

Table 1. Specifications

<p>Available Configurations</p> <p>Spring-to-Close Spring-to-Open</p> <p>Valve Body Sizes and End Connection Styles⁽¹⁾</p> <p>See table 2</p> <p>Maximum Inlet Pressures and Temperatures⁽¹⁾</p> <p>If the valve nameplate shows an ASME pressure-temperature class, maximum inlet pressure and temperature is consistent with the applicable class per ASME B16.34. If the nameplate does not show an ASME class, it will show a maximum cold working pressure at 38 °C (100 °F) (for example, 293 bar [4250 psi])</p> <p>Maximum Pressure Drops⁽¹⁾</p> <p>See tables 4, 5, 6, and 7</p> <p>Input Signal to Actuator</p> <p>See tables 4, 5, 6, and 7</p> <p>Actuator Maximum Casing Pressure⁽¹⁾</p> <p>3.4 bar (50 psig)</p> <p>Shutoff Classification per ANSI/FCI 70-2 and IEC 60534-4</p> <p>Class IV</p>	<p>Material Temperature Capabilities⁽¹⁾</p> <p>Actuator Assembly: -40 to 93°C (-40 to 200°F)</p> <p>Valve Body Assembly: Standard Bonnet O-Ring: -46 to 149°C (-50 to 300°F) Optional Fluorocarbon Bonnet O-Ring: -23 to 204°C (-10 to 400°F)</p> <p>Flow Characteristic</p> <p>Equal percentage</p> <p>Flow Direction</p> <p>Flow up only</p> <p>Port Diameters</p> <p>See table 2</p> <p>Valve Plug Travel</p> <p>19 mm (0.75 inch)</p> <p>Valve Plug Style</p> <p>Micro-Form valve plug</p> <p>Actuator Diaphragm Effective Area</p> <p>452 cm² (69 inches²)</p> <p>Actuator Pressure Connection Size</p> <p>1/4 NPT internal</p>
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1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.

Specifications

Table 1 lists specifications for the D4 control valve. Some of the specifications for a given control valve as it originally comes from the factory are stamped on a nameplate located on the actuator spring barrel.

Table 6. Maximum Shutoff Pressure Drops⁽¹⁾ for Fisher D4 Control Valves (Spring-to-Open)
When Used with Typical Control Instrumentation⁽²⁾

INPUT SIGNAL TO ACTUATOR		0 to 1.2 Bar (0 to 18 Psig)		0 to 1.4 Bar (0 to 20 Psig)		0 to 2.0 Bar (0 to 30 Psig)		0 to 2.3 Bar (0 to 33 Psig)		0 to 2.4 Bar (0 to 35 Psig)		0 to 3.4 Bar (0 to 50 Psig)	
SPRING		Light Rate				Heavy Rate							
INITIAL SPRING SETTING		0.23 Bar (3.4 Psig)		0.23 Bar (3.4 Psig)		0.28 Bar (4.0 Psig)		0.28 Bar (4.0 Psig)		0.28 Bar (4.0 Psig)		0.28 Bar (4.0 Psig)	
PORT DIAMETER		Maximum Pressure Drop											
mm	Inches	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi	Bar	Psi
6.4	0.25	293 ⁽³⁾	4250 ⁽³⁾	293 ⁽³⁾	4250 ⁽³⁾	293	4250	293	4250	293	4250	293	4250
9.5	0.375	293 ⁽³⁾	4250 ⁽³⁾	293 ⁽³⁾	4250 ⁽³⁾	293	4250	293	4250	293	4250	293	4250
12.7	0.5	187	2715	233	3380	293	4250	293	4250	293	4250	293	4250
19.1	0.75	78	1135	99	1430	147	2130	178	2575	198	2875	293	4250
25.4	1	41	600	53	765	80	1160	97	1410	109	1575	195	2830
31.8	1.25	24	355	32	465	49	715	60	875	68	985	123	1785

1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded.

2. For example, use the column marked 0-1.4 bar (0-20 psig) for a 0.21-1.0 bar (3-15 psig) pneumatic controller with 1.4 bar (20 psig) supply pressure.

3. For applications with downstream pressure in excess of 190 bar (2760 psig), use 190 bar (2760 psig) for Maximum Shutoff Pressure.

Table 7. Maximum Shutoff Pressure Drops⁽¹⁾ for Fisher D4 Control Valves (Spring-to-Open)
When Used with Instrumentation with Restricted Output Range⁽²⁾

INPUT SIGNAL TO ACTUATOR		0.4 to 2.0 Bar (6 to 30 Psig)		0.14 to 2.3 Bar (2 to 33 Psig)	
SPRING		Heavy Rate		Heavy Rate	
INITIAL SPRING SETTING		0.69 Bar (10.0 Psig)		0.42 Bar (6.1 Psig)	
PORT DIAMETER		Maximum Pressure Drop			
mm	Inches	Bar	Psi	Bar	Psi
6.4	0.25	293 ⁽³⁾	4250 ⁽³⁾	293	4250
9.5	0.375	293 ⁽³⁾	4250 ⁽³⁾	293	4250
12.7	0.5	196	2845	293	4250
19.1	0.75	82	1195	156	2265
25.4	1	43	630	85	1235
31.8	1.25	26	380	52	765
1. The pressure or temperature limits in the referenced tables and any applicable ASME code limitations should not be exceeded. 2. For example, an Electro-Pneumatic Transducer calibrated for 0.4-2.0 bar (6-30 psig) output pressure. 3. For applications with downstream pressure in excess of 202 bar (2925 psig), use 202 bar (2925 psig) for Maximum Shutoff Pressure.					

Installation

▲ WARNING

Always wear protective gloves, clothing, and eyewear when performing any installation operations to avoid personal injury.

To avoid personal injury or property damage caused by bursting of pressure-retaining parts or by uncontrolled process fluid, be certain the service conditions do not exceed the limits shown on the valve nameplate and in tables 1, 4, 5, 6, and 7. Use pressure-relieving devices required by government or accepted industry codes and good engineering practices.

Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

If installing into an existing application, also refer to the WARNING at the beginning of the Maintenance section in this instruction manual.

Spring-to-Close

Refer to figure 4.

1. Loosen the adjusting screw nut (key 44).
2. Turn the adjusting screw (key 31) clockwise to compress the spring or counterclockwise to decrease spring compression.
3. After adjustment, tighten the adjusting screw nut (key 44).

Spring-to-Open

Refer to figure 5.

1. Unscrew the spring case assembly (key 27).
2. Turn the adjusting stem nut (key 44) clockwise to compress the spring or counterclockwise to decrease spring compression.
3. After adjustment, replace the spring case assembly (key 27).

Maintenance

Refer to figure 4.

Valve parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and maintenance depends on the severity of the service conditions.

WARNING

Avoid personal injury from sudden release of process pressure or bursting of parts. Before performing any maintenance operations:

- Do not remove the actuator from the valve while the valve is still pressurized.
- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Disconnect any operating lines providing air pressure, electric power, or a control signal to the actuator. Be sure the actuator cannot suddenly open or close the valve.
- Use bypass valves or completely shut off the process to isolate the valve from process pressure. Relieve process pressure on both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline*. Process fluids may spray out under pressure when removing the packing hardware or packing rings.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Valve Plug and Seat Ring

The D4 control valve is designed to allow easy access to the valve plug and seat ring without disturbing the packing. Refer to other sections of this instruction manual if additional maintenance is required.

2. Install the plug (key 2) on the stem (key 47) and insert a new groove pin (key 4).
3. Thoroughly clean the seat ring and bonnet threads in the valve body (key 1). Also clean the valve body seat ring gasket surfaces.
4. Apply anti-seize lubricant (key 54) to the threads of the seat ring (key 3), and its mating threads in the valve body.
5. Apply anti-seize lubricant (key 54) to the seat ring gasket (key 9) and install into the valve body.
6. Screw the seat ring into the valve body. Use a socket wrench to tighten the seat ring to the torque values shown in table 8. Remove all excess lubricant after tightening.
7. Lubricate (key 54) the threads on the valve body and hammer nut and the contact surfaces of the bonnet and hammer nut flange. Install the bonnet and actuator assembly with pinned valve plug onto the valve body. Tighten the hammer nut using an adjustable wrench until the nut stops turning. A few hammer blows will be required to ensure that the assembly is tight.
8. See the actuator assembly and spring adjustment sections of this manual.

Valve Packing

Note

These instructions apply to valves manufactured with serial numbers equal to and greater than 18679262. See Appendix A for information on packing constructions with serial numbers less than 18679262.

If your D4 valve assembly has a packing retainer lock ring (see figure 6), proceed to Appendix A.

WARNING

Observe the warning at the start of the Maintenance section.

The valve stem packing can only be accessed from within the valve body. If packing maintenance is required, first disassemble per steps 1, 2, and 6 or 7 in the Valve Plug and Seat Ring Disassembly section of this document.

Disassembly

1. Unscrew the packing retainer (key 10) from the bonnet (key 5).
2. Remove the five Belleville springs (key 11), packing spacer (key 14), packing (key 13), and two anti-extrusion rings (key 12) from the bonnet, using a formed wire hook.
3. Clean and inspect the packing box wall to ensure that the packing surfaces are not damaged. If the surface condition is damaged, and cannot be improved by light sanding, replace the bonnet by contacting your Emerson Process Management sales office.
4. Inspect the valve stem for scratches or wear, and valve plug for wear or damage. Replace if necessary.

Assembly

Refer to figures 2, 3, 4, and 5.

Note

If your D4 valve assembly has a packing retainer lock ring (see figure 6), proceed to Appendix A.

1. Ensure the upper packing spacer (key 48) is installed, as shown in figure 2.
2. Using a non-marring installation tool, such as a 12-inch length of 1/2 inch PVC pipe, push the first anti-extrusion washer (key 12) fully into the packing box by hand. Then, use the packing spacer (key 14) to fully seat the anti-extrusion washer by firmly tapping the packing spacer against the anti-extrusion washer with a hammer and the PVC pipe.
3. Remove the packing spacer from the packing bore.

CAUTION

All D4 packing kits include a single use packet of high performance fluorinated grease. This is the only acceptable D4 packing lubricant.

Note

In the following procedure, carefully install each packing ring individually over the valve stem and push completely into the packing box with a non-marring tube. A 12-inch length of 1/2 inch PVC pipe works well for this. It is recommended that the lubricated packing rings be installed individually rather than pushed in as a set.

4. Apply a 3mm (1/8 inch) bead of the supplied high performance fluorinated grease (key 44) around the groove of the female packing adaptor as shown in figure 3 and install over the valve stem (key 16).
5. Apply a 3mm (1/8 inch) bead of the supplied high performance fluorinated grease (key 44) around the groove of the packing ring as shown in figure 3 and install over the valve stem.
6. Install the male packing adaptor, lower anti-extrusion washer (key 10), and lower packing spacer over the valve stem as shown in figure 2.
7. Firmly press all packing parts into the packing bore with a tube.
8. Install the five belleville springs (key 11) over the valve stem. The belleville springs should be single-stacked with the inside diameter of the inner spring contacting the packing spacer (key 14), and the outside diameter of the outer spring contacting the packing retainer (key 10).
9. Lubricate the threads of the packing retainer with anti-seize and install into the bonnet using a 1-5/8 inch wrench. Make sure the Belleville springs are completely enclosed by the packing retainer as shown in figure 2.
10. Torque the packing retainer to 136 N•m (100 lbf•ft). The packing retainer has been installed correctly when a metal-to-metal contact has been made between the packing retainer end and the bonnet (key 5). The packing retainer threads should be completely enclosed by the bonnet.

Actuator (Spring-to-Close)

⚠ WARNING

Observe the warning at the start of the Maintenance section.

3. Assemble the diaphragm plate assembly. Place the patterned side of the diaphragm (key 15) against the diaphragm plate (key 40). Be sure to turn the diaphragm washer (key 41) so that the side that is beveled on the inside diameter is against the O-ring (key 25). Also, make sure that it is assembled for installation with the diaphragm on the loading pressure side and the lockwasher (key 43) and lower spring seat (key 28) are on the spring side.
4. Fasten the diaphragm and diaphragm plate assembly on the stem with hex nuts (key 42). Place the diaphragm and diaphragm plate, and stem assembly into the lower casing and bonnet. Install the travel indicator (key 32) on the stem as the bottom of the stem enters the yoke window.

CAUTION

Over-tightening the diaphragm casing cap screws and nuts (keys 45 and 46) can damage the diaphragm. Do not exceed 27 N•m (20 lbf•ft) torque.

5. Replace the spring (key 30) on the diaphragm plate (key 40). Replace the upper spring seat (key 29). Position the upper casing (key 23) on the lower casing (key 39). Insert the cap screws (key 45) and tighten the hex nuts (key 46). Torque the casing cap screws evenly to 27 N•m (20 lbf•ft) using a crisscross pattern.
6. Adjust the initial spring set per the Spring Adjustment section in this manual.

Actuator (Spring-to-Open)

⚠ WARNING

Observe the warning at the start of the Maintenance section.

Refer to figure 5.

Before disassembling the actuator, disassemble the valve plug, seat ring, and packing according to instructions in this manual.

Disassembly

1. Unscrew the spring case assembly (key 27). Turn the adjusting screw nut (key 44) counterclockwise to remove all spring compression. Remove the adjusting screw nut, upper spring seat, and spring (keys 44, 29, and 30).
2. Unscrew the casing cap screws and hex nuts (keys 45 and 46), and remove the upper casing assembly (key 23) from the lower casing (key 39). Remove the cotter pin (key 36) and unscrew the adjusting stem (key 31).
3. Lift out the diaphragm (key 15), diaphragm plate (key 40), and stem assembly. Remove the travel indicator (key 32) when the bottom of the stem enters the yoke window.
4. To replace the diaphragm (key 15), separate the diaphragm assembly by using a wrench on the hex nuts (key 42) to unscrew the assembly.
5. Separate the parts--diaphragm washer, actuator O-ring (keys 41 and 25), diaphragm, and diaphragm plate, (keys 15 and 40).
6. Inspect the diaphragm and the actuator O-ring for damage or deterioration, and replace if necessary. If the diaphragm is replaced, a new O-ring should also be installed.
7. Inspect the stem O-ring (key 19) and bonnet bushing (key 20); replace if necessary. To inspect the casing O-ring (key 18), remove the cap screws (key 38) and lift off the lower casing (key 39). Replace the O-ring if necessary. Inspect the adjusting stem bushing (key 26) and actuator stem O-ring (key 53). Replace if necessary.

7. Replace the spring (key 30), spring seat (key 29), and adjusting stem nut (key 44) over the adjusting stem. Replace the spring case assembly (key 27).
8. Adjust the initial spring set per the Spring Adjustment section in this manual.

Parts Ordering

Each D4 control valve is assigned a serial number, which can be found on the nameplate. Refer to the number when contacting your Emerson Process Management sales office for assistance or when ordering replacement parts.

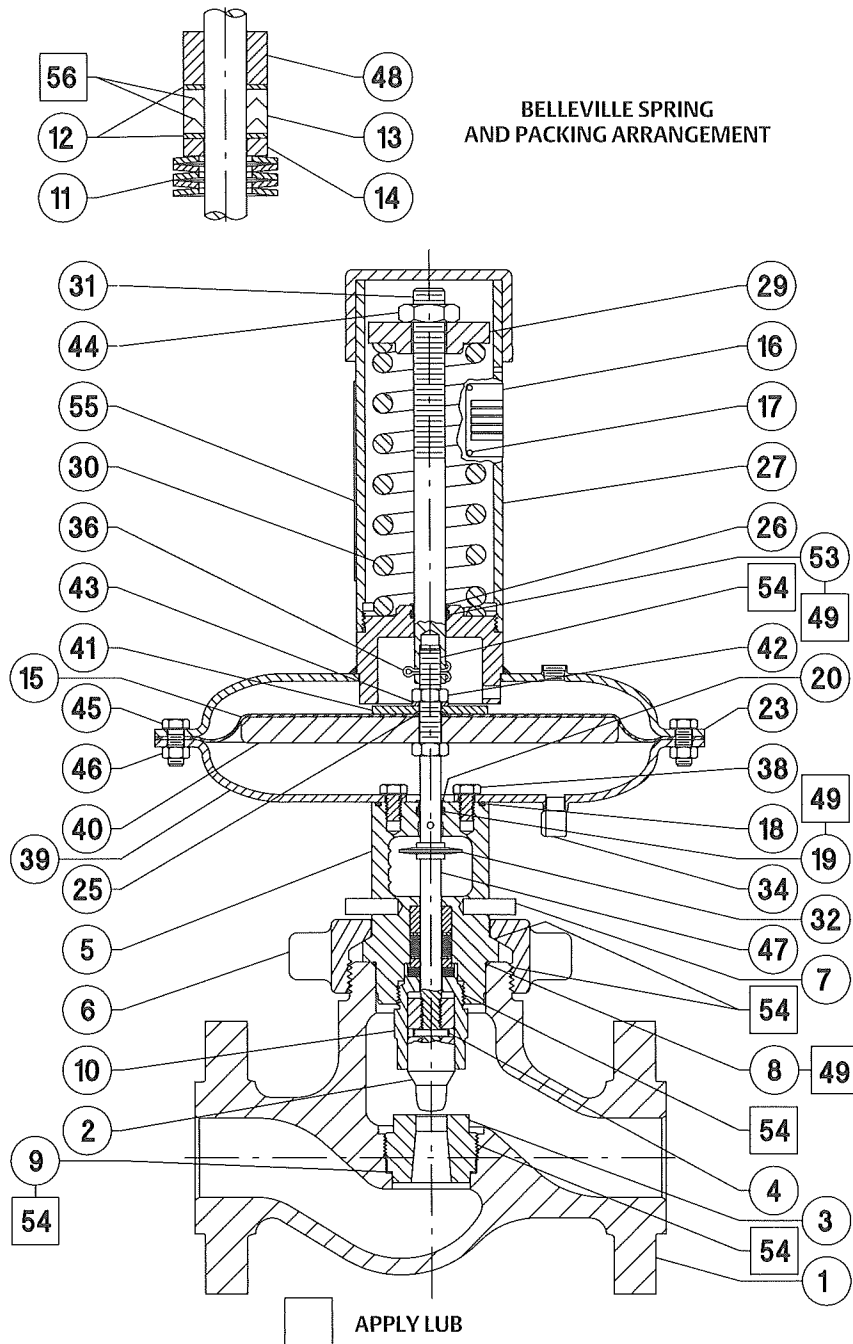
WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Process Management should not, under any circumstances, be used in any Fisher valve, because they may void your warranty, might adversely affect the performance of the valve, and could cause personal injury and property damage.

Note

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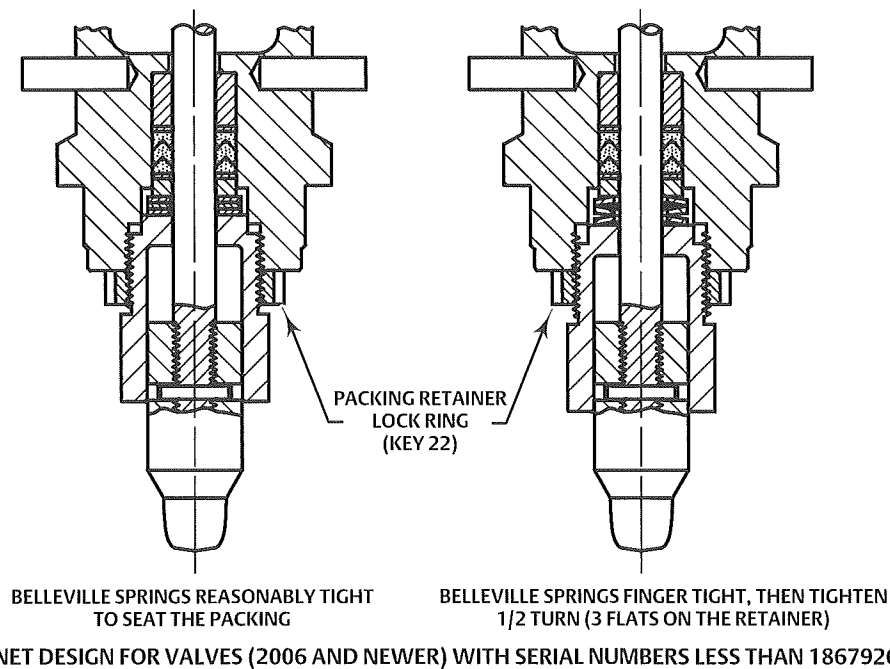
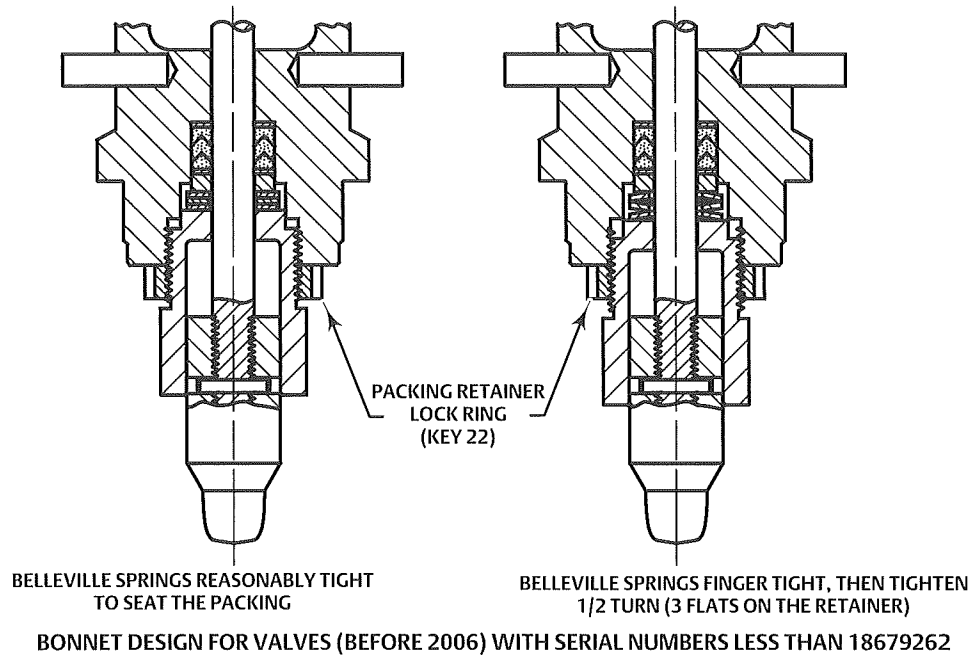
Figure 5. Fisher D4 Valve Assembly (Spring-to-Open)



CE02334-E

Key	Description	Part Number	Key	Description	Part Number
25*	Actuator O-ring	1K7561X0072	40	Diaphragm Plate	
26*	Adjusting Stem Bushing (spring-to-open only)	17A4059X012	41	Diaphragm Washer	
27	Spring Case Assembly		42	Hex Nut	
28	Lower Spring Seat		43	Lockwasher	
29	Upper Spring Seat		44	Adjustment Screw Nut	
30	Spring		45	Cap Screw	
	Spring-to-Close, Light Rate	1F176827092	46	Hex Nut	
	Spring-to-Close, Heavy Rate	1E792427082	47*	Valve Stem	
	Spring-to-Open, Light Rate	1F176727032		S20910, Reverse Acting	20C3681X022
	Spring-to-Open, Heavy Rate	1F714327092		S20910, Direct Acting	20C3716X022
31	Adjustment Screw or Stem		48	Upper packing spacer	
32	Travel Indicator		49	Lubricant (lithium grease)	
34	Vent Assembly		51	Drive Screw	
36*	Cotter Pin (spring-to-open only)	1C608035022	53*	Actuator Stem O-ring (spring-to-open only)	1C7821X0182
37	Pipe Plug		54	Lubricant (anti-seize)	
38	Cap Screw		55	Spring Setting Label (not shown)	
39	Lower Casing		56	High Performance Fluorinated Grease	
				Packing Lubricant	

Figure 6. Fisher D4 Belleville Spring Procedure



NOTE: RECOMMENDED SPARE PARTS, INCLUDING PACKING KITS, ARE THE SAME FOR BOTH BONNET DESIGNS.
NOTE: FOR SERIAL NUMBERS GREATER THAN 18679262, SEE THE STANDARD SECTION OF THIS INSTRUCTION MANUAL.

8. Install the Belleville springs (key 11). The Belleville springs (key 11) should be single stacked with the I.D. of the inner spring contacting the packing spacer (key 14) and the O.D. of the outer spring contacting the packing retainer (key 10). The final Belleville spring should be within the 1.26 inch diameter bore of the bonnet.
9. Adjust the packing retainer by hand until it makes contact with the Belleville springs. Do not tighten by hand, simply install the packing retainer until it makes contact with the Belleville springs. Tighten the packing retainer clockwise precisely 1.16 turns (7 flats on the retainer) to seat the packing. This should fully compress the Belleville springs as detected by an increase in torque between 6 and 7 flats.
10. Loosen the packing retainer completely. Adjust the packing retainer by hand until it makes contact with the Belleville springs. Do not tighten by hand, simply install the packing retainer until it makes contact with the Belleville springs. Tighten the packing retainer clockwise precisely 1/2 turn (3 flats on the retainer).
11. Lock the packing retainer (key 10) solidly in place by tightening the packing retainer locknut (key 22) using a spanner wrench or a hammer and punch or chisel.

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