

Fisher™ IC2 Cryogenic Top-Entry Control Valve



Table of Contents

Section 1: Introduction

1.1 Scope of the Manual 1

1.2 Description 1

1.3 Education Services 3

Section 2: Installation 4

Section 3: Maintenance

3.1 Packing Maintenance..... 7

3.2 Tightening Procedures - Packing Nut 8

3.3 Other Considerations 8

3.4 Bonnet Maintenance 10

3.5 Trim Maintenance 13

3.6 Bellows Maintenance 17

Section 4: Parts

4.1 Parts Ordering 18

4.2 Parts Kits 18

4.3 Parts List 19

Section 1: Introduction

1.1 Scope of the Manual

This instruction manual includes installation, maintenance and parts information for Fisher IC2 valve (see Figure 1). Refer to separate manuals for instructions covering the actuator and accessories.

WARNING



Do not install, operate or maintain IC2 valves 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 IC2 is a globe and angle style, single-port, unbalanced valve with integral end connections, body guiding, metal-to-metal seating, quick-change trim and stainless steel and aluminum construction materials.

Figure 1. Typical Fisher IC2 Valve with Extension Bonnet



IC2 GLOBE



IC2 ANGLE STAINLESS STEEL



IC2 ANGLE ALUMINUM

Table 1. Specifications

Available Configurations	Material Temperature Capabilities ⁽¹⁾
Single-port, globe and angle style control valve with body guiding, unbalanced valve plug and push-down-to-close valve plug action	-198 to +149°C / -325 to +300°F -254 to +149°C / -425 to +300°F -269 to +149°C / -452 to +300°F ⁽³⁾
Valve Sizes	Flow Coefficients
NPS ■ 1, ■ 1-1/2, ■ 2, ■ 3, ■ 4 and ■ 6	See Catalog 12
End Connection Styles ⁽¹⁾	Port Diameters and Maximum Valve Plug Travels
Butt weld end consistent with ASME B16.25 and SWE consistent with ASME B16.11. For additional options, consult your Emerson sales office .	See Table 3. For additional options consult your Emerson sales office .
Maximum Inlet Pressures ⁽¹⁾	Packing Arrangements
Consistent with CL600 according to ASME B16.34 for maximum bellows pressure drop capabilities see Bellows section.	■ Enhanced ENVIRO-SEAL PTFE ■ Enhanced ENVIRO-SEAL Duplex ■ Enhanced ENVIRO-SEAL Graphite ULF ■ ENVIRO-SEAL IS (ISO-Seal)
Trim Material	See Packing Selection Guidelines for Fisher Sliding-Stem Valves Bulletin (D101986X012) for more information. For additional options, consult your Emerson sales office .
■ 316 SST and Alloy 6	
Shutoff Classifications Per ANSI/FCI 70-2 and IEC 60534-4	Approximate Weights
Metal Seat: ■ Class IV (standard) ■ Class V (optional) ⁽²⁾ ■ Class VI (optional)	Fisher IC2 Globe Valve NPS 1: 26 kg / 57 lb NPS 1-1/2: 39 kg / 86 lb NPS 2: 43 kg / 95 lb NPS 3: 74 kg / 163 lb NPS 4: 122 kg / 269 lb NPS 6: Consult Emerson sales office . Fisher IC2 Angle Body Valve NPS 1: 27 kg / 60 lb NPS 1-1/2: 38 kg / 84 lb NPS 2: 39 kg / 86 lb NPS 3: 75 kg / 165 lb NPS 4: 127 kg / 280 lb NPS 6: Consult Emerson sales office .
Maximum Actuator Thrust	
See Table 2	
Flow Characteristics	
■ Linear ■ Equal Percentage	
Flow Directions	
Up through the seat ring only	
Construction Materials	Additional Options
Body and Bonnet: ■ Stainless Steel (316/CF8M) ■ Aluminum (5083-H112) Body Bolting: ■ SA-193-B8M Class 2 studs with SA194-8M nuts ■ SA193-B8 Class 1 studs with SA194-8 nuts Bellows Seal Assembly: ■ S31603	■ Drip plate ■ Drilled and tapped connection in bonnet for leak off service ■ Displacer
1. Do not exceed the pressure or temperature limits in this manual or any applicable code or standard limitations. 2. Class V shutoff cannot be performed with water. The residual trapped moisture from testing with water can cause valve and trim damage from the ice crystals formed at below freezing service temperatures. 3. Certain restrictions apply. Contact your Emerson sales office for more information.	

Table 2. Maximum Allowable Actuator Thrust for Standard IC2 Bonnet

VALVE SIZE, NPS	STEM DIAMETER		MAXIMUM ALLOWABLE STEM LOAD FOR 316 STRAIN HARDENED STEM MATERIAL	
	mm	in.	N	lb
1	9.5	3/8	9608	2160
	12.7	1/2	17081	3840
1-1/2	9.5	3/8	9608	2160
	12.7	1/2	17081	3840
2	12.7	1/2	17081	3840
	19.1	3/4	38437	8641
3	12.7	1/2	17081	3840
	19.1	3/4	38437	8641
4	12.7	1/2	17081	3700
	19.1	3/4	38437	8641

1.3 Education Services

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

Section 2: 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 may result if the valve assembly is installed where service conditions could exceed the limits given in Table 1 or on the appropriate nameplates. To avoid such 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. Because some valve/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](#).

NOTICE

Before installing the valve, inspect the valve and pipelines for any damage and any foreign material which may cause product damage.

1. Make certain the valve body interior is clean, that pipelines are free of foreign material and that the valve is oriented so that pipeline flow is in the same direction as the arrow on the side of the valve.
2. The recommended method of mounting for gas or liquid service is with the actuator vertical above the valve body. The actuator can be mounted 15 degrees or more above the horizontal with the proper supporting structure in place unless limited by seismic criteria. Mounting positions other than actuator vertical above the valve may result in uneven valve plug and guide wear that could result in reduced service life. However, in no case should the angle be so flat as to allow liquid inside the bonnet to come in contact with the packing. For mounting assistance, consult your [Emerson sales office](#).

NOTICE

To avoid possible damage to the packing, do not allow the installed actuator angle to be so flat as to allow liquid inside the bonnet to come in contact with the packing.

3. Use accepted piping and welding practices when installing the valve in the line.
4. If the actuator and valve are shipped separately, refer to the actuator mounting procedure in the appropriate actuator instruction manual.



WARNING

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

Valves with enhanced ENVIRO-SEAL™ live-loaded packing will not require this initial readjustment. See the Fisher instruction manual titled ENVIRO-SEAL Packing System for Sliding-Stem Valves ([D101642X012](#)) for packing instructions.

Section 3: Maintenance

Valve parts are subject to normal wear and must be inspected and replaced as necessary. Inspection and maintenance frequency depends on the severity of service conditions. This section includes instructions for packing maintenance and trim and bellows maintenance. All maintenance operations may be performed with the valve in the line.

WARNING

Avoid personal injury or property damage from sudden release of process pressure. 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 from both sides of the valve. Drain the process media from both sides of the valve.**
- **Vent the pneumatic 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 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.**

NOTICE

Follow instructions carefully to avoid damaging the product surfaces.

NOTE

Whenever a gasket seal is disturbed by removing or shifting parts, a new gasket should be installed upon reassembly. This is necessary to ensure a good gasket seal since the used gasket may not seal properly.

3.1 Packing Maintenance

This section covers packing used in standard IC2 bonnets and bellows bonnets (Figures 2, 3 and 4).

NOTE

If the valve has enhanced ENVIRO-SEAL live-loaded packing installed, refer to the ENVIRO-SEAL Packing System for Sliding Stem Valves Instruction Manual, [D101642X012](#) for packing instructions. Figures 2, 3 and 4 show typical enhanced ENVIRO-SEAL arrangements.

Enhanced ENVIRO-SEAL packing systems are designed for quality performance over extended periods. This longevity allows for packing maintenance to be performed at regularly scheduled plant outages or turnarounds.

Use the following instructions when inspecting or replacing enhanced ENVIRO SEAL packing. Additional information can be found in the ENVIRO-SEAL Sliding-Stem Valves Instruction Manual ([D101642X012](#)).

If changing the packing system material to a different material, such as PTFE to Graphite ULF, it is good practice to review the actuator sizing, as packing friction will change.

NOTICE

To prevent product damage caused by scratching or damaging the packing box wall, take care when removing the old packing parts from the packing box.

Replacing Packing

1. Isolate the control valve from the line pressure.
2. Release pressure and drain process media from both sides of the control valve.
3. If using a power actuator, also shut off all pressure lines to the power actuator and release all pressure from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while working on the equipment.
4. Disconnect the operating lines from the actuator and any leak-off piping from the bonnet.
5. Disconnect the stem connector and then remove the actuator from the valve by unscrewing the yoke locknut.
6. Remove any travel indicator parts and stem locknuts from the valve stem threads.
7. Remove the packing nut (key 3, Figures 2, 3 or 4) from bonnet.
8. Remove packing parts from bore using a packing extraction tool and check for damage to valve stem or packing box bore.
9. Install the enhanced ENVIRO-SEAL packing parts into the packing box. Use Figures 2, 3 and 4 to ensure the packing parts and spring pack are assembled in correct order.

10. Install the spring pack assembly with the attached springs, onto the stem, ensuring the Belleville springs are stacked properly and packing box parts are assembled in the correct order (Figures 2, 3 and 4). Packing parts cannot function properly if the Belleville springs or other packing parts are not stacked correctly.
11. Lubricate the packing nut (key 3, Figures 2, 3 or 4) with anti-seize lubricant and install hand tight.

3.2 Tightening Procedures - Packing Nut

1. To achieve maximum benefit from the enhanced ENVIRO-SEAL packing system, the packing nut must compress the Belleville springs to their "target load." The target load is the point where the Belleville springs are designed for optimum performance, when compressed to 85% of their maximum deflection or nearly flat. (Maximum deflection is when the springs are 100% compressed or completely flat). To obtain the target load of 85% compression of maximum deflection, perform the following:
 - Tighten the packing nut until the Belleville springs are compressed 100% (or completely flat), as detected by a rapid increase in nut torque.
 - For PTFE or Duplex packing, loosen packing flange nut 1/2 turn (180° of rotation).
 - For Graphite ULF packing, loosen packing flange nut 1/4 turn (90° of rotation).

The "target load" of 85% compression has now been reached.

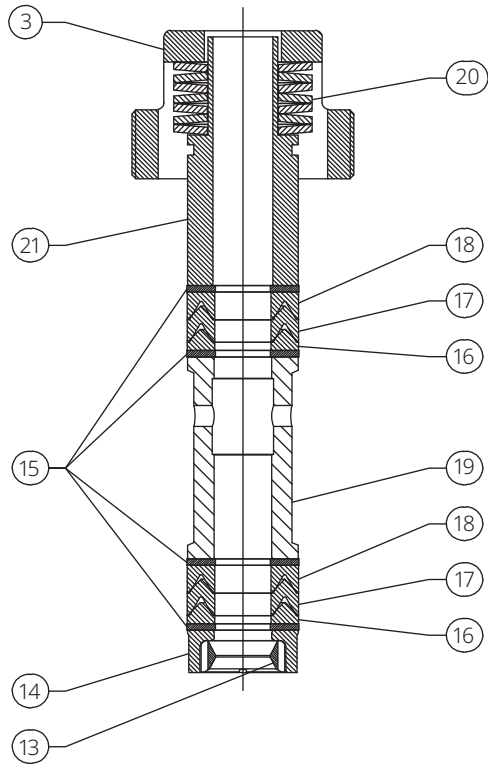
Refer to the appropriate valve and actuator instruction manuals when connecting the valve to the actuator. Under normal conditions, the packing nut should not require retightening.

2. However, when servicing, if the springs do not remain at the target load of 85% compression, retighten the packing box nut according to step 1 above.

3.3 Other Considerations

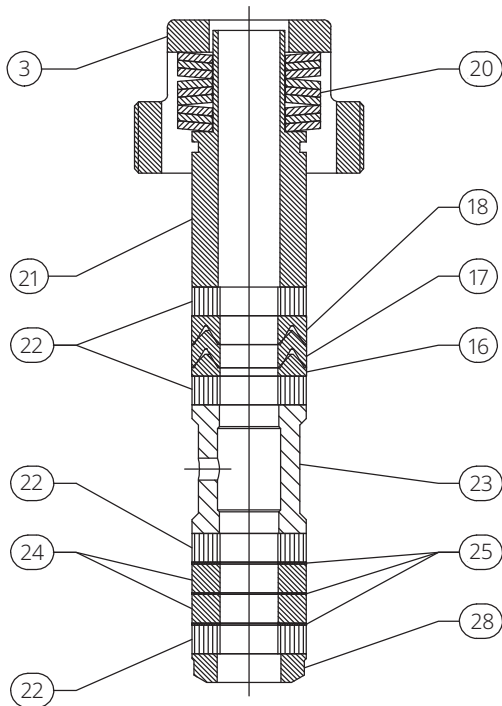
When repacking a valve with enhanced ENVIRO-SEAL packing that has been in service, check the condition of the packing bore after the packing has been removed. A good guideline to use in checking the condition of the packing bore is the 20/20 rule. If less than 20% of the surface area of the bore is pitted and if there are no pits deeper than 0.020 in., then the packing should work as designed. This does not need to be an exact measurement; visual inspection is adequate. If the packing bore does not meet these criteria, the unit should be replaced.

Figure 2. Enhanced ENVIRO-SEAL PTFE Packing Arrangement

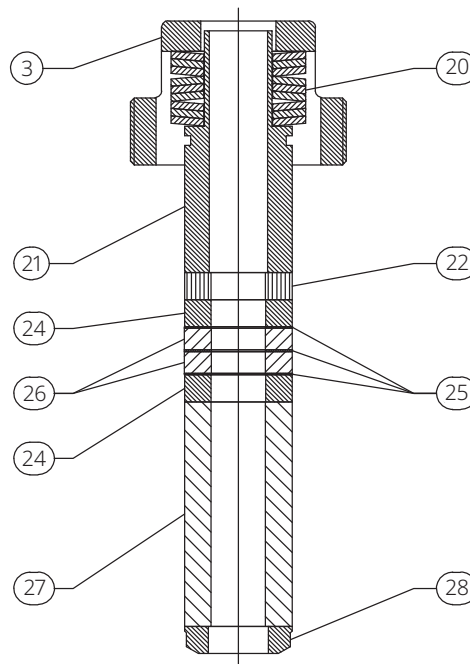


GH10958

Figure 3. Enhanced ENVIRO-SEAL Duplex Packing Arrangement



GH10958

Figure 4. Enhanced ENVIRO-SEAL Graphite ULF Packing Arrangement

GH10958

⚠ WARNING

To avoid personal injury or property damage caused by uncontrolled movement of the bonnet, loosen the bonnet by following the instructions in the next steps.

Do not remove a stuck bonnet 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 bonnet.

To avoid personal injury or damage to the seating surface caused by the valve plug and stem assembly dropping from the bonnet after being lifted out of the valve body, observe the following instructions.

3.4 Bonnet Maintenance

Key number locations are shown in Figure 6, unless noted. This section covers IC2 standard bonnets and bellows bonnets.

1. When lifting a bonnet, temporarily install a valve stem locknut on the valve stem. This locknut will prevent the valve plug and stem assembly from dropping out of the bonnet.

⚠ WARNING

To avoid possible personal injury, review your process shutdown procedures to be sure process pressure is not applied to the valve for the following procedure.

2. Hex nuts (key 13) attach the bonnet to the valve body (key 1). Loosen these nuts or cap screws approximately 3 mm / 1/8 in. Then, loosen the body-to-bonnet joint by either rocking the bonnet or prying between the bonnet and valve body. Work with a prying tool around the bonnet until the bonnet loosens.

Table 3. Body-to-Bonnet Torque Guidelines⁽²⁾

VALVE SIZE, NPS	BOLT TORQUES ⁽¹⁾	
	Bolt Material ⁽²⁾	
	B8	
	N•m	Lbf•ft
1	91	67
1-1/2 or 2	163	120
3	373	275
4	502	370
VALVE SIZE, NPS	B8M ⁽³⁾	
	N•m	Lbf•ft
1	87	64
1-1/2 or 2	163	120
3	373	275
4	502	370

1. Determined from laboratory testing.
 2. Lubricate with anti-seize compound compatible with cryogenic service temperatures. For other lubricants or bolting materials not listed in Table 3, contact your [Emerson sales office](#) for torque information.
 3. SA193-B8M strain hardened.

- If fluid leaks from the joint, it may indicate that process pressure is applied to the valve. Review your process shutdown procedures and be sure process pressure is not applied to the valve.
 - If no fluid leaks from the joint, remove the nuts completely and carefully lift the bonnet off the valve body.
3. Remove the stem locknut. Separate the valve plug and stem from the bonnet and set the parts on a protective surface to prevent damage to gasket or seating surfaces.
 4. Remove the bonnet gasket (key 9) and cover the opening in the valve to protect the gasket surface and prevent foreign material from getting into the valve body cavity.
 5. Remove the packing as described in steps 1 through 8 of the Replacing Packing section. Clean the packing box and metal packing parts.
 6. Inspect the valve stem threads and packing box surfaces for any sharp edges which might cut the packing. Scratches or burrs in the packing box surfaces could cause leakage or damage to the new packing. If the surface condition cannot be improved by light sanding, replace the damaged parts.
 7. If necessary, go to the Trim Maintenance procedures to remove, inspect or replace trim parts. Return to this section when installing the bonnet on the valve body.

Installing the Bonnet

1. Remove the covering protecting the valve body cavity and install a new bonnet gasket (key 9), making sure the gasket seating surfaces are clean and smooth. Then slide the bonnet over the stem and onto the stud bolts (key 12).

NOTE

Proper performance of the bolting procedures in step 12 compresses the bonnet gasket (key 9) to seal the body-to-bonnet joint.

The proper bolting procedures in step 12 include, but are not limited to, ensuring that bolting threads are clean and evenly tightening the cap screws or nuts onto the studs in a crisscross pattern. Tightening one cap screw or nut may loosen an adjacent cap screw or nut. Repeat the crisscross tightening pattern several times until each cap screw or nut is tight and the body-to-bonnet seal is made.

NOTE

Stud(s) and nut(s) should be installed such that the manufacturer's trademark and material grade marking is visible, allowing easy comparison to the materials selected and documented in the Emerson/Fisher serial card provided with this product.

WARNING

Personal injury or damage to equipment could occur if improper stud and nut materials or parts are used. Do not operate or assemble this product with stud(s) and nut(s) that are not approved by Emerson/Fisher engineering and/or listed on the serial card provided with this product. Use of unapproved materials and parts could lead to stresses exceeding the design or code limits intended for this particular service. Install studs with the material grade and manufacturer's identification mark visible. Contact your Emerson representative immediately if a discrepancy between actual parts and approved parts is suspected.

-
2. Lubricate the bolting with anti-seize lubricant and install the bonnet nuts (key 13), using accepted bolting procedures during tightening, so that the body-to-bonnet joint will withstand test pressures and application service conditions. Use the bolt torques in Table 3 as guidelines.
 3. Follow steps 9 through 11 under Replacing Packing procedure section.
 4. Adjust packing by tightening packing nut (key 3, Figures 2, 3 and 4) as described in Tightening Procedures - Packing Nut section.
 5. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

3.5 Trim Maintenance

⚠ WARNING

Refer to the **WARNING** at the beginning of the Maintenance section in this instruction manual.

This procedure describes how the valve trim can be completely disassembled. When inspection or repairs are required, perform only those steps necessary to accomplish the task. Observe the Warning at the start of the Maintenance section.

Key number locations are shown in Figure 6, unless otherwise noted.

Trim Disassembly

Key number locations are shown in Figure 6, unless otherwise noted.

1. Remove the actuator and the bonnet according to steps 1 through 9 of the Replacing Packing procedures in the Maintenance section.

⚠ WARNING

To avoid personal injury due to leaking fluids, avoid damaging gasket sealing surfaces. The surface finish of the packing stem (key 10) is critical for making a good packing seal.

The seating surfaces of the valve plug (key 3) and seat ring (key 2) are critical for proper shutoff.

Protect these surfaces accordingly.

Figure 5. Fisher IC2 Valve Stem Torque and Pin Replacement

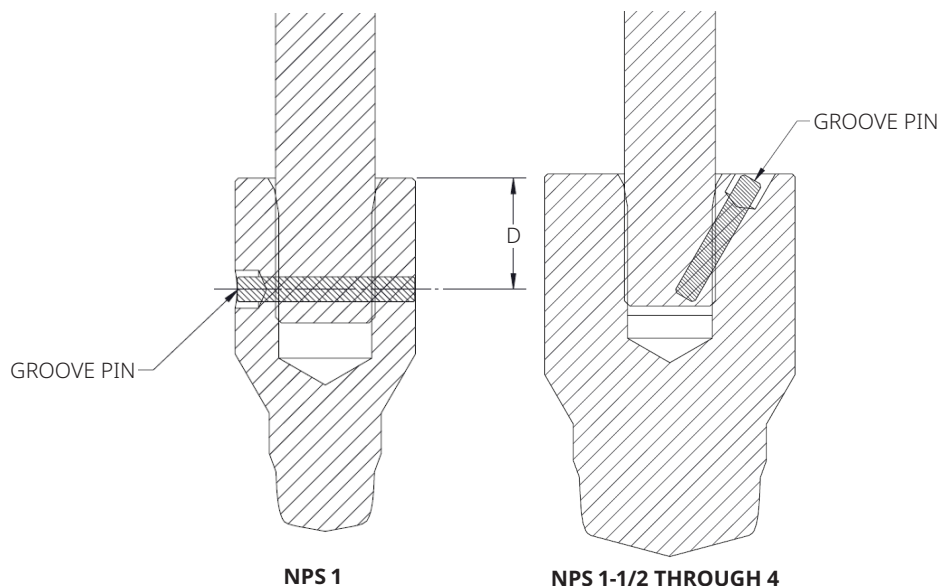


Table 4. Fisher IC2 Valve Stem Torque and Pin Replacement

VALVE STEM DIAMETER		TORQUE, MINIMUM TO MAXIMUM		DRILL SIZE, IN.
mm	in.	N•m	Lbf•ft	
9.5	3/8	40 to 47	25 to 35	3/32
12.7	1/2	81 to 115	60 to 85	1/8
19.1	3/4	238 to 339	175 to 250	3/16
25.4	1	421 to 482	310 to 355	1/4

Perform the following steps to remove the valve trim for standard bonnet constructions:

2. Lift stem stack and bonnet spacer with valve plug attached (keys 10, 7, 6, 3, 4 and 5 in Figure 6) together and gasket (key 9) out of the valve body and set them on a protective surface.
3. To disassemble the bonnet stem, middle stem and pin, drive or drill out the pin (key 14) and unscrew the bonnet stem (key 10) from the middle stem (key 6).
4. Remove displacer (key 5).
5. To disassemble the middle stem, plug stem and pin, drive or drill out the pin (key 16) and unscrew the middle stem (key 6) from the plug stem (key 4).
6. To disassemble the plug stem, plug and pin, drive or drill out the pin (key 17) and unscrew the plug stem (key 4) from the valve plug (key 3).
7. Remove seat ring using seat ring tool.
8. Inspect parts for wear or damage that could prevent proper operation of the valve. Clean, inspect and obtain replacement parts as necessary for reassembly.

Valves with Bellows Assembly

Perform the following steps to remove the valve trim:

1. Lift stem stack and stem/bellows assembly with valve plug attached (keys 10, 7, 6, 3, 4 and 5 in Figure 6) together and gasket (key 9) out of the valve body and set them on a protective surface.
2. Do not remove bonnet stem pin (key 14) due to no space to drill out pin.
3. To disassemble the bellows stem, plug stem and pin: place the stem/bellows assembly and valve plug in a soft-jaw chuck or other type of vise so that the jaws grip a portion of the valve plug that is not a seating or guiding surface. Drive out the pin (key 16). Then unscrew the bellows stem (key 6) from the plug stem (key 4). If the bellows assembly with bonnet stem is to be reused, protect them to prevent damage.

NOTICE

Do not grip the bellows shroud or other parts of the stem/bellows assembly. Grip only the flat areas on the stem where it extends out of the top of the bellows shroud.

4. Remove displacer (key 5).
5. To disassemble the plug stem, plug and pin, drive or drill out the pin (key 17) and unscrew the plug stem (key 4) from the valve plug (key 3).
6. Remove seat ring (key 2) using seat ring tool.
7. Inspect parts for wear or damage that could prevent proper operation of the valve. Clean, inspect and obtain replacement parts as necessary for reassembly.

Trim Assembly

This procedure assumes that all the trim and associated gaskets were removed from the valve body. If these parts were not all removed, start the assembly procedure at the appropriate step.

NOTICE

To avoid weakening the plug stem or bonnet stem that may cause failure in service, never reuse an old stem with a new valve plug. Using an old stem with a new plug requires drilling a new pin hole in the stem, which will weaken the stem. However, a used valve plug may be reused with a new stem.

Key number locations are shown in Figure 6, unless otherwise noted.

1. Install seat ring using seat ring tool and torque from Table 6.
2. Screw the plug stem (key 4) into the valve plug (key 3). Tighten to the torque value given in Table 6. Refer to Figure 4 to select the proper drill size. Drill through the stem using the hole in the valve plug as a guide. Remove any chips or burrs and drive in a new pin (key 17) to lock the assembly.
3. Slide displacer (key 5) down plug stem (key 4).
4. Screw the middle stem (key 6) into the plug stem (key 4). Tighten to the torque value given in Table 6. Refer to Figure 4 to select the proper drill size. Drill through the stem using one of the holes in the middle stem as a guide. Remove any chips or burrs and drive in a new pin (key 16) to lock the assembly.
5. Screw the middle stem (key 6) into the bonnet stem (key 10). Tighten to the torque value given in Table 6. Refer to Figure 4 to select the proper drill size. Drill through the stem using the hole in the top of the middle stem as a guide. Remove any chips or burrs and drive in a new pin (key 14) to lock the assembly.
6. Mount the bonnet on the valve body and complete reassembly using the Replacing Packing and Installing the Bonnet procedures in the Maintenance section.
7. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

Valves with Bellows Assembly

Perform the following steps to assemble and install the trim

1. Replace and install seat ring using seat ring tool and torque from Table 6.
2. Screw the plug stem (key 4) into the valve plug (key 3). Tighten to the torque valve given in Table 6. Refer to Figure 4 to select the proper drill size. Drill through the stem using the hole in the valve plug as a guide. Remove any chips or burrs and drive in a new pin (key 17) to lock the assembly.
3. Slide displacer (key 5) down plug stem (key 4).
4. If bellows assembly with bonnet stem can be used, proceed as follows:
 - a. Secure the valve plug in a soft-jaw chuck or other type of vise. Do not grip the plug on any seating surface. Position the plug in the chuck or vise for easy threading of the bellows stem. Screw the bellows stem (key 6) into the plug stem (key 4), which include bellows assembly and bonnet stem. Tighten to the torque valve given in Table 6. Refer to Figure 4 to select the proper drill size. Drill through the stem using one of the holes in the bellows stem as a guide. Remove any chips or burrs and drive in a new pin (key 16) to lock the assembly.
5. If bellows assembly with bonnet stem cannot be used, proceed as follows:
 - a. Screw a new bonnet stem (key 10) into bellows stem (key 6). Tighten to the torque valve given in Table 6. Refer to Figure 4 to select the proper drill size. Drill through the stem using the hole in the top of the middle stem as a guide. Remove any chips or burrs and drive in a new pin (key 14) to lock the assembly.
 - b. Slide bellows stem into bellows assembly and weld them together according to stem and bellows welding drawings.
 - c. To assembly bellows assembly and plug stem, as described in above step 4a.

NOTICE

When installing a valve plug on the ENVIRO-SEAL stem/bellows assembly, the valve stem must not be rotated. Damage to the bellows may result.

Do not grip the bellows shroud or other parts of the stem/bellows assembly. Grip only the flat areas on the stem where it extends out of the top of the bellows shroud.

6. Place a new gasket (key 9) on the shoulder of body, slide stem stack into body and then put another new gasket (key 9).
7. Mount the bonnet on the valve body and complete reassembly using the Replacing Packing and Installing the Bonnet procedures in the Maintenance section.
8. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

3.6 Bellows Maintenance

Key number locations are shown in Figure 6, unless otherwise noted.

Replacing a Non-Bellows Valve with a Bellows Assembly

1. Remove the actuator, bonnet assembly as described in the Replacing Packing section (steps 1 through 10).
2. Remove the stem stack assemblies as described in the Valve Trim Disassembly Valves without Bellows Assembly section (steps 1 through 7).
3. To install the new bellows/stem assembly, perform the Valve Trim Assembly Valves with Bellows Assembly Section (steps 1 through 6).
4. To install the new bellows bonnet and packing as described in the Replacing Packing and Installing the Bonnet procedures in the Maintenance section.
5. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

Replacing an Installed Bellows Assembly Valve

1. Remove the actuator, bonnet assembly as described in the Replacing Packing section (steps 1 through 10).
2. Remove the stem stack and bellows/stem assemblies as described in the Valve Trim Disassembly Valves with Bellows Assembly section (steps 1 through 7).
3. To install the new bellows/stem assembly, perform the Valve Trim Assembly Valves with Bellows Assembly Section (steps 1 through 6).
4. Inspect the bellows bonnet. Replace, if necessary.
5. Mount the bonnet on the valve body and complete reassembly using the Replacing Packing and Installing the Bonnet procedures in the Maintenance section.
6. Mount the actuator on the valve assembly and reconnect the actuator and valve stem according to the procedure in the appropriate actuator instruction manual.

Purging Bellows Bonnet

The bellows bonnet has been designed so that it can be purged or leak tested. Refer to Figure 6 for an illustration of a bellows bonnet and perform the following steps for purging or leak testing.

1. Remove the pipe plugs (key 18).
2. Connect a purging fluid to one of the pipe plug connections.
3. Install appropriate piping or tubing in the other pipe plug connection to pipe away the purging fluid or to make a connection to an analyzer for leak testing.
4. When purging or leak testing has been completed, remove the piping or tubing and reinstall the pipe plugs (key 18).

Section 4: Parts

4.1 Parts Ordering

Each body-bonnet assembly is assigned a serial number which can be found on the valve. This same number also appears on the actuator nameplate when the valve is shipped from the factory as part of a control valve assembly.

Refer to the serial number when contacting your [Emerson sales office](#) for technical assistance. When ordering replacement parts, refer to the serial number and to the eleven-character part number for each part required from the following parts kit or parts list information.

WARNING

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

4.2 Parts Kits

Gasket Kits

Includes key 9.

Table 5. Gasket Kits

Valve Size, NPS	Kit Part Number
1	RGASKETXJ02
1-1/2	
2	
3	RGASKETXJ12
4	

Table 6. Seat Ring Tool Kits and Seat Ring Installation Torque⁽¹⁾

Valve Size, NPS	Kit Part Number	TORQUE	
		N•m	lbf•ft
1	GK14147X022	244	180
1-1/2	GK14197X022	485	658
2	GK14197X032		
3	GK14207X022	1245	918
4	GK14210X022	2195	1619

1. Use LOX-8 for lubrication of seat ring threads.

4.3 Parts List

NOTE

Part numbers are shown for recommended spares only. For part numbers not shown, contact your Emerson sales office.

Enhanced ENVIRO-SEAL Packing Assembly

Table 7. Enhanced ENVIRO-SEAL Packing Assembly (Figures 2, 3 and 4)

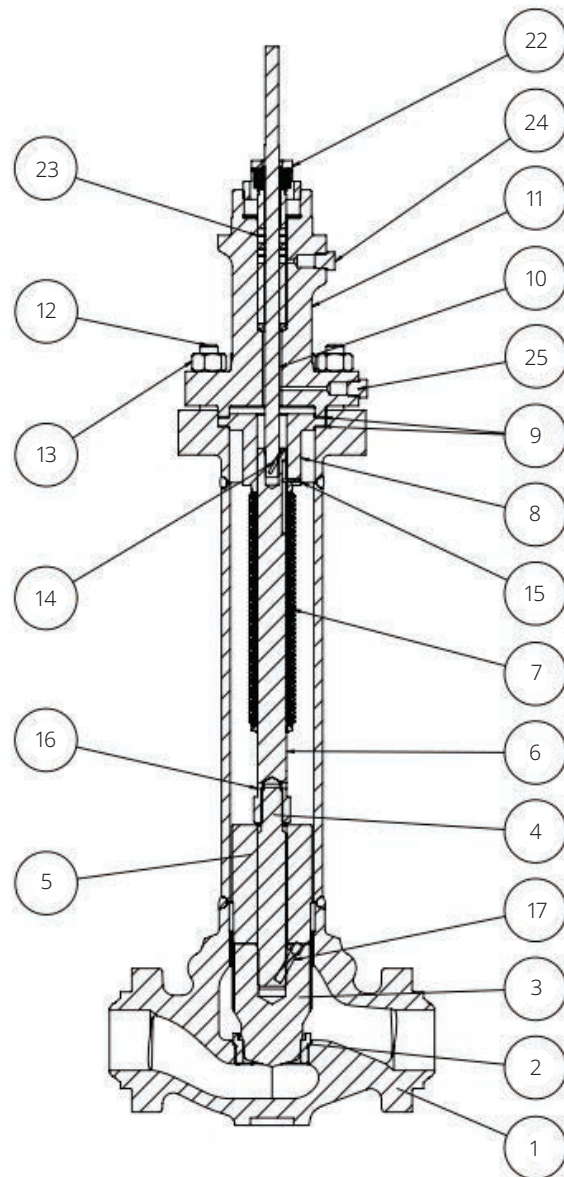
Key	Description	Key	Description
3*	Packing nut	21*	Packing follower
13*	Packing lower wiper	22*	Guide bushing
14*	Packing box ring	23*	Lantern ring
15*	Anti-extrusion washer	24*	Packing ring
16*	Packing ring, Male adaptor	25*	Packing washer
17*	Packing ring	26*	Packing ring
18*	Packing ring, Female adaptor	27*	Guide bushing
19*	Lantern ring	28*	Packing box ring
20*	Belleville spring	---	---
*Recommended spare parts.			

Valve Body Parts

Table 8. Valve Body Parts (Figure 6)

Key	Description	Key	Description
1	Body If you need a body as a replacement part, order by valve size, serial number and desired material.	11	Bonnet or bellows bonnet
2	Seat ring	12	Bonnet stud
3*	Plug	13	Bonnet nut
4*	Plug stem	14	Bonnet stem to middle/Bellows stem pin
5	Displacer	15	Anti-rotation pin
6	Middle/Bellows stem	16	Middle/Bellows stem to plug stem pin
7	Bellows assembly	17*	Plug stem pin
8	Bellows flange/Bonnet spacer	22	Packing nut
9	Bellows flange/Bonnet spacer gaskets	23	Packing
10	Bonnet stem	24	Pipe plug
		25	Pipe plug
*Recommended spare parts.			

Figure 6. Fisher IC2 Valve Assembly



 [LinkedIn.com/groups/3941826](https://www.linkedin.com/groups/3941826)
 [Fisher.com](https://www.fisher.com)

 [Facebook.com/FisherValves](https://www.facebook.com/FisherValves)
 [X.com/FisherValves](https://www.x.com/FisherValves)

D104800X012 © 2024, 2026 Emerson. All rights reserved. The Emerson logo is a trademark and service mark of Emerson Electric Co. Fisher and ENVIRO-SEAL are marks of an entity in the Emerson family of businesses. All other marks are the property of their respective owners.

Neither Emerson nor any of its affiliated entities assume responsibility for the selection, use or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

The contents of this publication are presented for informational purposes only, and while every effort has been made to ensure their accuracy, they are not to be construed as warranties or guarantees, express or implied, regarding the products or services described herein or their use or applicability. All sales are governed by our terms and conditions, which are available upon request. We reserve the right to modify or improve the designs or specifications of such products at any time without notice.

Emerson
Marshalltown, Iowa 50158 USA
Sorocaba, 18087 Brazil
Cernay, 68700 France
Dubai, United Arab Emirates
Singapore 128461 Singapore

www.fisher.com

FISHER™


EMERSON™