Key 18) needs to be replaced, proceed with the following disassembly steps.

- 7 Use a 1-1/2" deep socket or wrench to remove the bonnet lock nut (Key 21). Refer to Figure 14 on Page 13.
- 8 Remove the flat washer (Key 20).
- 9 Take note of the orientation of the lower diaphragm casing (Key 19) before removing it, specifically the position of the vent hole in relation to the valve body (Key 1). Remove the lower diaphragm casing and casing o-ring (Key 18).

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DISASSEMBLY (Continued)

VALVE DISASSEMBLY

NOTE: DF270 disassembly can proceed while the valve remains in-line after all process pressure and fluid is released. The following instructions assume that VALVE TRIM MAINTENANCE was not performed and that disassembly will proceed after completing the ACTUATOR DISASSEMBLY instructions.

Before You Begin:

- Read Safety Caution (Page 2).
- Use safe work practices and lock out procedures.
- Relieve process pressure and drain the process fluid from up and down stream of valve.
- Be aware of potentially hazardous process material that may be present in-line and in-valve. Isolate the valve from process pressure. Use a bypass or block valve if necessary, or completely shut off the process.
- If the valve assembly has been removed from the line, it is recommended that the valve be secured in a clamping device that will support the weight of the valve assembly.
- Angle Body Valves assemble the same as Globe Body Valves.

Special Tools Required:

- Mechanics Pick Set
- Punch
- Small Sledge Hammer

- 1 Before removing the hammer nut (Key 4) be sure that the valve plug (Key 14) has been placed in to its fully open position by pulling up on the valve stem (Key 15).
NOTE: Removing the hammer nut with the valve in its closed position could damage the valve plug and seat ring (Key 3).
- 2 A small sledge hammer is commonly used to loosen the hammer nut (Key 4) in a counter clockwise direction. Once the hammer nut is loosened it should move freely by hand. If the hammer nut or bonnet (Key 6) do not move freely, be cautious of a build up of process pressure in the body or bonnet. Remove the hammer nut.
- 3 Remove the washer (Key 5) from the hammer nut seating surface of the bonnet, inspect the washer for damage or corrosion and replace if necessary.

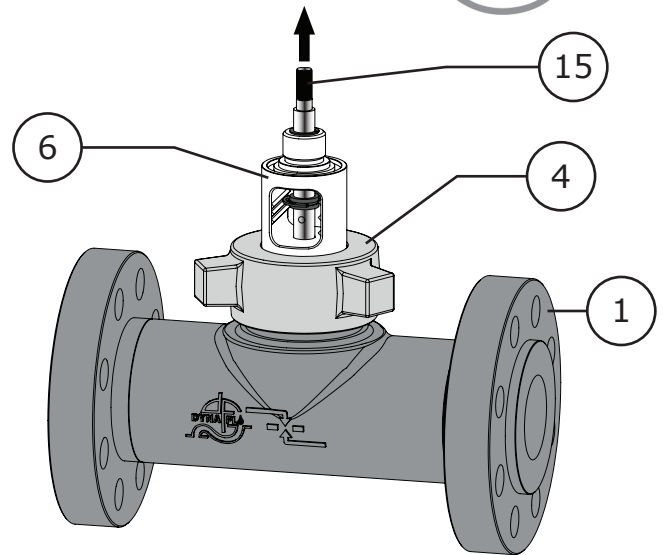


Figure 18 Place Valve in the Open Position

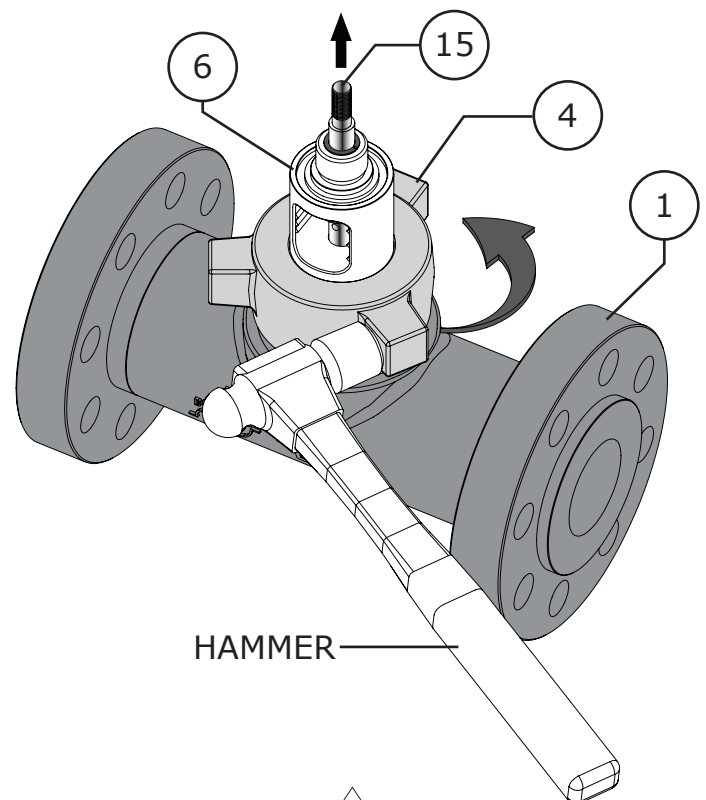


Figure 19 Loosen the Hammer Nut



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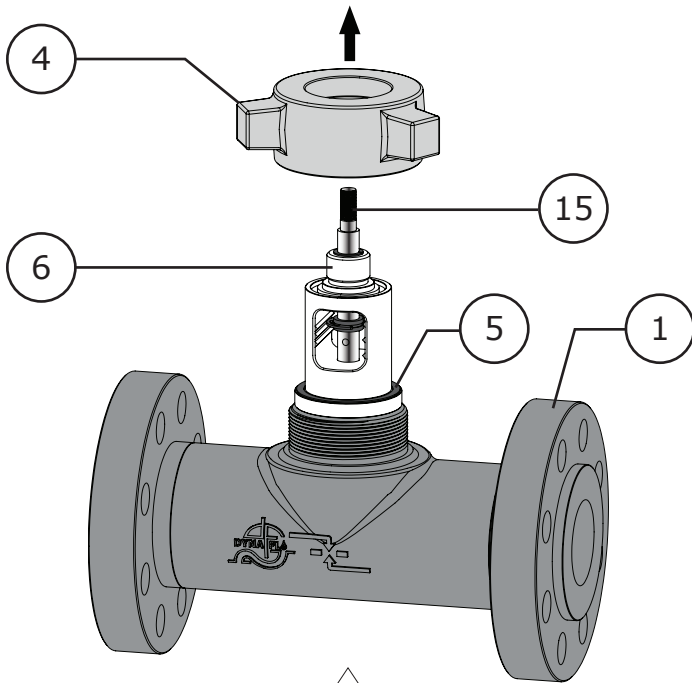


Figure 20 Hammer Nut Removal

DISASSEMBLY (Continued)

VALVE DISASSEMBLY (Continued)

- 4 Carefully remove the bonnet assembly from the valve body, make sure that the valve stem (Key 15) is supported so that the stem/plug assembly doesn't fall out of the bonnet during bonnet (Key 6) removal.
- 5 Remove the travel indicator (Key 33) by removing the metal snap ring from the plastic bushing and then removing the plastic bushing from the stem (Key 15). Refer to Figure 22.
NOTE: The travel indicator can also be removed as you remove the valve stem (Key 15) in Step 6.
- 6 Pull the plug/stem assembly (Keys 14, 15, 16, & 17) out through the bottom of the bonnet assembly as shown in Figure 23. **CAUTION:** When removing the plug/stem assembly the bonnet spacer (Key 8) is free floating and could fall or damage the stem. Be careful not to damage the valve stem during removal.
- 7 Remove the bonnet spacer (Key 8). Flip the bonnet assembly upside down (refer to Figure 24).

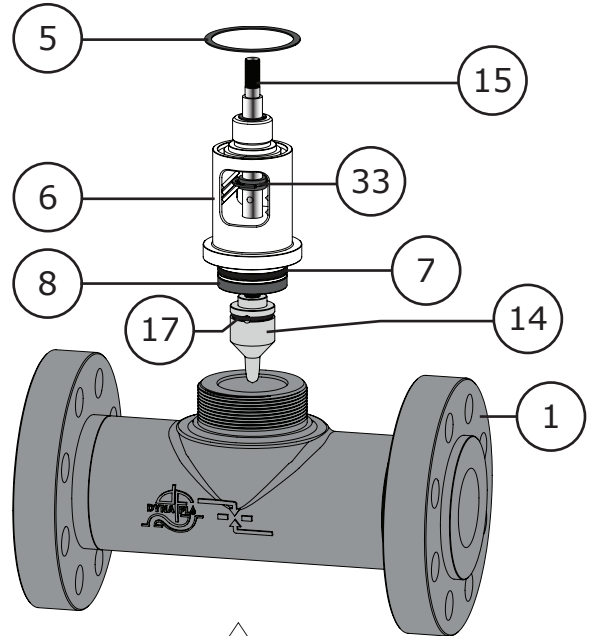


Figure 21 Bonnet Assembly Removal

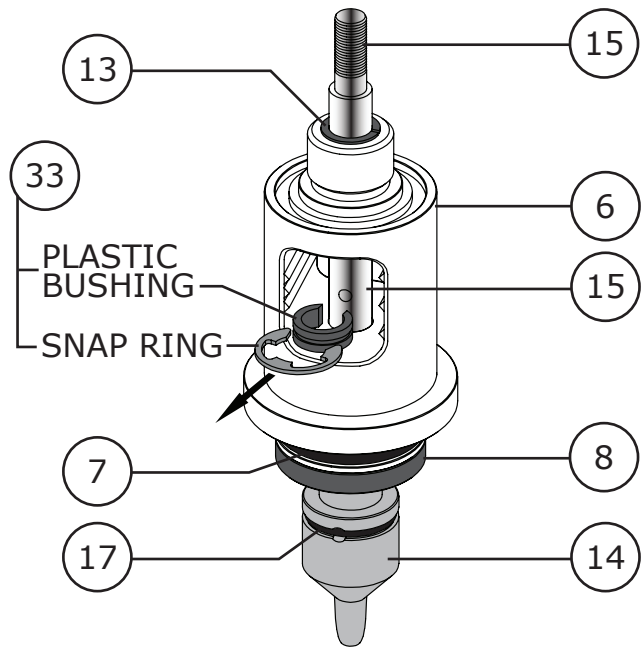


Figure 22 Travel Indicator Removal

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Figure 23
Plug/Stem Assembly
Removal

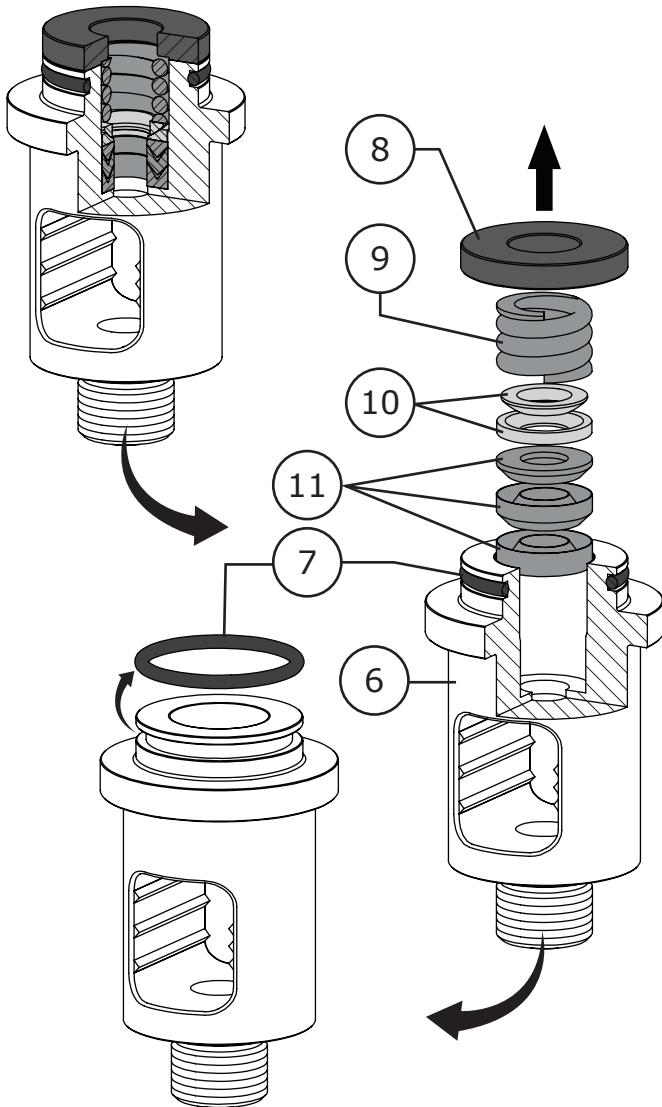
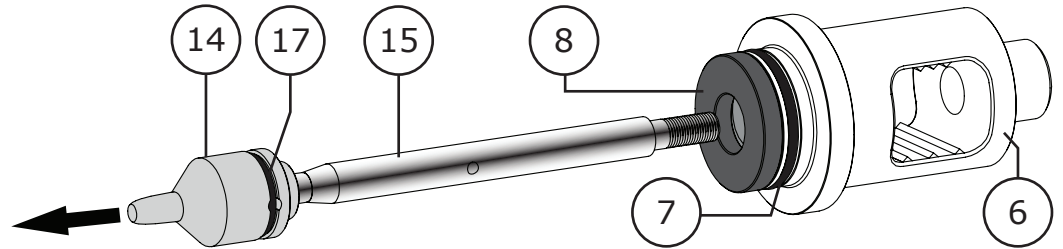


Figure 24 Bonnet Assembly Disassembly

DISASSEMBLY (Continued)

VALVE DISASSEMBLY (Continued)

- 8 If necessary, use a mechanic's pick set and remove the spring (Key 9), spherical washer (Key 10) and packing rings (Key 11) from inside the bore of the bonnet (Key 6). Also, remove the bonnet o-ring (Key 7). Refer to Figure 24.
- 9 Flip the bonnet (Key 6) so that it is right side up. Remove the stem bushing (Key 13) and stem o-ring (Key 12), use a pick set if necessary. Refer to Figure 25.

NOTE: If the plug/stem assembly (Keys 14, 15, 16, & 17) are in good condition it may not be necessary to separate the plug (Key 14) from the valve stem (Key 15). The o-ring (Key 17) should be replaced though.

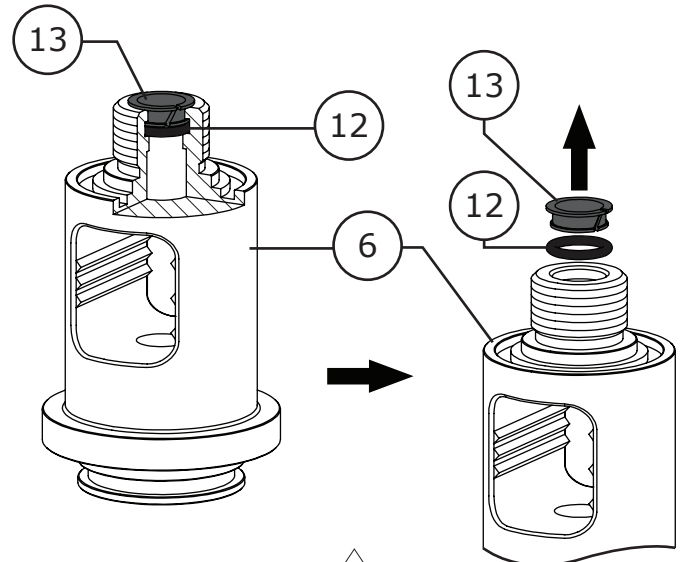


Figure 25 Bonnet Assembly Disassembly Continued



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DISASSEMBLY (Continued)

VALVE DISASSEMBLY (Continued)

10 Using a pick set, remove the plug o-ring (Key 17). Refer to Figure 26.

11 To separate the plug (Key 14) from the stem (Key 15) use a punch and push the groove pin (Key 16) out of the plug/stem assembly (Keys 14 & 15). Unscrew the plug from the stem as shown in Figure 26.

NOTE: For standard valve trim, the cage and seat ring are one-piece (Key 3). A two-piece cage and seat ring design was used for optional trim materials but were considered one unit (Keys 3A & 3B). The standard one-piece cage and seat ring design will have a removal hole near the top of the cage.

FOR STANDARD ONE-PIECE CAGE AND SEAT RING:

12 Using a mechanic's pick carefully remove the cage/seat ring assembly (Key 3) using the cage window if necessary.

NOTE: Be very gentle when removing the cage/seat ring assembly using the cage windows and avoid damaging the cage. Refer to Figure 27.

13 Using a mechanic pick set, remove and replace the seat ring o-ring (Key 2). **NOTE:** When possible, used o-rings should be replaced. Refer to Figure 27.

14 Clean and inspect all parts for damage and wear. Replace or repair parts as necessary, all soft parts (o-rings, gaskets and packing) should be replaced.

15 Refer to TRIM ASSEMBLY section on Page 20 for re-assembly instructions.

FOR DISCONTINUED TWO-PIECE CAGE AND SEAT RING:

12 Carefully remove the cage (Key 3A) as shown in Figure 28. The cage from a two-piece design is set on top of the seat ring (Key 3B) and easily removed.

13 If necessary use a mechanic pick set and remove the seat ring (Key 3B) as shown in Figure 28. **NOTE:** Seat rings from a two-piece design do not use an o-ring (Key 2) and are easily removed.

14 Clean and inspect all parts for damage and wear. Replace or repair parts as necessary, all soft parts (o-rings, gaskets and packing) should be replaced.

15 Refer to TRIM ASSEMBLY section on Page 20 for re-assembly instructions.

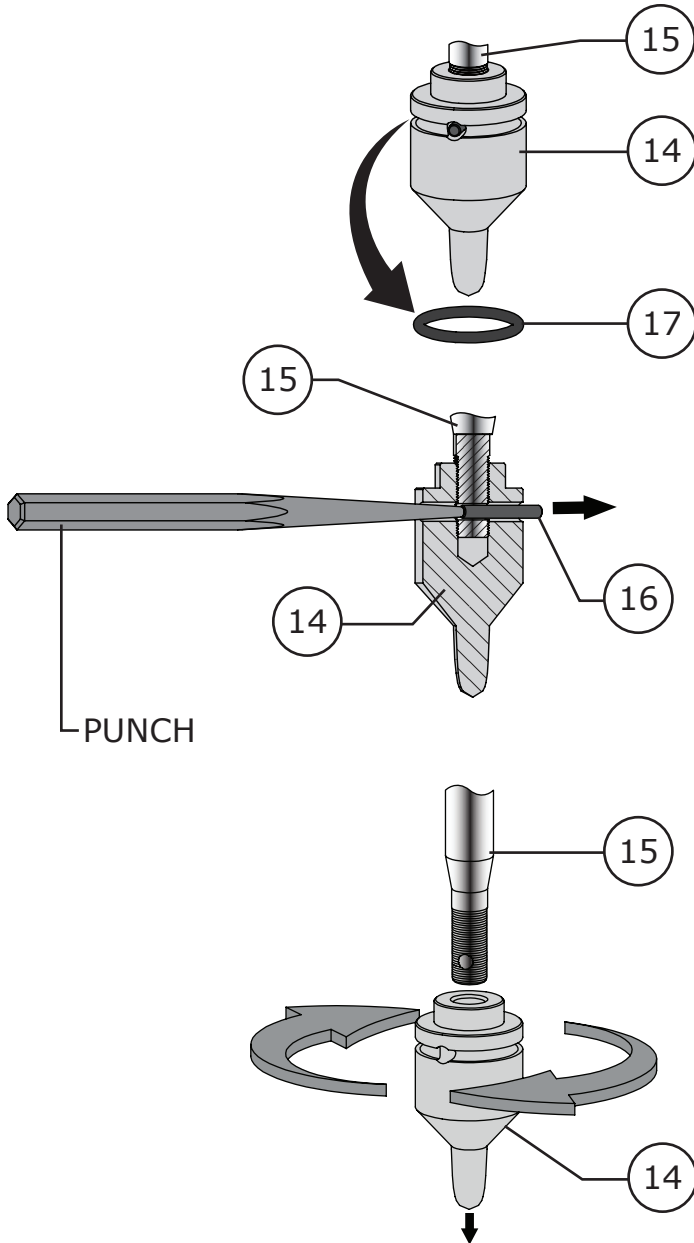


Figure 26 Plug/Stem Disassembly

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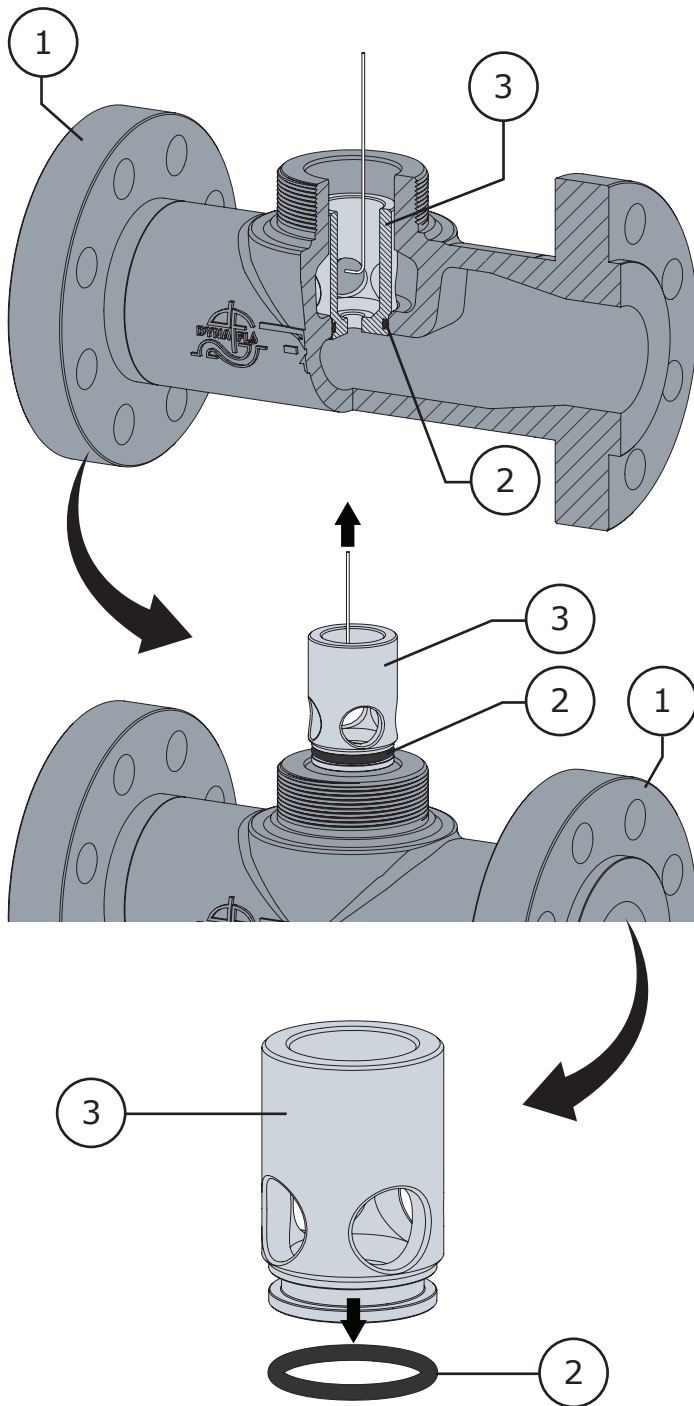


Figure 27 One-Piece Cage/Seat Ring Removal

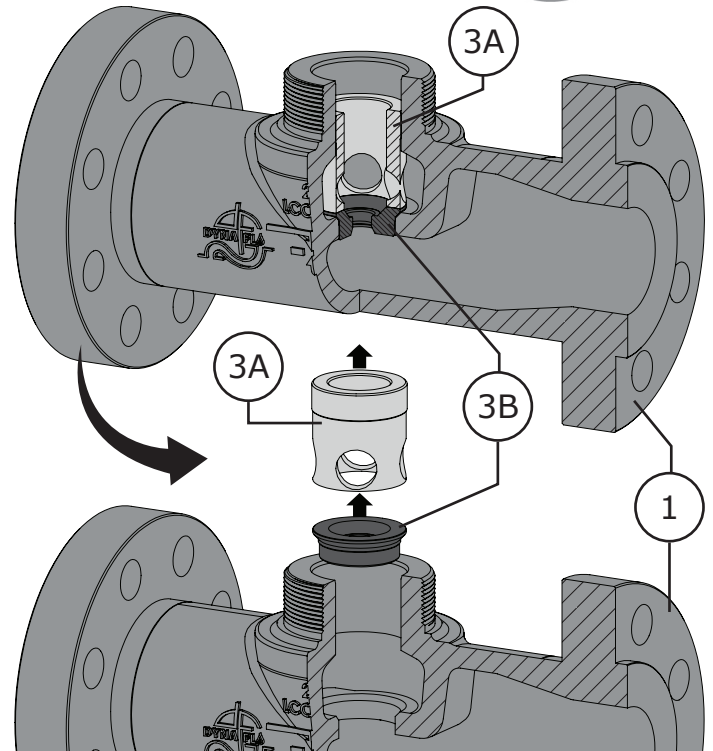


Figure 28 Discontinued Two-Piece Cage/Seat Ring Removal

ASSEMBLY

Before You Begin:

- Read Safety Caution (Page 2).
- Use safe work practices and lock out procedures.
- Clean and inspect all parts.
- Replace or repair damaged parts. Replace all soft parts (Seals, o-rings, gaskets, live loaded packing). Replace diaphragm if necessary.
- If the valve assembly has been removed from the line, it is recommended that the valve be secured in a clamping device that will support the weight of the valve assembly.
- Angle Body Valves assemble the same as Globe Body Valves.

Lubricants Required:

- Permatex® Nickel Anti-Seize or equivalent (Key A)
- Dow Corning Molykote® 111 or equivalent (Key B)
- Lubriplate® No. 105 Grease or equivalent (Key C)
- Medium Strength Liquid Thread Locker (Key D)



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ASSEMBLY (Continued)

WARNING: When reassembling a DF270, the assembly of the actuator must take place with the bonnet / actuator detached from valve. To assemble a Fail Closed actuator while the valve plug is in the body can cause damage to the plug and seat.

TRIM ASSEMBLY

NOTE: For standard valve trim, the cage and seat ring are one-piece (Key 3). A two-piece cage and seat ring design was used for optional trim materials but was considered one unit (Keys 3A & 3B).

- 1 Clean and inspect the seating surface in the valve body. Make sure the valve body is free of debris, oil, and grease.

FOR STANDARD ONE-PIECE CAGE AND SEAT RING:

- 2 Apply Dow Corning Molykote® 111 (Key B) to the seat ring o-ring (Key 2) and install it into the o-ring groove on the cage/seat ring (Key 3). Refer to Figure 30.
- 3 Install the cage/seat ring (Key 3) into the valve body (Key 1) and push down on the cage to assure the assembly is properly seated in the valve bore. Refer to Figure 30.

FOR DISCONTINUED TWO-PIECE CAGE AND SEAT RING:

- 2 Install the seat ring (Key 3B) into the bore of the valve body (Key 1) as shown in Figure 31.
- 3 Place the cage (Key 3A) into the valve body (Key 1) so that it sits on top of the seat ring (Key 3B).

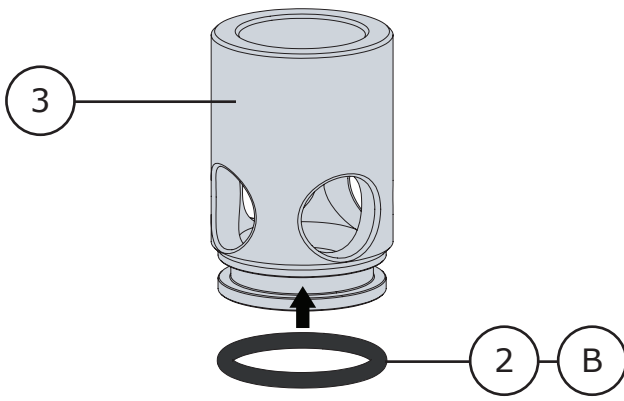


Figure 29 Seat Ring O-Ring Installation

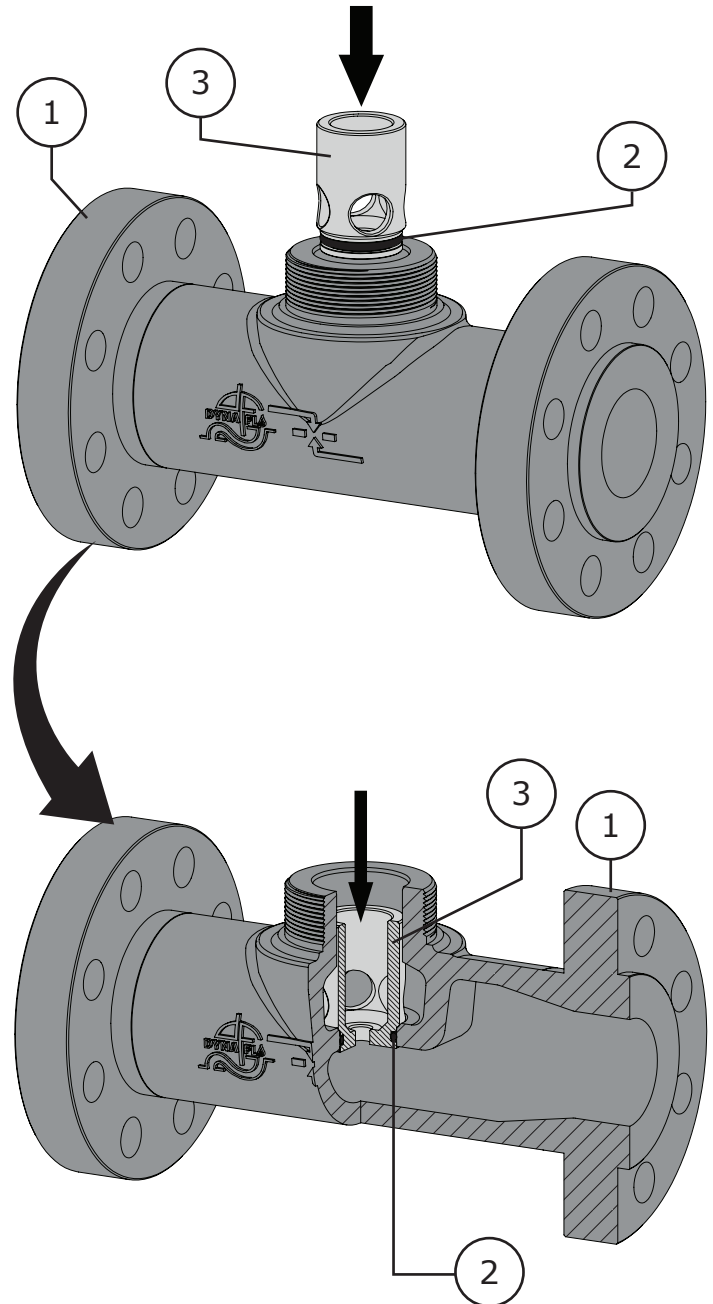


Figure 30 One-Piece Cage/Seat Ring Installation

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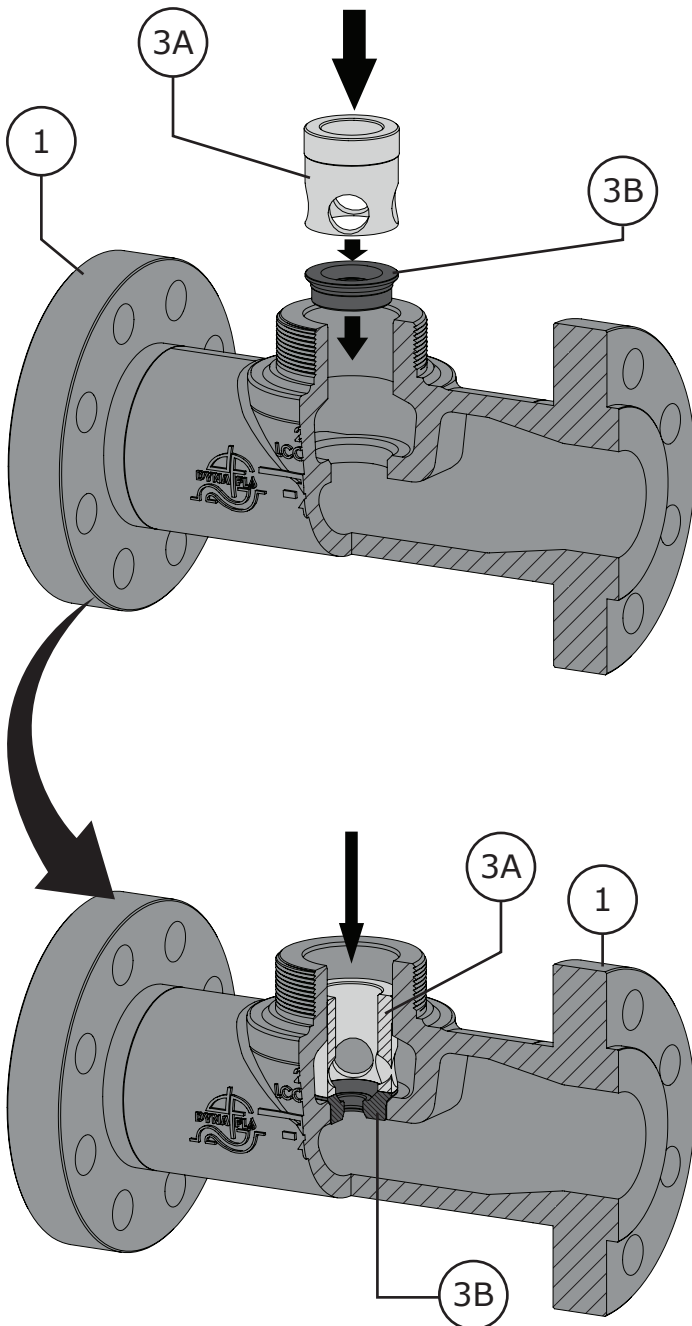


Figure 31 Discontinued Two-Piece Cage/Seat Ring Installation

ASSEMBLY (Continued)

TRIM ASSEMBLY (Continued)

PLUG/STEM ASSEMBLY:

- 4 If the plug (Key 14) and valve stem (Key 15) are not yet assembled, apply Permatex® Nickel Anti-Seize (Key A) to the threads of the valve stem as shown in Figure 32.
- 5 Thread the plug (Key 14) on to the stem (Key 15) as shown in Figure 32 until the groove pin hole in the plug aligns with the hole in the stem.
- 6 Insert the groove pin (Key 16) through the valve plug (Key 14) and valve stem (Key 15) as shown in Figure 33. **NOTE:** Very little force should be required to insert the groove pin, do not apply excessive force.
- 7 Install the plug o-ring (Key 17) in to the o-ring groove on the valve plug (Key 14) to secure the groove pin (Key 16) in place.

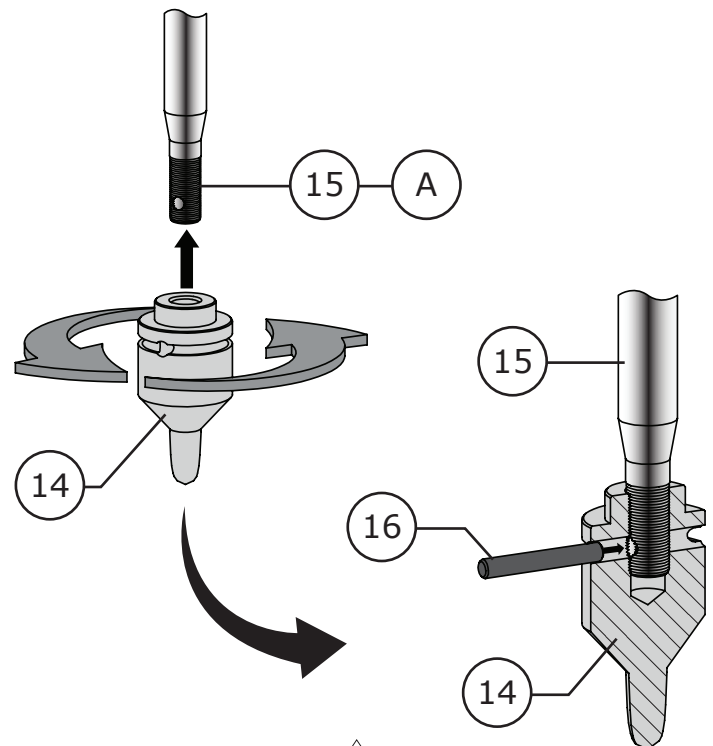


Figure 32 Plug/Stem Assembly Part 1



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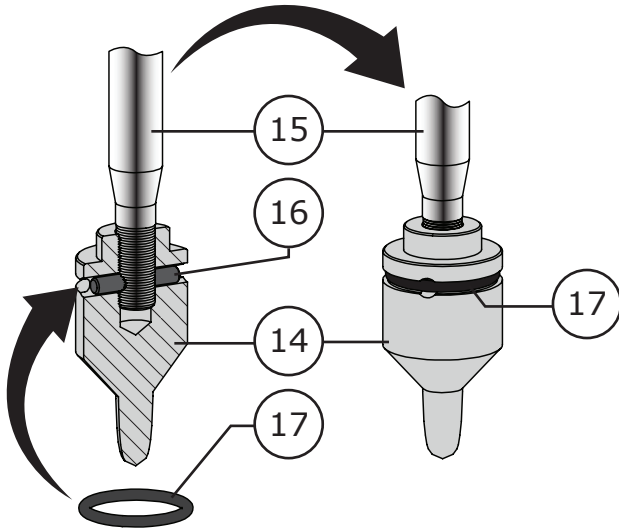


Figure 33 Plug/Stem Assembly Part 2

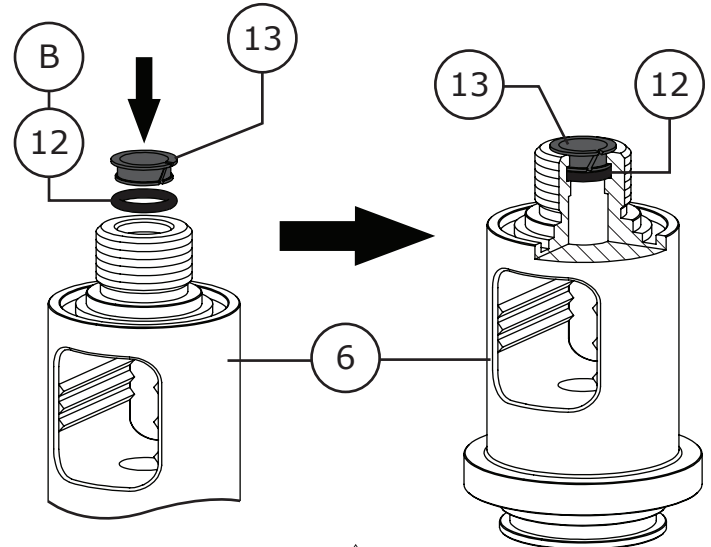


Figure 34 Stem O-Ring/Bushing Installation

ASSEMBLY (Continued)

BONNET ASSEMBLY

- 1 Place the bonnet (Key 6) right side up on a flat work surface. Apply Dow Corning Molykote® 111 (Key B) to the stem o-ring (Key 12) and install it in to the o-ring groove inside the top of the bonnet as shown in Figure 34.
- 2 Install the stem bushing (Key 13) as shown in Figure 34. When installed correctly the stem bushing will 'snap' in to place over the stem o-ring (Key 12).

FLIP THE BONNET (KEY 6) PACKING SIDE UP.

- 3 Apply Dow Corning Molykote® 111 (Key B) to the bonnet o-ring (Key 7) and install it in to the o-ring groove on the outside diameter of the bonnet (Key 6).
- 4 Apply Dow Corning Molykote® 111 (Key B) to the packing rings (Key 11) and install them in to the bore of the bonnet (Key 6). **NOTE:** It is important to install the packing rings one at a time so that they remain level and no air gets trapped between rings.
- 5 Install spherical washer (Key 10), spring (Key 9), and bonnet spacer (Key 8) as shown in Figure 35. **NOTE:** The bonnet spacer will just sit on top of the bonnet (Key 6) and will slide off if not careful.

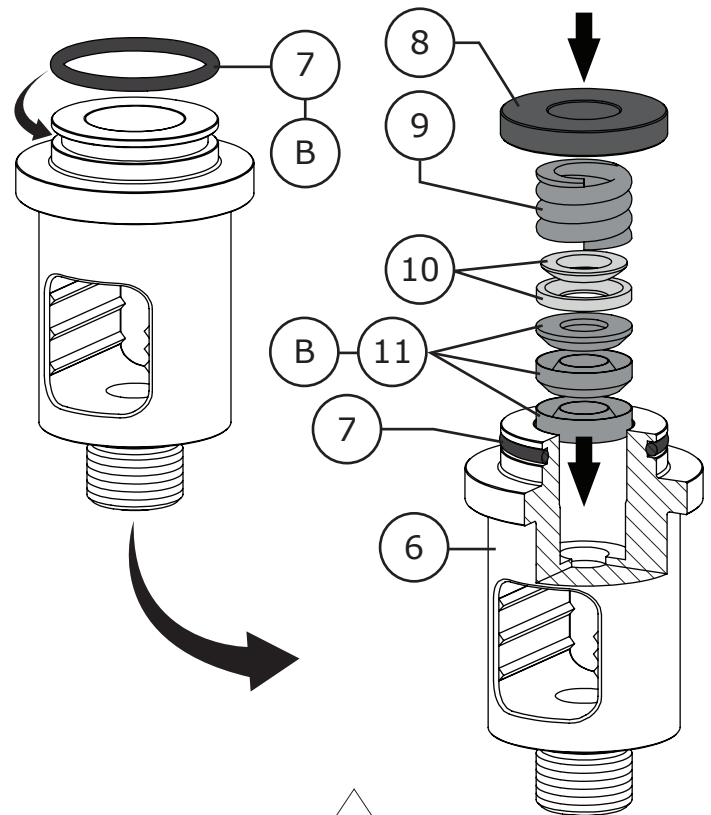


Figure 35 Bonnet Assembly

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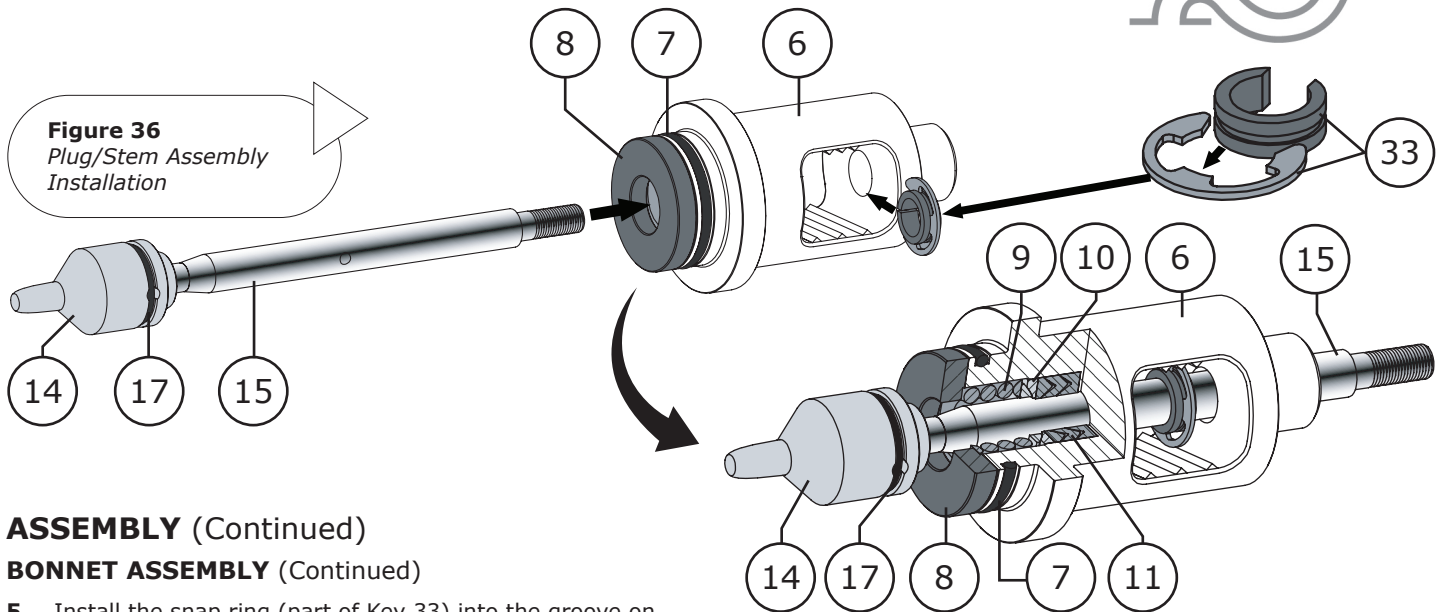


Figure 36
Plug/Stem Assembly
Installation

ASSEMBLY (Continued)

BONNET ASSEMBLY (Continued)

- 5 Install the snap ring (part of Key 33) into the groove on the plastic bushing (part of Key 33), refer to Figure 36. Prepare the travel indicator (Key 33) so that when the stem (Key 15) is inserted through the bonnet (Key 6) the travel indicator gets installed on the stem in the bonnet window as shown above.
- 6 Carefully insert the plug/stem assembly (Keys 14 & 15) through the bonnet assembly as shown in Figure 36. Avoid scratching or damaging the valve stem (Key 15) during assembly.

- 7 Apply Lubriplate® No. 105 Grease (Key C) to surface of the valve plug (Key 14) and carefully insert the bonnet assembly into the valve body and orientate the window of the bonnet (Key 6) so that it is perpendicular to the valve body (Key 1) as shown in Figure 37. **NOTE:** It is important that the valve plug not be rotated once it is placed into the valve seat (Key 3 & 3B). Rotating or dropping the plug in the seat can cause damage to both.

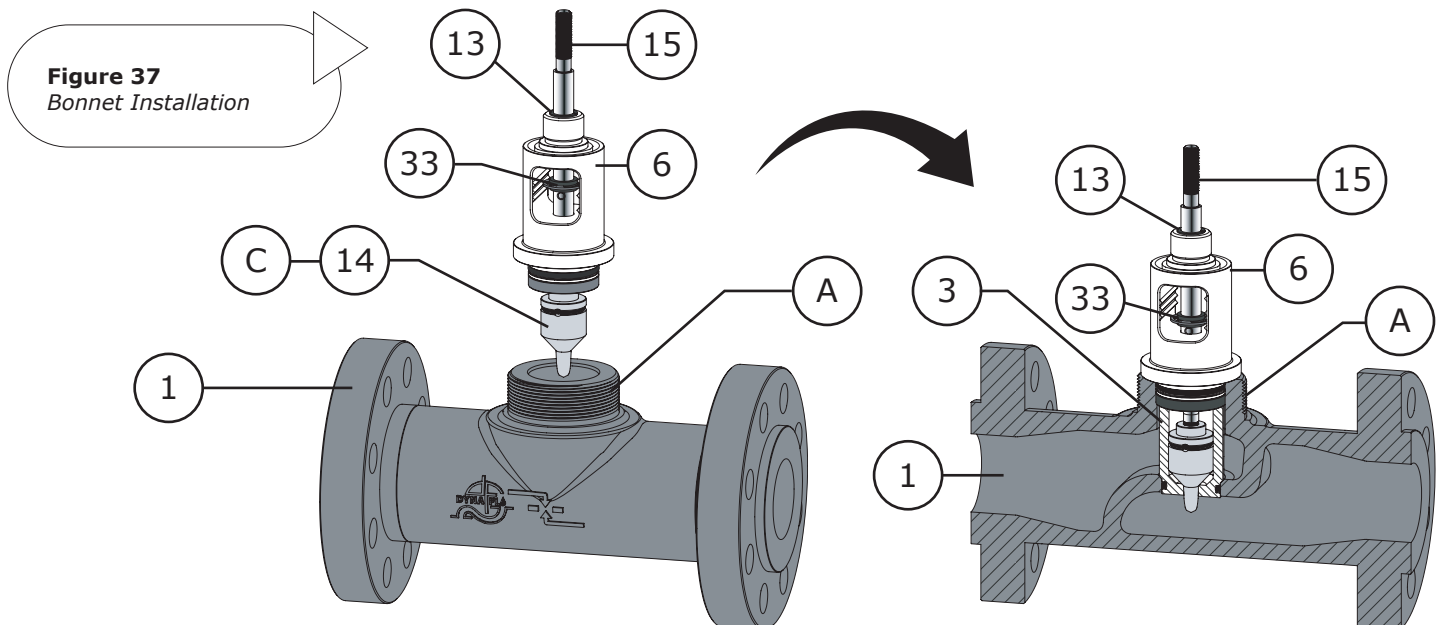


Figure 37
Bonnet Installation

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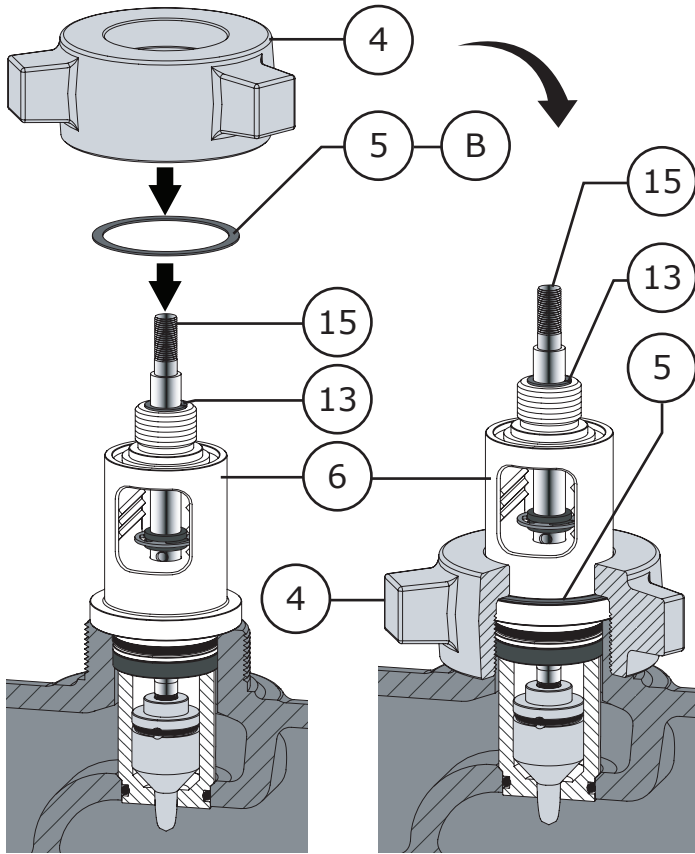


Figure 38 Bonnet Assembly Washer/Hammer Nut

ASSEMBLY (Continued)

BONNET ASSEMBLY (Continued)

- 8 Apply Permatex® Nickel Anti-Seize (Key A) to the threads of the valve body (Key 1).
- 9 Apply Permatex® Nickel Anti-Seize (Key A) to both sides of the bonnet washer (Key 5) and slide it over the bonnet (Key 6) so that it sits as shown in Figure 38.
- 10 Carefully slide the hammer nut (Key 4) over the valve bonnet (Key 6) so that it rests on top of the bonnet washer as shown in Figure 38.
- 11 Place the valve plug (Key 14) in to its fully open position by pulling up on the valve stem (Key 15). **NOTE:** Tightening the hammer nut with the valve in its closed position could damage the valve plug and seat ring (Key 3).

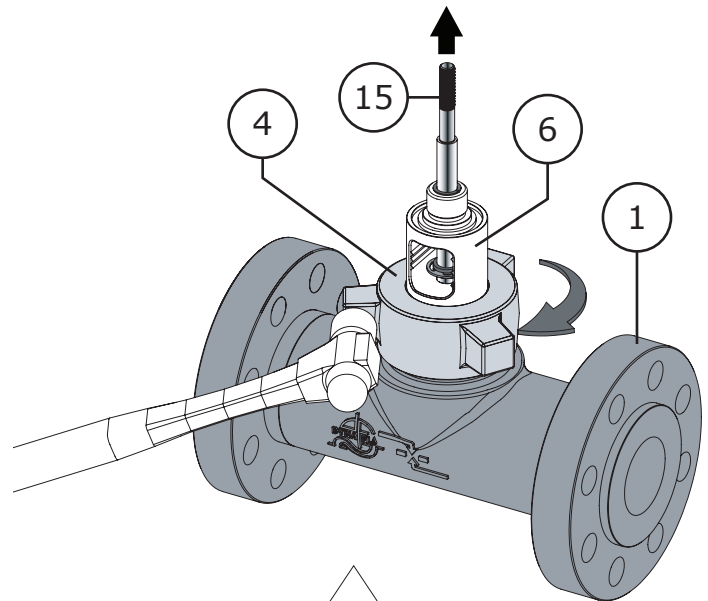


Figure 39 Hammer Nut Tightening

- 12 Hold the bonnet assembly in place during tightening so that it does not twist out of alignment. Tighten/torque the hammer nut (Key 4) to 200 lbs-ft. When the hammer nut is properly tightened the packing inside the bonnet will have reached the proper load, refer to Figure 39.

ACTUATOR ASSEMBLY

NOTE: A conversion from Fail Open to Fail Closed or vice versa may require more or less springs depending on the required shut-off pressure needed (Refer to the Sales Bulletin).

- 1 Apply Dow Corning Molykote® 111 (Key B) to the casing o-ring (Key 18) and install it in to the O-ring groove on top of the bonnet (Key 6). Refer to Figure 40.
- 2 Place the lower diaphragm casing (Key 19) over the valve stem so that it rests on the casing o-ring (Key 18). Orientate the NPT connection of the casing so that it is centered within the bonnet window (Key 6). Reference Figure 40 or any marks made during disassembly for correct NPT orientation.
- 3 Install the flat washer (Key 20).
- 4 Apply Permatex® Nickel Anti-Seize (Key A) to the exposed threads of the bonnet (Key 6).
- 5 While holding the lower diaphragm casing (Key 19) in place, thread the bonnet locknut (Key 21) onto the bonnet threads using a 1-1/2" deep socket and tighten to 200 lbf-ft. (Refer to Figure 40)

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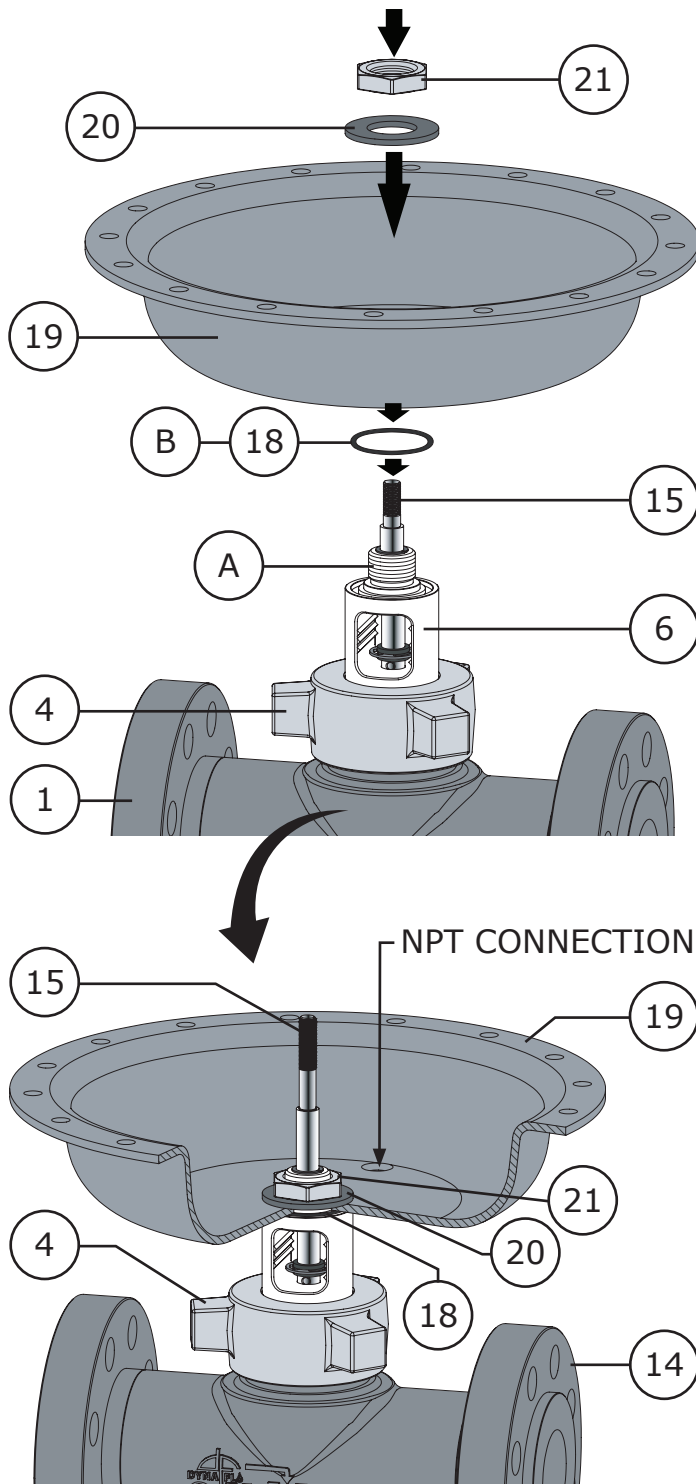


Figure 40 Lower Diaphragm Casing Installation

ASSEMBLY (Continued)

ACTUATOR ASSEMBLY (Continued)

FOR FAIL CLOSED ACTUATORS (Refer to Figures 41 & 42):

- 6 Install the diaphragm plate washer (Key 22).
- 7 Install the diaphragm (Key 23). Make sure that the diaphragm is in contact with the diaphragm plate washer (Key 22) and that the holes in the diaphragm align with the holes in the lower diaphragm casing (Key 19).
- 8 Install the diaphragm plate (Key 24) as shown in Figure 41.
- 9 Install the diaphragm plate spacer (Key 25).
- 10 Apply medium strength liquid thread locker (Key D) to the threads of the stem nut (Key 26) and thread it onto the valve stem (Key 15). Using a 9/16" socket, torque down the stem nut to 100 lbf-in. **NOTE:** It may be necessary to immobilize the valve stem using a screwdriver or rod during tightening in order to keep the valve stem from rotating.
- 11 Set the springs (Key 27) in the diaphragm plate (Key 24) in a circular pattern on the plate embossments. **NOTE:** There should be 6 plate embossments, if your actuator configuration requires less than 6 springs (3 typical), leave an empty embossment between each spring so that they are equally spaced.
- 12 Place the upper casing (Key 28) over the springs, be sure that the NPT connection of the upper casing is aligned with the NPT connection of the lower casing (Key 19). Also, be sure that the bolt holes of the upper casing are aligned with the bolt holes of the lower casing and diaphragm (Key 23).
- 13 Install the **long** (1-1/4") cap screws (Key 29) opposite from each other as shown in Figure 42. Partially thread a nut (Key 30) onto one of the **long** cap screws. It may be necessary to compress the springs (Key 27) by pushing slightly on the upper casing (Key 28) to thread a nut onto the second **long** cap screw.
- 14 Using two 9/16" wrenches or socket set, evenly tighten the two **long** cap screws (Key 29) using an alternating pattern until the 10 **short** cap screws (Key 31) can be installed and the nuts (Key 30) threaded on. It is not recommended to completely tighten any of the cap screws until they are all inserted through the casings (Keys 19 & 28) as the diaphragm (Key 23) may need to shift during installation. Refer to Figure 43.
- 15 Install the remaining 10 **short** cap screws (Key 31) and nuts (Key 30). Tighten all cap screws to 20 lbf-ft (27 N•m).



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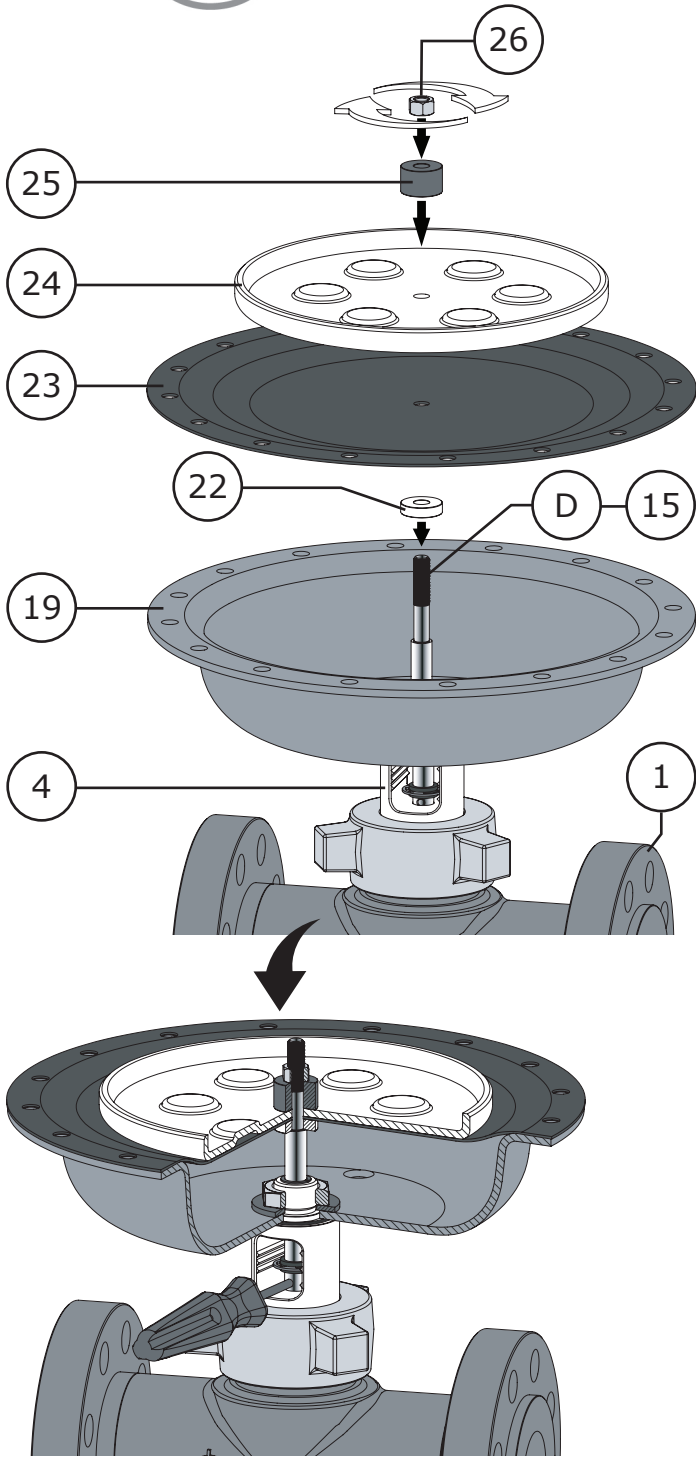


Figure 41 Lower Diaphragm Assembly (Fail Closed)

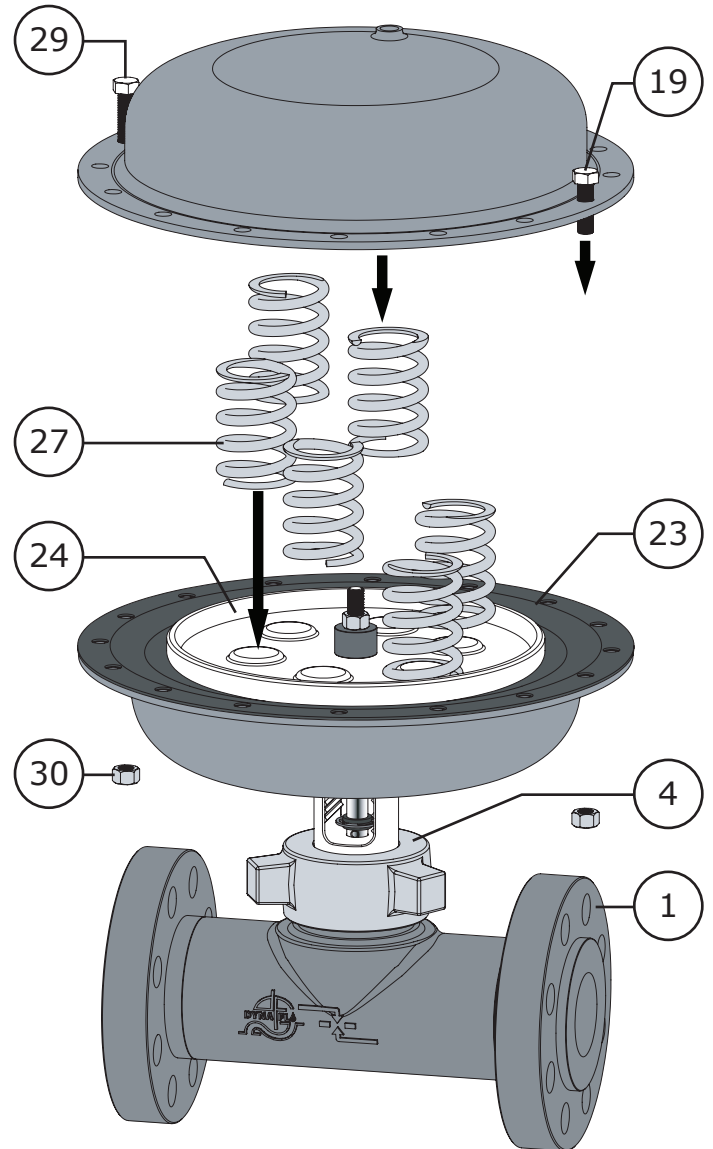


Figure 42 Upper Diaphragm Assembly (Fail Closed)

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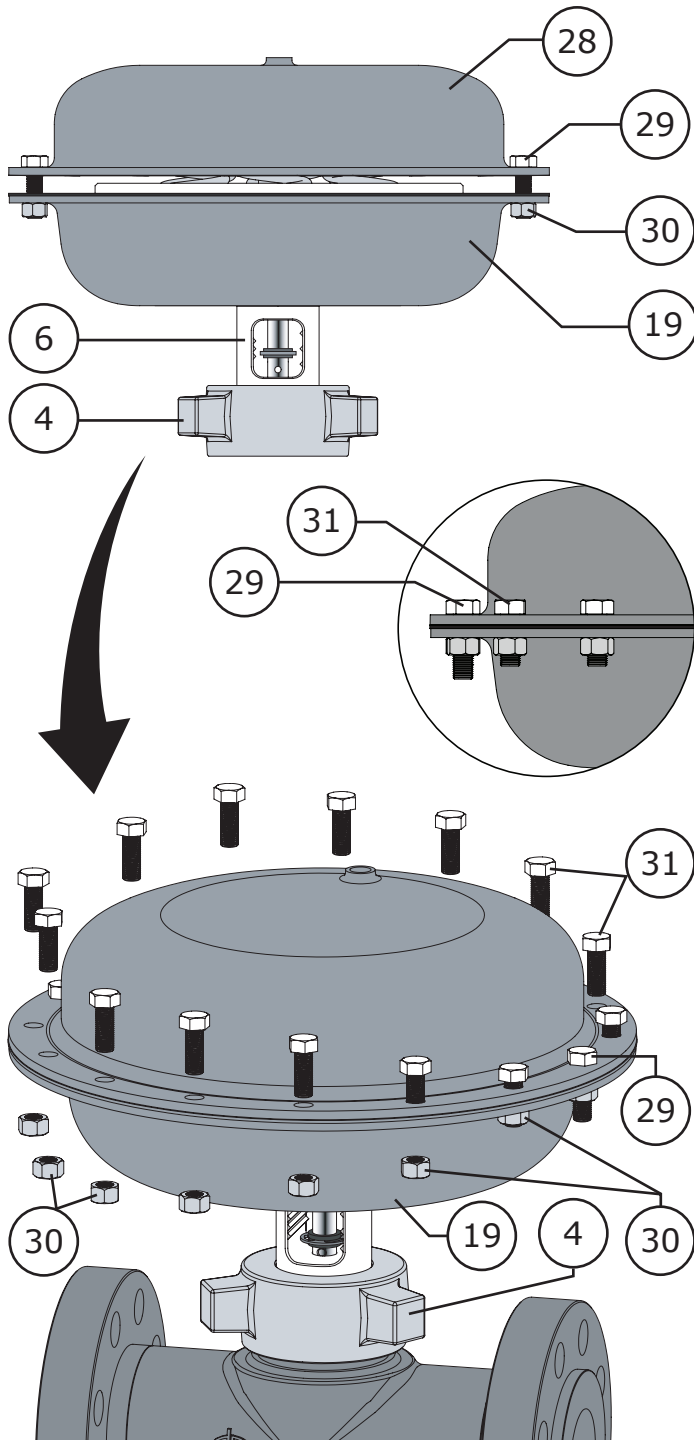


Figure 43 Short Cap Screw Installation (Fail Closed)

ASSEMBLY (Continued)

ACTUATOR ASSEMBLY (Continued)

FOR FAIL OPEN ACTUATORS (Refer to Figures 44 & 45):

- 6 Install the diaphragm plate spacer (Key 25).
- 7 Set the springs (Key 27) in to the inside of the lower diaphragm casing (Key 19), spacing them equally in a circular pattern so that the springs will line up with the plate embossments of the diaphragm plate (Key 24).
NOTE: There should be 6 plate embossments, if your actuator configuration requires less than 6 springs (3 typical), leave an empty embossment between each spring so that they are equally spaced. Refer to Figure 45.
- 8 Set the diaphragm plate (Key 23) over the valve stem (Key 15) so that the diaphragm plate embossments drop in to all the available springs (Key 27).
- 9 Install the diaphragm (Key 23). Make sure that the diaphragm is in contact with the diaphragm plate (Key 24) and that the holes in the diaphragm align with the holes in the lower diaphragm casing (Key 19).
- 10 Install the diaphragm plate washer (Key 22).
- 11 Apply medium strength liquid thread locker (Key D) to the threads of the stem nut (Key 26) and thread it onto the valve stem. Using a 9/16" socket, torque down the stem nut to 100 lbf-in. **NOTE:** It may be necessary to immobilize the valve stem (Key 15) using a screwdriver or rod during tightening in order to keep the valve stem and other parts from rotating.
- 12 Place the upper casing (Key 28) over the lower casing (Key 19), be sure that the NPT connection of the upper casing is aligned with the NPT connection of the lower casing. Also, be sure that the bolt holes of the upper casing are aligned with the bolt holes of the lower casing and diaphragm (Key 23).
- 13 Install the **long** (1-1/4") cap screws (Key 29) opposite from each other as shown in Figure 45. Thread a nut (Key 30) onto each of the **long** cap screws hand tight and then manipulate the diaphragm (Key 23) in order to install the 10 remaining **short** cap screws (Key 31). Thread a nut on to the **short** cap screws and using two 9/16" wrenches or socket set, tighten all the cap screws to 20 lbf-ft (27 N·m).

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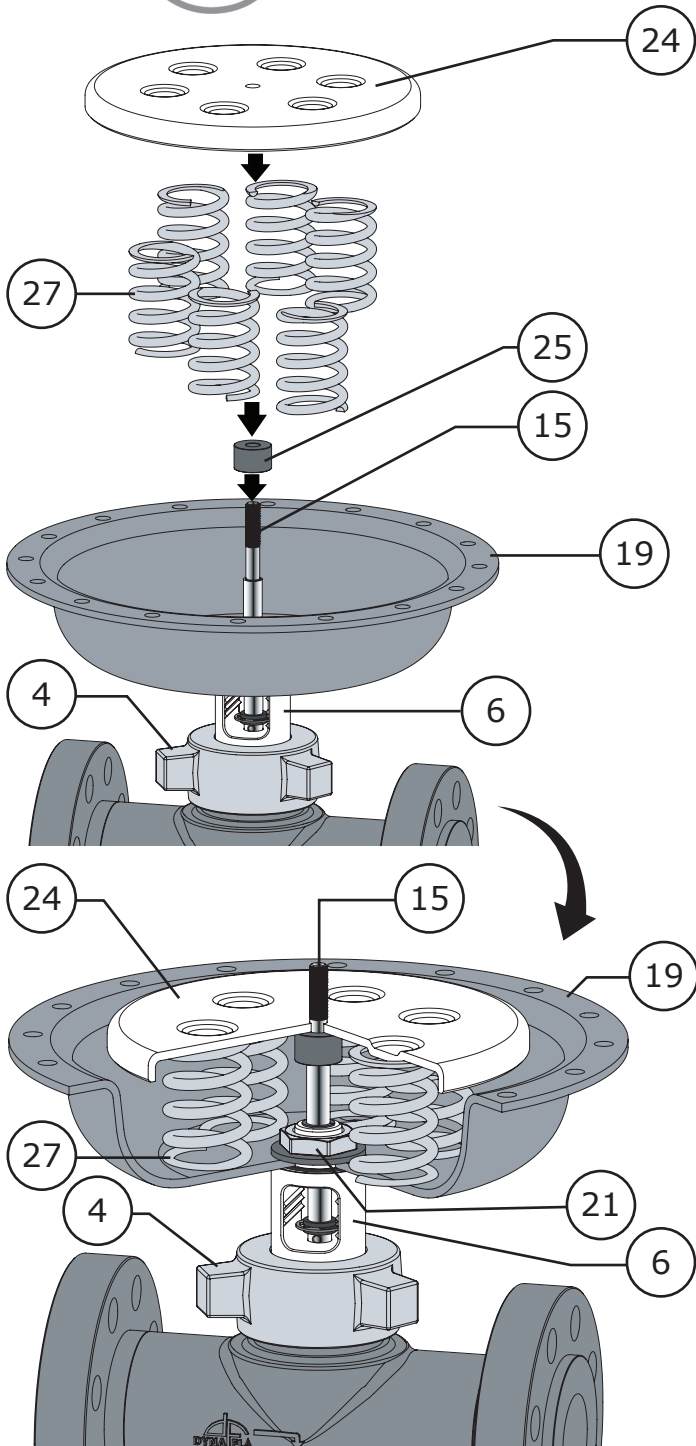


Figure 44 Lower Diaphragm Assembly (Fail Open)

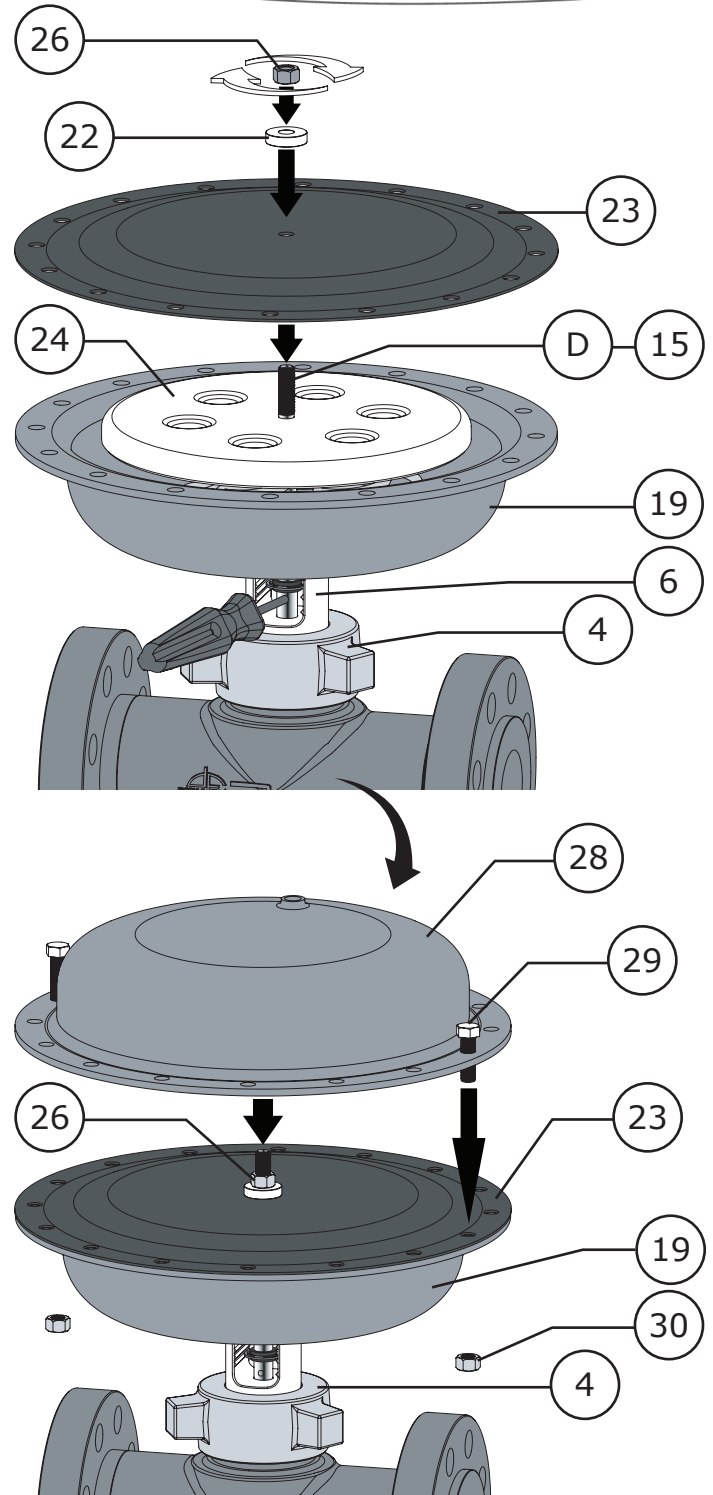


Figure 45 Upper Diaphragm Assembly (Fail Open)

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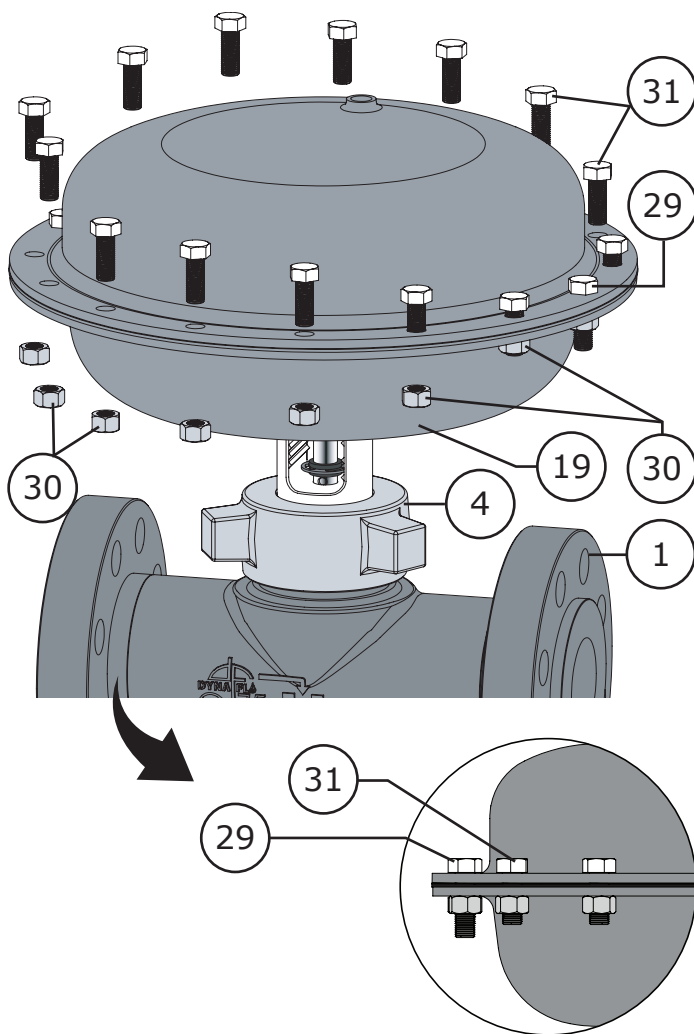


Figure 46 Short Cap Screw Installation (Fail Open)

ASSEMBLY (Continued)

VALVE ASSEMBLY

- 1 Install the vent cap (Key 32) into the NPT of the upper casing (Key 28) for **FAIL CLOSED** actuators. Install the vent cap (Key 32) into the NPT of the lower casing (Key 19) for **FAIL OPEN** actuators. Refer to Figure 47.
- 2 Stroke the valve a few times and look for smooth operation. Use liquid leak solution and check for leaks around the diaphragm casing. Reposition the travel indicator (Key 33) appropriately.

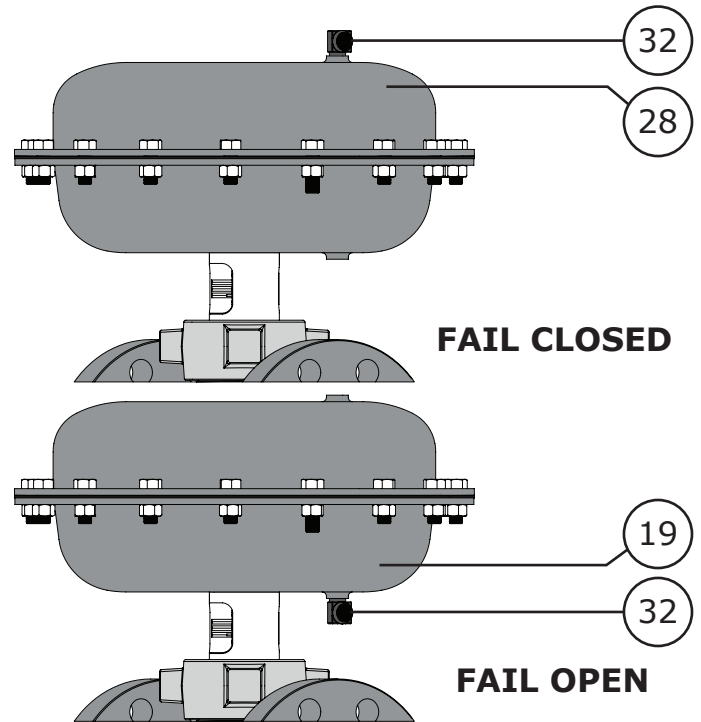
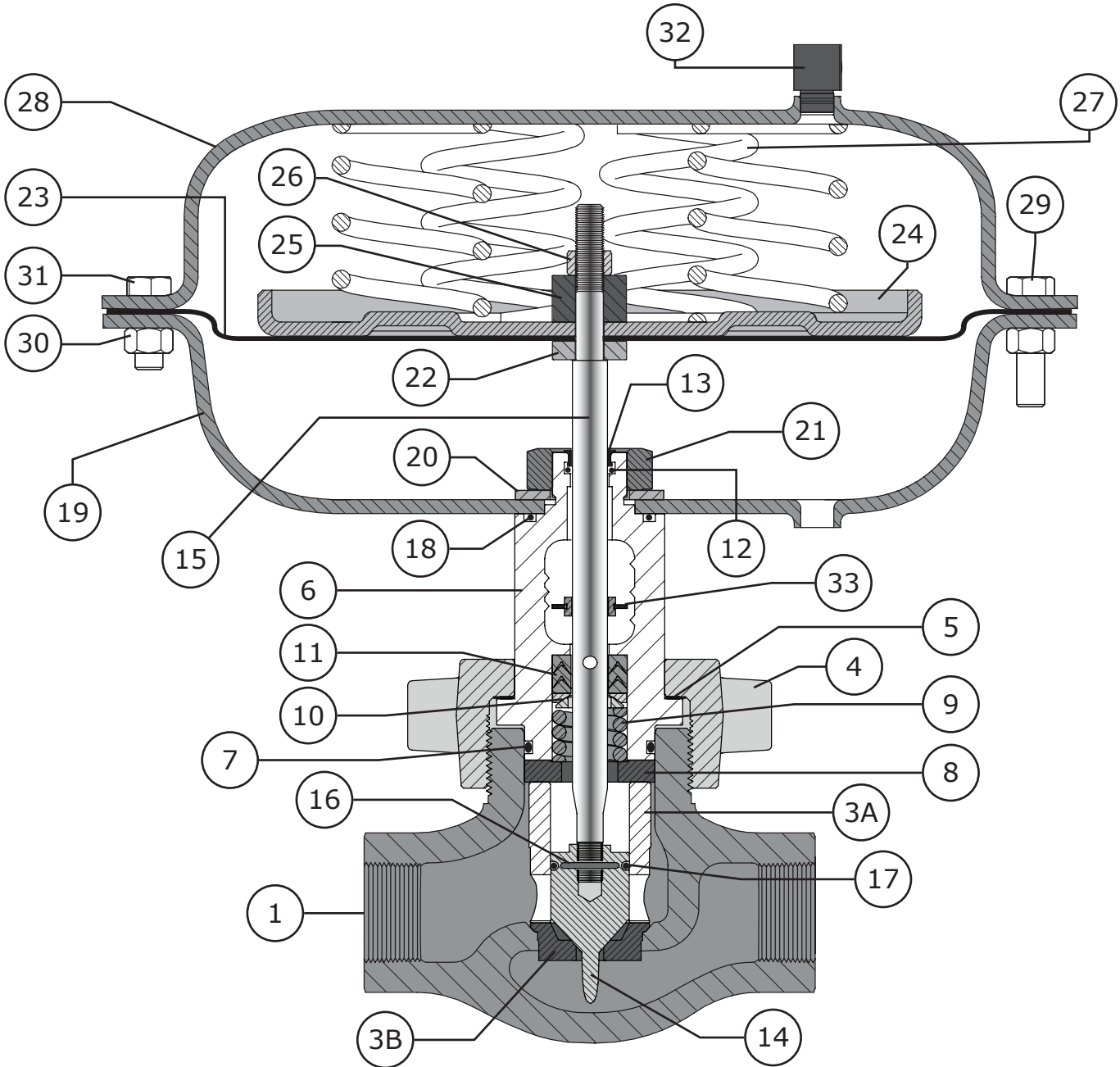


Figure 47 Vent Cap Installation



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**NOTE - Actuator casing (Keys 19 & 28)
rotated 90° for clarity.**

Figure 48 DF270 Fail Closed NPS 1 Inch Valve Cross Section (Discontinued 2 Piece Cage/Seat Ring Design)

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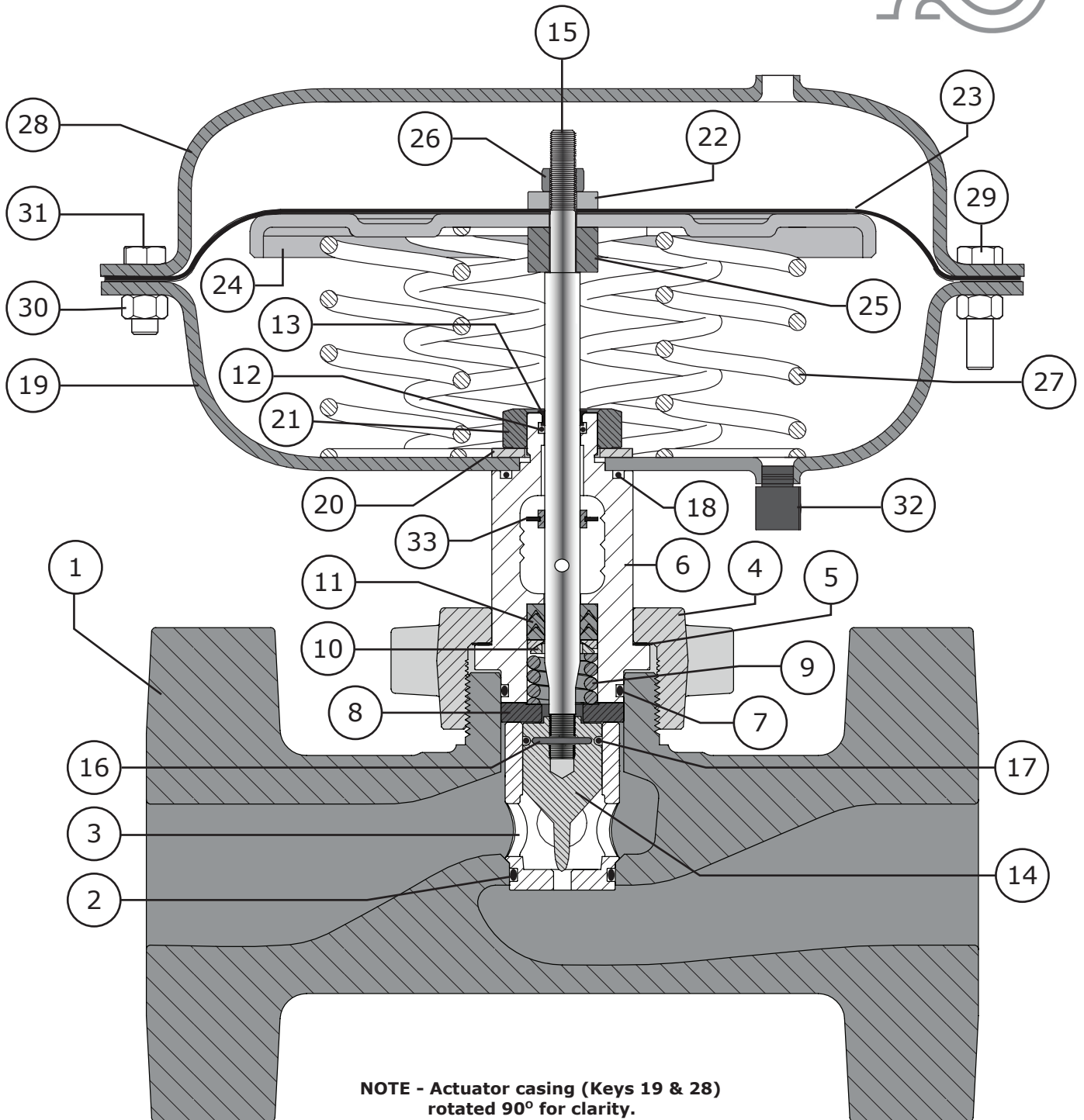


Figure 49 DF270 Fail Open 2 Inch Flanged Valve Cross Section (Standard 1 Piece Cage/Seat Ring Design)



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Parts List

Key	Description	Material	Part Number
1	Body	If you need a body as a replacement part, order by valve size, serial number and desired material.	
2	Seat Ring O-Ring	HNBR	DF20788X01D
		Viton	DF20788X02D
3	Cage / Seat Ring Assembly		
	1/4 INCH PORT	S17400 DH1150	DF208014X1D
	3/8 INCH PORT	S17400 DH1150	DF208038X1D
	1/2 INCH PORT	S17400 DH1150	DF208012X1D
	3/4 INCH PORT	S17400 DH1150	DF208034X1D
	1 INCH PORT	S17400 DH1150	DF208100X1D
3A & 3B	1/4 INCH PORT	S17400 / Tungsten Carbide	DF208014X7D
	3/8 INCH PORT	S17400 / Tungsten Carbide	DF208038X7D
	1/2 INCH PORT	S17400 / Tungsten Carbide	DF208012X7D
	3/4 INCH PORT	S17400 / Tungsten Carbide	DF208034X7D
	1 INCH PORT	S17400 / Tungsten Carbide	DF208100X7D
4	Hammer Nut	LF2	DF20208X01D
5	Bonnet Washer	S30200	DF20215X01D
6	Bonnet	LCC	DF21251X01D
7	Bonnet O-Ring	HNBR	DF10209X01D
		Viton	DF10209X02D
8	Bonnet/Cage Spacer	S17400 DH1150	DF20226X01D
9	Packing Spring	Inconel X750	DF10221X01D
10	Spherical Washer	S31600	DF20220X01D
11	Packing Set	PTFE / CPTFE	DF10206X01D
12	Stem O-Ring	HNBR	DF10210X01D
		Viton	DF10210X02D
13	Stem Bushing	Nylon	DF40418X01D
14	Valve Plug		
	1/4 INCH PORT	S17400 DH1150	DF206014X1D
	3/8 INCH PORT	S17400 DH1150	DF206038X1D
	1/2 INCH PORT	S17400 DH1150	DF206012X1D
	3/4 INCH PORT	S17400 DH1150	DF206034X1D
	1 INCH PORT	S17400 DH1150	DF206100X1D
	1/4 INCH PORT	S31600 ⁽¹⁾ / Tungsten Carbide	DF206014X7D
	3/8 INCH PORT	S31600 ⁽¹⁾ / Tungsten Carbide	DF206038X7D
	1/2 INCH PORT	S31600 ⁽¹⁾ / Tungsten Carbide	DF206012X7D
	3/4 INCH PORT	S31600 ⁽¹⁾ / Tungsten Carbide	DF206034X7D
	1 INCH PORT	S31600 ⁽¹⁾ / Tungsten Carbide	DF206100X7D

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Parts List (Continued)

Key	Description	Material	Part Number
15	Valve Stem	S31600 ⁽¹⁾	DF20352X01D
16	Groove Pin	S31600	DF40303X01D
17	Pin O-Ring	HNBR	DF20781X01D
		Viton	DF20781X02D
18	Casing O-Ring	HNBR	DF10209X01D
		Viton	DF10209X02D
19	Lower Diaphragm Casing	Steel / Zinc	DF20401X01D
20	Flat Washer	Zinc Plated Steel	FWZN100
21	Bonnet Lock Nut	Steel	DF10208X01D
22	Diaphragm Plate Washer	S30300	DF10406X01D
23	Diaphragm	Nitrile / Nylon	DF20404X01D
24	Diaphragm Plate	Steel	DF20403X02D
25	Diaphragm Plate Spacer	S30300	DF20212X01D
26	Stem Nut	Zinc Plated Steel	NHCZ38
27	Springs	Steel / Zinc	DF20701X01D
28	Upper Diaphragm Casing	Steel / Zinc	DF20408X01D
29	Long Cap Screw	Zinc Plated Steel	H5FZ38.114
30	Nut	Zinc Plated Steel	NHFZ38
31	Cap Screw	Zinc Plated Steel	H5FZ38.100
32	Vent Cap	Plastic	Y602-12D
33	Travel Indicator	Plastic	DF10310X01D
34	Nameplate	Steel	NAME18DF2ZD
35	Casing Sticker	Vinyl	DF20219X01D

NOTES: 1 - All S31600 barstock is dual grade S31600/S31603 (316/316L)

Parts Ordering

Whenever corresponding with Dyna-Flo about a Model DF270 control valve, refer to the actuator nameplate or the back of the valve body for the unit serial number. Please order by the complete part number (as given in the Parts List) of each part required.

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Model DF270 Control Valve

MODEL NUMBERING SYSTEM

SAMPLE PART NUMBER: DF270-1GC3-6BN-14S

VALVE SIZE				1
1	1 INCH	2	2 INCH	
BODY STYLE				G
G	GLOBE STYLE			
ACTUATOR STYLE				C
C	FAIL CLOSED	O	FAIL OPENED	
SPRING RANGE⁽¹⁾				3
3	SIZE 69 ACTUATOR WITH 0-20 PSIG (0-1.38 BAR) OPERATING SIGNAL		6	SIZE 69 ACTUATOR WITH 0-35 PSIG (0-2.41 BAR) OPERATING SIGNAL
2	SIZE 69 ACTUATOR WITH 3-15 PSIG (0.21-1.03 BAR) OPERATING SIGNAL		5	SIZE 69 ACTUATOR WITH 6-30 PSIG (0.41-2.07 BAR) OPERATING SIGNAL
NUMBER OF SPRINGS				6
3	3 SPRINGS	6	6 SPRINGS	
ASME RATING				B
A	150	B	300	C 600 D 900 ⁽²⁾
F	900 FNPT			
CONNECTION STYLE				N
N	FNPT	F	RF	J RTJ
O-RING				-
-	HNBR (STANDARD) [-46 to 149°C (-50 to 300°F)]		2	VITON [-18 to 204°C (-0 to 400°F)]
TRIM SIZE				14
14	1/4 INCH	38	3/8 INCH	12 1/2 INCH 34 3/4 INCH
10	1 INCH			
TRIM MATERIAL				S
S	S17400 DH 1150		T	TUNGSTEN CARBIDE
NOTES				
1	Using a DF270 with an I/P having an output signal of 3-15 or 6-30 PSI (0.21-1.03 or 0.41-2.07 bar), fail open is not recommended. The constant signal (3 or 6 Psig) to the actuator is higher than the initial set for both 3 or 6 spring configurations. This prevents the actuator from being able to fully open resulting in reduced flow rates, and possible trim damage.			
2	2 inch flanged bodies are class 900/1500.			

DF270 - - - - -

Our Commitment to Quality

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