

Fisher™ CVX Hydro-Plug Fixture

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Introduction

Scope of Manual

This instruction manual includes installation and operation information for the Fisher CVX Hydro-Plug Fixture. The CVX Hydro-Plug Fixture can be very useful in establishing hydro test boundaries since most CVX valves are split class valves. This manual is not intended to cover all details required for successful hydro testing.

Key numbers identified for valve disassembly are shown in the specific valve instruction manual. Refer to separate instruction manuals for instructions covering the exact valve, actuator, and accessories associated with the Hydro-Plug.

Do not install, operate, or maintain a CVX Hydro-Plug Fixture 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](#) or Local Business Partner before proceeding.

Description

The CVX Hydro-Plug fixture provides a convenient way to establish hydrotest boundaries associated with using a split class valve typical of the CVX. The Hydro-Plug fixture is intended to be used so that the upstream piping can be tested at the required pressure for body and inlet piping pressure class without overpressurizing the lower pressure class outlet and outlet piping.

Educational Services

For information on available courses for the Fisher CVX Hydro-Plug Fixture, 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

Principle of Operation

The Hydro-Plug replaces the valve plug and cage and allows pressurization of the valve inlet, valve body, and inlet piping to the appropriate hydro pressure without overpressurizing the lower pressure class valve outlet and outlet piping.

CAUTION

The Hydro-Plug Fixture employs a rubber O-ring to create a positive seal at the valve seat. The sealing integrity of this O-ring will be compromised if the Hydro-Plug is installed when welding the valve body inline, or during welding preheat or post weld heat treatment.

Maintenance

⚠ WARNING

To avoid personal injury or property damage from pressurized escape of process media, ensure that the system is completely depressurized and appropriate safety measures have been taken prior to carrying out any of the following procedures. Only trained competent individuals with the proper equipment should attempt to disassemble and install a Hydro-Plug Fixture, and reassemble a CVX valve.

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

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

The following valve disassembly steps are intended as a quick reference only. Refer to the CVX instruction manual, D103606X012, for further detail regarding valve disassembly.

Actuator Removal

The following actuator disassembly steps are intended as a quick reference only. Refer to the appropriate actuator instruction manual for further detail regarding actuator removal.

1. Release the actuator seat load by either manually stroking the valve or applying the appropriate instrument signal. The stem connector may be removed once the plug is off the valve seat.
2. If an instrument signal has been used to stroke the plug off the seat, remove the signal only after removing the stem connector.
3. Isolate and disconnect the operating lines from the actuator.
4. Loosen the yoke locknut or the fasteners and remove the actuator from the valve.

Packing Box

Unbolt the packing stud nuts, (key 68), and remove the packing flange (key 66) and packing follower, (key 65) (reference appropriate instruction manual for key numbers). Remove as much packing as possible from the packing box.

CAUTION

Extreme care should be taken to avoid scratching the stem or the packing box.

Bonnet and Trim

1. Loosen the bonnet stud nuts (key 55), using an even and opposing pattern (for example, if the first nut loosened is at the 1 o'clock position, the next nut to be loosened would be at the 7 o'clock position). This will prevent uneven loading of the bonnet studs which may cause binding.

Individual nuts should not be completely loosened while the remaining nuts are tight. It is suggested that at least two stages of loosening be used to avoid overloading the last few remaining studs.

2. Remove the bonnet (key 6) from the valve with uni-axial pull. If the bonnet seems to bind in the valve body, check the alignment of the hoist or pulling mechanism. Deviation from an axial pull of the parts may result in galling or bending of the stem (key 23).

CAUTION

Do not attempt to over-power any binding, as damage to the guide surfaces may result.

The bonnet may be lightly tapped back into alignment with a soft face mallet. The stem and plug should be pushed back into the valve body while the bonnet is being removed. Once the bonnet is removed, dislodge any remaining packing rings from the packing box.

3. Remove the packing ring (key 63) from the bottom of the packing box. Lightly sand the inside of the packing box with 60 or 80 grit paper to remove any adherent packing material. Final cleanup should be made with 160 grit or higher paper.
4. 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.
5. Remove the plug assembly (key 22, 23, and 53) as a single unit by grasping the valve stem (key 23) 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. The plug should be temporarily stored on a clean wooden or cloth surface.
6. Remove the cage (key 21) from the valve body. Remove and discard the upper and lower cage gaskets (key 43). Reference the CVX valve instruction manual for guidance in performing this disassembly. The cage contains sensitive guiding surfaces on its outside diameter and care must be taken during handling. The cage should be temporarily stored on a clean wooden or cloth surface.
7. Clean and inspect the guiding and sealing surfaces of the plug assembly. For balanced plug designs, 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 indicates wear that requires replacement of the ring. The Bore Seal ring has a C-shaped cross section with the open portion of the C-shape facing the seating surface of the plug for flow-up designs and the open portion of the C-shape facing the seating surface of the plug for flow-down designs. 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](#) or Local Business Partner for Bore Seal ring replacement.

Table 1. Recommended Bonnet Bolt Torque

Bolt Size, Inch	Threads per Inch	Recommended Bolt Torque, lbf•ft ⁽¹⁾
1	8	405
1-1/8	8	550
1-1/4	8	730
1-3/8	8	980
1-1/2	8	1290
1-5/8	8	1650
1-3/4	8	2070
1-7/8	8	2560
2	8	3130
2-1/4	8	4490

1. Torques for studs with heavy hex nuts.

8. Clean and inspect the inside diameter surfaces of the cage. The entire length of the cage inside diameter is either a sealing and/or guiding surface and any measurable wear requires that the cage be replaced.
9. **Integral Diffuser Constructions Only:** The seat ring remains retained inside the valve body regardless if it is bolted or welded. Clean and inspect the angled 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 or Local Business Partner for specific instructions on reconditioning the seating surface.
10. **Bolted Seat Ring Removable Diffuser Only:** The bolted seat ring and seat diffuser must be removed. Loosen the seat ring bolts, (key 76) using an even and opposing pattern (for example, if the first nut loosened is at the 1 o'clock position, the next nut to be loosened would be at the 7 o'clock position). This will prevent uneven loading of the

seat ring studs, which may cause binding. Individual bolts should not be completely loosened while the remaining bolts are tight. It is suggested that at least two stages of loosening be used to avoid overloading the last few remaining studs. Reference the CVX instruction manual for guiding on removing the bolted seat ring and seat diffuser (key 77). Discard lower diffuser gaskets (key 75). The bolted seat ring and seat diffuser contain sensitive guiding and gasket surfaces on its outside diameter and care must be taken in their handling. The seat ring and seat diffuser should be temporarily stored on a clean wooden or cloth surface.

11. Remove all used gaskets and foreign matter from the interior of the valve and from the inlet and outlet openings. Remove any foreign matter that may be in the valve trim. Inspect all valve body guiding and sealing surfaces for any signs of wear.

Visual Inspection

Visually inspect the interior of the valve for abnormal wear, signs of erosion, or scoring if the valve has been in service. All scores and scratches should be removed by grinding or filing to remove any interference of the clearance zones between the internal bores and the mating parts. The affected area should be sanded with 100 grit or finer paper. Do not attempt to completely remove the score, only the interference should be removed and sanded.

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.

Installation of the Hydro-Plug

Inspect the valve to ensure that all parts and gaskets have been removed and the valve body is free from foreign debris. For CVX constructions containing integral diffusers, lubricate the inside and outside of the seat lip and the upper valve body bore and counterbore. For CVX constructions with removable diffusers, lubricate the lower body bore where the bolted seat and removable diffuser guide and the upper valve body bore and counterbore. Install the trim as noted below and illustrated in the Hydro-Plug Fixture drawings, figures 1 to 3).

1. Place the lower cage gasket (key 43) in the valve body.
2. **Integral Diffuser Constructions only:** Insert the Hydro-Plug (key 2) in the valve body, making sure that the gasket remains properly placed. Note that the Hydro-Plug must extend to and engage with the seat ring. If there is any question regarding the proper seating of the Hydro-Plug inside the valve body, the following measurements can be taken for confirmation. Measure the thickness of the Hydro-Plug flange at its largest diameter. Measure the depth of the mating counterbore where the Hydro-Plug 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 Hydro-Plug flange should be the difference in these two measured values, minus an additional 0.045 inch to allow for the uncompressed gasket.
3. **Bolted Seat Ring Removable Diffuser Only:** Insert the Hydro-Plug (key 2) into the valve body, making sure that the gasket remains properly placed.
4. Place the upper cage gasket (key 43) on the Hydro-Plug.
5. Lubricate the bonnet studs (key 54) and lower the bonnet (key 6) onto the valve body, making sure that the upper cage gasket remains in the gasket containment groove.
6. Lubricate and tighten the bonnet fasteners as recommended in the appropriate valve instruction manual. Torque values are also shown in table 1 of this document.

CAUTION

Failure to comply with good body-to-bonnet bolting practices and the torque values shown in table 1 or in the appropriate valve instruction manual may result in damage to the valve.

Piping Hydro Test with Hydro-Plug Fixture Installed

⚠ WARNING

To avoid personal injury or property damage from pressurized escape of process media, ensure that the system is completely depressurized and appropriate safety measures have been taken prior to carrying out any of the following procedures. Only trained competent individuals with the proper equipment should attempt to perform the following procedure.

- Always wear protective gloves, clothing, and eyewear when performing any maintenance operations to avoid personal injury.
- Check with your process or safety engineer for any additional measures that must be taken to protect against process media.

Note

The following steps are not intended to be complete instructions for performing a safe and complete hydrotest. They are intended only to address the basic issues required for hydrotesting.

1. Establish hydrotest boundaries to ensure that all required components are tested without overpressurizing the lower pressure class piping and components. After following all safety precautions and venting the system of air, raise the system to the required hydrotest pressure.
2. At the completion of the hydrotest procedure, secure and depressurize the system.

Disassembly of the Hydro-Plug Fixture

1. Loosen the bonnet nuts, (key 55) using an even and opposing pattern (for example, if the first nut loosened is at the 1 o'clock position, the next nut to be loosened would be at the 7 o'clock position). This will prevent uneven loading of the bonnet flange studs which may cause binding.

Individual nuts should not be completely loosened while the remaining nuts are tight. It is suggested that at least two stages of loosening be used to avoid overloading the last few remaining studs.

2. Remove the bonnet (key 6) from the valve with uni-axial pull. If the bonnet seems to bind in the valve body, check the alignment of the hoist or pulling mechanism. Deviation from an axial pull of the parts may result in galling or bending of the stem.

CAUTION

Do not attempt to over-power any binding, as damage to the guide surfaces may result.

3. Remove and discard the upper cage gasket (key 43).
4. Remove the Hydro-Plug (key 2) from the valve body cavity using the integral eyebolt holes in the Hydro-Plug.
5. Remove and discard the lower cage gasket (key 43).

CAUTION

To avoid compromising the service life of the CVX valve body and/or trim, do not reuse the blowout gaskets for valve reassembly.

Cleaning

After removal of the hydro-plug, the interior of the valve body should be rinsed with clean water or repeatedly wiped with clean towels until the surfaces are clean to the touch. All internal parts should be cleaned prior to reassembly.

Reassembly

Refer to the appropriate valve instruction manual for guidance in reassembling the valve.

Ordering Information for Hydro-Plug Fixture

Information required for specifying and ordering the CVX Hydro-Plug Fixture.

Valve Information

- Valve Serial Number
- Valve Tag Number
- Customer Order Number
- Valve Model Number
- Material (carbon steel unless otherwise specified)

⚠ 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.

Figure 1. Fisher CVX Welded Seat Ring Integral Diffuser Hydro-Plug

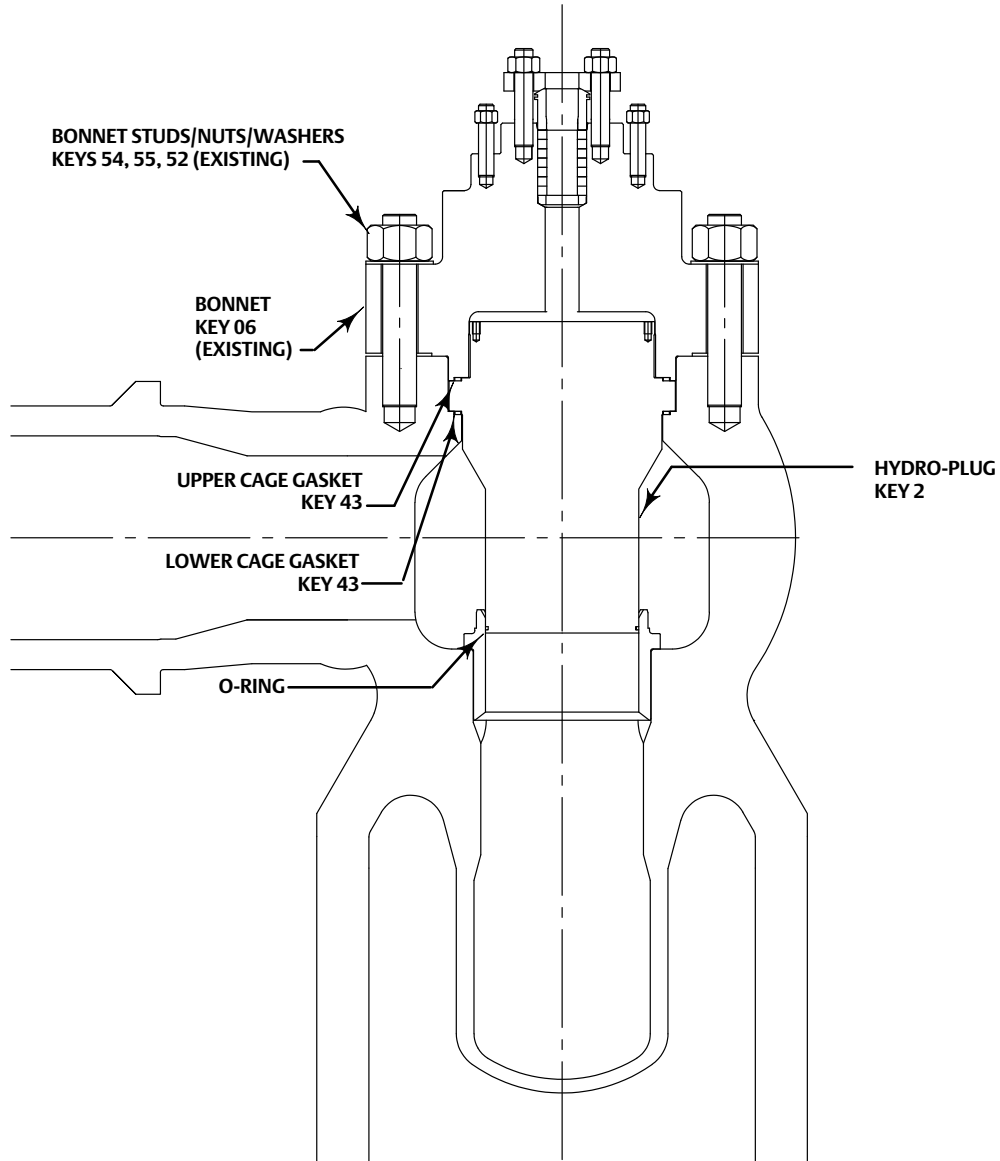


Figure 2. Fisher CVX Bolted Seat Ring Integral Diffuser Hydro-Plug

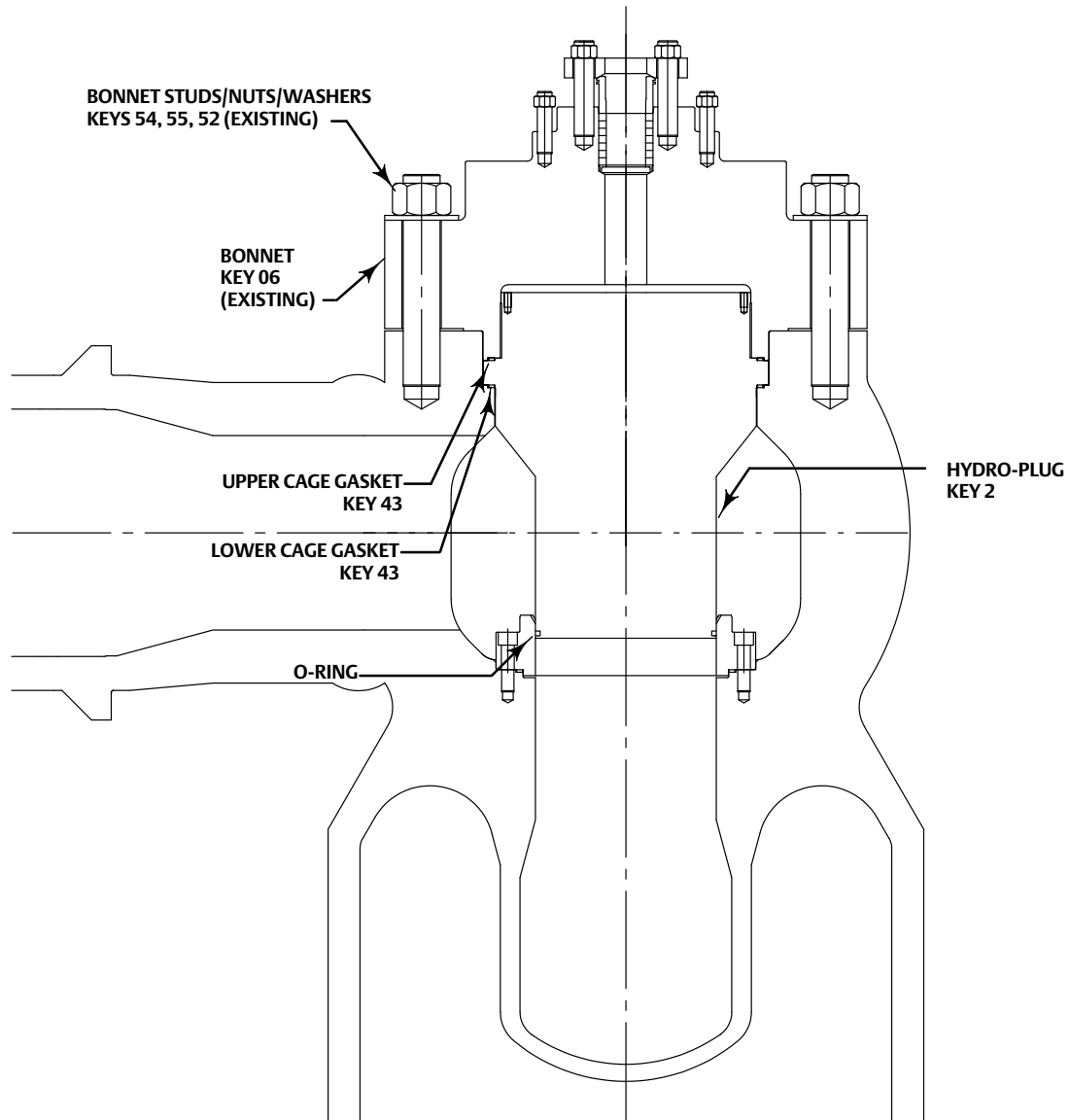
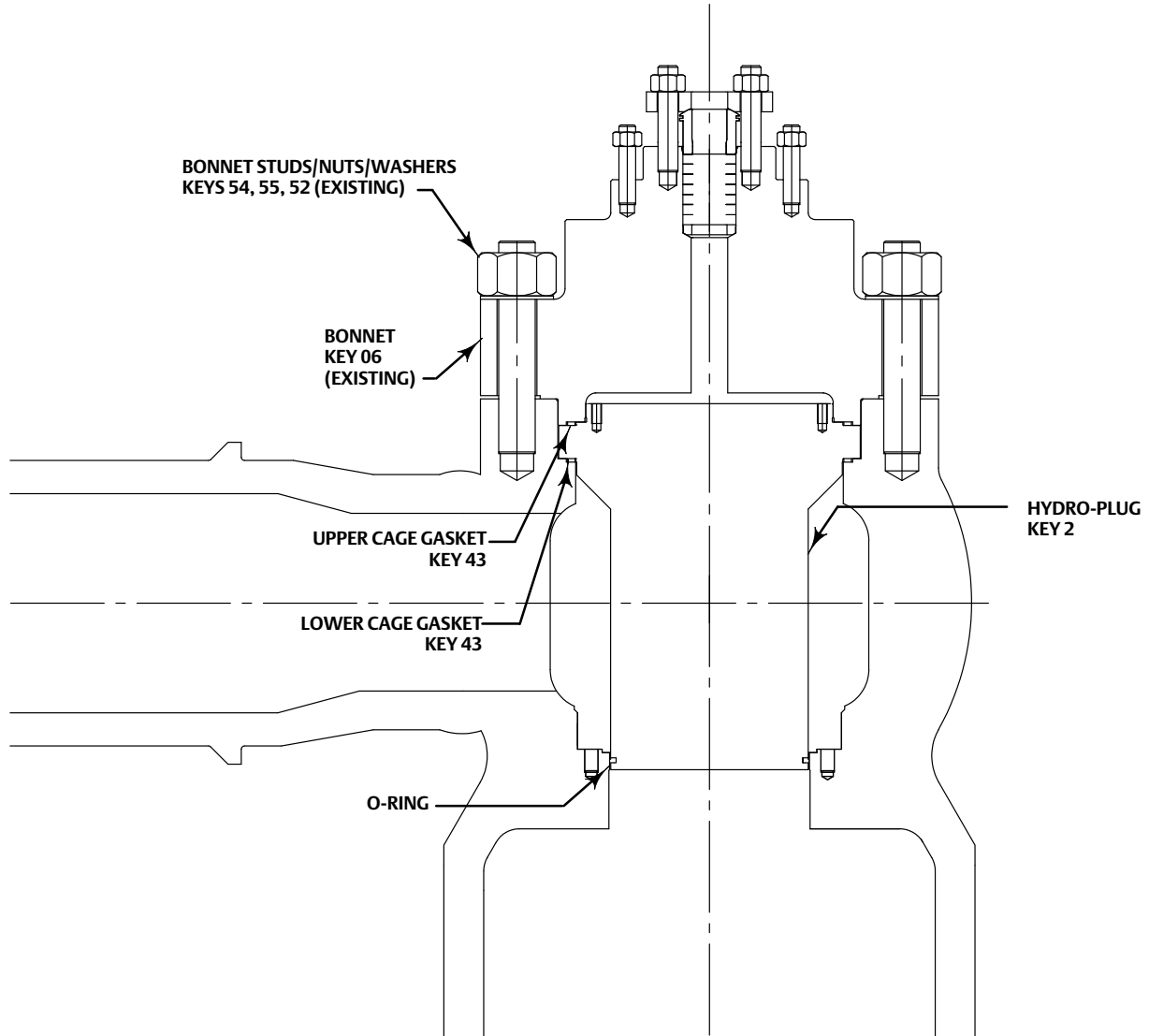


Figure 3. Fisher CVX Bolted Seat Ring Removable Diffuser Hydro-Plug



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