

Fisher™ TBX-P Steam Pressure Control Valve

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Figure 1. Fisher TBX-P Steam Pressure Control Valve



X1715

Introduction

Scope of Manual

This instruction manual includes installation, maintenance, and operation information for the Fisher TBX control valve. Refer to separate instruction manuals for instructions covering the actuator and accessories.



Do not install, operate, or maintain a TBX-P 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.

Table 1. Specifications for Standard Designs (Physical Specifications)

<p>End Connection Sizes⁽¹⁾ Valve Inlet: NPS 4 through NPS 24 Valve Outlet: NPS 8 through NPS 60</p> <p>End Connection Types</p> <ul style="list-style-type: none"> ■ ASME Buttweld (all sizes) ■ ASME Raised Face Flanges (all sizes) ■ ASME Ring Type Joint Flanges (all sizes) <p>Valve Configuration Angle Pattern (flow up or flow down)</p> <p>Valve Body Ratings⁽²⁾⁽⁴⁾ ASME: CL150 - CL2500</p> <p>Bonnet Type Bolted</p> <p>Shutoff Classifications per ANSI/FCI 70-2 and IEC 60534-4 Standard: Class V Optional: Class IV</p> <p>Flow Characteristics⁽³⁾ Whisper Trim™ III: Linear WhisperFlo™ (flow up only): Linear</p> <p>Flow Direction Whisper Trim III: Flow up or down WhisperFlo: Flow up</p> <p>Construction Materials Body/Bonnet</p> <ul style="list-style-type: none"> ■ SA105 Carbon Steel ■ SA182 Grade F22 (2.25Cr-1 Mo) ■ SA182 Grade F91 (9Cr-1 Mo-V) ■ SA182 Grade F92 (Cr-2 W-V) 	<p>Bonnet Bolting</p> <ul style="list-style-type: none"> ■ SA193 Grade B7 ■ SA193 Grade B16 ■ N07718 <p>Seat Ring <i>Welded Seat Ring (flow up only)</i></p> <ul style="list-style-type: none"> ■ Carbon Steel with Alloy 6 ■ 2.25Cr-1 Mo with Alloy 6 ■ 9Cr-1 Mo-V with Alloy 6 ■ 9Cr-2 W-V with Alloy 6 <p><i>Bolted Seat Ring</i></p> <ul style="list-style-type: none"> ■ 2.25Cr-1 Mo with Alloy 6 and N07718 Bolting ■ N06625 with Alloy 6 and N07718 Bolting ■ N07718 with Alloy 6 and N07718 Bolting <p>Plug: <i>Control Plug</i> SA182 Grade F22 (2.25Cr-1 Mo) with Alloy 6</p> <p>Guiding Surfaces SA182 Grade F91 (9Cr-1 Mo-V) with Alloy 6</p> <p>Guiding Surfaces</p> <p>Stem</p> <ul style="list-style-type: none"> ■ SA479 Type S20910 ■ N07718 <p>Cage: <i>Control Cage</i></p> <ul style="list-style-type: none"> ■ 2.25Cr-1 Mo Nitrided ■ 9Cr-1 Mo-V Nitrided ■ S41000 Cage with 2.25Cr-1 Mo Retainer⁽⁵⁾ ■ S41000 Cage with 9Cr-1 Mo-V Retainer⁽⁵⁾ <p><i>Lower Cage (flow down only)</i></p> <ul style="list-style-type: none"> ■ 2.25Cr-1 Mo Nitrided ■ 9Cr-1 Mo-V Nitrided <p>Piston Rings Alloy 6B with N07750 Expander</p> <p>Bore Seal N07718</p> <p>Gaskets <i>Bonnet:</i> N07718/Graphite <i>All Others:</i> N06600/Graphite</p> <p>Packing Graphite/Flexible Graphite</p>
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1. Consult your [Emerson sales office](#) for additional options.

2. Not all valve sizes are available in all valve body ratings.

3. Contact your Emerson sales office for other flow characteristics.

4. Intermediate classes above CL2500 available upon request. Consult your Emerson sales office for additional information. PN pressure ratings available per pressure requirements of EN1092-1.

5. WhisperFlo constructions only.

Educational Services

For information on available courses for the Fisher TBX-P steam pressure control valve, as well as a variety of other products, contact:

Emerson Automation Solutions
Educational Services - Registration
Phone: 1-641-754-3771 or 1-800-338-8158
E-mail: education@emerson.com
emerson.com/fishervalvetraining

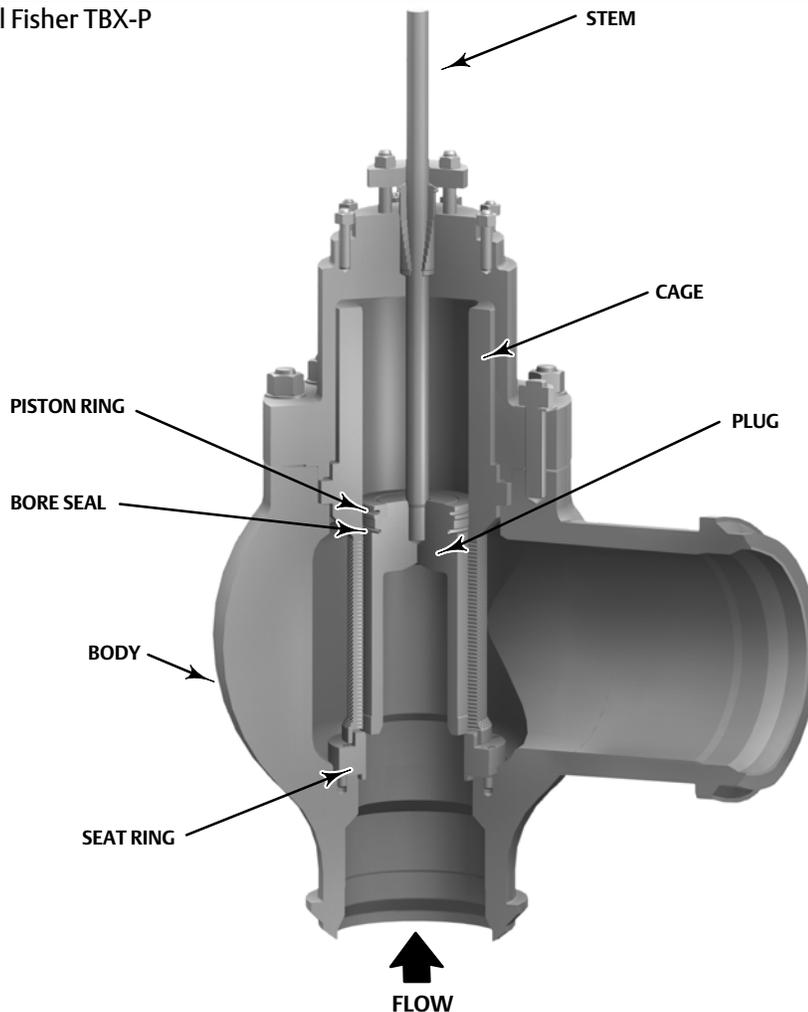
Description

TBX-P steam pressure control valves (see figure 1) are balanced-plug angle valves that are custom built for each application. Typical installations include steam pressure control, vent to atmosphere, auxiliary steam and other applications requiring dependable and accurate control of steam pressure.

The TBX-P steam pressure control valve (see figure 1) is designed to handle the most severe applications in today's cycling power plants as well as provide precise pressure control for process applications. The TBX-P incorporates more than 30 years of steam pressure control experience and product development. The valve body is designed with the latest finite element analysis (FEA) and computational fluid dynamics (CFD) tools to optimize performance and reliability for demanding steam systems.

The TBX-P is a flow up or flow down design providing the ultimate combination of performance and maintainability. The flow down TBX-P incorporates Emerson's low noise Whisper Trim III technology. The flow up TBX-P incorporates the same Whisper Trim III technology as the flow down design, but can also be outfitted with WhisperFlo Trim technology.

Figure 2. Typical Fisher TBX-P



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 TBX-P valve is installed where service conditions could exceed the limits of the pressure rating noted on the nameplate. 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.

CAUTION

This valve is intended for a specific range of service conditions (see table 1). Applying different conditions to the valve could result in parts damage, malfunction of the valve, or loss of control of the process. *Do not expose this valve to service conditions or variables other than those for which this valve is intended.* If you are not sure what these conditions are, you should contact Emerson for more complete specifications. Provide the product serial number (shown on the nameplate) and all other pertinent information.

Check that the TBX-P valve is properly orientated with respect to the flow direction of the valve (either flow up or flow down). Incorrect installation can result in damage to the valve and poor performance.

1. Before installation, all piping upstream of the valve must be blown clean so that no loose materials such as welding slag, dirt or other foreign matter, are left in the pipe. Use care to keep foreign matter out of the line openings while preparing the valve installation.
2. If possible, before fitting in the line, connect the actuator to a temporary air supply and operate to verify positioning. Disconnect the instrument lines (if applicable).

⚠ WARNING

Do not lift the valve by its actuator yoke. Lifting lugs attached to the actuator must not be used to lift the complete valve assembly unless clearly marked as being rated to support the complete valve assembly weight. Personal injury or damage to equipment could occur if the valve is improperly lifted into place.

All lifting and rigging must be completed in accordance with federal/national/provincial, state and local regulations and applicable lifting and rigging equipment standards. Only personnel trained in proper lifting and rigging practices shall perform valve/actuator assembly lifting, rigging and installation. Because each lift will be unique, the method of lifting the valve assembly, the correct location for attaching and lifting the valve assembly, and what the valve assembly will do when lifted shall be considered for each lift.

Lifting and rigging equipment used to lift, install or remove a valve assembly or component must be properly selected and sized for the weight and configuration of the valve assembly or component being lifted. The weight of the complete valve assembly, including attached accessories, must be taken in consideration for this purpose. The lifting and rigging equipment must be properly maintained and inspected for damage before each use.

Lifting lugs or other lifting equipment attached to the valve or actuator must never be used to lift or support the weight of attached piping.

If the TBX-P is equipped with butt-weld ends, the valve body must be supported using a lifting sling or other method that does not place a load or force onto the finished surface of the butt-weld ends. The TBX-P does not have a stable resting condition. The valve inlet and outlet must be fully supported until fully welded (butt-weld end connections) or bolted (flanged end connections) into the piping.

CAUTION

Care must be taken when lifting the valve/actuator assembly to ensure all accessories and tubing are not damaged in the process. Accessories and tubing may need to be removed prior to lifting to prevent damage and properly reinstalled before use. Protect valve flange faces, butt weld ends, and other connection surfaces from damage during lifting.

3. Arrange lifting slings, or other lifting and rigging equipment appropriate for the valve weight and configuration to safely lift the valve to the pipe opening.

⚠ WARNING

Do not expose the valve to undue stresses by installing it in bent pipes or flanges. Personal injury and equipment damage could result from flange sealing failure due to improper installation.

4. **Flanged Connections**—Lubricate the flange connection bolts with a high temperature thread lubricant. Install flange gaskets and connection bolts per accepted practices and tighten securely.
5. **Welded Connections**—Welding procedures should be in accordance with the applicable codes and the base materials. For preheat, welding electrodes, and postweld heat treatment, refer to the applicable codes and practices applicable for the specific facility. Materials are specified on the customer specification sheet. Emerson recommends the valve be disassembled for welding, however if the valve inlet and outlet connections are to be welded with the valve assembled, the valve plug should be maintained off the valve seat during all associated operations. If the valve is to be welded by SMAW process, the valve must be disassembled for welding to ensure that any weld slag is removed from the valve.

CAUTION

Depending on valve body materials used, post weld heat treating may be required. If so, damage to internal parts is possible. In general, if post weld heat treating is to be performed, all trim parts should be removed. Contact your [Emerson sales office](#) for additional information.

Pneumatic lines (where applicable) should be thoroughly blown clean with dry air before connection. Check electronic lines for correct connection.

6. If foreign debris has been introduced into the valve or upstream piping during installation, it must be removed prior to using the valve for the first time. A blowout or blowdown tool can be purchased to match the TBX-P valve and facilitate piping blowdown without removal of the valve from the line. Contact your Emerson sales office for pricing and availability of fixtures. Review Fisher instruction manuals, TBX-P Blowout Fixture ([D103206X012](#)) and Fisher Blowdown Fixture ([D103207X012](#)) prior to use.
7. After cleanliness of the piping system has been assured, connect instrumentation and power supply to the TBX-P valve actuator and associated equipment.
8. Monitor the TBX-P valve as the system is brought online. Some visible vapors may be seen while the lubricants are heated. If you see any steam leaks after startup, follow isolation and disassembly procedures and disassemble the valve and replace the gaskets (key 43). If the packing box leaks, tighten hex nuts (key 68). If leakage continues, replace the packing (key 64). Be sure to properly isolate the TBX-P valve prior to disassembly of valve or packing.

⚠ WARNING

Personal injury could result from packing leakage. Valve packing was tightened prior to shipment; however, the packing might require some readjustment to meet specific service conditions. Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Maintenance

It is recommended that diagnostic tests be performed on the valve 3 to 6 months prior to scheduled maintenance shutdowns. Complete valve disassembly is recommended if tests performed on the valve indicate leakage, sticking, or substandard operation. If diagnostics indicate normal valve operation, complete disassembly and inspection of the TBX-P is recommended during every other regularly scheduled outage or after 24 to 36 months, whichever comes first. Table 2 identifies the recommended inspection tips and diagnostics that can be performed with corresponding repair and replacement information.

Table 2. Inspection Summary

Key	Part Description	Inspection Tips and Diagnostics	Repair	Replacement
1	Valve Body	Inspect for erosion, thermal fatigue, and other damage.	Consult your local Emerson Service Center for a recommendation on necessary weld repair or replacement if damage exists.	
6	Bonnet	Inspect gasket surfaces for damage that could indicate gasket leakage. Inspect packing box to ensure no galling, scoring, or particulate is present.	If damage exists consult your local Emerson Service Center for a recommendation on necessary weld repair or replacement.	
21	Cage	Inspect cage bore for excessive wear, galling damage, particulate damage, and flow passage damage or clogging.	Consult your local Emerson Service Center for a recommendation on necessary repair or replacement if damage exists.	As needed for optimal performance
22	Plug	Inspect for seat erosion, excessive wear, galling damage, and particulate damage, paying close attention to the seating and guiding surfaces.	Re-cutting/machining of seating surfaces can be performed by your local Emerson Service Center.	As needed for optimal performance
23, 53	Stem and Stem Pin	Inspect stem for dings, scoring, and galling. Inspect valve stem connection for tightness.	Valve stem connection can be repaired by your local Emerson Service Center.	As needed
24	Seat	Inspect for seat erosion, particulate damage, galling, and proper bolt torque (if applicable, refer to table 3).	Re-cutting/machining of seating surfaces can be performed by your local Emerson Service Center.	As needed to maintain proper shutoff
25	Plug Retainer	Inspect for excessive wear, galling, and other damage.	Repair can be performed by your local Emerson Service Center.	As needed
43, 75	All Gaskets	Every valve disassembly requires replacement of gaskets.	Replacement Only	Every valve disassembly
45	Piston Ring	Inspect for particulate buildup, scoring, and excessive wear. Ensure piston ring is free to expand and contract in the groove.	Replacement Only	As needed
46	Bore Seal Ring	Inspect for excessive wear, galling, signs of leakage, and other damage.	Replacement Only	Every 36 months for optimal performance
63	Packing Box Ring	Inspect for scoring, galling, and other damage.	Replacement Only	As needed
64	Packing Set	Every valve disassembly requires replacement of the packing set.	Replacement Only	Every valve disassembly
65	Packing Follower	Inspect for scoring, galling, and other damage.	Replacement Only	As needed
66	Packing Flange	Inspect for scoring, galling, and other damage.	Replacement Only	As needed

⚠ 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 process pressure. Relieve process pressure from both sides of the valve. Drain the process media from both sides of the valve.
- Vent the power actuator loading pressure and relieve any actuator spring precompression.
- Use lock-out procedures to be sure that the above measures stay in effect while you work on the equipment.
- The valve packing box may contain process fluids that are pressurized, *even when the valve has been removed from the pipeline*. Process fluids may spray out under pressure when removing the packing hardware or packing rings, 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.

Servicing

Shut off steam flow and vent all system pressure before breaking any pressure boundaries.

⚠ WARNING

Residual system pressure may be released during the following steps if the system was improperly isolated or vented.

Use extreme care to prevent personal injury while loosening any fasteners in the pressure boundary.

Removal of Valve Bonnet and Trim

1. Disconnect all external connections to the positioner and actuator and remove the actuator from the valve. Consult the actuator manufacturer's documentation for assistance in actuator removal.
2. Loosen and remove the hex nuts (key 68) along with the packing follower (key 65). If possible, remove packing set (key 64) from the packing box.
3. Loosen bonnet stud nuts (key 55) using an even pattern to avoid uneven expansion of the gaskets. Remove the entire bonnet assembly (key 6), pulling evenly in line with the valve stem (key 23) centerline. Uneven bonnet removal can result in galling or bending of the valve stem. If difficulty is encountered in removing the bonnet, check the bonnet for alignment and straighten the bonnet before making further attempts to remove it from the valve body.

CAUTION

The bonnet must be handled with care while being removed from the body. Damage to the bonnet can result in gasket leakage while the valve is in service.

Protect the bonnet by placing it on clean cloth or wood while the valve is disassembled.

4. Dislodge any remaining packing (key 64) from the packing box and discard. Remove the packing box ring (key 63) from the bottom of the packing box. Inspect all parts: packing box, packing box ring (key 63), packing follower (key 65), valve stem (key 23), hex nuts (key 68) and studs (key 69) for signs of wear. Replace parts that are damaged or show excessive wear.
5. Inspect the bonnet guiding surfaces and gasket mating surfaces. Light damage on the guiding surface may be repaired with an emery cloth or other suitable material. Damage to the gasket mating surface may require bonnet replacement to avoid leakage.
6. Remove the plug assembly (flow up and flow down: keys 22, 23, 25, and 53) as a single unit by lifting the valve stem (key 23) with appropriate rigging and lifting equipment and pulling the assembly from the body cavity. The plug assembly contains sensitive guiding and sealing surfaces on its outside diameter and care must be taken in its handling. Protect the plug by placing it on clean cloth or wood while the valve is disassembled.
7. **Flow Up Construction only:** If the TBX-P has a magnetite catcher (key 79) and excess magnetite buildup is present, remove the magnetite catcher located in the bore of the plug (key 22) by cutting the tackwelds at the base of the part and unscrewing from the plug. Clean as necessary to remove magnetite buildup.
8. Remove the cage (key 21) from the valve body. Remove and discard two (2) cage gaskets (key 43). Reference figures 9, 10, and 11 for guidance in performing this disassembly. The cage contains sensitive guiding surfaces on its inside and outside diameter and care must be taken during handling. Protect the cage by placing it on clean cloth or wood while the valve is disassembled.
9. **ANSI/FCI 70-2 Class V constructions only:** Clean and inspect the guiding and sealing surfaces of the plug assembly. Inspect the piston ring (key 45) and Bore Seal ring (key 46) for signs of excess wear or damage and replace if necessary. The piston ring is a two-piece design with an outer seal ring and an inner expander ring. The outer ring diameter should be expanded beyond the diameter of the plug in its free state. It can be shifted within its groove to inspect for uneven wear around its circumference. The piston ring should require some compression when installing the plug into the cage. Lack of required compression indicates that the piston ring has worn or relaxed and should be replaced. Vertical marks in the axial orientation also indicate wear that requires replacement of the ring. The Bore Seal ring has a C-shaped cross section. The open portion of the C-shape faces the stem side of the plug on flow up valves. The open portion of the C-shape faces the seating surface of the plug for flow down valves. See figure 3 for proper orientation. Any uneven marks around the circumference of the ring or any flattening of the ring shape at its outside diameter are indications of wear and require replacement. Contact your [Emerson sales office](#) for Bore Seal ring replacement.

ANSI/FCI 70-2 Class IV constructions only: Clean and inspect the guiding and sealing surfaces of the plug assembly. Inspect the two piston rings (key 45) for signs of wear or damage and replace if necessary. The piston ring is a two piece design with an outer seal ring and an inner expander ring. The outer ring diameter should be expanded beyond the diameter of the plug in its free state. It can be shifted within its groove to inspect for uneven wear around its circumference. The piston ring should require some compression when installing the plug into the cage. Lack of required compression indicates that the piston ring has worn or relaxed and should be replaced. Vertical marks in the axial orientation also indicate wear that requires replacement of the ring.
10. Clean and inspect the cage bore for excessive wear. The entire length of the cage bore is either a sealing and/or guiding surface and any measurable wear requires that the cage be replaced.
11. Welded seat rings remain retained inside the valve body. Clean and inspect the seating surface. Any detectable damage around the circumference of the seating surface is an indication of wear and requires reconditioning to ensure seating performance. Contact your Emerson sales office for specific instructions on reconditioning the seating surface. If the TBX-P has a bolted seat ring, remove the cap screws (key 76) and discard the gasket(s) (key 75) that sit between the valve body and seat ring. Inspect cap screws for damage and excessive wear; replace as necessary.

12. **Flow down construction only.** Remove the lower cage (key 78); reference figure 9 for guidance in performing this disassembly. The cage contains sensitive guiding surfaces on its inside and outside diameter and care must be taken during handling. Protect the cage by placing it on clean cloth or wood while the valve is disassembled.
13. Remove all used gaskets and foreign material from the interior of the valve and from the inlet and outlet openings. Remove any foreign material that may be in the valve body or trim. Inspect all valve body guiding and sealing surfaces for any signs of wear.
14. If the valve has been in service, visually inspect the interior of the valve for abnormal wear, erosion, or thermal fatigue. The gasket surfaces of the valve body and bonnet should be inspected to verify that they are not damaged and are free of imbedded gasket material. All scratches should be removed by grinding or filing to remove any interference of the clearance zones between the internal bores and the mating parts. All signs of thermal fatigue should be carefully evaluated to determine if repair or replacement is necessary. Your local Emerson Service Center can help determine the severity of damage, if present, and recommend a course of action.

Valve Assembly

1. **Cleaning**--Make certain that all interior surfaces of the valve body and bonnet (including the packing box) are clean and free of dirt, including the inlet and outlet openings. All surfaces of the valve interior that receive mating parts should be given special attention when cleaning. All sliding fit surfaces should be coated with a copper-based high temperature anti-seize lubricant prior to reassembly. Refer to figures 9, 10, and 11 for reference.

If the TBX-P has a bolted seat ring or is flow down orientation, proceed with steps 2 through 4; otherwise, proceed directly to step 5.

2. Place one gasket (key 75) into the valve body. **If the TBX-P is a flow up construction:** Install the seat ring (key 24) onto this gasket surface. **If the TBX-P is a flow down construction:** Install the lower cage (key 78) onto the gasket surface ensuring the bolt holes in the cage flange are positioned with the bolt holes in the valve body. Then place another gasket (key 75) onto the diameter of the lower cage, and install the seat ring (key 24) onto this second gasket surface.

Note

Horizontal actuator only: TBX-P valves positioned in the process pipeline with a horizontal actuator/trim may require special attention to ensure that the spiral wound gaskets are maintained in the proper location during the valve assembly procedures without falling out of the gasket groove. A gasket manufacturer recommends spray adhesive 3M #77 Super Spray Adhesive to temporarily hold gaskets in place until they are fully contained by the TBX-P valve body and trim components. Please note special spiral wound gasket-positioning techniques may be recommended. To use the adhesive, lightly spray the gasket groove that the gasket will be installed in. Also lightly spray one side of the spiral wound gasket that will be contacting the previously coated gasket groove. Let the spray adhesive set for one minute and then lightly press the spiral wound gasket into the gasket groove.

Other Considerations: Ensure the spiral wound gasket is located in the correct location when contact is made. Trying to remove the gasket after contact will damage the gasket by pulling out or removing the soft filler/facing material. If the gasket is incorrectly positioned after applying the spray adhesive it must be removed and discarded. The gasket groove will then need to be cleaned and a new gasket will need to be installed.

3. Lubricate the seat ring cap screws (key 76) and all surfaces that contact the screws, including the valve body and seat ring.
4. Torque the cap screws in a crisscross pattern, using no more than 1/4 of the specified torque as indicated in table 3. Repeat the crisscross pattern, working up to the specified torque in 1/4 increments until the final torque is achieved. Wait a minimum of 1 minute to allow for gasket/screw relaxation and recheck the torque, adjusting as necessary.

Table 3. TBX-P (Flow Up and Flow Down) Bolted Seat Ring Torque with Nickel Anti-Seize Lubricant⁽¹⁾

CAP SCREW SIZE, Inch	THREADS PER INCH	LUBRICATION	RECOMMENDED BOLT TORQUE	
			N • m	lbf • ft
3/8	16	Nickel Anti-Seize	41	30
1/2	13		91	67
5/8	11		163	120

1. For other lubricants, contact your [Emerson sales office](#) for recommended bolt torque.

5. Install one cage gasket (key 43) into the groove in the valve body. If the valve has a horizontal stem orientation, ensure that the gasket remains in the groove and does not get pinched during cage installation.

Note

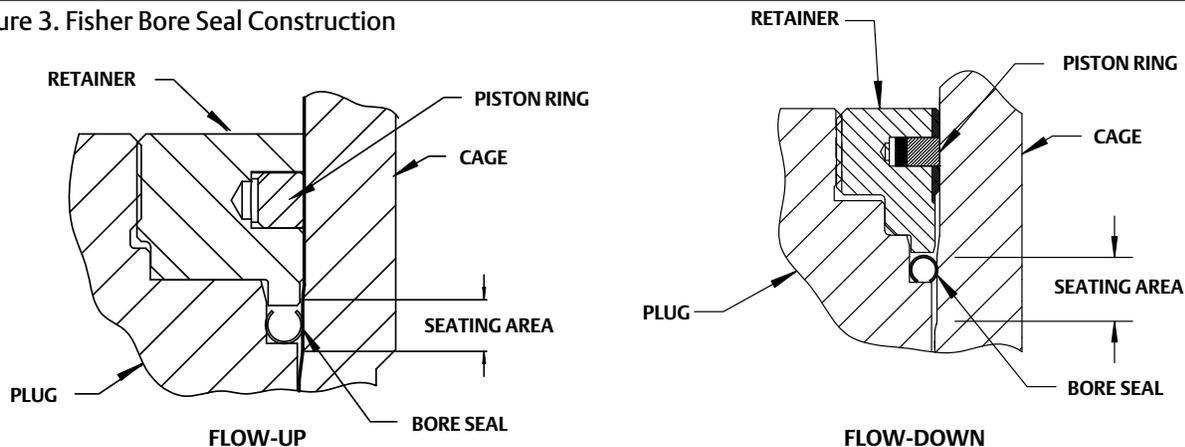
Horizontal actuator only: Follow the note in step 2 above to ensure the gaskets are in the proper location during valve assembly.

6. Lubricate the inside of the cage as completely as possible. Insert the lubricated cage (key 21) into the valve body. Ensure the lower cage diameter slides over the outside diameter of the seat ring. If there is any question regarding the proper seating of the cage inside the valve body, the following measurements can be taken for confirmation. Measure the thickness of the cage flange at its largest diameter. Measure the depth of the mating counterbore where the cage flange engages into the valve body. When assembled with a new cage gasket, the resulting depth from the top of the valve body to the top of the cage flange should be the difference in these two measured values, minus an additional 0.045 inches to allow for the uncompressed gasket.
7. **Flow Up Construction only:** If applicable, install the magnetite catcher (key 79) by threading into the bore of the plug (key 22). Apply four tackwelds equally spaced along the circumference of the plug to prevent rotation during service.

If the TBX-P is an ANSI/FCI 70-2 Class V construction, proceed with steps 8 through 15; otherwise proceed directly to step 16 for Class IV constructions.

8. The plug assembly includes a plug (key 22), stem (key 23), stem pin (key 53), retainer (key 25), piston ring (key 45) and Bore Seal ring (key 46). Lubricate the plug assembly at all raised outside diameter surfaces and lubricate the piston ring(s) and Bore Seal ring.
9. Orient the Bore Seal for correct sealing action based on the process fluid flow direction through the valve, refer to figure 3 to complete this step.

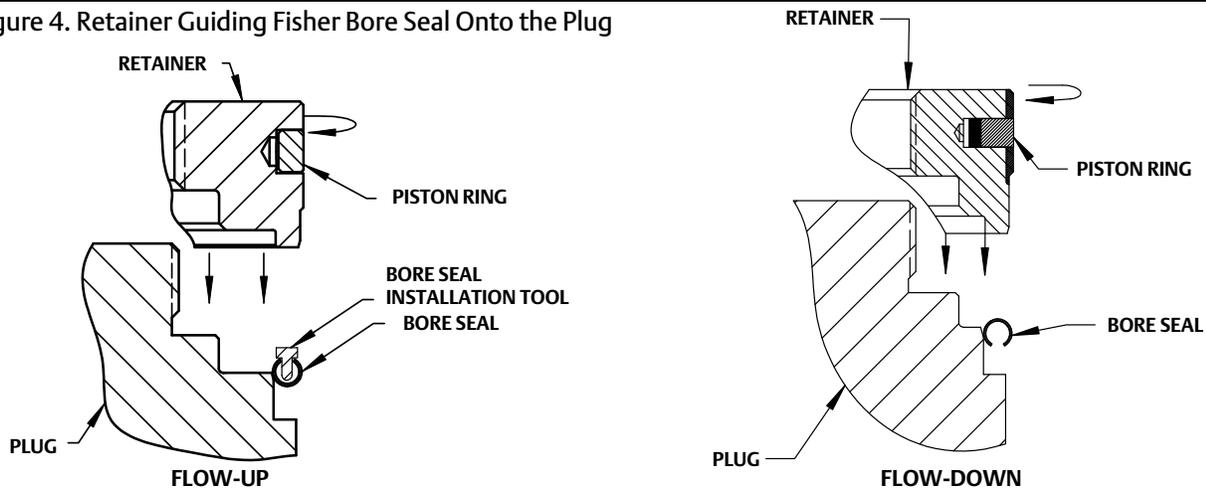
Figure 3. Fisher Bore Seal Construction



10. Place the Bore Seal plug seal over the top of the valve plug. The retainer will help guide the Bore Seal down onto the plug. Do not force the Bore Seal over the plug (figure 4).

11. For the Flow-up design, the Bore Seal installation tool (figure 8) must be inserted into the Bore Seal prior to using the retainer to guide it down the plug.
12. Apply a suitable high-temperature lubricant to the threads on the plug. Then, place the Bore Seal retainer onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
13. If applicable, remove the retainer and then the installation tool. Place the Bore Seal retainer back onto the plug and tighten the retainer using an appropriate tool such as a strap wrench.
14. Using an appropriate tool such as a center punch, stake the threads on top of the plug in one place to secure the Bore Seal retainer.

Figure 4. Retainer Guiding Fisher Bore Seal Onto the Plug



15. Install the lubricated plug assembly into the cage. The piston ring(s) should require some radial compression to collapse into the cage diameter. Do not use a metallic tool to create this piston ring compression as this could damage the outer sealing diameter of the ring. The plug(s) should slide into the cage(s) smoothly with little effort until the Bore Seal ring reaches its mating cage diameter. The extra load required to seat the Bore Seal trim seal will be applied during actuator set up.
16. ANSI/FCI 70-2 Class IV constructions only: The plug assembly includes a plug (key 22), stem (key 23), stem pin (key 53), and two piston rings (key 45). Lubricate the plug assembly at all raised outside diameter surfaces and lubricate the piston rings. Install the lubricated plug assembly into the cage. The piston rings should require some radial compression to collapse into the cage diameter(s). Do not use a metallic tool to create this piston ring compression, as this could damage the outer sealing diameter of the ring. The plug(s) should slide into the cage(s) smoothly with little effort. Refer to figures 5 and 7.
17. Install the second cage gasket (key 43) over the cage boss where it will be self-centering for the mating bonnet groove.

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.

18. Apply appropriate high-temperature anti-seize lubricant to the bonnet studs (key 54) and screw them into the valve body. Back the studs out 1/2 to 1 turns after bottoming the stud in the valve body.
19. Lubricate the bonnet locating surfaces and carefully install the bonnet (key 6). Use care to avoid bending the stem.
20. Install bonnet stud washers (key 52) and nuts (key 55) and hand tighten.
21. Tighten the bonnet nuts (key 55) in a uniform, multistage cross pattern. Monitor the distance between the bonnet and body and keep it even to ensure that the bonnet is being torqued evenly. It is recommended that torquing be performed in a minimum of four torque levels until the final torque level is achieved. You may need to torque multiple times at each torque level to ensure that the bonnet is torqued evenly. Required torque can be found in table 4. After final torquing, ensure there is an even gap and that the metal-to-metal contact between the valve body and bonnet is achieved around the entire circumference of the body-bonnet joint.

Table 4. Recommended Body/Bonnet Bolting Torque with Nickel Anti-Seize Lubricant⁽¹⁾

BOLT SIZE. Inch	THREADS PER INCH	LUBRICATION	RECOMMENDED BOLT TORQUE ⁽²⁾	
			N•m	Lbf•ft
1	8	Nickel Anti-Seize	522	385
1-1/8			712	525
1-1/4			942	695
1-3/8			1268	935
1-1/2			1654	1220
1-5/8			2129	1570
1-3/4			2671	1970
1-7/8			3308	2440
2			4027	2970
2-1/4			5776	4260

1. For other lubricants, contact your [Emerson sales office](#) for recommended bolt torque.
 2. Torques for lubricated studs with heavy hex nuts.

22. After the body/bonnet studs have been torqued to the required level, check the plug movement to ensure that the plug still moves freely.
23. Recheck cleanliness of the packing box. Insert the packing box ring (key 63) over the stem and into the packing box. Measure the depth of the packing box before and after ring insertion to be certain that it has traveled to the bottom of the packing box. Insert packing rings (key 64), after lubricating with high temperature grease, into the packing box and staggering the gaps on adjacent rings. The packing follower (key 65) can be used to ensure that each packing ring is pushed down before installing the next packing ring.
24. After all packing rings are installed, thoroughly lubricate the studs (key 69) and insert the packing follower (key 65) and the packing flange (key 66). Tighten the hex nuts (key 68) tight enough to block leakage but not so tight that stem travel is hindered. Consult table 5, Recommended Packing Nut Torque for recommended torque levels. Evenly tighten the nuts to the maximum level, then loosen and retighten to the minimum torque level. After operating, further tightening may be required to prevent leakage.
25. Install the actuator on the valve in accordance with manufacturer's standard procedure. If this is an ANSI/FCI 70-2 Class V construction, the plug assembly will require an additional load and travel to seat the Bore Seal ring (refer to figures 6 and 7 for details). After calibration of the actuator, the valve should be ready to return to service.

Table 5. Recommended Packing Nut Torque with Anti-Seize Lubricant

STEM DIAMETER Inch	ASME PRESSURE RATING	MAXIMUM TORQUE		MINIMUM TORQUE	
		N•m	Lbf•ft	N•m	Lbf•ft
1-1/4	CL300	49	36	33	24
	CL600	67	49	45	33
	CL900	83	61	56	41
	CL1500	102	75	68	50
	CL2500	122	90	82	60
2	CL300	65	48	59	43
	CL600	91	67	83	61
	CL900	120	88	109	80
	CL1500	147	108	133	98
	CL2500	170	125	156	115

Figure 5. Fisher TBX-P Flow Up Class IV Construction

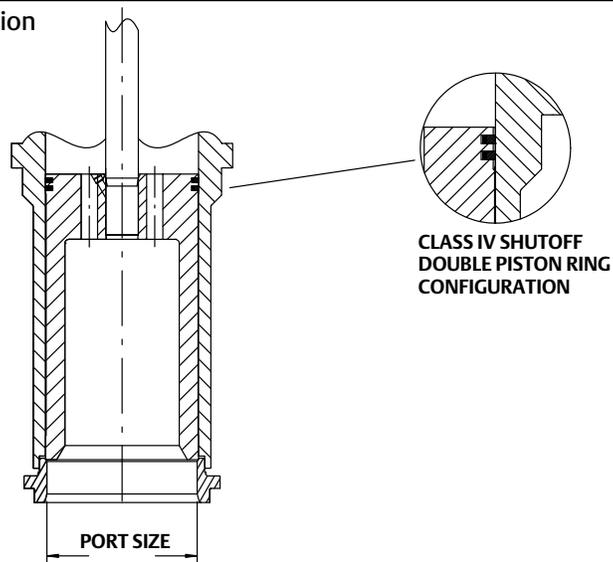
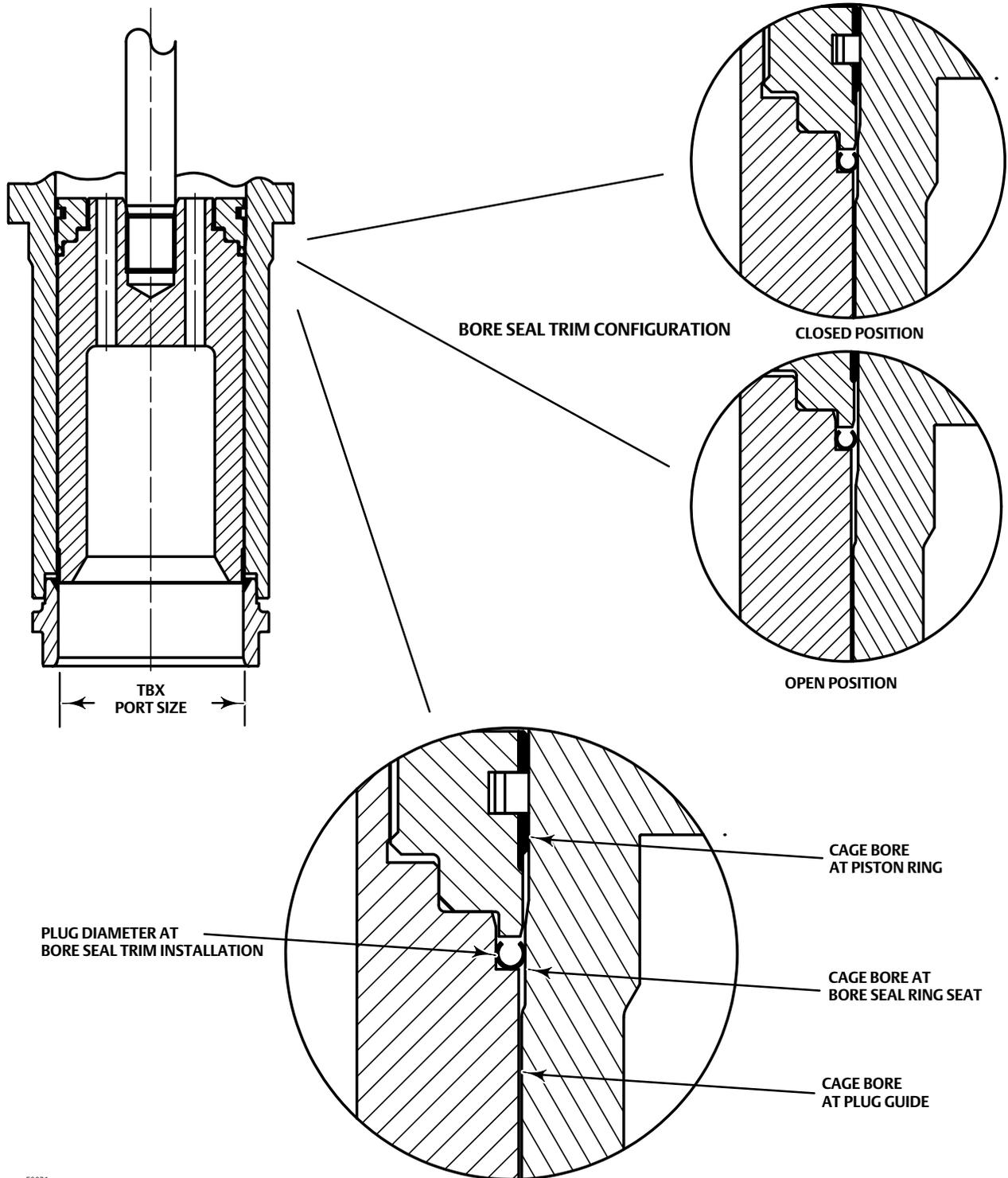


Figure 6. Fisher TBX-P Flow Up Class V Construction



E0921

Figure 7. Fisher TBX-P Flow Down Construction

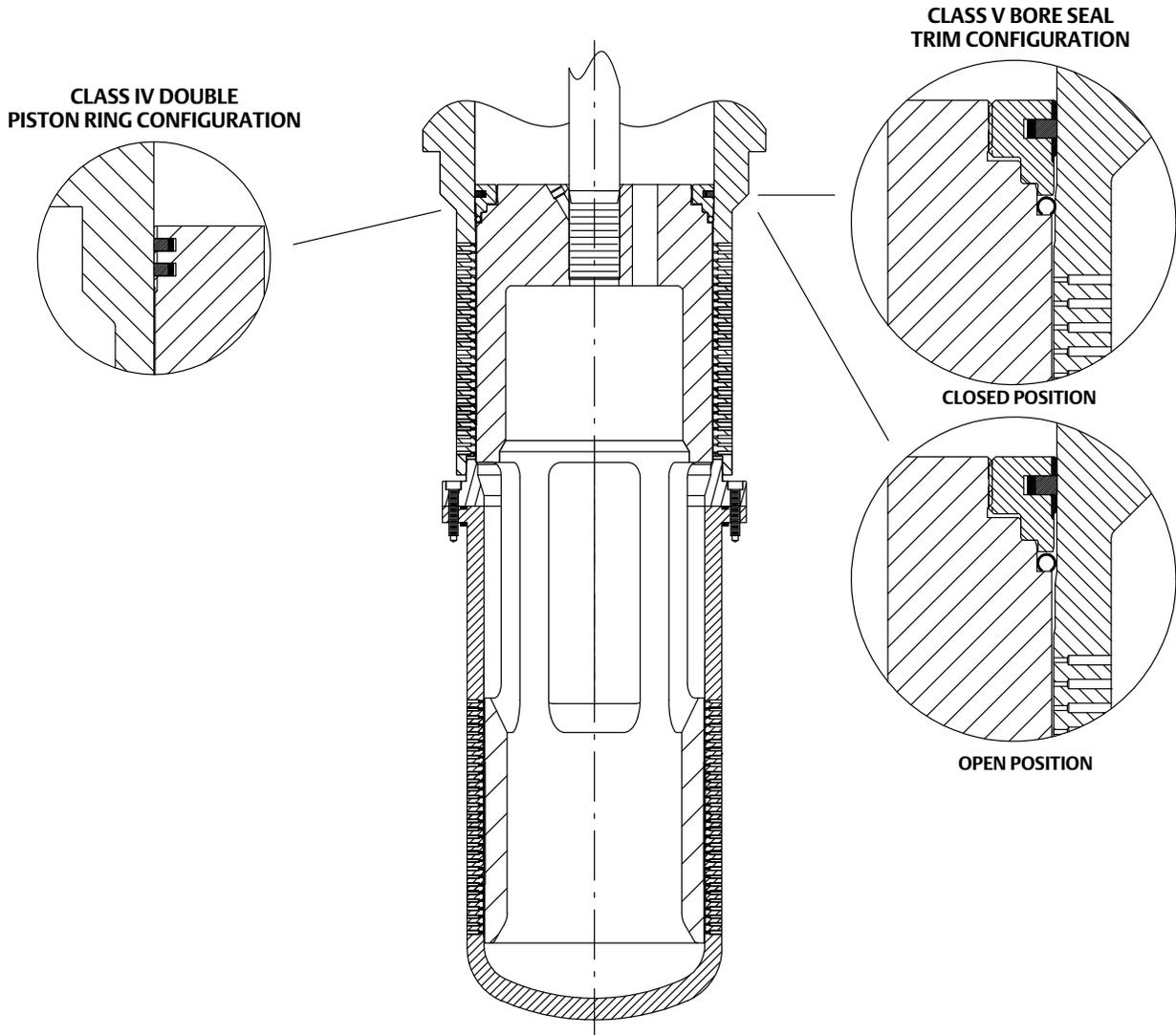
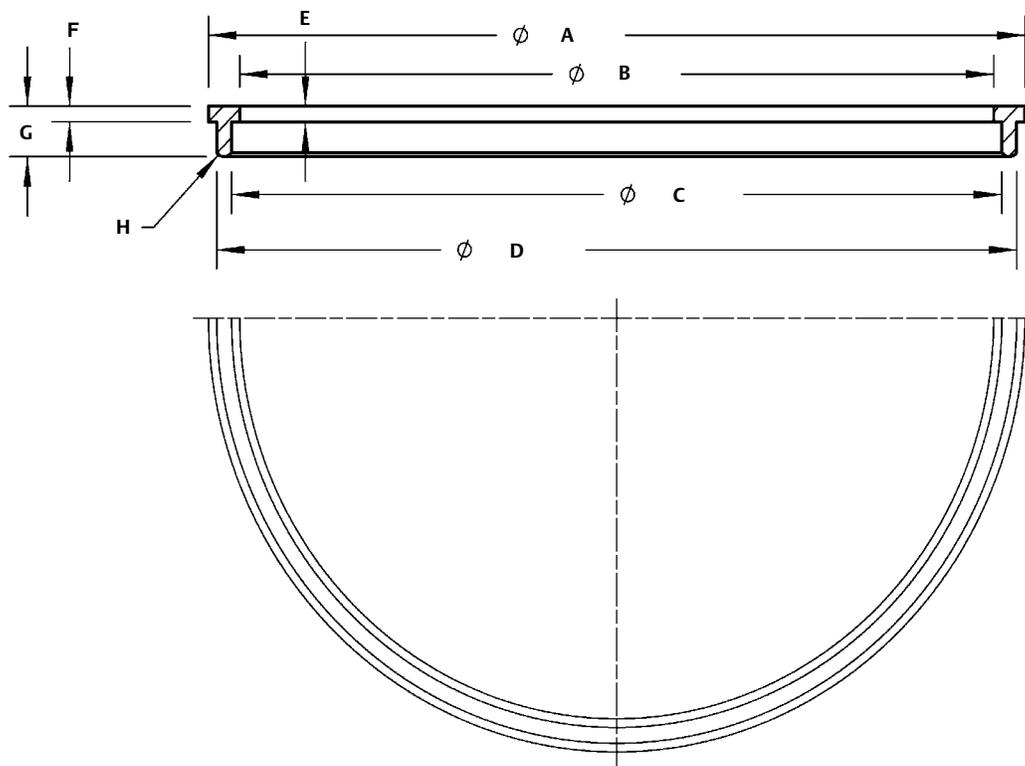


Figure 8. Bore Seal Installation Tool (Flow Up Only)



GE22109-A

Table 6. Bore Seal Installation Tool Dimensions (Flow Up Only)

VALVE PORT SIZE, INCH	Dimensions, Inches (See Figure 8)								Tool Part Number
	A	B	C	D	E	F	G	H	
3.4375	(1)								n/a
4.28	(1)								n/a
4.70	4.77	4.35	4.45-4.47	4.67-4.65	0.10	1.10	0.32	R.06	GE18267X012
5.375	5.49	5.07	5.17-5.19	5.39-5.37	0.10	0.10	0.32	R.06	GE22109X012
6.25	6.34	5.92	6.02-6.04	6.24-6.22	0.10	0.10	0.32	R.06	GE18266X012
7.00	7.11	6.69	6.79-6.81	7.01-6.99	0.09	0.10	0.32	R.06	GE18264X012
7.62	7.76	7.34	7.44-7.46	7.66-7.64	0.10	0.10	0.32	R.06	GE18263X012
8.00	(1)								n/a
9.20	9.39	8.97	9.07-9.09	9.29-9.27	0.10	0.10	0.32	R.06	GE17916X012
10.00	10.12	9.7	9.80-9.82	10.02-10.00	0.10	0.10	0.32	R.06	GE17914X012
11.00	(1)								n/a
11.20	11.35	10.93	11.015-11.025	11.265-11.255	0.10	0.10	0.32	R.07	GE17905X012
13.75	(1)								n/a
14.75	14.84	14.424-14.416	14.516-14.536	14.736-14.716	0.1	0.1	0.32	R.05	GE34073X012
16.70	(1)								n/a
18.25	(1)								n/a
19.9375	(1)								n/a

1. For sizes contact your [Emerson sales office](#).

Parts Ordering

Each TBX-P valve is assigned a serial number that can be found on the bonnet flange. Refer to the serial number when contacting your [Emerson sales office](#) for technical assistance. When ordering replacement parts, refer to the serial number and key numbers for each part required. The key numbers in the Parts List and the assembly drawing in figures 9, 10, and 11 can be used to help in part identification.

⚠ 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.

Parts List

Note

Contact your [Emerson sales office](#) for part numbers.

Key	Description
-----	-------------

1	Body
6	Bonnet
21*	Control Cage
22*	Control Plug
23*	Stem
24	Seat
25	Plug Retainer

Key	Description
-----	-------------

43*	Cage Gasket, 2 req'd
45*	Piston Ring
46*	Bore Seal ring
52	Bonnet Stud Washer
53*	Stem Pin
54	Bonnet Stud
55	Bonnet Stud Nut
60	Actuator Stud
61	Actuator Stud Nut
63*	Packing Box Ring
64*	Packing Set
65*	Packing Follower
66*	Packing Flange
68*	Hex Nut
69*	Stud
75*	Gasket
76*	Seat Ring Cap Screws
78*	Lower Cage
79	Magnetite Catcher (not shown)

Figure 9. Fisher Flow Down TBX-P Assembly with Bolted Seat Ring

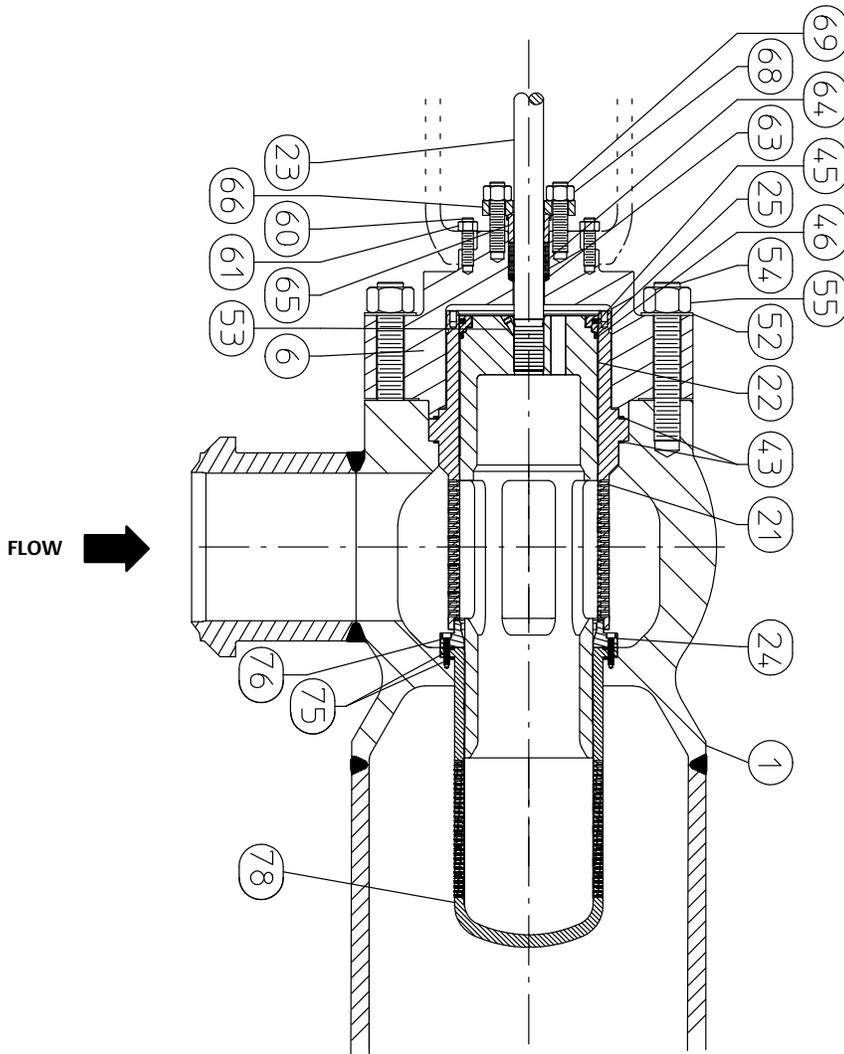


Figure 10. Fisher Flow Up TBX-P Assembly with Bolted Seat Ring

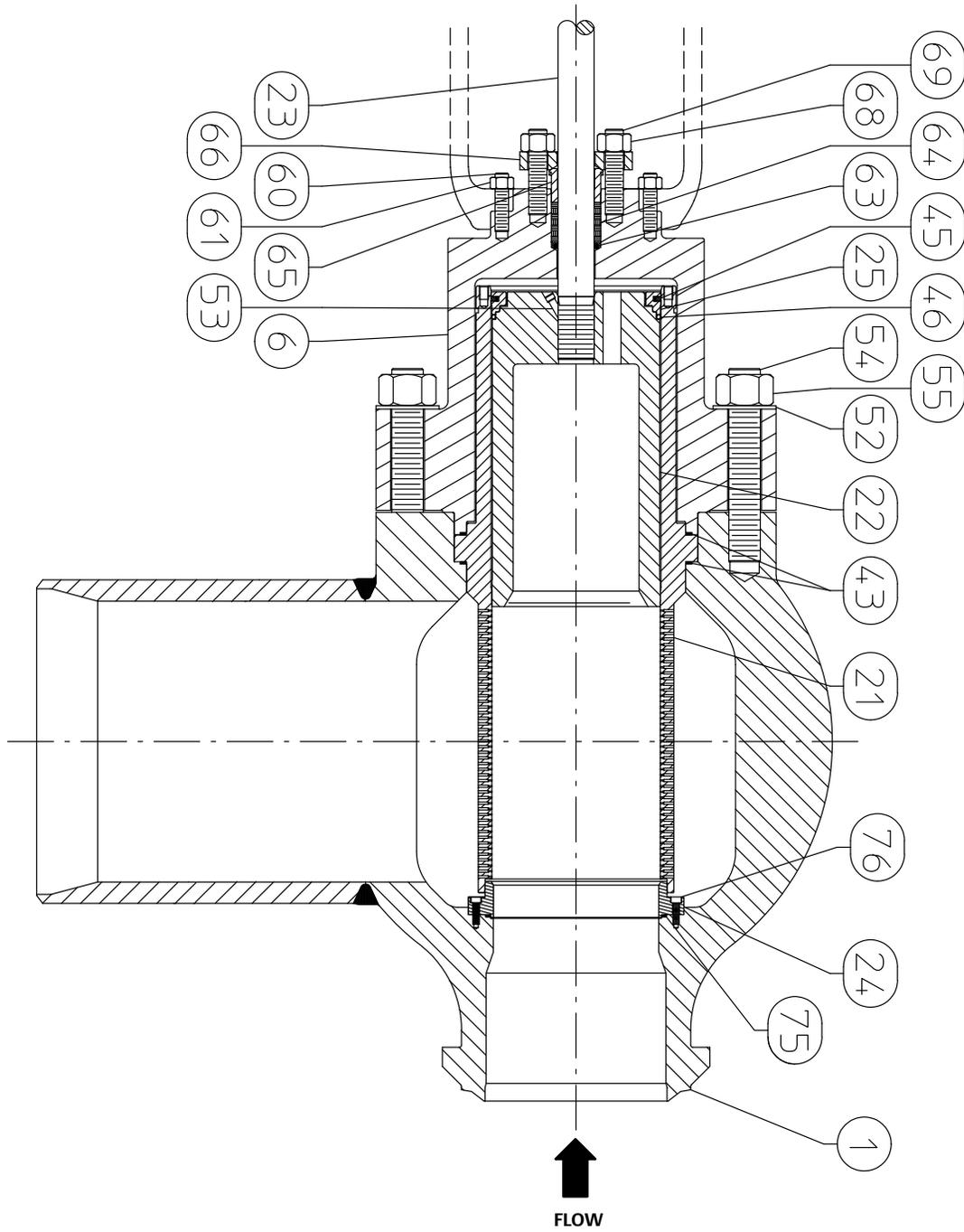
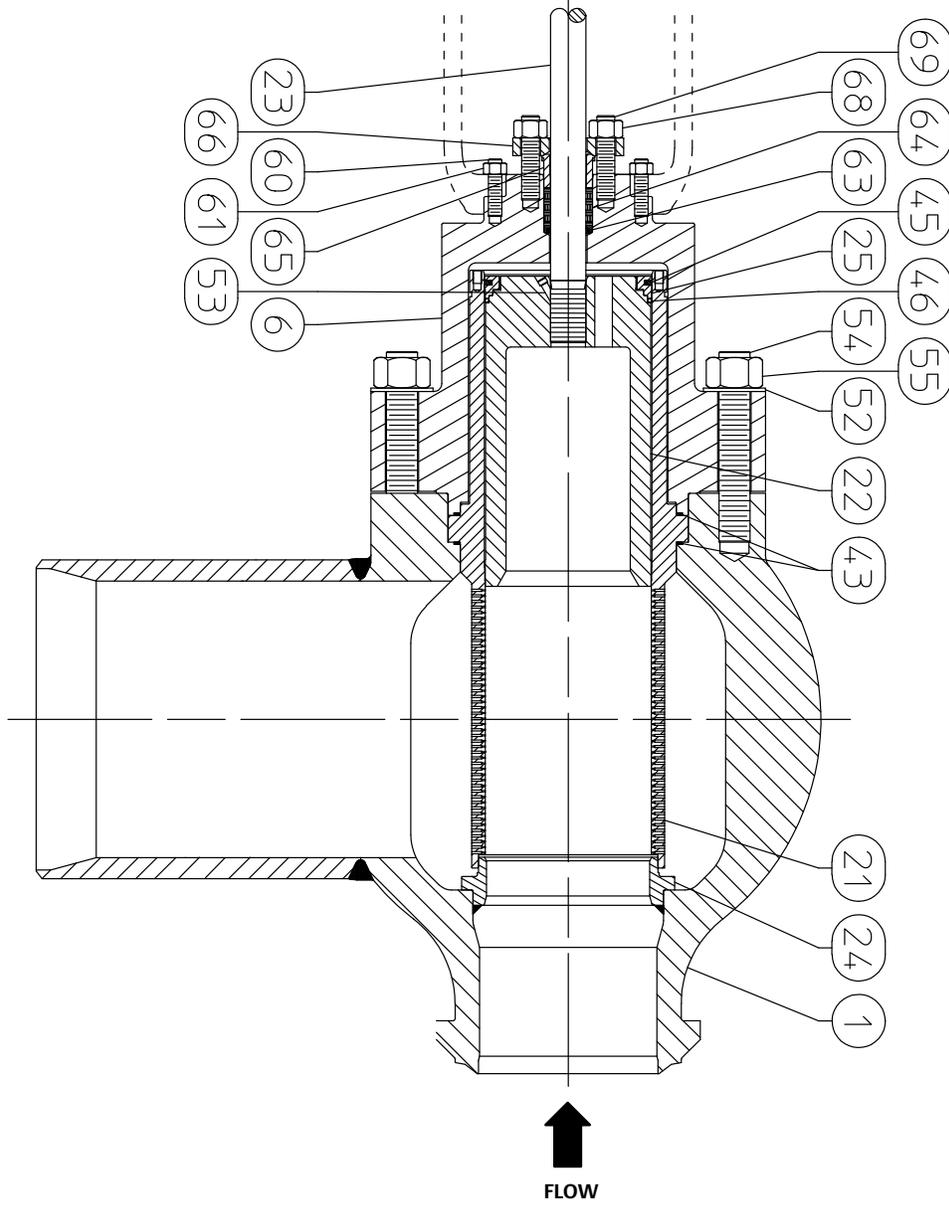


Figure 11. Fisher Flow Up TBX-P Assembly with Welded Seat Ring



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