Instruction Manual
D103175X012
September 2026

Fisher™ GX Control Valve and Actuator System



FISHER™

EMERSON™

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Section 1: Introduction

1.1 Scope of the Manual

This instruction manual includes installation, maintenance and parts information for the Fisher GX control valve and actuator system.

WARNING

Do not install, operate or maintain a GX valve without being fully trained and qualified in valve, actuator and accessory installation, operation and maintenance. To avoid personal injury or property damage, it is important to carefully read, understand and follow all the contents of this manual, including all safety cautions and warnings. If you have any questions about these instructions, contact your Emerson sales office before proceeding.

1.2 Description

The GX is a compact, state-of-the-art control valve and actuator system, designed to control a wide range of process gases, vapors and fluids.

The GX is rugged, reliable and easy to select. It requires no actuator sizing—the actuator selection is automatic once the valve body construction is selected.

The GX meets the requirements of both EN and ASME standards. It is available with a complete accessory package, including the Fisher FIELDVUE™ instruments.

Figure 1. Fisher GX Control Valve, Actuator and Fisher FIELDVUE DVC7K Digital Valve Controller



X2121

Table 1. Fisher GX Valve Specifications

Specifications	EN	ASME
Valve Body Size	DN 15, 20, 25, 40, 50, 80, 100, 150	NPS 1/2, 3/4, 1, 1-1/2, 2, 3, 4, 6
Pressure Rating	PN 10 / 16 / 25 / 40 per EN 1092-1	CL150 / 300 per ASME B16.34
End Connections	Flanged raised face per EN 1092-1	Flanged raised face per ASME B16.5
Valve Body/Bonnet Materials	1.0619 steel	ASME SA216 WCC steel
	1.4409 stainless steel	ASME SA351 CF3M stainless steel
	CW2M (sizes DN 25 through 100 only)	CW2M (NPS 1 through 4 only)
	ASME SA352 LCC	ASME SA352 LCC
	ASTM A990 CN3MCu/ASME SA351 CN7M (Cast Alloy 20) (sizes DN 25 through 100 only)	ASTM A990 CN3MCu/ASME SA351 CN7M (Cast Alloy 20) (NPS 1 through 4 only)
	CD3MN Duplex SST (sizes DN 25 through 100 only)	CD3MN Duplex SST (NPS 1 through 4 only)
	CF3 304L SST (sizes DN 25 through 100 only)	CF3 304L SST (NPS 1 through 4 only)
	- - -	M35-2 (NPS 1 through 4 only)
	- - -	N7M Alloy B2 (NPS 1 through 4 only)
Face-to-Face Dimensions	Consistent with EN 558-1 Series 1	Consistent with ANSI/ISA 75.08.01
Shutoff per IEC 60534-4 and ANSI/FCI 70-2	Metal seat - Class IV (standard)	
	Metal seat - Class V (optional)	
	PTFE seat - Class VI (optional)(1)	
Flow Direction	Flow-up (Cavitrol™ III trim, Flow down)	
Flow Control Characteristics	Equal Percentage and Linear	
Trim Style	**Port Diameters**	**Trim Style Description**
	4.8 mm	Micro-Flow trim (unbalanced)
	9.5, 14, 22 mm	Stem-Guided with Contoured Plug (unbalanced) or Port-Guided with Cavitrol III trim (unbalanced)
	36, 46 mm	Port-Guided Plug (unbalanced)
	70, 90, 136 mm	Balanced Trim with Contoured plug or Unbalanced Port-Guided Plug
Handwheel	Available as an option	
Travel Stop	Available as an option	

1. For 4.8 to 14 mm ports, Class VI shutoff is achieved without PTFE seat.

1.3 Education Services

Emerson's Education Services
Phone: 800-338-8158
Email: education@emerson.com
emerson.com/en/final-control/services/valve-training

Section 2: Valve Installation

⚠ WARNING

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

Personal injury or equipment damage caused by sudden release of pressure or bursting of pressure retaining parts might result if service conditions exceed those for which the product was intended. To avoid injury or damage, provide a relief valve for over pressure protection as 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.

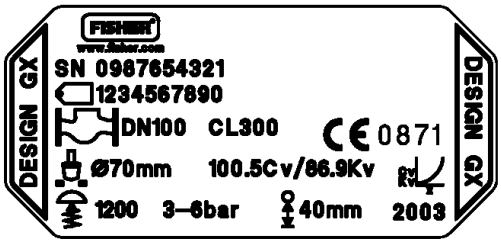
⚠ WARNING

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop and controlled fluid conditions. Responsibility for the safety of process media and compatibility of valve materials with process media rests solely with the purchaser and end-user. Since some body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Emerson sales office. Provide the product serial number (shown on the nameplate, Figure 2) and all other pertinent information.

NOTE

The acronym of CWP may appear on the nameplate. CWP (Cold Working Pressure) denotes the pressure rating at normal ambient temperature. A normal ambient temperature range being -4 to +100°F / -20 to +38°C.

Figure 2. Fisher GX Nameplate Examples (Key 35)



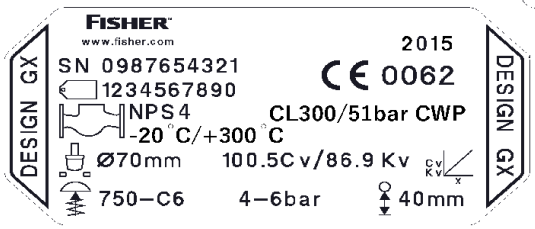
GE01296-H

WITHOUT SPRING INFORMATION (USED PRIOR TO 2009)



GG12198-D

ELECTRIC ACTUATOR



GE41229-G

WITH SPRING INFORMATION

⚠ WARNING

If you move or work on an actuator installed on a valve with loading pressure applied, keep your hands and tools away from the stem travel path to avoid personal injury. Be especially careful when removing the stem connector to release all loading on the actuator stem whether it be from air pressure on the diaphragm or compression in the actuator springs. Likewise take similar care when adjusting or removing any optional travel stop. Refer to the relevant actuator Maintenance Instructions.

NOTICE

Ensure the valve and adjacent pipelines are free of foreign material that could damage the valve seating surfaces.

1. Before installing the valve, inspect it to be certain that the valve body cavity is free of all foreign material. Clean out all pipelines to remove scale, welding slag and other foreign material.
2. The control valve assembly may be installed in any orientation unless limited by seismic criteria. However, the normal method is with the actuator vertical above the valve. Other positions may result in uneven trim wear and improper operation. With some valves, the actuator may also need to be supported when it is not vertical. For more information, consult your Emerson sales office. Flow through the valve must be in the direction indicated by the arrow cast on the valve.

3. Use accepted piping practices when installing the valve in the pipeline. Use a suitable gasket between the valve and the pipeline flanges.
4. If continuous operation is required during inspection or maintenance, install isolating valves on either side of the control valve with a bypass valve to control the flow while the control valve is receiving maintenance.

⚠ WARNING

Personal injury could result from packing leakage. Valve packing is tightened before shipment; however the packing might require some readjustment to meet specific service conditions.

Section 3: Maintenance

⚠ WARNING

Avoid personal injury or property damage 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 the process pressure. Relieve the process pressure from both sides of the valve.**
- **Depending on the actuator construction, it will be necessary to manage the pneumatic actuator loading pressure and any actuator spring pre-compression. It is essential to refer to the relevant actuator instructions in this manual to ensure safe removal of the actuator from the valve.**
- **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 or when loosening the packing box pipe plug.**
- **Check with your process or safety engineer for any additional measures that must be taken to protect against process media.**

NOTE

Whenever a gasket seal is disturbed by removing or shifting gasketed parts, install a new gasket during reassembly. This ensures a good gasket seal because the used gasket may not seal properly.

3.1 Actuator Maintenance

For electric actuators, see the supplier's instruction manual.

The following sections provide procedures for actuator maintenance. Refer to Figures 17, 18, 19 and 20.

The actuator soft parts may require periodic replacement. This includes the diaphragm (key 10), diaphragm O-ring (key 109), actuator rod bushing (key 19) and the actuator rod seal (key 20).

If the actuator stroking direction (air-to-open or air-to-close) is unknown, refer to the nameplate on top of the actuator casing and Figure 2.

There are several optional actuator constructions, depending on supply pressure. Refer to the nameplate on the top of the actuator to determine the construction installed. Refer to Figure 3 and Table 2 for proper spring configuration.

NOTE

Older GX actuator nameplates do not contain spring configuration information. If you require replacement springs or wish to switch to an optional actuator construction, consult your Emerson sales office.

NOTE

When the Fisher GX actuator is equipped with a Fisher FIELDVUE instrument, additional considerations may be required. Refer to the appropriate FIELDVUE instrument quick start guide for mounting instructions:

- Fisher FIELDVUE DVC7K Digital Valve Controller Quick Start Guide, D104766X012
- Fisher FIELDVUE DVC2000 Digital Valve Controller Quick Start Guide, D103203X012
- Fisher FIELDVUE DVC6200 Digital Valve Controller Quick Start Guide, D103556X012

Actuator Disassembly (For Air-to-Open Constructions - see Figure 17 or 18)

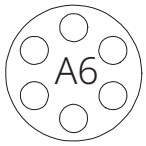
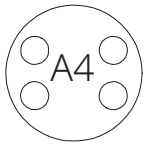
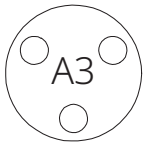
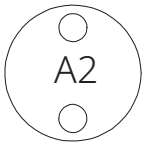
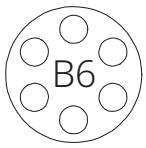
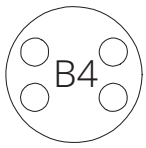
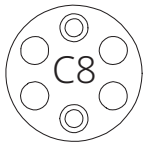
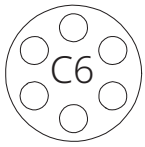
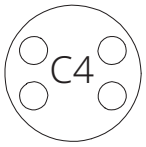
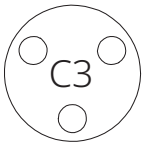
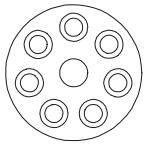
1. Connect a separate air supply to the lower diaphragm casing via the air supply connection on the yoke (as shown in Figure 17 or 18) and apply sufficient air pressure to raise the valve plug/stem off the seat to mid-travel.
2. Remove the stem connector nut half (key 23), stem connector bolt half (key 24) and travel indicator (key 26).
3. Push the valve plug/stem (key 3) down until it contacts the seat.
4. Loosen the locknut (key 28) and thread the stem adjustor nut (key 27) down until it clears the top of the valve plug/stem (key 3).
5. Shut off the air pressure and disconnect the separate air supply to the lower diaphragm casing (as shown in Figure 17 or 18).

⚠ WARNING

To avoid personal injury or property damage due to actuator springs (keys 12 and 82) being under compression, remove the long cap screws (key 16) last.

The upper actuator casing may remain fixed to the diaphragm and lower casing during disassembly, even if the casing cap screws have been loosened. If this happens, the actuator springs are still under compression. The upper casing could suddenly come loose and jump, due to the compressed energy of the springs. If the upper casing is stuck to the diaphragm and lower casing when you begin loosening the casing cap screws, pry the casings apart with a prying tool. Always ensure that the springs are dispersing energy and the upper casing is moving against the long bolts during disassembly.

Figure 3. Spring Configuration

ACTUATOR	TRAVEL	GX ACTUATOR - SPRING QUANTITY AND ARRANGEMENT				
225	20					
		6 - GE37264X012	4 - GE37264X012	3 - GE37264X012	2 - GE37264X012	
750	20					
		6 - GE00366X012	4 - GE00366X012			
750	40					
		6 - GE37344X012 AND 6 - GE40917X012	6 - GE37344X012 AND 2 - GE40917X012	6 - GE37344X012	4 - GE37344X012	3 - GE37344X012
1200	40 AND 60					
		8 - GE13551X012 AND 7 - GE13552X012				

NOTE:
CONCENTRIC CIRCLES INDICATE NESTED SPRINGS.
SPRING ARRANGEMENTS ARE SHOWN LOOKING DOWN AT LOWER CASING FROM ABOVE.

GG00398-B

6. Remove the short actuator casing cap screws and hex nuts (keys 17 and 18) first. Once these have been removed from the actuator assembly, carefully remove the long actuator cap screws and hex nuts (keys 16 and 18), alternating between them to gradually release the spring energy (compression).
7. Remove the upper diaphragm casing (key 9) and the actuator springs (key 12 and/or 82).
8. Lift off the actuator stem/diaphragm assembly (includes keys 22, 11, 10, 14, 13, 109 and 15) and remove the cap screw (key 14), actuator spacer (key 13), actuator rod (key 22) and washer (key 15).
9. Replace the diaphragm (key 10), diaphragm O-ring (key 109), actuator rod bushing (key 19) and actuator rod seal (key 20), as needed.

Actuator Disassembly (For Air-to-Close Constructions - see Figure 19 or 20)

1. Remove the stem connector nut half (key 23), stem connector bolt half (key 24) and travel indicator (key 26).

⚠ WARNING

To avoid personal injury or property damage due to actuator springs (key 12) being under compression, remove the long cap screws (key 16) last.

The upper actuator casing may remain fixed to the diaphragm and lower casing during disassembly, even if the casing cap screws have been loosened. If this happens, the actuator springs are still under compression. The upper casing could suddenly come loose and jump, due to the compressed energy of the springs. If the upper casing is stuck to the diaphragm and lower casing when you begin loosening the casing cap screws, pry the casings apart with a prying tool. Always ensure that the springs are dispersing energy and the upper casing is moving against the long bolts during disassembly.

2. Remove the short actuator casing cap screws and hex nuts (keys 17 and 18) first. Once these have been removed from the actuator assembly, carefully remove the long actuator cap screws and hex nuts (keys 16 and 18), alternating between them to gradually release the spring energy (compression).
3. Remove the upper diaphragm casing (key 9).
4. Lift off the actuator stem/diaphragm assembly (includes keys 22, 11, 10, 14, 13, 109 and 15) and remove the cap screw (key 14), actuator spacer (key 13), actuator rod (key 22) and washer (key 15).
5. Remove the actuator springs (key 12 and/or 82).
6. Replace the diaphragm (key 10), diaphragm O-ring (key 109), actuator rod bushing (key 19) and actuator rod seal (key 20), as needed.

Table 2. Actuator Spring Configuration Based on Minimum Supply Pressure(1)

ACTUATOR SIZE	TRAVEL mm	STEM MATERIAL	MINIMUM SUPPLY PRESSURE	SPRING CONFIGURATION	
				Air-to-Open	Air-to-Close
225	20	S20910, N05500 S31603	4 bar / 58 psi	A6	A3
				A4(2)	A4(2)
			3 bar / 44 psi	A4	A3
			2 bar / 29 psi	A3	A2
225	20	S31803, N10675, N06022	4 bar / 58 psi	A6	A3
			3 bar / 44 psi	A4	A3
			2 bar / 29 psi	A3	A2
750	20	S20910, N05500 S31603	4 bar / 58 psi	B6	B4
				B6(2)	B6(2)
			3 bar / 44 psi	B6	B4
			2 bar / 29 psi	B4	B4
750	20	S31803, N10675, N06022	4 bar / 58 psi	B4	B4
			3 bar / 44 psi	B4	B4
			2 bar / 29 psi	B4	B4
750	40	S20910, N05500 S31603	4 bar / 58 psi	C12	C6
			3 bar / 44 psi	C8	C3
			2 bar / 29 psi	C4	C3
750	40	S31803, N10675, N06022	4 bar / 58 psi	C8	C6
			3 bar / 44 psi	C8	C3
			2 bar / 29 psi	C4	C3
1200	40 or 60	S20910, N05500 S31603	4 bar / 58 psi	D15	D15
			3 bar / 44 psi	D15	D15
			2 bar / 29 psi	N/A	N/A

1. Only applicable to actuators with spring information on the nameplate (see Figure 2).
2. Only applicable to Cavitrol III constructions.

Table 3. Fisher GX Maximum Rated Travel

ACTUATOR SIZE	NUMBER OF CASING BOLTS	TRAVEL mm
225	6	20
750	10	20 or 40
1200	16	40 or 60

Table 4. Body Nut (Key 7) Torque Requirements(1)

VALVE SIZE	TORQUE	
	N•m	lbf•ft
DN 15, 20, 25 / NPS 1/2, 3/4, 1	45.5	33.5
DN 40 / NPS 1-1/2	79.8	58.9
DN 50 / NPS 2	79.8	58.9
DN 80 / NPS 3	163	120
DN 100 and 150 / NPS 4 and 6	282	208
1. Lubricate with anti-seize compound.		

Table 5. Yoke/Extension Bonnet Nut (Key 46) Torque Requirements (used on Extension Bonnet and Bellows Bonnet Constructions)(1)

VALVE SIZE	TORQUE	
	N•m	lbf•ft
DN 15, 20, 25, 40 and 50 / NPS 1/2, 3/4, 1, 1-1/2 and 2	79.8	58.9
DN 80 and 100 / NPS 3 and 4	163	120
1. Lubricate with anti-seize compound.		

Actuator Assembly For Air-to-Open Constructions (or to Change Action to Air-to-Open - see Figure 17 or 18)

1. Install the diaphragm (key 10) on the diaphragm plate (key 11). Insert the cap screw (key 14) through the actuator spacer (key 13) and place this assembly through the diaphragm/diaphragm plate assembly.
2. Place the diaphragm O-ring (key 109) and the washer (key 15) over the center hole of the diaphragm, so that the convex part of the washer is facing down toward the diaphragm and contains the O-ring. Ensure the convex part of the washer is guided in the diaphragm center hole as shown in Figure 17 or 18.
3. Screw the actuator rod (key 22) onto the cap screw (key 14) and torque to 80 N•m / 59.1 lbf•ft. Install the actuator stem/diaphragm assembly back into the actuator yoke (key 8).
4. Place the actuator springs (key 12 and/or 82) onto the spring locators in the diaphragm plate (key 11). See Figure 3 and Table 2 for proper spring quantity and arrangement.
   - If the nameplate does not contain spring information, use the same quantity and arrangement as originally installed.
5. Install the upper diaphragm casing (key 9) so that the ribs on the top of the upper diaphragm casing are perpendicular with the yoke legs.
   - For Sizes 225 and 750 actuators, install the 2 long cap screws (key 16) and hex nuts (key 18) 180 degrees apart from each other and in line with the actuator yoke legs.
   - For Size 1200 actuators, install the 4 long cap screws (key 16) and hex nuts (key 18) 90 degrees from each other, with two of them in line with the actuator yoke legs.
6. Tighten the long cap screws (key 16) and hex nuts (key 18), alternating between them to gradually compress the springs, until the two casing halves and diaphragm touch.

7. Install the remaining short cap screws (key 17) and hex nuts (key 18) to the casing.
8. Tighten the actuator casing cap screws evenly using a cross-tightening procedure. Torque to 55 N•m / 40 lbf•ft.
9. If you had previously removed the actuator assembly from the valve, place the actuator assembly back onto the valve body (key 1). Install the four body nuts (key 7), but tighten them only finger-tight.
10. Connect a separate air supply to the actuator air supply connection (as shown on the yoke in Figure 17 or 18) and apply sufficient air pressure to raise the actuator rod (key 22) to the travel stop.

NOTE

If converting from air-to-close to air-to-open action, first move the vent cap (key 21) from the air supply connection on the yoke leg (see Figure 19 or 20) to the top of the casing (see Figure 17 or 18).

11. For standard bonnet constructions (Figures 17, 18, 19 and 20), tighten the body nuts (key 7) evenly using a cross-tightening procedure. See Table 4 for torque requirements.

    For extension and bellows bonnet constructions (Figures 21 and 22), tighten the bonnet nuts (key 46) evenly using a cross-tightening procedure. See Table 5 for torque requirements.
12. With the valve plug/stem (key 3) on the seat, thread the stem adjustor nut (key 27) up until it is the rated travel distance specified in Table 3 from the actuator rod (key 22). Thread the locknut (key 28) up against the stem locknut and tighten per Table 6.

Table 6. Stem Connector Torque Values

PART	STEM MATERIAL	TORQUE	
		N•m	lbf•ft
M8 Stem Connector Cap Screws	All	35	26
M10 Stem Connector Jam Nut (Rie 4606 Coated)	S31603, S20910, N05500	48	35
	N06022, S31803, N10675	35	26
M14 Stem Connector Jam Nut	S31603, S20910, N05500	175	129
	N06022, S31803, N10675	138	102

13. Stroke the actuator rod until it contacts the stem adjuster nut (key 27) and install the stem connector halves and travel indicator (keys 23, 24 and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
14. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
15. Tighten the stem connector cap screws (key 25) to 35 N•m / 26 lbf•ft.
16. Release the actuator pressure.

NOTE

For air-to-open action, the air supply tubing must be connected to the actuator yoke at the air supply connection, see Figure 17 or 18. (If converting from air-to-close to air-to-open, the tubing will need to be re-routed to this location).

Actuator Assembly For Air-to-Close Constructions (or to Change Action to Air-to-Close - see Figure 19 or 20)

1. Position the upper diaphragm casing (key 9) upside down on the bench so that it lays flat and not off balance.

NOTE

If converting from air-to-open to air-to-close action, first move the vent cap (key 21) from the top of the casing (see Figure 17 or 18) and thread into the air supply connection on the yoke leg (see Figure 19 or 20).

2. Install the diaphragm (key 10) on the diaphragm plate (key 11). Place the diaphragm O-ring (key 109) and the washer (key 15) over the center hole of the diaphragm, so that the convex part of the washer is facing down toward the diaphragm and contains the O-ring. Ensure the convex part of the washer is guided in the diaphragm center hole as shown in Figure 19 or 20.
3. Insert the cap screw (key 14) through the washer and diaphragm, install the actuator spacer (key 13) and screw the actuator rod (key 22) onto the cap screw (key 14) finger-tight.
4. Radially align the spring locators in the diaphragm plate assembly (key 11) with the casing cap screw holes in the diaphragm (key 10). This will ensure that the springs do not cover the air path in the yoke.
5. Torque the cap screw (key 14) to the actuator rod (key 22) to 80 N•m / 59.1 lbf•ft and lay this assembly into the upper diaphragm casing (key 9).
6. Place the actuator springs (key 12 and/or 82) onto the spring locators in the diaphragm plate (key 11). See Figure 3 and Table 2 for proper spring quantity and arrangement.
   - If the nameplate does not contain spring information, use the same quantity and arrangement as originally installed.
7. Remove and replace the actuator rod bushing (key 19) and actuator rod seal (key 20) in the actuator yoke (key 8), if necessary.
8. Set the actuator yoke (key 8) down onto the assembly that is resting in the upper diaphragm casing (key 9) so that the yoke legs are perpendicular with the ribs on the top of the upper diaphragm casing (key 9).
   - For Sizes 225 and 750 actuators, install the 2 long cap screws (key 16) and hex nuts (key 18) 180 degrees apart from each other and in line with the actuator yoke legs.
   - For Size 1200 actuators, install the 4 long cap screws (key 16) and hex nuts (key 18) 90 degrees from each other, with two of them in line with the actuator yoke legs.
9. Tighten the long cap screws (key 16) and hex nuts (key 18), alternating between them to gradually compress the springs, until the two casing halves and diaphragm touch.

10. Install the remaining short cap screws (key 17) and hex nuts (key 18) to the casing.
11. Tighten the actuator casing cap screws evenly using a cross-tightening procedure. Torque to 55 N•m / 40 lbf•ft.
12. If you had previously removed the actuator assembly from the valve, place the actuator assembly back onto the valve body (key 1). For standard bonnet constructions (Figures 17, 18, 19 and 20), install the body nuts (key 7) and tighten evenly using a cross-tightening procedure. See Table 4 for torque requirements.

    For extension and bellows bonnet constructions (Figures 21 and 22), install the bonnet nuts (key 46) and tighten evenly using a cross-tightening procedure. See Table 5 for torque requirements.
13. With the valve plug/stem (key 3) in the closed position (on the seat), thread the stem adjustor nut (key 27) up until it is at the rated travel (see Table 3) from the actuator rod (key 22). Thread the locknut (key 28) up against the stem locknut and tighten per Table 6.
14. Stroke the actuator rod until it contacts the stem adjuster nut (key 27) and install the stem connector halves and travel indicator (keys 23, 24 and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
15. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
16. Tighten the stem connector cap screws (key 25) to 35 N•m / 26 lbf•ft.

NOTE

For air-to-close action, the air supply tubing must be connected to the actuator upper casing at the air supply connection, see Figure 19 or 20. (If converting from air-to-open to air-to-close, the tubing will need to be re-routed to this location.)

3.2 Packing Maintenance

Key numbers refer to Figures 14, 17, 18, 19, 20, 21 and 22.

Packing Adjustment

For Fisher enhanced ENVIRO-SEAL™ spring-loaded single PTFE V-ring packing (Figure 14) or for Fisher enhanced ENVIRO-SEAL graphite ULF packing (Figure 15), the Belleville spring pack (key 34) maintains a sealing force on the packing. If leakage is detected around the packing follower (key 29) check to be sure that the packing follower (key 29) is tight. Using a wrench, tighten the packing follower (key 29) in 1/4 turn intervals until the leakage is stopped. If leakage cannot be stopped in this manner, proceed to the Replacing Packing section in this manual.

3.3 Replacing Packing (Pneumatic Actuators)

This section provides instruction on replacing packing in standard bonnets, extension bonnets and bellows extension bonnets.

Isolate the control valve from the line pressure, release pressure from both sides of the valve body and drain the process media from both sides of the valve. Shut off all pressure lines to the actuator and release all pressure from the actuator. Use lock-out procedures to ensure that the above measures stay in effect while you work on the equipment.

1. For air-to-open constructions:
    a. Connect a separate air supply to the lower diaphragm casing via the air supply connection on the yoke (as shown in Figure 17 or 18) and apply sufficient air pressure to raise the valve plug/stem off the seat to mid travel.
    b. Remove the stem connector nut half (key 23), stem connector bolt half (key 24) and travel indicator (key 26).
    c. Push the valve plug stem (key 3) down until it contacts the seat.
    d. Loosen the locknut (key 28) and thread the stem adjustor nut (key 27) down until it clears the top of the valve plug stem (key 3).
    e. Shut off the air pressure and disconnect the separate air supply to the lower diaphragm casing (as shown in Figure 17 or 18).
2. For air-to-close constructions, as shown in Figure 19 or 20, remove the stem connector nut half (key 23), stem connector bolt half (key 24) and travel indicator (key 26).

⚠ WARNING

To avoid personal injury or property damage by uncontrolled movement of the actuator yoke (key 8), loosen the body/yoke nuts (Figures 17, 18, 19 and 20, key 7) or bonnet/yoke nuts (Figures 21 and 22, key 46) by following the instructions in the next step. Do not remove a stuck actuator yoke by pulling on it with equipment that can stretch or store energy in any other manner. The sudden release of stored energy can cause uncontrolled movement of the actuator yoke.

NOTE

The following step also provides additional assurance that the valve body fluid pressure has been relieved.

3. For standard bonnet constructions (Figures 17, 18, 19 and 20), body nuts (key 7) attach the actuator yoke (key 8) to the valve body (key 1). Loosen these nuts approximately 3 mm / 1/8 in.

   For extension and bellows bonnet constructions, bonnet nuts (key 46) attach the actuator yoke (key 8) to the extension bonnet (key 39). Loosen these nuts approximately 3 mm / 1/8 in.

4. Then loosen the valve-to-yoke gasketed joint by either rocking the actuator yoke or prying between the valve and actuator yoke. Work the prying tool around the actuator yoke until it loosens.

⚠ WARNING

If there is evidence of process fluid under pressure leaking from the joint, retighten the valve body/joint nuts and return to the Warning at the beginning of the Maintenance section to ensure proper steps have been taken to isolate the valve and relieve process pressure, thus avoiding property damage or personal injury.

5. If no fluid leaks from the joint, loosen the packing follower (key 29) two turns to relieve the packing compression load.
6. For standard bonnet constructions (Figures 17, 18, 19 and 20), remove the body nuts (key 7) completely. For extension and bellows bonnet constructions (Figures 21 and 22), remove the bonnet nuts (key 46) completely.

NOTICE

To avoid property damage, place the actuator yoke on a protective surface, as described in the following procedure.

7. Carefully lift off the actuator yoke and set it on a protective surface to prevent damage. For standard bonnet constructions, if the bonnet (key 4) together with the valve stem plug assembly has a tendency to lift with the actuator yoke, ensure it does not drop from the actuator. For extension and bellows constructions, ensure the bonnet (key 4) does not lift with the actuator yoke. For DN 150 balanced constructions, if the bonnet, guide sleeve or valve stem assembly have a tendency to lift with the actuator yoke, ensure they do not drop from the actuator.

NOTICE

For extension and bellows bonnet constructions, lifting the bonnet with the actuator yoke may cause possible damage to the valve plug and to the bellows.

8. Remove the stem adjustor nut (key 27) and locknut (key 28).
9. For standard bonnet constructions, remove the bonnet and the valve plug/stem assembly and set on a protective surface.

   For extension and bellows bonnet constructions, remove only the bonnet (key 4).

   For DN 150 balanced constructions, remove the guide sleeve, bonnet and valve plug stem assembly.

Table 7. Packing Follower Torque(1)

Valve Size	Packing Style	Torque N•m / lbf•ft	Packing Style	Torque N•m / lbf•ft
DN 15, 20, 25, 40 and 50	Fisher enhanced ENVIRO-SEAL PTFE	10 / 7.4	Fisher enhanced ENVIRO-SEAL ULF	35 / 26
DN 80 and 100		23 / 17		50 / 37
DN 150		36 / 26		68 / 50

1. Lubricate with anti-seize compound.

10. Remove the valve/yoke gasket (Figures 17, 18, 19 and 20 key 5, Figures 21 and 22 key 47) and cover the opening of the valve to protect the gasket surface and prevent foreign matter from getting into the valve cavity.
11. Remove the packing follower (key 29) from the bonnet (key 4).
12. Remove the Belleville spring pack (key 34) and packing spacer (key 30) from the bonnet (key 4). Carefully push out the remaining packing box parts from the bonnet (key 4) using a rounded rod or other tool which will not scratch the packing box wall. Clean the packing box and the metal packing box parts.

⚠ WARNING

Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing.

13. Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing. If the surface condition cannot be improved by light sanding, replace the damaged parts.
14. Remove the covering protecting the valve cavity and install a new valve/yoke gasket (Figures 17, 18, 19 and 20 key 5, Figures 21 and 22 key 47) making sure that the gasket seating surfaces are clean and smooth.

    For DN 150 balanced constructions, two gaskets are required; one between the valve body and guide sleeve and the other between the guide sleeve and bonnet. Ensure the gasket seating surfaces are clean and smooth for both gaskets.
15. Carefully install the bonnet (key 4) onto the valve stem.
16. Install the new packing and the metal packing box parts according to Figure 14 for Fisher enhanced ENVIRO-SEAL PTFE packing and according to Figure 15 for Fisher enhanced ENVIRO-SEAL graphite ULF packing. Place a smooth-edged pipe over the valve stem and gently tap each soft packing part into the packing box. Apply anti-seize lubricant to the threads and install the packing follower (key 29).
17. Install the locknut (key 28) and stem adjustor nut (key 27).
    For standard bonnet constructions, install the valve plug/bonnet sub assembly into the valve body (key 1).
18. Mount the actuator onto the valve and install the body nuts (Figures 17, 18, 19 and 20 key 7, Figures 21 and 22 key 46), but tighten them only finger-tight.
19. For air-to-open, connect a separate air supply to the lower diaphragm casing air supply connection (as shown in Figure 17 or 18) and apply sufficient air pressure to raise the actuator rod (key 22) to the travel stop. Proceed to the next step.

    For air-to-close, proceed to the next step.
20. For standard bonnet constructions, tighten the body nuts (key 7) evenly using a cross-tightening procedure. See Table 4 for torque requirements.

    For extension and bellows bonnet constructions, tighten the bonnet nuts (key 46) evenly using a cross-tightening procedure. See Table 5 for torque requirements.
21. Thread the stem lock adjustor (key 27) up until it is the rated travel distance specified in Table 3 from the actuator rod (key 22). Thread the locknut (key 28) up against the stem locknut and tighten to the torque specified in Table 6.
22. Stroke the actuator rod until it contacts the stem adjuster nut (key 27) and install the stem connector halves and travel indicator (keys 23, 24 and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
23. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
24. Tighten the stem connector cap screws (key 25) to 35 N•m / 26 lbf•ft.

Table 8. Seat Ring / Cage Torque Requirements[1]

VALVE SIZE		TORQUE	
DN	NPS	N•m	lbf•ft
15, 20, 25	1/2, 3/4, 1	170	124
40	1-1/2	320	234
50	2	460	337
80	3	1020	747
100	4	1520	1113
150	6	3400	2500
1. Lubricate with anti-seize compound.			

Table 9. Stem Extension Torque Requirements

VALVE SIZE		TORQUE	
DN	NPS	N•m	lbf•ft
15, 20, 25, 40, 50	1/2, 3/4, 1, 1-1/2, 2	40	30
80, 100	3, 4	120	89

Table 10. Bellows Nut Torque Requirements[1]

VALVE SIZE		TORQUE	
DN	NPS	N•m	lbf•ft
15, 20, 25, 40, 50	1/2, 3/4, 1, 1-1/2, 2	350	260
80, 100	3, 4	650	480
1. Lubricate with anti-seize compound.			

25. Tighten the packing follower (key 29) to the torque specified in Table 7.

    Alternately, the packing follower can be tightened by the following method:

    a. Tighten the packing follower until the Belleville springs are compressed 100% (or completely flat), as detected by a rapid increase in nut torque.

    b. For DN 15 through 100 / NPS 1/2 through 4, loosen the packing follower 60° of rotation.

       For DN 150 / NPS 6, loosen the packing follower 90° of rotation.

26. For air-to-open, release the actuator pressure.

27. For air-to-open, ensure the vent (key 21) is installed into the upper diaphragm casing (see Figure 17 or 18).

    For air-to-close, ensure the vent (key 21) is installed into the actuator yoke air supply connection (see Figure 19 or 20).

3.4 Replacing Packing (Electric Actuators)

This section provides instruction on replacing packing in standard bonnets, extension bonnets and bellows extension bonnets.

Isolate the control valve from the line pressure, release pressure from both sides of the valve body and drain the process media from both sides of the valve. Use lock-out procedures to ensure that the above measures stay in effect while you work on the equipment.

1. Stroke the actuator so the valve plug/stem (key 3) is at mid travel.
2. Remove the stem connector nut half (key 23), stem connector bolt half (key 24) and travel indicator (key 26).
3. Use precaution to ensure the actuator is locked in position and cannot stroke.
4. Mark the position of the locknut (key 28) on the stem for reassembly.
5. Push the valve plug/stem (key 3) down until it contacts the seat.
6. Loosen the locknut (key 28) and thread the stem adjustor nut (key 27) down until it clears the top of the valve plug stem (key 3).

⚠ WARNING

To avoid personal injury or property damage by uncontrolled movement of the actuator yoke (key 8), loosen the body/yoke nuts (Figures 17, 18, 19 and 20, key 7) or bonnet/yoke nuts (Figures 21 and 22, key 46) by following the instructions in the following step 7 below. Do not remove a stuck actuator yoke by pulling on it with equipment that can stretch or store energy in any other manner. The sudden release of stored energy can cause uncontrolled movement of the actuator yoke.

NOTE

The following step also provides additional assurance that the valve body fluid pressure has been relieved.

7. For standard bonnet constructions (Figures 17, 18, 19 and 20), body nuts (key 7) attach the actuator yoke (key 8) to the valve body (key 1). Loosen these nuts approximately 3 mm / 1/8 in.

   For extension and bellows bonnet constructions, bonnet nuts (key 46) attach the actuator yoke (key 8) to the extension bonnet (key 39). Loosen these nuts approximately 3 mm / 1/8 in.
8. Then loosen the valve-to-yoke gasketed joint by either rocking the actuator yoke or prying between the valve and actuator yoke. Work the prying tool around the actuator yoke until it loosens.

⚠ WARNING

If there is evidence of process fluid under pressure leaking from the joint, retighten the valve body/joint nuts and return to the Warning at the beginning of the Maintenance section to ensure proper steps have been taken to isolate the valve and relieve process pressure, thus avoiding property damage or personal injury.

9. If no fluid leaks from the joint, loosen the packing follower (key 29) two turns to relieve the packing compression load.
10. For standard bonnet constructions (Figures 17, 18, 19 and 20), remove the body nuts (key 7) completely.

    For extension and bellows bonnet constructions (Figures 21 and 22), remove the bonnet nuts (key 46) completely.

NOTICE

To avoid property damage, place the actuator yoke on a protective surface, as described in the following procedure.

11. Carefully lift off the actuator yoke and set it on a protective surface to prevent damage.

    For standard bonnet constructions, if the bonnet (key 4) together with the valve stem plug assembly has a tendency to lift with the actuator yoke, ensure it does not drop from the actuator.

    For extension and bellows constructions, ensure the bonnet (key 4) does not lift with the actuator yoke.

NOTICE

For extension and bellows bonnet constructions, lifting the bonnet with the actuator yoke may cause possible damage to the valve plug and to the bellows.

12. Remove the stem adjustor nut (key 27) and locknut (key 28).
13. For standard bonnet constructions, remove the bonnet and the valve plug/stem assembly and set on a protective surface.

    For extension and bellows bonnet constructions, remove only the bonnet (key 4).
14. Remove the valve/yoke gasket (Figures 17, 18, 19 and 20 key 5, Figures 21 and 22 key 47) and cover the opening of the valve to protect the gasket surface and prevent foreign matter from getting into the valve cavity.
15. Remove the packing follower (key 29) from the bonnet (key 4).
16. Remove the Belleville spring pack (key 34) and packing spacer (key 30) from the bonnet (key 4). Carefully push out the remaining packing box parts from the bonnet (key 4) using a rounded rod or other tool which will not scratch the packing box wall. Clean the packing box and the metal packing box parts.

Table 11. GX Electric Actuator Maximum Allowable Thrust

VALVE SIZE	STEM DIAMETER	TRAVEL	BONNET STYLE	STEM MATERIAL STRENGTH	MAXIMUM THRUST	
	mm	mm			N	lbf
DN 25 to 50 / NPS 1 to 2	10	20	Plain	High[1]	17,000	3820
				Low[2]	7600	1710
			Bellows/ Extension	High[1]	11,400	2560
				Low[2]	6700	1500
DN 80 to 100 / NPS 3 to 4	14	20, 40	Plain	High[1]	20,000	4500
				Low[2]	20,000	4500
			Bellows/ Extension	High[1]	20,000	4500
				Low[2]	14,500	3260

1. High strength stem materials consist of S200910, N05500 and S31603.
2. Low strength materials consist of S31803, N10675 and N06022.

⚠ WARNING

Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing.

17. Inspect the valve stem, threads and packing box surfaces for any sharp edges that might cut the packing. Scratches or burrs could cause packing box leakage or damage the new packing. If the surface condition cannot be improved by light sanding, replace the damaged parts.
18. Remove the covering protecting the valve cavity and install a new valve/yoke gasket (Figures 17, 18, 19 and 20 key 5, Figures 21 and 22 key 47) making sure that the gasket seating surfaces are clean and smooth.
19. Carefully install the bonnet (key 4) onto the valve stem.
20. Install the new packing and the metal packing box parts according to Figure 14 for Fisher enhanced ENVIRO-SEAL PTFE packing and according to Figure 15 for Fisher enhanced ENVIRO-SEAL graphite ULF packing. Place a smooth-edged pipe over the valve stem and gently tap each soft packing part into the packing box. Apply anti-seize lubricant to the threads and install the packing follower (key 29).
21. Install the locknut (key 28) and stem adjustor nut (key 27). Ensure they are aligned with the mark made on the stem disassembly and tighten.

    For standard bonnet constructions, install the valve plug/bonnet sub assembly into the valve body (key 1).
22. Mount the actuator onto the valve and install the body nuts (Figures 17, 18, 19 and 20 key 7, Figures 21 and 22 key 46), but tighten them only finger-tight.

23. For standard bonnet constructions, tighten the body nuts (key 7) evenly using a cross-tightening procedure. See Table 4 for torque requirements.

    For extension and bellows bonnet constructions, tighten the bonnet nuts (key 46) evenly using a cross-tightening procedure. See Table 5 for torque requirements.

24. Push the valve plug/stem to the valve seat. Thread the stem adjustor nut (key 27) and locknut (key 28) to the previously marked position. Thread the locknut (key 28) up against the stem locknut and tighten to the torque specified in Table 6.
25. Stroke the actuator rod until it contacts the stem adjuster nut (key 27) and install the stem connector halves and travel indicator (keys 23, 24 and 26) with the cap screws (key 25). Install the stem connector halves in the proper orientation so that when looking at the inside of the stem connector halves, the flats are down and the beveled surfaces are up.
26. Align the pointer of the travel indicator (key 26) with the appropriate mark on the travel scale.
27. Tighten the stem connector cap screws (key 25) to 35 N•m / 26 lbf•ft.
28. Tighten the packing follower (key 29) to the torque specified in Table 7.

    Alternately, the packing follower can be tightened by the following method:

    a. Tighten the packing follower until the Belleville springs are compressed 100% (or completely flat), as detected by a rapid increase in nut torque.

    b. For DN 15 through 100 / NPS 1/2 through 4, loosen the packing follower 60° of rotation.

NOTICE

Ensure that the electric actuator maximum thrust output does not exceed the values in Table 11. The up travel stop must be set in the electric actuator in order to prevent damage to the valve trim.

Valve Trim Maintenance

Key numbers in this section refer to Figures 17, 18, 19, 20, 21 and 22.

3.5 Valve Trim Disassembly

1. Remove the actuator and bonnet assembly as described in the Replacing Packing section (steps 1 through 10).
   - For standard bonnet constructions (Figures 17, 18, 19, 20 and 24), proceed to the Seat Ring / Cage Removal section.
   - For extension bonnet constructions (Figure 21), proceed to step 3.
   - For bellows bonnet constructions (Figure 22), proceed to step 2.

2. For bellows bonnet constructions (Figure 22), use a bellows nut tool made according to the dimensions in Figure 25 and Table 13 to remove the bellows nut (key 51) as follows:
   a. Insert the bellows nut tool into the extension bonnet (key 39). Be certain the tool lugs are engaged in the corresponding recesses in the bellows nut.
   b. Use a torque gun or driver having sufficient torque capabilities according to Table 10. Connect the gun to a socket that snugly fits the hex head on the bellows nut tool.
   c. Insert the socket onto the hex head of the bellows nut tool.

⚠ WARNING

Be careful to hold the torque gun, attached socket and tool at right angles to the bellows nut when applying torque. Tilting the gun and socket while applying torque may cause the lugs on the bellows nut tool to suddenly disengage from the lugs on the bellows nut thus causing possible damage to the bellows nut and possible personal injury.

   d. Remove the bellows nut (key 51).
3. For both extension and bellows bonnet constructions: Body nuts (key 7) attach the extension bonnet (key 39) to the valve body (key 1). Loosen these nuts approximately 3 mm / 1/8 in. Then loosen the extension bonnet-to-body gasketed joint by either rocking the extension bonnet or prying between the body and extension bonnet. Work the prying tool around the extension bonnet until it loosens.
4. Remove the body nuts (key 7) completely and carefully lift the extension bonnet (key 39) and valve plug/stem extension assembly (keys 3, 40 and 48) or plug/bellows/stem extension assembly (keys 3, 49 and 48) from the top of the valve body.
5. Use a wrench to unscrew the plug/stem assembly (key 3) from the stem extension (key 40) or from bellows/stem assembly (key 49) as follows:
   a. Insert the wrench onto the stem extension hex flats (see Figures 21 and 22).

NOTICE

In the following procedure, take precautions to ensure the valve plug and stem finish are not damaged.

   b. Clamp the plug/stem assembly (key 3) and holding it stable, unscrew the stem extension (key 40) or bellows/stem assembly (key 49). Take precautions to ensure the valve plug and stem finish are not damaged.

NOTE

There is a stem assembly locking insert (Figures 21 and 22, key 48) in the valve plug/stem extension assembly. It is possible this insert may drop out during stem disassembly. If this is the case, ensure it is retained for reassembly of the valve stem to the stem extension.

6. Remove the plug/stem assembly (key 3) and bellows/stem assembly (key 49) from the extension bonnet. Remove the bellows gasket (key 50).
7. Proceed to the seat ring removal section.

3.6 Seat Ring / Cage Removal

NOTICE

Use care to avoid damaging the gasket sealing surfaces.

The surface finish of the valve stem (key 3) is critical for making a good packing seal. The seating surfaces of the seat ring (key 2), cage (key 99) and the valve plug (key 3) are critical for tight shutoff and should therefore also be treated with care and properly protected.

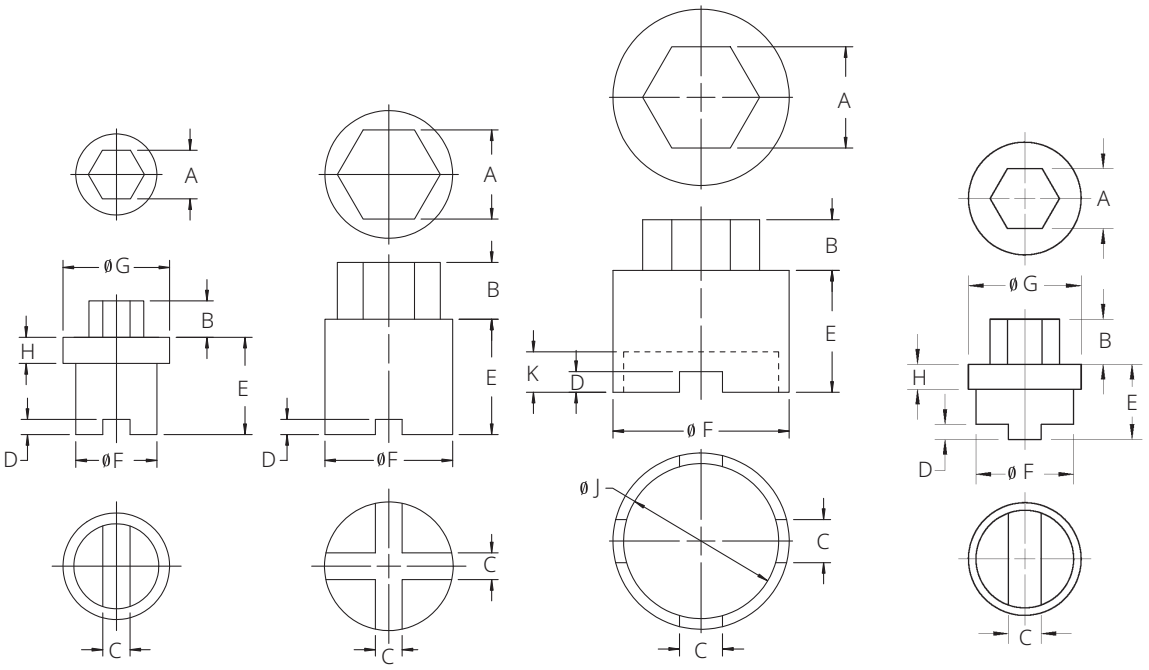
1. Packing parts can be removed from the bonnet if desired. Replace these parts as described in the section on Packing Maintenance.
2. Use a seat ring tool made according to the dimensions in Figure 4 and Table 12 to remove the seat ring (key 2) as follows:
   a. Insert the tool into the valve body. Be certain the tool lugs are engaged in the corresponding recesses in the seat ring.
   b. Use a torque gun or driver having sufficient torque capabilities according to Table 8. Connect the gun to a socket that snugly fits the hex head on the seat ring tool.
   c. Insert the socket onto the hex head of the seat ring tool.

⚠ WARNING

Be careful to hold the torque gun, attached socket and tool at right angles to the seat ring when applying torque. Tilting the gun and socket while applying torque may cause the lugs on the seat ring tool to suddenly disengage from the lugs on the seat ring thus causing possible damage to the seat ring and possible personal injury.

3. Remove the seat ring (key 2) from the valve body.
4. Inspect parts for wear or damage that would prevent proper operation of the valve body.
5. Replace trim parts as necessary.

Figure 4. Seat Ring Removal and Installation Tool



DN 15, 20, 25 / NPS 1/2, 3/4, 1

DN 40, 50, 80, 100 / NPS 1-1/2, 2, 3, 4

DN 150 / NPS 6

DN 25 Cav III / NPS 1

GE02918-6

GG01215

Table 12. Seat Ring Removal and Installation Tool Dimensions

VALVE SIZE		PART NUMBER	A	B	C	D	E	F☒	G☒	H	J☒	K
DN	NPS		mm									
15, 20, 25	1/2, 3/4, 1	GE02918X012	24	15	15.2	9	54	40	45	10	- - -	- - -
25 (Cavitrol III)	1 (Cavitrol III)	Not Available	24	18	13	6	30	39	45	10	- - -	- - -
40[1]	1-1/2[1]	GE02918X022	36	20	2 X 13.2	7.5	58	53	- - -	- - -	- - -	- - -
50[1]	2[1]	GE02918X032	46	28	2 X 13.2	7.5	63	63	- - -	- - -	- - -	- - -
80	3	GE02918X042	60	36	2 X 15.2	8.5	100	93	- - -	- - -	- - -	- - -
100	4	GE02918X052	70	44	2 X 17.2	9.5	114	113	- - -	- - -	- - -	- - -
150	6	GE02918X062	100	50	2 X 43	10.5	170.5	174	- - -	- - -	153	20

1. Also used for Cavitrol III cage removal.

3.7 Valve Trim Assembly

Assembly of Unbalanced Trim

Refer to Figures 11, 17, 18, 19, 20, 21, 22 and 24.

1. Before installing the new seat ring / cage, thoroughly clean the threads in the valve body port. Apply suitable lubricant to the threads and to the 60° surface of the new seat ring (key 4). Screw the seat ring into the valve body. Using the seat ring tool, tighten the seat ring and torque according to the values in Table 8. Remove all excess lubricant after tightening.
2. For standard bonnet constructions, perform the following. (Proceed to step 3 for extension and bellows bonnets.)
    a. Clean the body/yoke gasket seating surfaces and install a new body/yoke gasket (key 5).
    b. Remove any protective tape or covering from the valve plug/stem assembly.
    c. Insert the valve plug/stem assembly into the seat ring.

NOTICE

If the packing is to be reused and was not removed from the bonnet, perform the following step carefully to avoid damaging the packing with the stem threads.

    d. Install bonnet and actuator yoke onto the valve body by completing the assembly according to steps 15 to 27 of the section Replacing Packing, omitting step 16 if new packing is not being installed.
3. For extension and bellows bonnet constructions, perform the following.
    a. For bellows bonnet constructions, clean the extension bonnet/bellows gasket seating surfaces and install a new bellows gasket (key 50).
    b. Remove any protective tape or covering from the valve plug/stem assembly (key 3). Then insert the plug/stem assembly (key 3) through the extension bonnet bushing (key 41).
    c. Remove any protective tape or covering from the stem extension (key 40) or the bellows stem assembly (key 49). Screw the plug/stem assembly (key 3) into the stem extension or bellows/stem assembly. Note: Do not apply lubricant to the threads of the plug/stem assembly (key 3) or the bellows/stem assembly (key 49).

NOTE

Ensure the stem assembly locking insert (Figures 21 and 22, key 48) has been first inserted in the bottom of the threaded hole in the stem extension.

NOTICE

In the following procedure, take precautions to ensure the valve plug and stem finish are not damaged.

d. Clamp the plug/stem assembly (key 3) and hold it stable. Using a box spanner tool tighten the plug/stem assembly (key 3) into the stem extension (key 40) or into the bellows/stem assembly (key 49) according to the stem extension torque requirements listed in Table 9. Take precautions to ensure the valve plug and stem finish are not damaged.

e. For bellows bonnet constructions, if using a N10276/PTFE bellows gasket install PTFE washer (key 120) on top of the bellows flange. Apply suitable lubricant to the threads and to the bottom surface of the bellows nut (key 51). Screw the bellows nut into the extension bonnet. Using the bellows nut tool, a lathe or boring mill, tighten the bellows nut or torque according to the values in Table 10. Remove all excess lubricant.

f. Clean the body/extension bonnet seating gasket surface and install the gasket (key 5).

g. Install the extension bonnet and plug/stem assembly onto the valve body. Install the body/yoke nuts (key 7) and tighten evenly using a cross-tightening procedure. See Table 4 for torque requirements.

NOTICE

If the packing is to be reused and was not removed from the bonnet, perform the following step carefully to avoid damaging the packing with the stem threads.

h. Install the bonnet and actuator yoke onto the extension bonnet by completing the assembly according to steps 15 to 27 of the section Replacing Packing, omitting step 16 if new packing is not being installed.

Assembly of Balanced Trim

(Available in DN 80, 100 and 150 / NPS 3, 4 and 6 only.)

Refer to Figure 9.

NOTICE

To protect the valve plug seal ring (key 37) and to ensure it seals properly, be careful not to scratch the surfaces of the ring groove in the valve plug or any of the surfaces of the replacement ring.

1. With the valve plug (key 3) removed according to the Disassembly portion of the Valve Trim Maintenance procedure, proceed as appropriate:

   The seal ring (key 37) cannot be reused because it is a closed ring which must be pried and/or cut from the groove. Once the seal ring is removed, the elastomeric backup ring (key 38), which is also a closed ring, can be pried from the groove.

   To install a new backup ring and seal ring onto the valve plug, apply a general purpose silicone-base lubricant to both rings (keys 38 and 37). Place the backup ring over the valve plug (key 3) and into the groove. Place the seal ring over the top edge of the valve plug (key 3) so that it enters the groove on one side of the valve plug. Slowly and gently stretch the seal ring and work it over the top edge of the valve plug. The PTFE material in the seal ring must be permitted time to cold-flow during the stretching procedure, so avoid jerking sharply on this ring. Stretching the seal ring over the valve plug may make it seem unduly loose when in the groove, but it will contract to its original size after insertion into the bonnet.
2. Install the seat ring, valve plug/stem, bonnet and actuator yoke into the valve body by completing the assembly according to steps 1 to 3 of the section Assembly of Unbalanced Trim.

3.8 Repair Nameplate

If required by the end-user, an optional repair nameplate is available for recording changes made to the valve trim during maintenance (see Figure 28). This nameplate can be ordered as a spare part and is easily mounted to the actuator casing using a casing bolt. (Reference the Parts Ordering section of this manual.)

As shown in Figure 28, the repair nameplate provides locations for maintenance personnel to record trim data, such as:

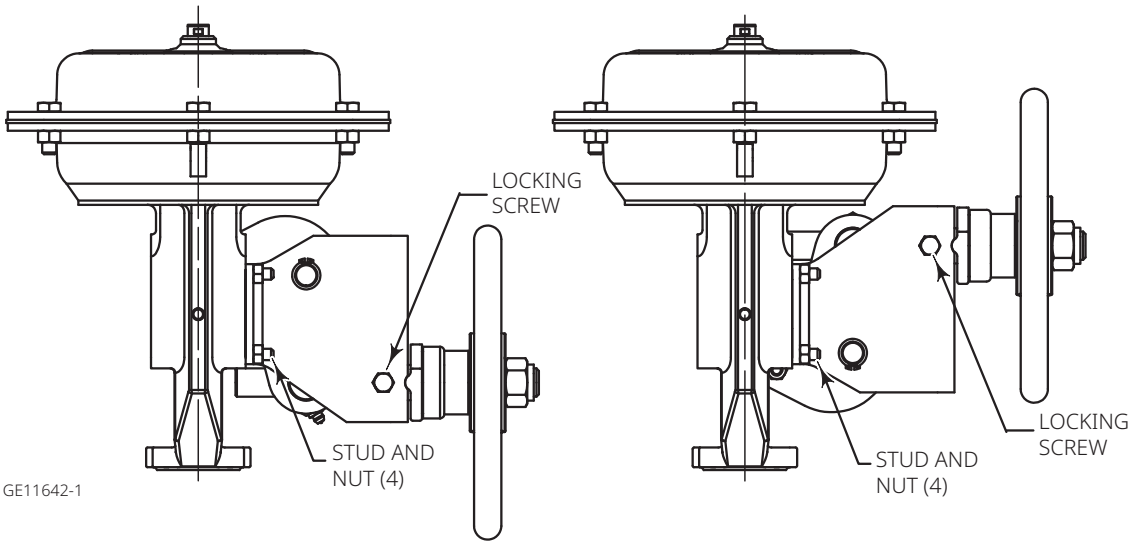
- Date of maintenance
- Trim material
- Port diameter
- Flow capacity (C_V / K_V)
- Flow characteristic
- Actuator Action ATO/ATC

Bellows Maintenance

This section provides instruction on the replacement of the bellows / stem assembly (see key 49 in Figure 22).

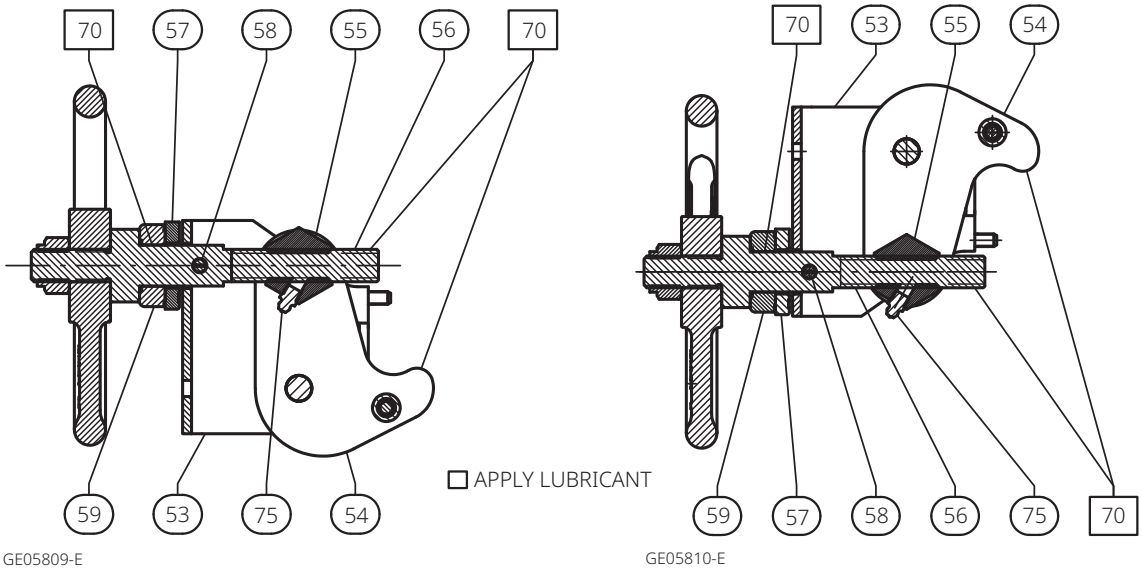
1. Remove the actuator, bonnet assembly as described in the Replacing Packing section (steps 1 through 10).
2. Remove the plug/stem assemblies as described in the Valve Trim Disassembly section (steps 2 through 6).
3. To install the new bellows / stem assembly (key 49), perform the Valve Trim Assembly (step 3).

Figure 5. Fisher GX Handwheel Assembly



AIR-TO-CLOSE, SPRING-TO-OPEN **AIR-TO-OPEN, SPRING-TO-CLOSE**

Figure 6. Fisher GX Handwheel Orientation and Grease Zerk Location



AIR-TO-OPEN, SPRING-TO-CLOSE **AIR-TO-CLOSE, SPRING-TO-OPEN**

Section 4: Handwheel Operation

NOTICE

This handwheel is designed only for use with Sizes 225 and 750 actuators with 20 mm travel. To avoid equipment damage, do not assemble this handwheel on Size 750 actuators with 40 mm travel or Size 1200 actuators.

4.1 Principle of Operation

The GX handwheel is designed to compress the actuator springs and override the actuator fail action. Turning the handwheel drives the screw, nut and levers. The levers push against the stem connector to transfer this motion. Reversing the direction of the handwheel will move the nut and levers in the opposite direction. Once the levers are no longer in contact with the stem connector, the locking screw should be used to secure the handwheel against undesired movement. To prevent damage due to overtravel, the handwheel should not be turned more than 2 full turns past the point at which the levers no longer contact the stem connector.

⚠ WARNING

To avoid personal injury or loss of process control due to equipment damage, ensure the levers are completely disengaged and the locking screw is tight while the valve is in normal pneumatic operation.

During normal pneumatic operation when the handwheel is not needed, a locking screw (see Figure 5) is provided on the side of the handwheel housing to lock the handwheel levers out of the way.

⚠ WARNING

To avoid personal injury or equipment damage due to possible sudden shifting or falling of the valve assembly, do not lift the valve assembly by the handwheel.

4.2 GX Handwheel Installation (for use with 20 mm travel only)

1. Note the orientation of the levers to the stem connector for either the air-to-close, spring-to-open configuration or for the air-to-open, spring-to-close configuration, as shown in Figure 6.
2. Adjust the handwheel to allow positioning the levers above the stem connector before installation.
3. Install the handwheel to the GX mounting pad with four studs and nuts, as shown in Figure 5. Torque to 24 N•m / 18 lbf•ft.
4. Apply lithium grease to the grease zerk and to the tip of the levers (where they contact the stem connector), as shown in Figure 6.

Section 5: Travel Stop Operation

5.1 Principle of Operation

NOTICE

This travel stop is designed only for use with Sizes 225 and 750 actuators with 20 mm travel. To avoid equipment damage, do not assemble this travel stop on Size 750 actuators with 40 mm travel or Size 1200 actuators.

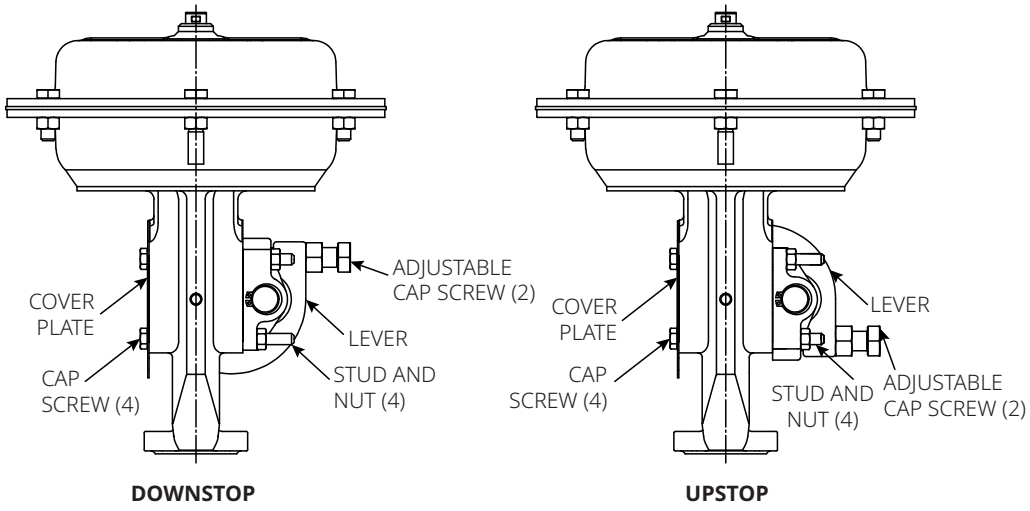
The GX travel stop is designed to mechanically limit and stop the valve at a preset position in an emergency or upon loss of instrument air. This assembly is mounted on the yoke with four studs. The lever pushes against the stem connector to stop the travel. Travel position can be adjusted by two adjustable cap screws on the lever, as shown in Figure 7. A cover plate assembly is available to prevent pinch point damage caused by the lever, as shown in Figure 7.

WARNING

To avoid personal injury or equipment damage due to possible sudden shifting or falling of the valve assembly, do not lift the valve assembly by the travel stop.

To avoid personal injury or loss of process control due to equipment damage, screw the adjustable cap screws to ensure the lever is completely disengaged while the valve is in normal pneumatic operation.

Figure 7. Fisher GX Travel Stop Assembly



5.2 GX Travel Stop Installation

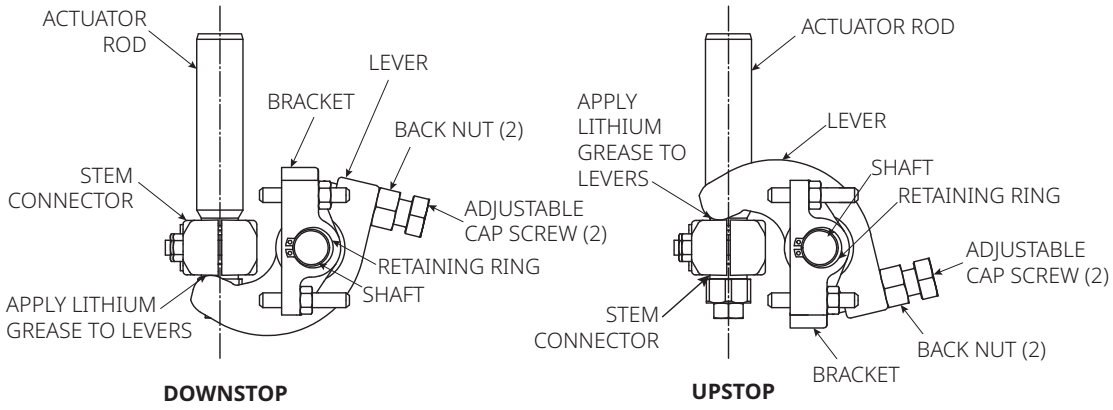
Downstop

1. Note the orientation of the lever to the stem connector for downstop positioning, as shown in Figure 8. Adjust the travel stop to allow positioning the lever below the stem connector before installation.
2. Install the travel stop to the GX mounting pad with four studs and nuts, as shown in Figure 7. Torque to 24.5 N•m / 18 lbf•ft.
3. Apply lithium grease to the tip of the lever (where it contacts the stem connector) and to the two adjustable cap screws, as shown in Figure 8.

Upstop

1. Note the orientation of the lever to the stem connector for upstop positioning, as shown in Figure 8. Adjust the travel stop to allow positioning the lever above the stem connector before installation.
2. Install the travel stop to the GX mounting pad with four studs and nuts, as shown in Figure 7. Torque to 24.5 N•m / 18 lbf•ft.
3. Apply lithium grease to the tip of the lever (where it contacts the stem connector) and to the two adjustable cap screws, as shown in Figure 8.

Figure 8. Fisher GX Travel Stop Orientation



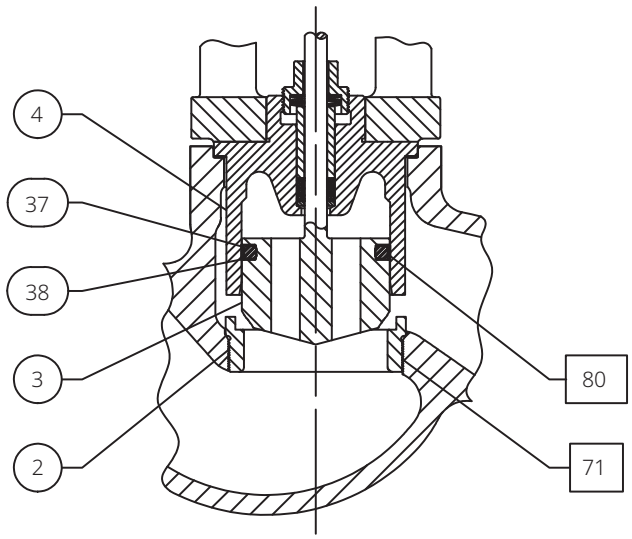
5.3 Setting the Travel Stop Position

After sending the required position air signal to the actuator, screw the adjustable cap screws to assure the lever contacts with the stem connector tightly, then tighten the back nut. Check the actual stem position when giving the 100% air signal.

Standard Accuracy for the travel stop position is +/- 10% for 20 mm travel. For added precision, use the following procedure.

1. Send the desired position air signal to the actuator.
2. Set the travel stop, screw the adjustable cap screws to assure the lever contacts with the stem connector tightly, then tighten the back nut.
3. Send a 100% air signal.
4. Measure the difference between the actual stem position and the desired position.
5. Send the air signal for the desired position minus the differential position measured in step 4.
6. Reset the travel stop by adjusting the two cap screws and then tighten the back nut.

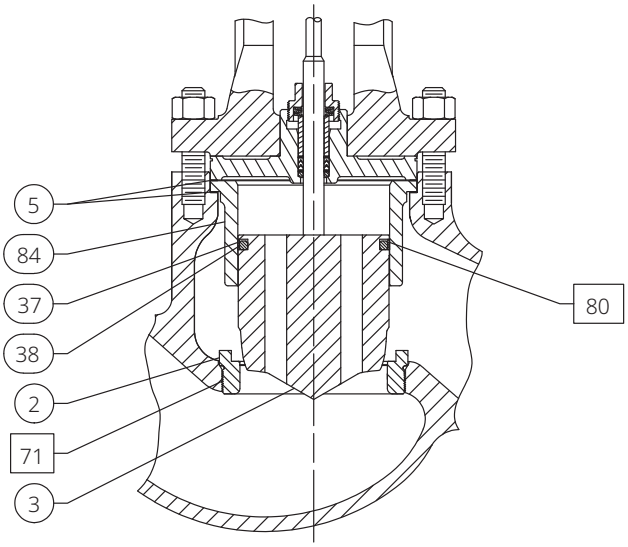
Figure 9. Fisher GX Balanced Trim (Standard for DN 80 and 100 / NPS 3 and 4)



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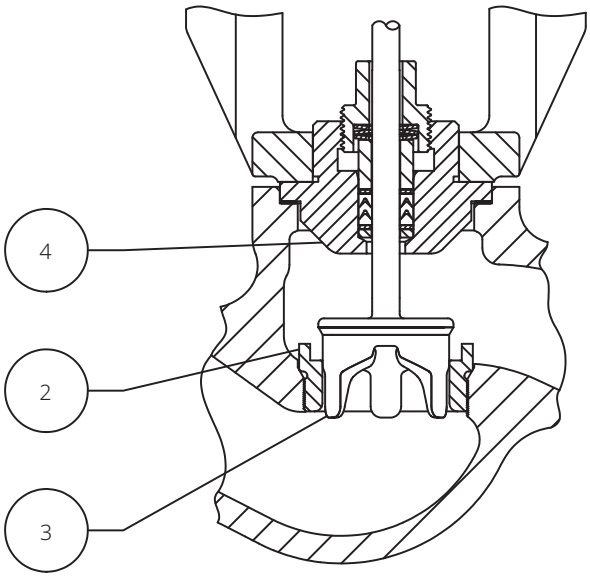
Figure 10. Fisher GX Balanced Trim (DN 150 / NPS 6)



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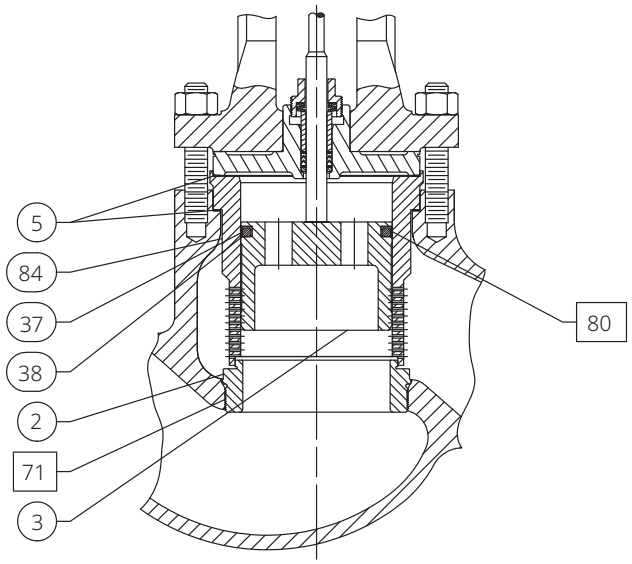
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Figure 11. Fisher GX Unbalanced Port-Guided Trim (DN 40 to 150 / NPS 1-1/2 to 6)



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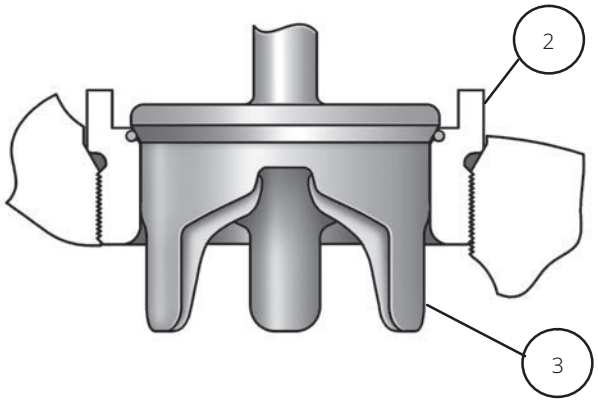
Figure 12. Fisher GX with Fisher Whisper Trim™ III (DN 150 / NPS 6)



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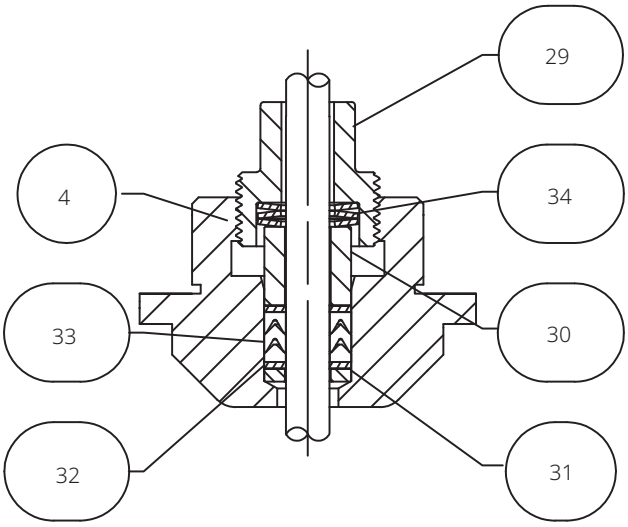
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Figure 13. Fisher GX Control Valve with Typical Soft Seat Trim Construction (Port Sizes of 36 to 136 mm)



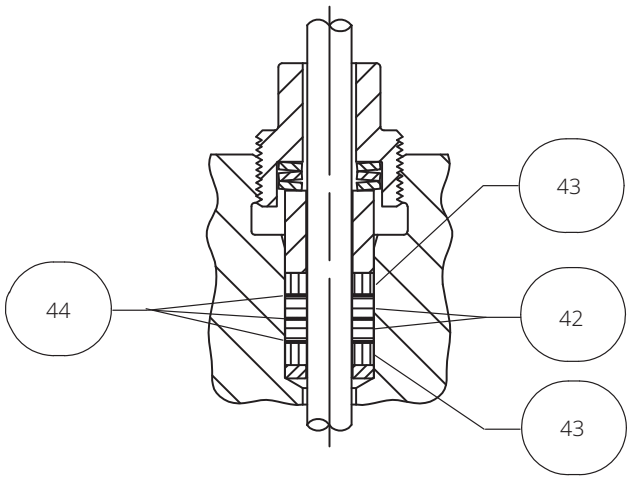
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Figure 14. Fisher GX with Fisher enhanced ENVIRO-SEAL PTFE Packing DN 5 through 150 / NPS 1/2 through 6



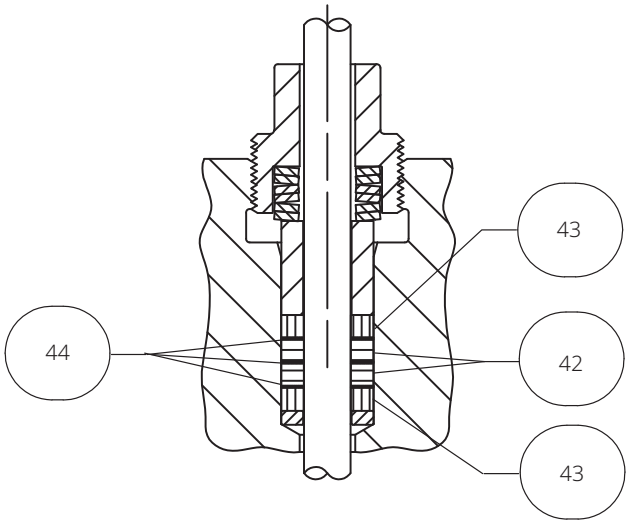
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Figure 15. Fisher GX with Fisher enhanced ENVIRO-SEAL Graphite ULF Packing DN 15 through 100 / NPS 1/2 through 4



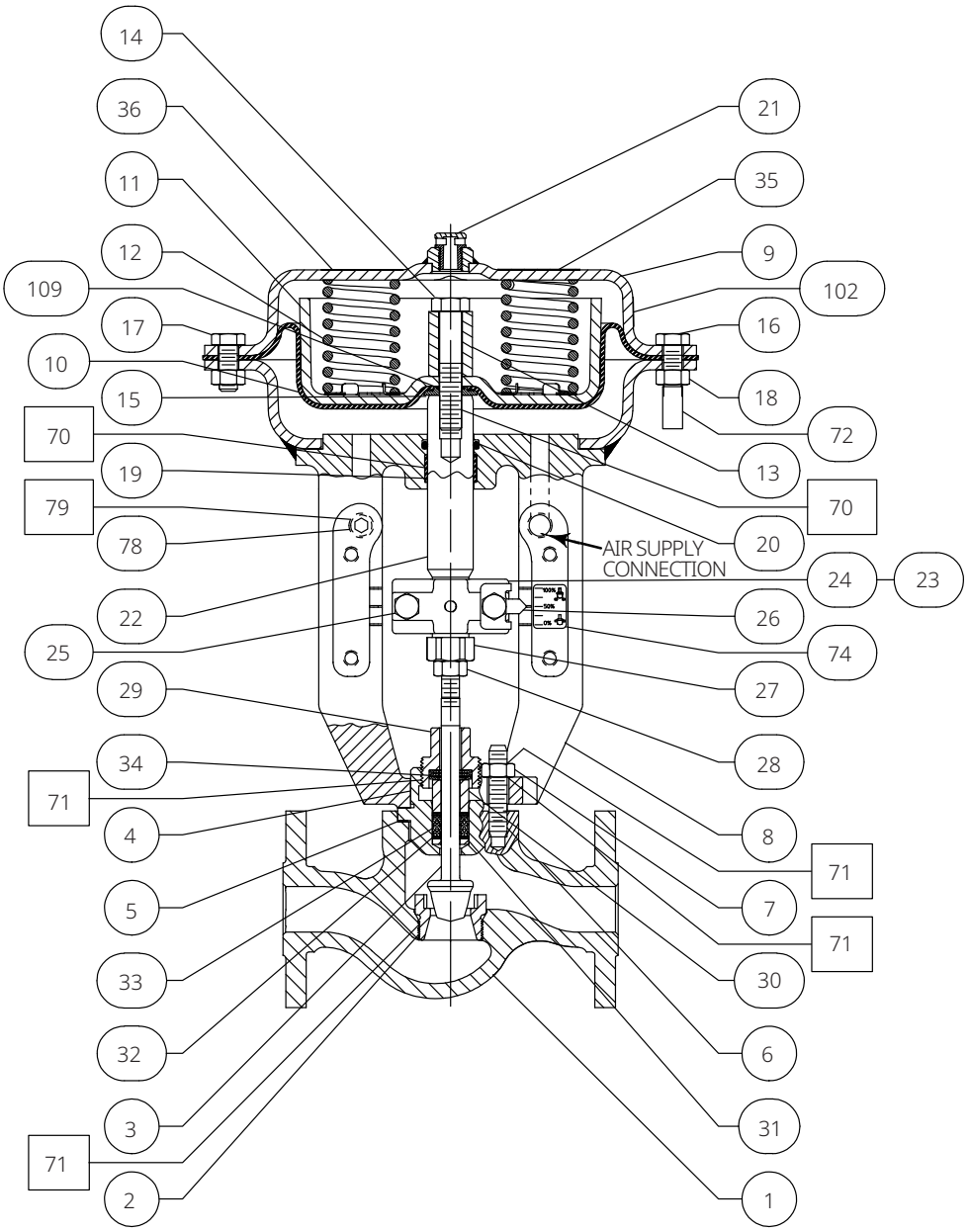
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Figure 16. Fisher GX with Fisher enhanced ENVIRO-SEAL Graphite ULF Packing DN 150 Only / NPS 6 Only



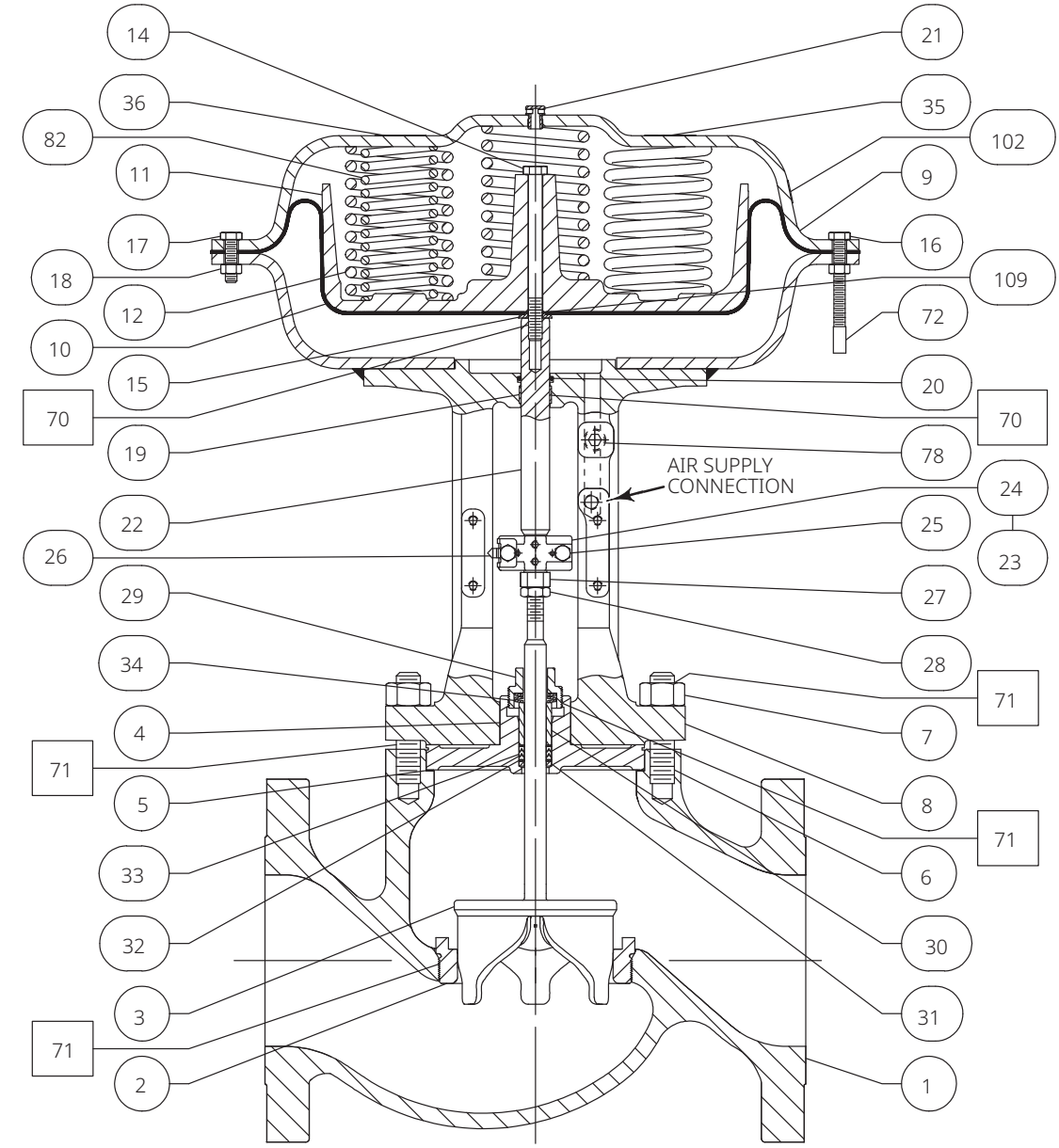
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Figure 17. Fisher GX Control Valve and Actuator System Assembly, Air-to-Open (Spring-to-Close) (DN 25 / NPS 1 with Unbalanced Contoured Plug)



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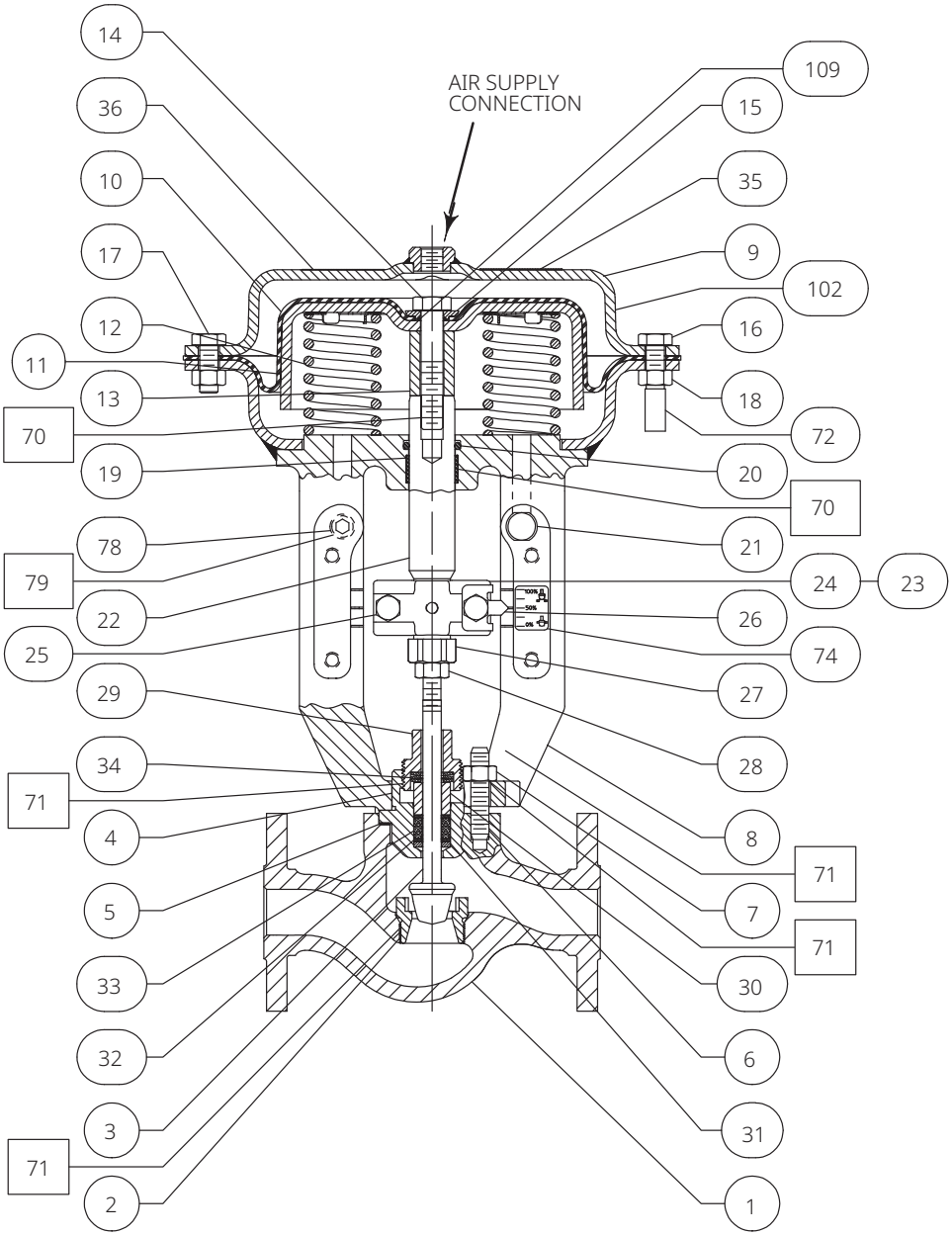
Figure 18. Fisher GX Control Valve and Actuator System Assembly, Air-to-Open (Spring-to-Close) (DN 150 / NPS 6 with Unbalanced Contoured Plug)



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Figure 19. Fisher GX Control Valve and Actuator System Assembly, Air-to-Close (Spring-to-Open) (DN 25 / NPS 1 with Unbalanced Contoured Plug)



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Figure 20. Fisher GX Control Valve and Actuator System Assembly, Air-to-Close (Spring-to-Open) (DN 150 / NPS 6 with Unbalanced Contoured Plug)

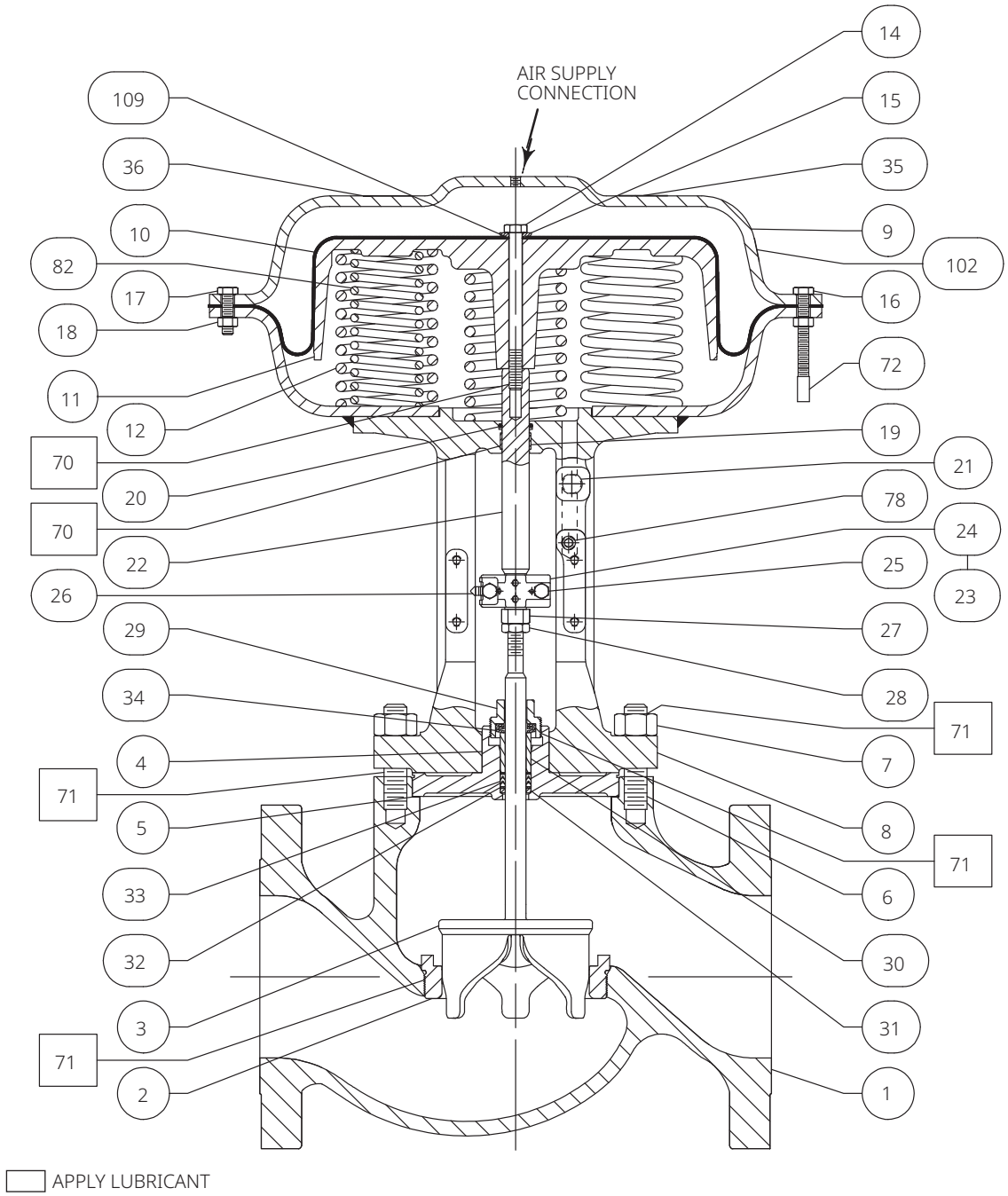
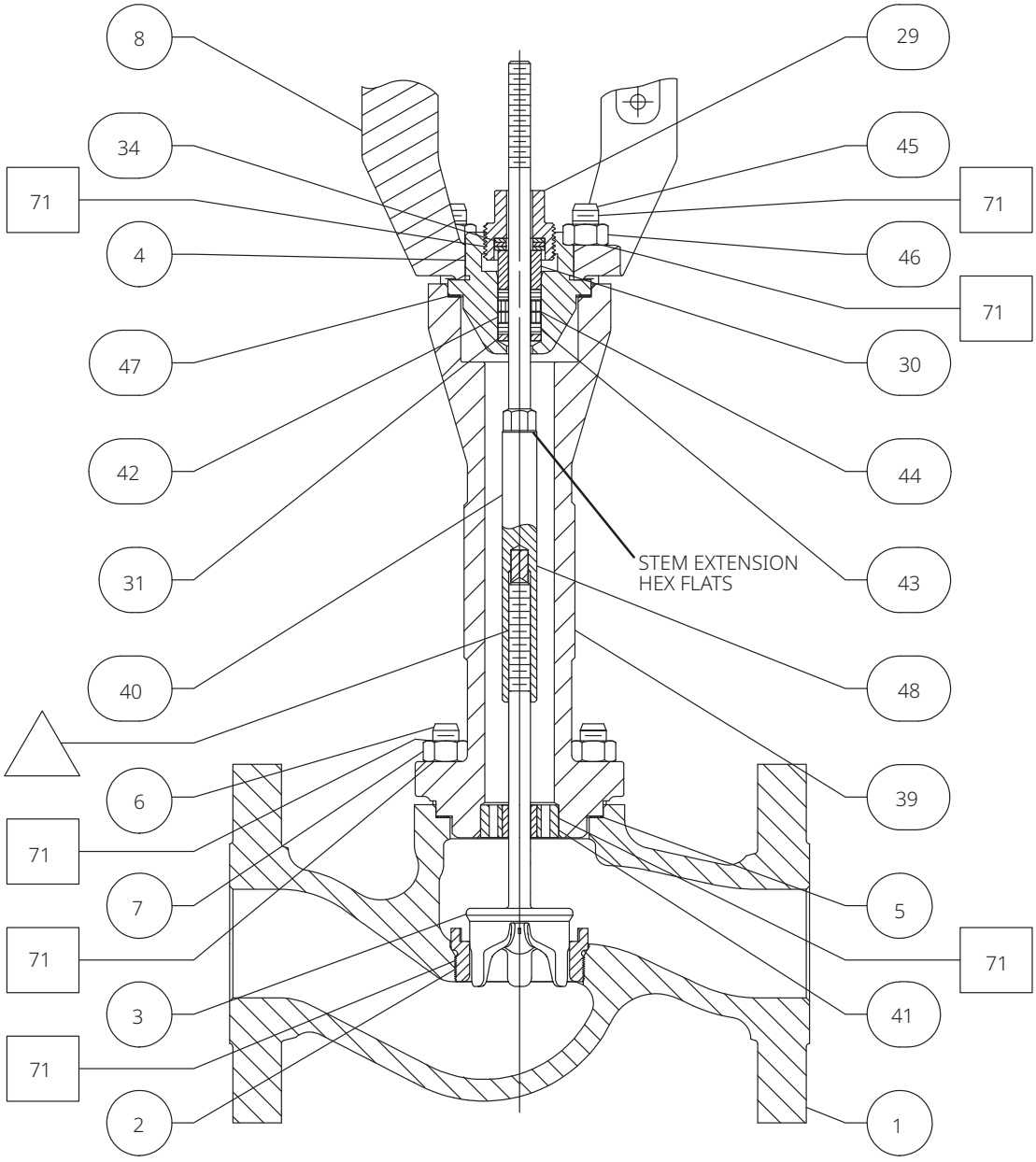
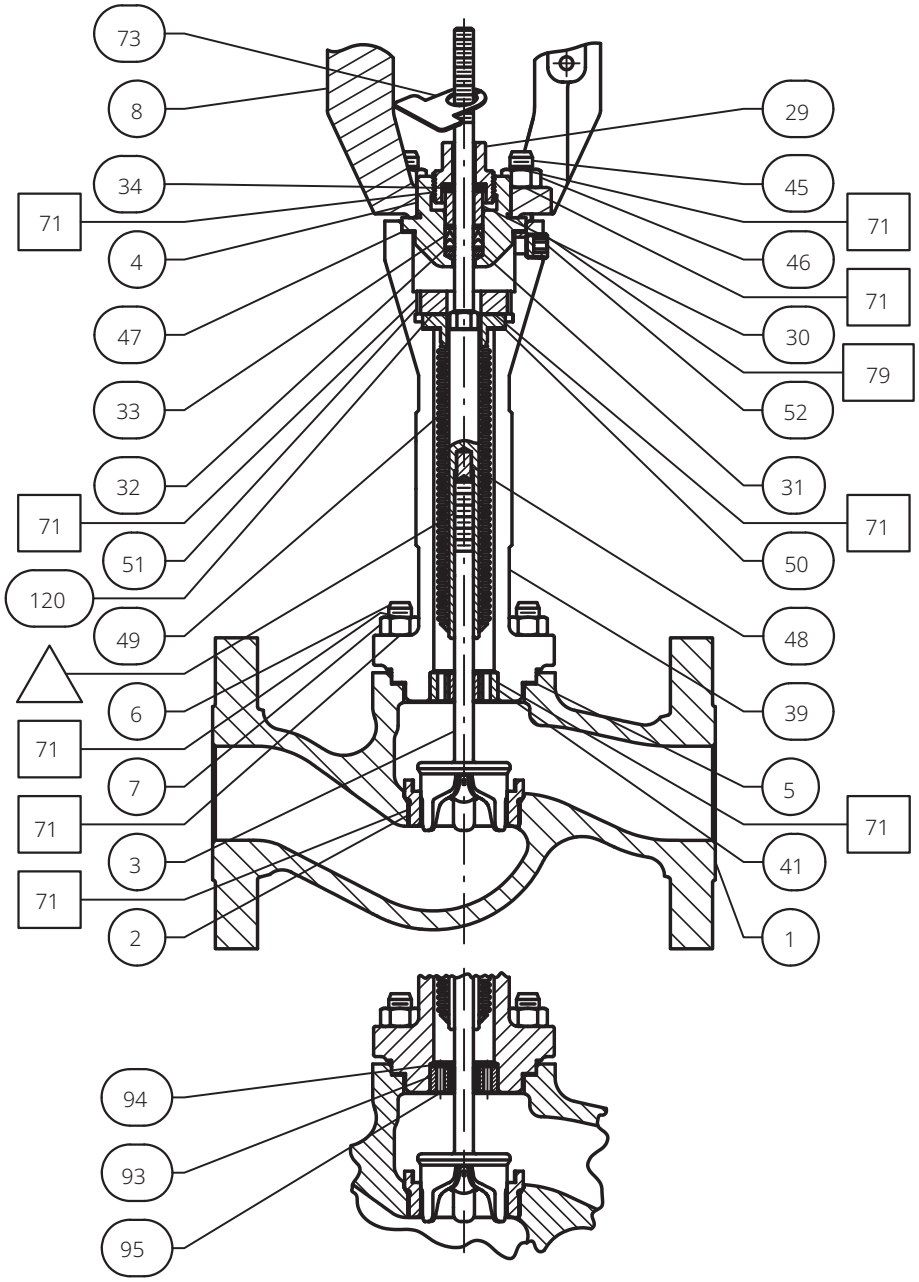


Figure 21. Extension Bonnet with Fisher enhanced ENVIRO-SEAL Graphite ULF Packing



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Figure 22. Bellows Extension Bonnet with Fisher enhanced ENVIRO-SEAL PTFE Packing

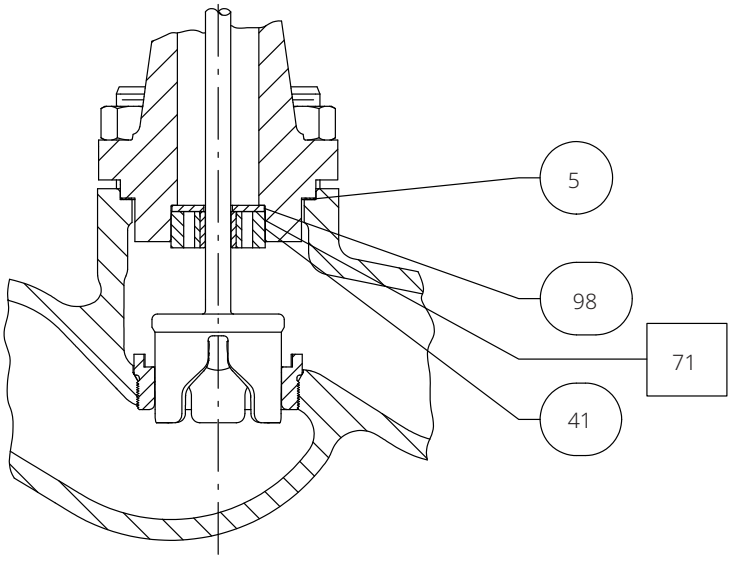


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DO NOT APPLY LUBRICANT

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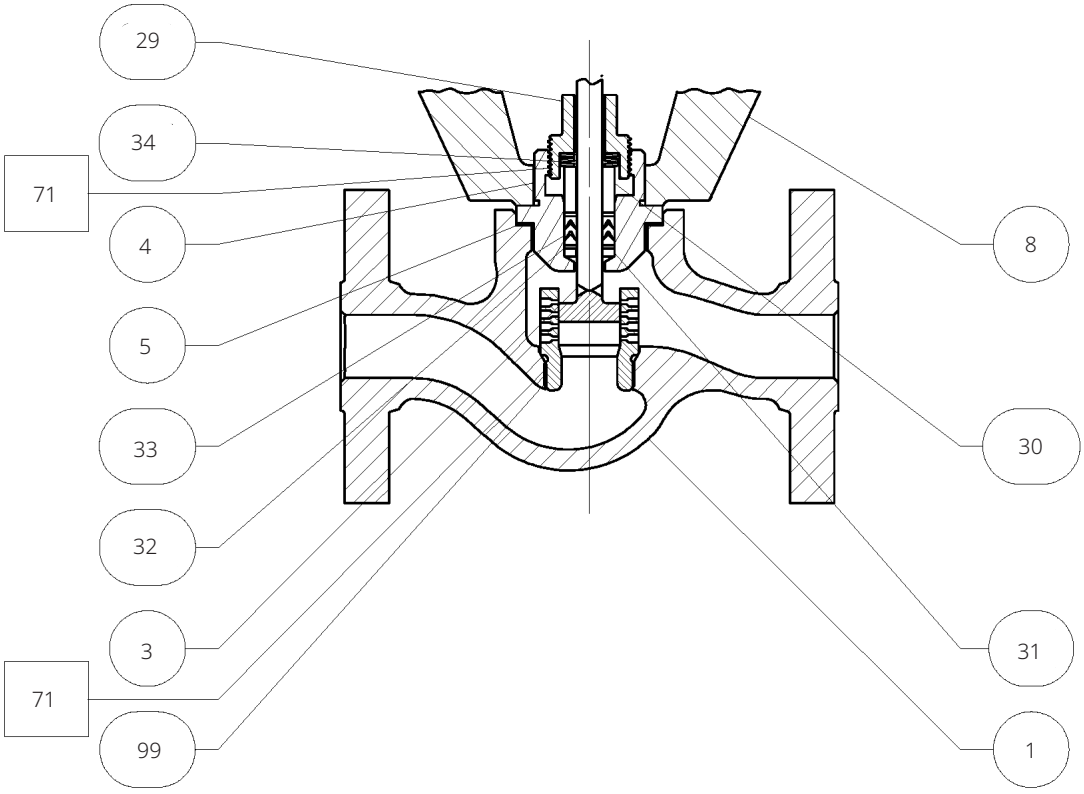
Figure 23. Cryogenic Extension Bonnet



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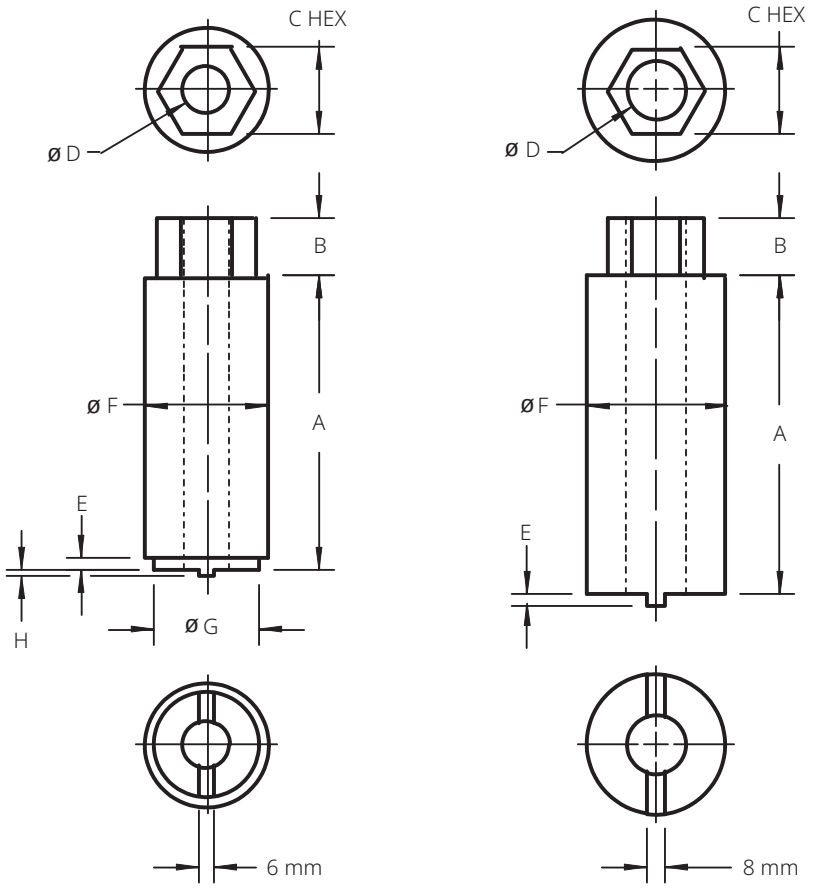
Figure 24. Fisher Cavitrol III Trim, DN 25, 40 and 50 / NPS 1, 1-1/2 and 2



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Figure 25. Bellows Nut Removal and Installation Tool



DN 15, 20, 25, 40 and 50 / NPS 1/2, 3/4, 1, 1-1/2 and 2

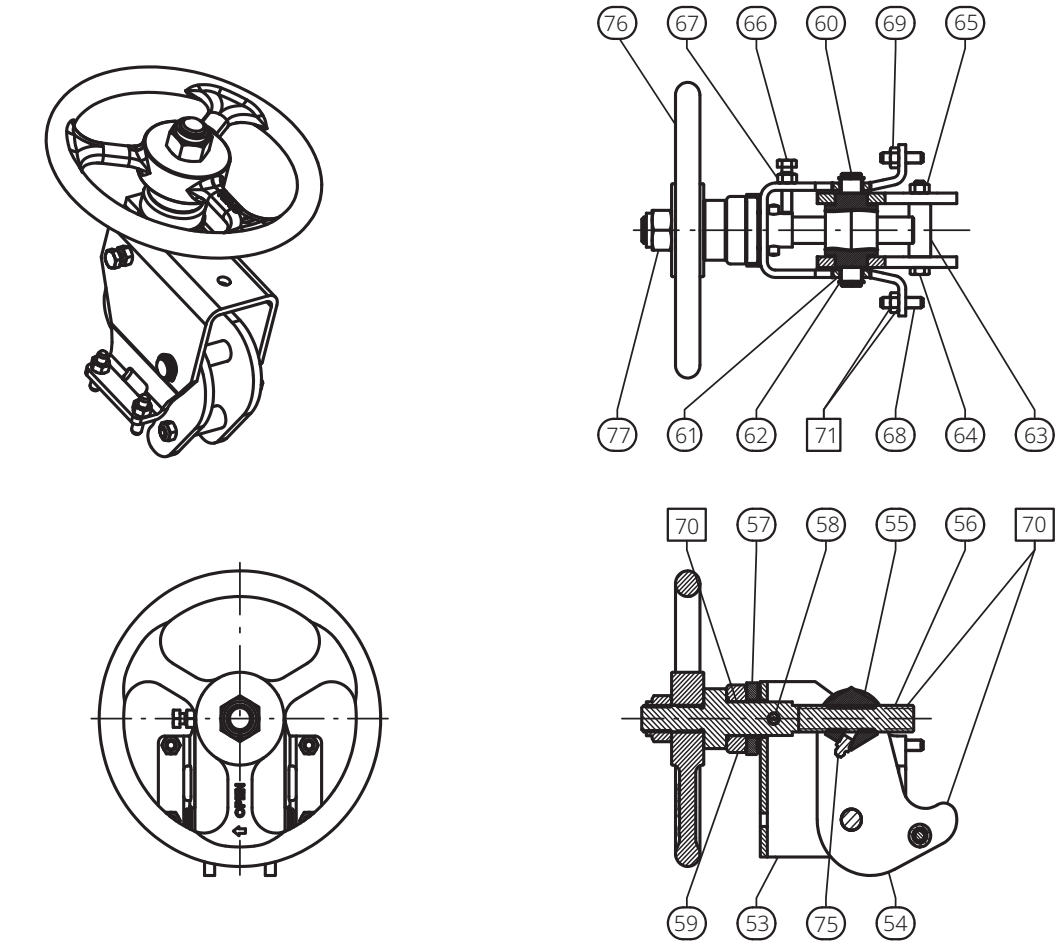
DN 80 and 100 / NPS 3 and 4

GF00536_3

Table 13. Bellows Nut Removal and Installation Tool Dimensions

VALVE SIZE		A	B	C	D	E	F☒	G☒	H
DN	NPS	mm							
15, 20, 25, 40, 50	1/2, 3/4, 1, 1-1/2, 2	125	25	36	20	5	53	45	3
80, 100	3, 4	135	25	1.42	25	5	60	- - -	- - -

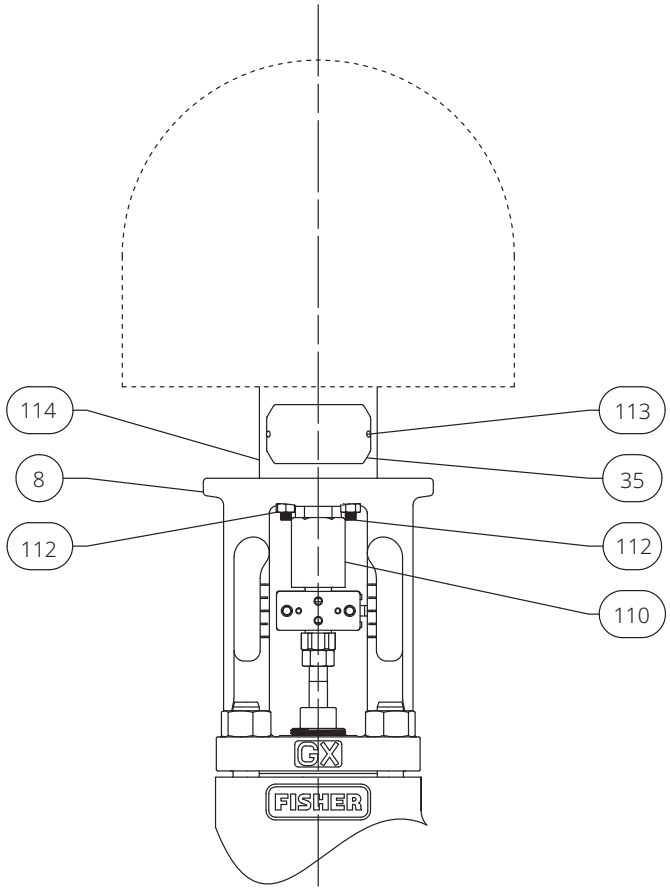
Figure 26. Handwheel Assembly



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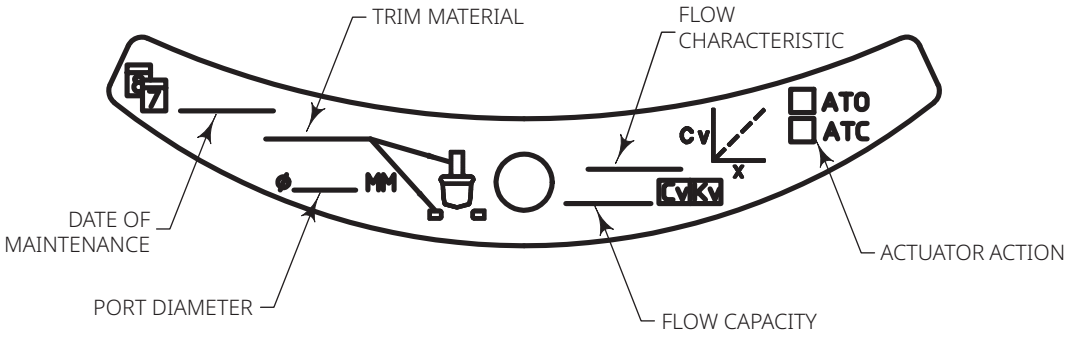
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Figure 27. Fisher GX Electric Actuator Mounting



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Figure 28. Repair Nameplate (Spaces Provided for Recording Trim Maintenance Data)



GE11233-B

Section 6: Parts

6.1 Parts Ordering

Each valve is assigned a serial number which can be found on the valve or on the nameplate (Figure 2 and key 35, not shown). The nameplate will normally be fitted to the actuator. Refer to this serial number when contacting your Emerson sales office for technical assistance. When ordering replacement parts refer to this serial number and give the part description from the following parts list.

⚠ WARNING

Use only genuine Fisher replacement parts. Components that are not supplied by Emerson Automation Solutions 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.

6.2 Parts Kits

Table 14. Packing Kits

VALVE SIZE	DN 15 TO 50 / NPS 1/2 to 2	DN 80 AND 100 / NPS 3 and 4	DN 150 / NPS 6
Stem Diameter	**10 mm**	**14 mm**	**19 mm**
Fisher enhanced ENVIRO-SEAL PTFE packing (Contains keys 32 and 33)	RGXPACKX012	RGXPACKX022	RGXPACKX072
Fisher enhanced ENVIRO-SEAL Graphite ULF packing (Contains keys 42, 43 and 44)	RGXPACKX052	RGXPACKX042	RGXPACKX082

Table 15. Actuator Kits

Actuator Size	225	750	1200
Actuator (Contains keys 10, 15, 19, 109 and 20)	RGX225X0022	RGX750X0032	RGX1200X042

Table 16. Balanced Seal Kits(1)

Valve Size	DN 80 / NPS 3	DN 100 / NPS 4	DN 150 / NPS 6
Nitrile (Contains keys 37 and 38)	RGXSEALX012	RGXSEALX022	RGXSEALX072
Ethylene Propylene (EPDM) (Contains keys 37 and 38)	RGXSEALX032	RGXSEALX042	RGXSEALX082
Fluorocarbon (FKM) (Contains keys 37 and 38)	RGXSEALX052	RGXSEALX062	RGXSEALX092
1. A Gasket Kit is required when replacing the seals.			

Table 17. Gasket Kits

Valve Size	DN 15 to 25 / NPS 1/2 to 1	DN 40 / NPS 1-1/2	DN 50 / NPS 2	DN 80 / NPS 3	DN 100 / NPS 4	DN 150 / NPS 6
Body / Bonnet Gasket Kit (Graphite Laminate) (Contains key 5)	GE00077X012	GE00078X012	GE00079X012	GE00080X012	GE00052X012	RGASKETXA62
Body / Bonnet Gasket and Extension Bonnet Gasket Kit (Graphite Laminate) (Contains keys 5 and 47)	RGASKETXA12	RGASKETXA22	RGASKETXA32	RGASKETXA42	RGASKETXA52	- - -
Body / Bonnet Gasket, Extension Bonnet Gasket and Bellows Gasket (Graphite Laminate) (Contains keys 5, 47 and 50)	RGASKETXB12	RGASKETXB22	RGASKETXB32	RGASKETXB42	RGASKETXB52	- - -

Table 18. Repair Nameplate

Description	DN 15 to 150 / NPS 1/2 to 6
18-8 stainless steel nameplate. Will mount to all GX actuator sizes using casing bolt. See Figure 28.	GE11233X012

6.3 Parts List

NOTE

Contact your Emerson sales office for part numbers.

Table 19. Parts List

Key	Description	Key	Description
1	Valve body	13	Actuator spacer
2*	Seat ring	14	Cap screw
2*	Cavitrol III cage	15	Washer(2)
3*	Valve plug/Stem	16	Cap screw, long Size 225 actuator (2 req'd) Size 750 actuator (2 req'd) Size 1200 actuator (4 req'd)
4	Bonnet		
5*	Body/Bonnet gasket, Graphite laminate(1)		
6	Body/Bonnet bolting (4 req'd)	17	Cap screw, short Size 225 actuator (4 req'd) Size 750 actuator (8 req'd) Size 1200 actuator (12 req'd)
7	Body/Bonnet nut (4 req'd)		
8	Actuator yoke		
9	Upper diaphragm casing	18	Hex nut Size 225 actuator (6 req'd) Size 750 actuator (10 req'd) Size 1200 actuator (16 req'd)
10*	Diaphragm(2)		
11	Diaphragm plate		
12	Actuator springs	19*	Actuator rod bushing(2)

*Recommended spare parts.
See Parts Kits.
1. See gasket kits table.
2. See actuator kits table.
3. See packing kits table.
4. See balanced seal kits table.

- continued -

Table 19. Parts List (continued)

Key	Description	Key	Description
20*	Actuator rod seal[2]	56	Drive screw
21	Vent cap	57	Pivot washer
22	Actuator rod	58	Grooved pin
23	Stem connector nut half	59	Bearing
24	Stem connector bolt half	60	Pivot pin
25	Cap screw (2 req'd)	61	Bushing
26	Travel indicator	62	Retainer ring
27	Stem adjustor nut	63	Spacer
28	Locknut	64	Cap screw
29	Packing follower	65	Hex nut
30	Packing spacer	66	Lock screw
31*	Packing box ring	67	Hex nut
32*	Anti-extrusion washer (2 req'd)[3]	68	Stud
33*	Fisher enhanced ENVIRO-SEAL PTFE packing set[3]	69	Hex nut
34	Belleville spring (3 req'd)	70	Lubricant, Lithium grease
35	Nameplate	71	Lubricant, Anti-seize
36	Warning tag	72	Cap plug
37*	Seal ring[4]	73	Warning tag
38*	Backup ring[4]	74	Travel indicator scale
39	Extension bonnet	75	Zerk fitting
40*	Stem extension	76	Handwheel
41*	Extension bonnet lower bushing	77	Locknut
42*	Graphite ULF packing ring (2 req'd)[3]	78	Pipe plug
43*	Packing ring (2 req'd)[3]	79	Anti-seize sealant
44*	Packing washer (3 req'd)[3]	80	Lubricant, Silicone sealant
45	Yoke/Extension bonnet bolting (4 req'd)	81	Pipe plug
46	Yoke/Extension bonnet nut (4 req'd)	82	Inner actuator spring
47*	Extension bonnet gasket[1]	84	Guide sleeve
48*	Insert (req'd for assembly of valve stem to extension stem)	84*	Fisher Whisper Trim III cage
		109*	O-ring[2]
49*	Bellows/Stem assembly	110	Rod adaptor
50*	Bellows gasket[1]	111	Stud
51	Bellows nut	112	Nut
52	Pipe plug	113	Drive screw
53	Handjack body	114	Electric actuator spacer
54	Lever	115	Lead seal and wire (not shown)
55	Operating nut	120	PTFE washer

*Recommended spare parts.
See Parts Kits.
1. See gasket kits table.
2. See actuator kits table.
3. See packing kits table.
4. See balanced seal kits table.

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