

NPS 4 CL1679 HPS for Duke Energy - Catawba Station

Duke Order: 00084234

Emerson Order: 033-B800153416 Items 1A-1D (Hardware)

BOM Drawing: GE30958

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Introduction

Scope of Manual

This instruction manual includes installation, maintenance, and parts information for an NPS 4 HPS valve with CL1679 ratings for Duke Energy Corporation, Catawba Nuclear Station, Design Specification Number DPS 1205-06-00-0001, Rev 1, Order Number 033-B800153416, Item 1A-1D, Catawba. Refer to separate manuals for instructions covering the actuator, positioner, and accessories.

Do not install, operate, or maintain HPS valves without first • being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance, and • carefully reading and understanding the contents of this manual. If

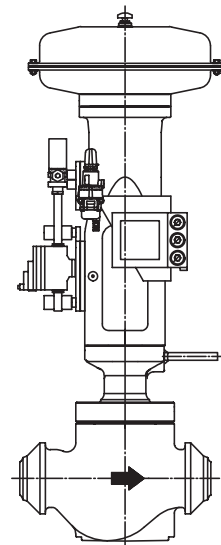


Figure 1. NPS 4 CL1679 HPS Control Valve with Size 70 667NS Actuator

you have any questions about these instructions, contact your Emerson Process Management™ sales office before proceeding.

Description

The HPS high-pressure globe valve (figure 7) has a metal seat, cage guiding, quick change trim, push-down-to-close valve plug action, and uses an unbalanced valve plug.

Specifications

Specifications for the HPS valve are shown in table 1.



HPS Valve

Table 1. Specifications

<p>End Connection Styles and Ratings⁽¹⁾ Buttwelding: Consistent with CL1500 intermediate ratings per ASME B16.34</p> <p>Shutoff Classifications Class IV</p> <p>Flow Characteristic Equal percentage</p>	<p>Flow Direction Normally flow up</p> <p>Approximate Weights (valve body and bonnet assemblies) 221 kg (489 lb)</p>
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1. The pressure or temperature limits in this manual and any applicable standard limitations should not be exceeded.

Table 2. Torque for Body-to-Bonnet Bolting Using Anti-Seize Lubricant

VALVE RATING	VALVE SIZE, NPS	TORQUE			
		N•m		lbf•ft	
		B7, B16, BD and 660 Studs	B8 and B8M Studs	B7, B16, BD and 660 Studs	B8 and B8M Studs
CL1679	4	970	730	720	540

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

Some bonnet flanges have a tapped hole that was used to handle the bonnet during manufacture. Do not use this tapped hole to lift the valve assembly or personal injury may result.

WARNING

When ordered, the valve configuration and construction materials were selected to meet particular pressure, temperature, pressure drop, and controlled fluid conditions indicated when the valve was ordered. Since some body/trim material combinations are limited in their pressure drop and temperature ranges, do not apply any other conditions to the valve without first contacting your Emerson Process Management sales office.

1. Before installing the valve, inspect it to ensure that the valve body cavity is free of foreign material.
2. Clean out all pipelines to remove scale, welding slag, and other foreign materials before installing the valve.
3. Flow through the valve must be in the direction indicated by the flow arrow, which is stamped on or attached to the valve body.

CAUTION

Depending on valve body materials used, post-weld heat treating might be needed. Post-weld heat treatment can damage internal elastomeric, plastic, and metal parts. Shrink-fit pieces and threaded connections might also loosen. In general, if post-weld heat treating is needed, remove all trim parts. Contact your Emerson Process Management sales office for additional information.

4. Use accepted piping and welding practices when installing the valve in the pipeline. For flanged valve bodies, use a suitable gasket between the body and pipeline flanges.
5. Install a three-valve bypass around the valve if continuous operation is required during maintenance.
6. If the actuator and valve body are shipped separately, refer to the actuator mounting procedure in the appropriate actuator instruction manual.
7. If the valve body was shipped without packing installed in the packing box, install the packing before putting the valve body into service. Refer to instructions given in the Packing Maintenance procedure.



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.

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 lubrication, packing maintenance, and trim maintenance. All maintenance operations may be performed with the valve in the line.



WARNING

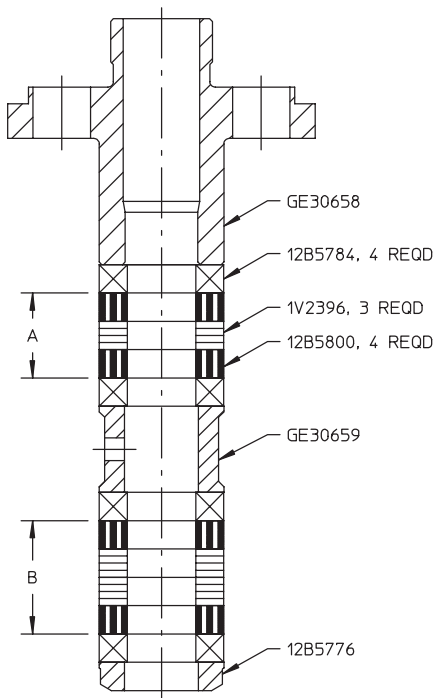
Avoid personal injury or damage to property from sudden release of pressure or uncontrolled process fluid. Before starting disassembly:

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

HPS Valve

Table 3. Valve Stem Connection Torque and Drill Size for Pin Hole

VALVE SIZE, NPS	VALVE STEM DIAMETER		DESIGN	VALVE STEM CONNECTION TORQUE (MINIMUM-MAXIMUM)		DRILL SIZE FOR PIN
	mm	Inches		N•m	Lbf•ft	Inches
4	19.1	3/4	HPS	237 - 339	175 - 250	3/16



GE30660-A

Figure 2. Packing Arrangement

Note

The HPS valve uses spiral-wound gaskets which are crushed to provide their seal. A spiral-wound gasket should never be reused. Whenever a gasket seal is disturbed by removing or shifting gasketed parts, a new gasket must be installed upon reassembly. This is necessary to ensure a good gasket seal, since the used gasket will not seal properly.

CAUTION

The spiral-wound gaskets are of special design. Failure to use Fisher® replacement parts may result in valve damage.

Packing Maintenance

Do not install, operate, or maintain HIGH-SEAL ULF live-loaded packing systems without first being fully trained and qualified in valve, actuator, and accessory installation, operation, and maintenance, and carefully reading and understanding the contents of this manual. If you have any questions about these instructions, contact your Emerson Process Management™ sales office before proceeding.

HIGH-SEAL ULF live-loaded packing systems combine the excellent sealing performance of the ENVIRO-SEAL Graphite ULF packing set with the high-performance of the HIGH-SEAL spring pack. The long-travel HIGH-SEAL Belleville springs accurately compensate for any packing consolidation or wear, keeping the packing stress nearly constant over the life of the packing set.

The HIGH-SEAL load scales ensure accurate initial packing adjustment and provide positive visual indication of the packing stress at any time. It is recommended that new packing sets be adjusted to the MAX level.

HIGH-SEAL ULF packing systems are intended for more-severe applications with pressure limits up to 290 bar (4200 psig). If your application exceeds these limits, consult your Emerson Process Management sales office. For ratings on packing systems, refer to 59.1:062(A) Packing Selection Guidelines For Sliding Stem Valves. However, do not exceed the pressure/temperature limits of the valve. If the piping and valve are insulated, do not allow insulation to extend above the yoke boss surface, covering the HIGH-SEAL ULF packing arrangement. Keep the HIGH-SEAL ULF packing arrangement exposed to ambient air conditions.

The flange, Belleville springs, stud bolts and nuts, packing follower, and packing arrangement are an integral part of the HIGH-SEAL ULF system (see figure 7). For maximum packing life and to operate within the friction specified for a 19.1 mm (3/4 inch) stem diameter (7517-7735 Newtons [1690-1739 pounds force]), do not interchange any other packing parts with the parts in the HIGH-SEAL ULF system.

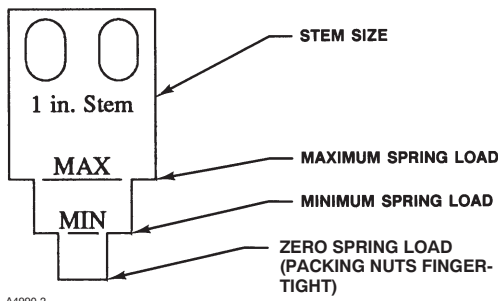


Figure 3. Typical Load Scale

WARNING

Refer to the Warning at the beginning of the Maintenance section on page 3.

If the valve is in service, isolate the control valve from the line pressure, release pressure from both sides of the valve body, and drain the process media from both sides of the valve. 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 you work on the equipment. Refer to instructions in the appropriate valve and actuator instruction manuals.

WARNING

HIGH-SEAL ULF live-loaded packing systems are intended for a specific range of pressure, temperature and other service conditions. The valves for which these packing systems are available are also intended for a specific range of pressure, temperature and other service conditions. Do not expose the packing system or the valve to service conditions or variables other than those for which the packing system and valve are intended. If you are not sure what these conditions are, contact your Emerson Process Management sales office. Provide the product serial number (shown on the nameplate) and all other pertinent information. Applying different conditions could result in parts damage, malfunction of the valve or loss of control of the process, and could also result in personal injury or property damage.

If you are installing the HIGH-SEAL ULF packing system in a valve that is still connected to an actuator, it will be necessary to disconnect the valve from the actuator to provide sufficient space to install the packing assembly. Refer to appropriate valve and actuator instruction manuals. Remove old packing parts from the packing box by using the valve instruction manual procedures.

The valve stem condition is critical to packing sealing performance and life. As-new surface finish (0.1 μm [4 μin]R_a max) is recommended for best performance. Refer to the appropriate valve instruction manual for instructions on replacing the valve stem.

Check the condition of the packing bore after you have removed the packing. An easy method for cleaning debris and minor imperfections from the bore is to use a brake cylinder hone attached to an electric drill. This method will do a good job of cleaning the packing bore without changing the dimension of the bore.

Inspect the packing bore size and surface finish. If the packing bore is worn, pitted, damaged, or oversized more than 0.010 inch, replace the valve bonnet or have your Emerson Process Management Service Center repair it.

1. Install the packing arrangement into the valve packing box.

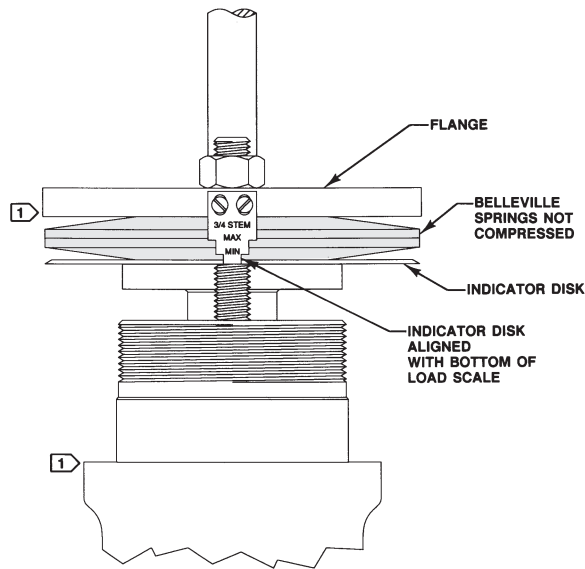
Packing Installation

HIGH-SEAL ULF packing systems are designed for quality performance over extended periods. This longevity allows packing maintenance to be performed as it should be, at regularly scheduled plant outages or turn-arounds.

Note

Be sure to install the packing rings in the sequence shown in figure 2. Identify parts by color or by the number stamped on the part.

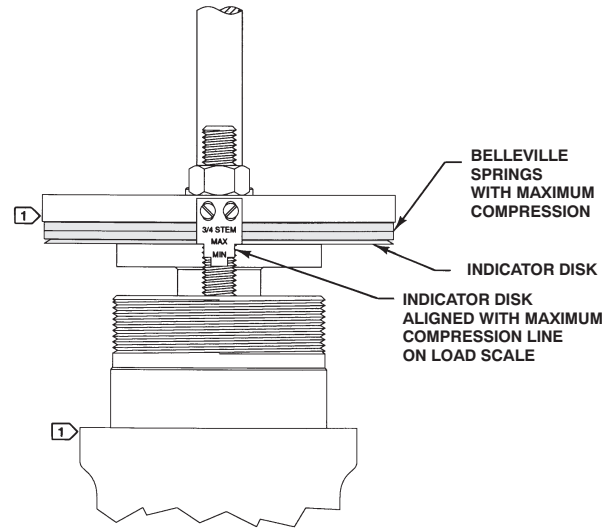
HPS Valve



1 THESE TWO SURFACES MUST REMAIN PARALLEL AS YOU ALTERNATELY AND EVENLY TIGHTEN THE PACKING NUTS.

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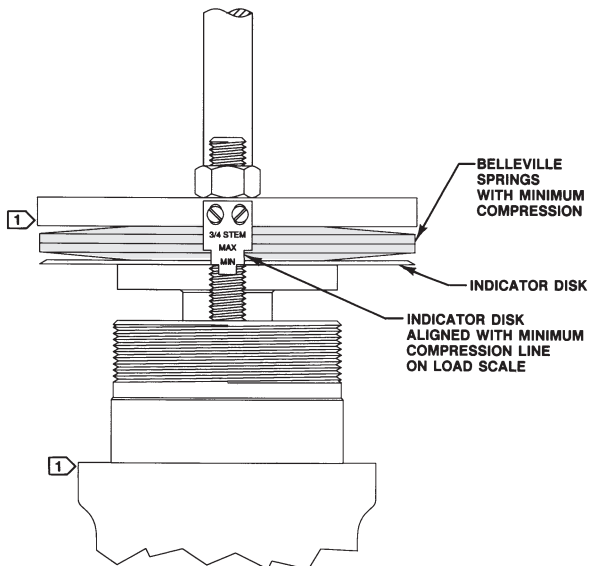
Figure 4. HIGH-SEAL ULF Packing Assembly Showing the Load Properly Adjusted for Decompressed Springs



1 THESE TWO SURFACES MUST REMAIN PARALLEL AS YOU ALTERNATELY AND EVENLY TIGHTEN THE PACKING NUTS.

A4993-3/IL

Figure 6. Load Scale Indicating Maximum Spring Compression



1 THESE TWO SURFACES MUST REMAIN PARALLEL AS YOU ALTERNATELY AND EVENLY TIGHTEN THE PACKING NUTS.

A4992-2/IL

Figure 5. Load Scale Indicating Minimum Spring Compression

2. Install the packing follower (key 4).
3. Refer to the appropriate valve and actuator instruction manuals when connecting the valve to the actuator.

4. Place the packing follower against the packing as shown in figure 7.
5. Place the indicator disk and the first Belleville spring while guiding them onto the packing follower. Make certain the cone-shaped side of the Belleville spring is towards the indicator disk as shown in figure 4.
6. Place the second Belleville spring (key 27) with the coned-shaped side toward the flange (key 18); see figure 4. Position the flange on top of the spring, making sure the second spring fits into its guide in the flange.

CAUTION

Keep the packing follower and flange centered on the valve stem. If any metal part makes contact with the stem, it can cause damage to the stem surface. Vertical scratches or nicks on the stem surface can cause excessive leakage from the packing.

7. Lubricate the packing nuts with anti-seize lubricant and tighten them hand-tight.
8. The load scale (figure 3) is used to indicate compression on the Belleville springs. Position the load scale by slightly loosening the mounting screws. Align the bottom edge of the load scale with the indicator disk and retighten the screws. Figure 4

illustrates the load scale properly adjusted before the nuts have been tightened and with the Belleville springs not compressed.

9. Tighten the packing nuts while observing the two load scales (key 28) to make sure the flange (key 18) is tightened evenly. Figure 5 indicates minimum spring compression with the indicator disk aligned with the minimum compression line on the load scale. Be sure to keep the follower centered on the stem while tightening the nuts. Tighten the nuts alternately and evenly, keeping the flange parallel with the valve (see figures 5 and 6), until the indicator disk aligns with the maximum compression line on the load scales, as shown in figure 6.

10. The packing is now properly loaded and the packing nuts do not need to be retightened unless the indicator begins to approach the minimum compression line (see figure 5). After the valve has been in service for awhile, visually check the load scale to determine loading. Under normal conditions, the packing nuts should not require retightening for the life of the packing.

Trim Removal

Key numbers referenced in this procedure are shown in figure 7, except where indicated.

1. Remove the actuator and bonnet by following steps 1 through 6 of the replacing packing procedure. Observe all warnings and cautions.
2. Lift the valve stem and attached valve plug out of the valve body. If the valve plug is to be reused, tape or otherwise protect the valve plug stem and the valve plug seating surface to prevent scratches.
3. Lift out the cage (key 5) and the bonnet gasket (key 13).
4. Remove the seat ring (key 11) and the seat ring gasket (key 14).
5. Refer to the Valve Plug Maintenance procedure or to the Lapping Seats procedure.

Valve Plug Maintenance

Key numbers used in this procedure are shown in figure 7, except where indicated.

1. With the valve plug (key 2) removed according to the trim removal procedure, proceed as appropriate:
2. To replace the valve plug stem (key 2), drive out the pin, and unscrew the stem from the valve plug.

CAUTION

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. This weakens the stem and may cause the stem to fail in service. If a new valve plug is required, always order a valve plug, stem, and pin as an assembly. Specify the correct part number of each of the three parts, but state that the parts are being ordered as an assembly.

A used valve plug may be reused with a new stem.

3. Thread the new stem into the valve plug and tighten it to the appropriate torque value given in table 3. Using the valve plug pin hole as a guide, drill the pin hole through the stem. Refer to table 3 for drill sizes.
4. Drive in the pin to lock the assembly.

Lapping Seats

Key numbers referenced in this procedure are shown in figure 7, except where indicated.

A certain amount of leakage should be expected with metal-to-metal seating in any valve body. If the leakage becomes excessive, however, the condition of the seating surfaces of the valve plug and seat ring can be improved by lapping. (Deep nicks should be machined out rather than ground out.) Use a good quality lapping compound of a mixture of 280 to 600-grit. Apply the compound to the bottom of the valve plug.

Note

HPS valves use spiral-wound gaskets. These gaskets provide their seal by being crushed and therefore should never be reused. This includes reusing a gasket after the lapping procedure has been performed.

An "old" gasket can be used to lap the seat, however the gasket must be replaced with a new gasket.

To preserve the effects of lapping, do not change either the position of the seat ring in the valve body cavity or the position of the cage on the seat ring after lapping the seating surfaces. When the parts are removed for

HPS Valve

cleaning and replacement of the “old” gaskets, return them to the original positions.

Use the following procedure to lap the seating surfaces.

1. Install the following parts according to the instructions presented in the trim replacement procedure: “old” seat ring gasket (key 14), seat ring (key 11), cage (key 5), and “old” bonnet gasket (key 13).
2. Install the valve plug and stem assembly (key 2) into the cage.
3. Install the bonnet (key 1) over the valve stem, and secure the bonnet with four of the hex nuts (key 7).
4. Attach a handle, such as a piece of strap iron secured by stem locknuts, to the valve stem. Rotate the handle alternately in each direction to lap the seats.
5. After lapping, disassemble as necessary (you may mark the position of the seat ring and cage with a soft tip marker). Clean the seating surfaces, replace the gaskets, reassemble (taking care to return the seat ring and cage to their original positions), and test for shutoff. Repeat the lapping procedure if necessary.

Trim Replacement

 **WARNING**

Observe the warning at the start of the Maintenance section.

After all trim maintenance has been completed, reassemble the valve body by following the numbered steps below. Be certain that all gasketed surfaces have been well cleaned. Key numbers referenced in this procedure are shown in figure 7, except where indicated.

CAUTION

Inspect the seat ring, cage, bonnet, and body gasket surfaces. These surfaces must be in good condition, with all foreign material removed. Small burrs less than approximately 0.076 mm (0.003 inches) in height (the thickness of a human hair) can be ignored. Scratches or burrs that run

across the serrations are not permitted under any conditions, since they will prevent the gaskets from sealing properly.

1. Install the seat ring gasket (key 14) into the valve body. Install the seat ring (key 11).
2. Install the cage.
3. Install the valve plug into the cage.
4. Install the bonnet gasket (key 13) on the cage.
5. Install the bonnet over the valve stem and onto the valve body.

Note

The prelubricated hex nuts (key 7) referred to in step 6 can be identified by a black film coating on the nut threads.

The proper bolting procedures in step 6 include--but are not limited to--ensuring that the bonnet stud threads are clean, and that the hex nuts are evenly tightened to the specified torque values.

CAUTION

Failure to comply with good bonnet-to-body bolting practices and the torque values shown in table 2 may result in damage to the valve. Cheater bars or slug wrenches should not be used for this procedure.

Hot torquing is not recommended.

6. Lubricate the stud threads and the faces of the hex nuts (key 7) with anti-seize lubricant (not necessary if new factory prelubricated hex nuts are used). Replace the hex nuts, but do not tighten them. Torque the nuts in a crisscross pattern to no more than 1/4 of the nominal torque value specified in table 2. When all nuts are tightened to that torque value, increase the torque by 1/4 of the specified nominal torque and repeat the crisscross pattern. Repeat this procedure until all nuts are tightened to the specified nominal value. Apply the final torque value again and, if any nut still turns, tighten every nut again.
7. Install new packing and packing box parts per steps 15 and 16 of the Replacing Packing procedure. Be certain to observe the note given prior to step 15 of that procedure.
8. Mount the actuator by following the procedures in the actuator instruction manual. Check for packing leakage as the valve is being put into service.

Parts Ordering

Each body-bonnet assembly is assigned a serial number, which can be found on the valve body. This same number also appears on the actuator nameplate when the valve body is shipped from the factory as part of a control valve assembly. Refer to the number when contacting your Emerson Process Management sales office for technical assistance or when ordering replacement parts.

When ordering replacement parts, also be sure to include the 11-character part number for each part required.



WARNING

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

Note

Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use and maintenance of any product. Responsibility for the selection, use, and maintenance of any product remains with the purchaser and end-user.

Parts List

Also refer to BOM drawing GE30958.

Key	Description
1	Seismic Bonnet Assy
2	Valve Plug/Stem Assy
3	Valve Body
4	Packing Follower
5	Cage
7	Hex Nut, 8 req'd
9	Stud, Cont Thd, 8 req'd
10	Stud, 2 req'd
11	Seat Ring
12	Nut, 2 req'd
13	Bonnet Gasket, Spiral Wound
14	Seat Ring Gasket, Spiral Wound
15	Lubricant, Anti-Seize
16	Drive Screw, 6 req'd
17	Flow Arrow
18	Packing Flange
19	Lantern Ring
20	Packing Box Ring
21	Nameplate, Nuclear
22	Nameplate, SS Body
23	Packing Ring, 3 req'd
24	Packing Ring, 4 req'd
25	Guide Bushing, 4 req'd
26	Washer, 2 req'd
27	Belleville Spring, 2 req'd
28	Load Scale, 2 req'd
29	Indicator Disk
30	Machine Screw, 4 req'd

HPS Valve

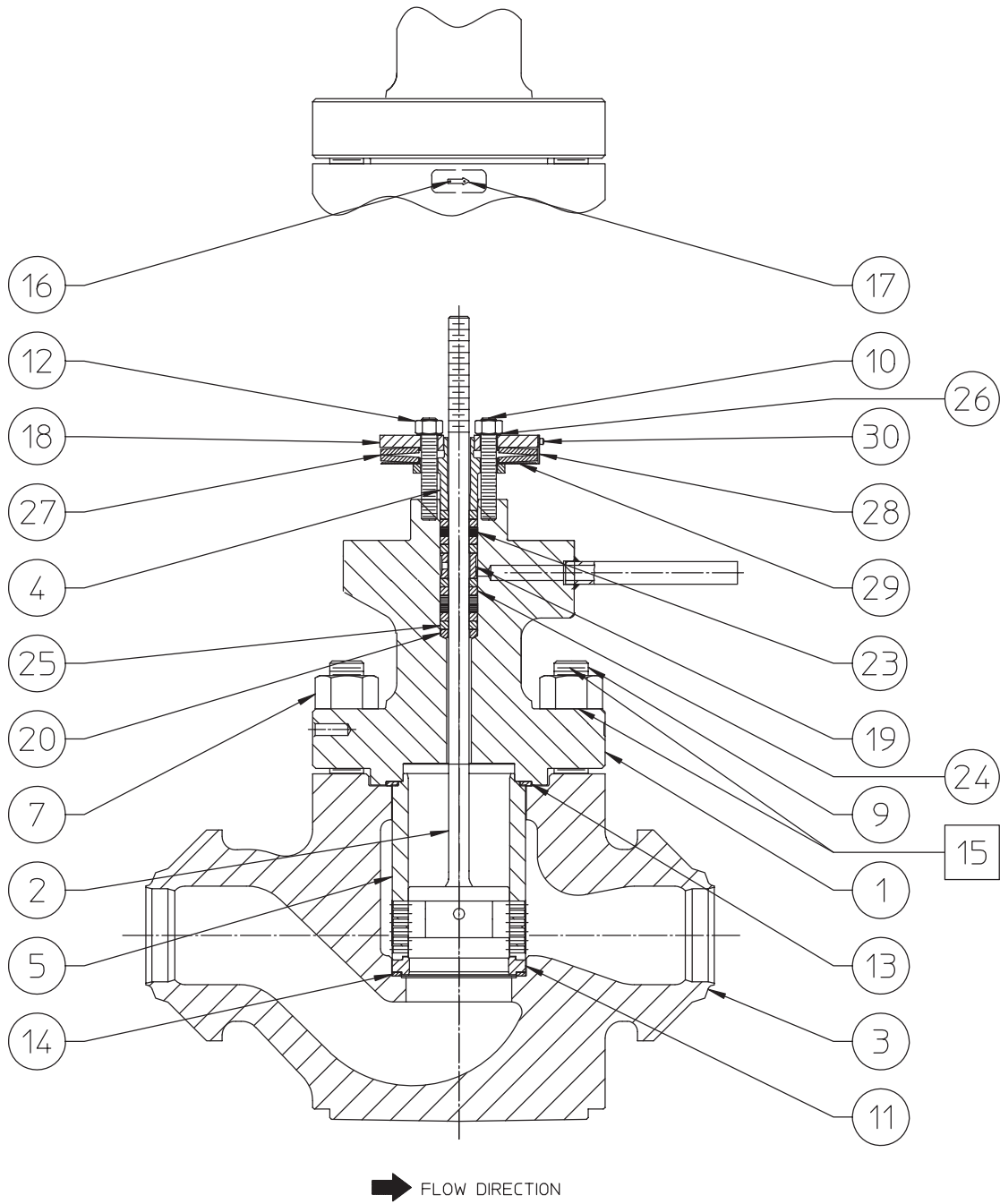


Figure 7. NPS 4 HPS Valve

HPS Valve

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