

Fisher™ Vee-Ball™ V200U Rotary Control Valve DN 80 through 250 (NPS 3 through 10)

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Figure 1. Fisher V200U Flangeless Vee-Ball with Bettis™ RPE Actuator and FIELDVUE™ DVC2000 Digital Valve Controller



X1711

Introduction

Scope of Manual

This instruction manual provides installation, operation, maintenance, and parts information for the Fisher Vee-Ball Flangeless V200U rotary control valve sizes DN80 through DN250 (NPS 3 through NPS 10) (see figure 1).

For information on ENVIRO-SEAL™ packing, see the ENVIRO-SEAL Packing System for Rotary Valves instruction manual ([D101643X012](#)). Refer to separate manuals for information concerning the actuator, positioner and accessories.



Do not install, operate, or maintain Vee-Ball 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.

Table 1. Specifications

<p>Valve Sizes See table 2</p> <p>Valve End Connection Styles Flangeless (all sizes) ■ mates EN1092-1 PN10-40 Type B raised-face flanges (see table 2) ■ mates with ASME B16.5 CL150/CL300 raised-face flanges (see table 2)</p> <p>Maximum Inlet Pressure⁽¹⁾ Consistent with applicable EN 12516-1 or ASME B16.34 ratings</p> <p>Standard Flow Direction Forward (into the convex face of the Vee-Ball)</p> <p>Dimensions See table 4</p> <p>Actuator Mounting ■ Right-hand, standard or ■ left-hand, optional, as viewed from the valve inlet (see figure 10 and the Actuator Mounting section)</p>	<p>Standard: Ball rotates counterclockwise to close when viewed from actuator side of valve</p> <p>Optional: Ball rotates clockwise to close Ball rotation is 90 degrees</p> <p>Valve/Actuator Action For right-hand mount actuator, the standard ball design and actuator action is counter-clockwise to close (CCW). The ball will rotate to the top of the valve body when open for a horizontal pipe run with the valve shaft positioned horizontal. ■ Left-hand actuator mounting with CCW action is an option.</p> <p>Left-hand actuator mounting with a special clockwise to close (CW) ball design and actuator action is also available to allow the ball to rotate to the top of the valve body for a horizontal pipe run with the valve shaft positioned horizontal.</p> <p>With diaphragm or piston rotary actuator, field-reversible between: ■ push-down-to-close (PDTC) (extending actuator rod closes valve) and ■ push-down-to-open (PDTO) (extending actuator rod opens valve.)</p> <p>Approximate Weight See table 3</p>
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1. The pressure/temperature limits in this manual, and any applicable code or standard limitation, should not be exceeded.

Description

The V200U Vee-Ball valves (figure 1) with a V-notch ball are used in throttling or on-off service. The V200U is a flangeless construction capable of interfacing with EN 1092-1 Type B or ASME B16.5 raised face flanges. The splined or square drive shaft connects to a variety of rotary-shaft actuator options.

Specifications

Specifications for these valves are shown in table 1 and in the Fisher V200U Vee-Ball Rotary Control Valves Bulletin 51.3:V200U (D104550X012).

Educational Services

For information on available courses for Fisher Vee-Ball valves, 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

Table 2. Valve Body Materials, End Connections, and Ratings

VALVE BODY MATERIAL	VALVE SIZE, DN	VALVE SIZE, NPS	FLANGELESS VALVE END CONNECTION COMPATIBILITY					
			ASME B16.5		EN1092-1			
			Raised Face Flange		Type B Raised Face Flange			
			CL150	CL300	PN10	PN16	PN25	PN40
EN 1.4408/CF8M	80	3	X	X	X	X	X	X
	100	4	X	X	X	X	X	X
	150	6	X	X	X	X	X	X
	200	8	X	X	X	X	X	X
	250	10	X	X	X	X	X	X

Table 3. V200U Approximate Weights

VALVE SIZE		RATING	WEIGHT	
DN	NPS		kg	lbs
80	3	CL150	8	18
		CL300	10	22
		PN10-40	9	19
100	4	CL150 and 300	13	28
		PN10/16	12	26
		PN25/40	13	28
150	6	CL150 and 300	27	58
		PN10-40		
200	8	CL150 and 300	49	109
		PN10/16		
		PN25/40		
250	10	CL150	64	140
		CL300	102	225
		PN10/16	64	140
		PN25/40	71	156

Installation

Installation steps are provided in this section for V200U valves. Key numbers in installation procedures are shown in figure 14 and 15 unless otherwise indicated.

⚠ 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 either the valve body rating or the mating pipe flange joint rating. To avoid such injury or damage, provide a relief valve for overpressure 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. To avoid possible personal injury and 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](#).

⚠ WARNING

The valve drive shaft is not necessarily grounded to the pipeline when installed. Personal injury or property damage could result from an explosion caused by a discharge of static electricity from valve components if the process fluid or the atmosphere around the valve is flammable. If the atmosphere around the valve or the process fluid is flammable, electrically bond the drive shaft to the valve.

Note

Standard PTFE packing is composed of a partially conductive carbon-filled PTFE female adaptor with PTFE V-ring packing. Standard graphite packing is composed of all conductive graphite ribbon packing. Alternate shaft-to-valve body bonding is available for hazardous service areas where the standard packing is not sufficient to bond the shaft to the valve (see the following step).

Attach the optional bonding strap assembly (key 131, figure 2) to the valve drive shaft (key 6) with the clamp (key 130, figure 2) and connect the other end of the bonding strap assembly to the valve body with the cap screw (key 23).

1. If the valve is to be stored before installation, protect the flange mating surfaces and keep the valve body cavity dry and free of foreign material.
2. Install a three-valve bypass around the control valve assembly if continuous operation will be necessary during inspection and maintenance of the valve.
3. The valve is normally shipped as part of a control valve assembly, with an actuator mounted on the valve. If the valve and actuator have been purchased separately or if the actuator has been removed, mount the actuator according to the Actuator Mounting section and the appropriate actuator instruction manual.
4. Standard flow direction is forward (fluid flows into the convex face of the V-notch ball).
5. Install the valve in a horizontal or vertical pipeline with the drive shaft in a horizontal position.

CAUTION

Do not allow the valve to be installed in the pipeline with the drive shaft in the vertical position because of excessive wear to valve component parts.

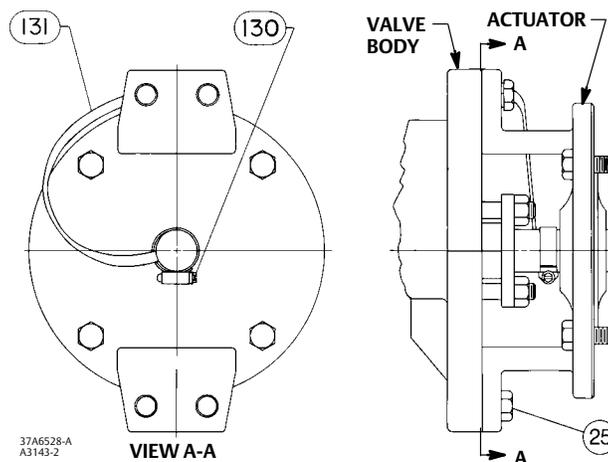
6. The actuator can be right- or left-hand mounted with the shaft in a horizontal orientation as shown in figure 1. If necessary, refer to the appropriate actuator instruction manual for actuator installation and adjustment procedures.

CAUTION

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

7. Be certain the valve and adjacent pipelines are free of any foreign material that could damage the valve sealing surfaces.
8. Be sure the pipeline flanges are in line with each other.

Figure 2. Optional Shaft-to-Body Bonding Strap Assembly



Installing V200U Valves

1. To avoid potential interference with the valve outlet end pipe flange, the V200U ball should be in the closed position prior to installation. Install the V200U valve using long studs to connect the two pipeline flanges. Refer to figure 3 for the length of studs required based on the mating pipeline flange pressure class. Lubricate the studs with anti-seize lubricant.

CAUTION

For DN 100, 200, and 250 (NPS 4, 8, and 10), damage to the ball (key 2) could occur if the downstream piping interferes with the ball rotation. Prior to installing the valve body between adjacent flanges, reference dimension P in table 4 and measure carefully to ensure the ball will rotate without interference.

2. Install two studs in the flanges before you place the valve in the line. Place the two studs so they will contact the line-centering features at the bottom of the valve body.
3. Insert appropriate flange gaskets that are compatible with the process fluid.
4. Place the valve on the two studs. Install all remaining studs. Measure carefully to be sure the valve is centered on the pipeline flanges, and tighten the flange stud nuts. Tighten the nuts in a criss-cross sequence to be sure the flange gaskets are properly torqued.
5. Connect pressure lines to the actuator as indicated in the actuator instruction manual. When an auxiliary manual actuator is used with a power actuator, install a bypass valve on the power actuator (if one is not supplied) for use during manual operation.

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

If the valve has ENVIRO-SEAL live-loaded packing installed, this initial re-adjustment will probably not be required. See ENVIRO-SEAL Packing System for Rotary Valves instruction manual ([D101643X012](#)) for packing instructions.

Figure 3. Fisher V200U Dimensions and Required Clearances for Installation

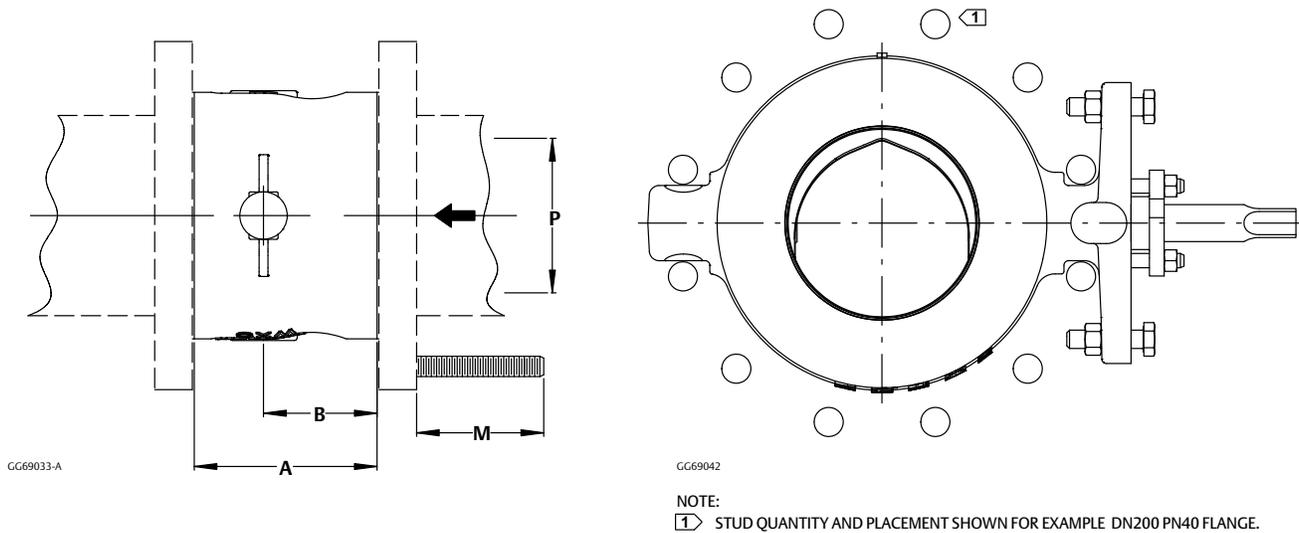


Table 4. Fisher V200U Dimensions and Required Clearances for Installation

VALVE SIZE, DN	VALVE SIZE, NPS	DIMENSION									
		A	B	M ⁽¹⁾				p ⁽²⁾			
				PN 10/16	PN 25/40	CL150	CL300	PN 10/16	PN 25/40	CL150	CL300
mm											
80	3	100	59	225	240	204	216	---	---	---	---
100	4	116	68	250	270	223	242	103	104	99	99
150	6	160	89	310	340	274	299	---	---	---	---
200	8	200	124	355	405	324	356	188	190	188	188
250	10	240	147	410	470	375	413 ⁽³⁾	253	253	242	237
Inches											
80	3	3.94	2.34	8.86	9.45	8.00	8.50	---	---	---	---
100	4	4.58	2.67	9.85	10.63	8.75	9.50	4.06	4.09	3.90	3.90
150	6	6.30	3.52	12.21	13.39	10.75	11.75	---	---	---	---
200	8	7.87	4.89	13.98	15.95	12.75	14.00	7.40	7.48	7.40	7.40
250	10	9.45	5.78	16.15	18.51	14.75	16.25 ⁽³⁾	9.96	9.96	9.53	9.33

1. Clearance necessary to remove the bolt.
 2. Minimum internal diameter of the mating pipe or flange required for Vee-Ball clearance.
 3. The NPS 10 CL300 construction requires 4 bolts per side (8 total) to be installed in blind, tapped holes on the valve body. The M value for these 1 – 8 UNC fasteners is 140 mm (5.5 inch).

Maintenance

Valve parts are subject to normal wear and must be inspected and replaced as necessary. The frequency of inspection and replacement depends upon the severity of service conditions.

Key numbers in this procedure are shown in figures 14 and 15 unless otherwise noted.

⚠ WARNING

The Vee-Ball closes with a shearing, cutting motion, which could result in personal injury. To avoid injury, keep hands, tools, and other objects away from the Vee-Ball while stroking the valve.

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

Packing Maintenance

Key numbers in this procedure are shown in figures 14 and 15 unless otherwise noted. A detailed view of the packing is also shown in figure 4.

If the valve is equipped with the ENVIRO-SEAL Packing System, refer to:

- The separate ENVIRO-SEAL Packing System for Rotary Valves instruction manual ([D101643X012](#)) for maintenance instructions, and
- The Parts List section of this manual for retrofit kits, parts kits, and individual parts.

If the packing is relatively new and tight on the drive shaft (key 6), and if tightening the packing follower nuts does not stop leakage, it is possible that the drive shaft is worn or nicked so that a seal cannot be made. If the leakage comes from the outside diameter of the packing, it is possible that the leakage is caused by nicks or scratches on the packing box wall. Inspect the drive shaft and packing box wall for nicks or scratches while performing the following procedure.

Replacing Packing

When using this procedure, it is recommended that the actuator not be removed from the valve while the valve is still in the pipeline or between flanges. Valve/actuator adjustments must be made with the valve out of the pipeline. Refer to the Determining Closed Position portion of the Actuator Mounting section.

Disassembly

⚠ WARNING

Observe the steps in the **WARNING** at the beginning of the Maintenance section.

1. 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, shut off all pressure lines to the power actuator, release pressure from the actuator, and disconnect the pressure lines from the actuator. Use lock-out procedures to be sure that the above measures stay in effect while you are working on the equipment.
2. To avoid potential interference with the valve outlet end pipe flange, the V200U ball should be in the closed position prior to removal.
3. Remove line bolting, remove the control valve from the pipeline, and place the valve/actuator assembly on a flat surface with the seal protector ring facing up.
4. Remove the actuator cover. Take note of the orientation of the actuator with respect to the valve body and the lever orientation with respect to the valve drive shaft (see figure 12) for Fisher actuation.

⚠ WARNING

When the actuator is removed from the valve, the ball/shaft assembly may suddenly rotate, with a shearing, cutting motion, which could result in personal injury. To avoid injury, carefully rotate the ball to a stable position at the bottom of the valve body cavity. Make sure the ball will not rotate.

CAUTION

When removing the actuator from the valve, do not use a hammer or similar tool to drive the lever or actuator off the valve shaft. Driving the lever or actuator off the valve shaft could damage the ball, seal, and valve.

If necessary, use a puller to remove the lever or actuator from the valve shaft. It is okay to tap the puller screw lightly to loosen lever or actuator, but hitting the screw with excessive force could damage the ball, seal, and valve.

5. Remove the clamped lever (do not loosen the actuator turnbuckle adjustment), remove the actuator mounting screws and nuts (keys 23 and 24), and remove the actuator. (If necessary, refer to the actuator instruction manual for assistance.)
6. If applicable, remove the bonding strap assembly before attempting to remove the packing (see figure 2).
7. Remove the packing follower nuts and packing follower (keys 17 and 20). For alloy packing constructions, the packing follower (key 17) and a separate packing flange (key 40) must be removed if present.

If the valve is equipped with the ENVIRO-SEAL packing system, refer to the ENVIRO-SEAL Packing System for Rotary Valves instruction manual ([D101643X012](#)) for disassembly.

⚠ WARNING

Personal injury could result from packing leakage. Do not scratch the drive shaft or packing box wall while removing packing parts in the following procedure.

8. Remove the packing parts (see figure 4, keys 16, 17, 35, and 39 depending on construction) using a formed wire hook with a sharp end. Pierce the rings with the sharp end of the hook in order to remove them. Do not scratch the drive shaft or packing box wall; scratching these surfaces could cause leakage. Clean all accessible metal parts and surfaces to remove particles that would prevent the packing from sealing.

Assembly

If the valve is equipped with the ENVIRO-SEAL packing system, refer to the ENVIRO-SEAL Packing System for Rotary Valves instruction manual ([D101643X012](#)) for assembly.

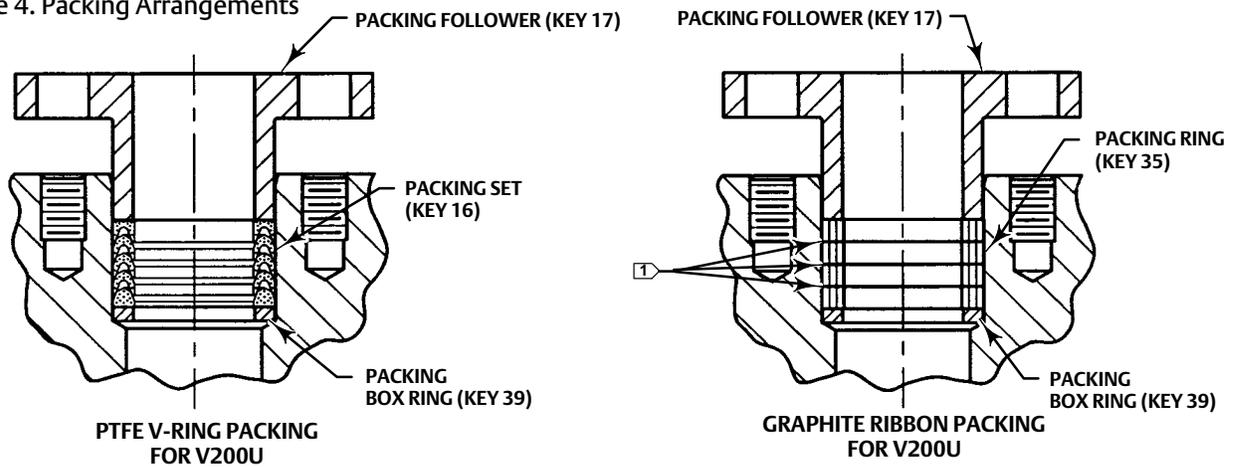
1. To help ensure correct centering of the Vee-Ball (key 2) on the seal (key 11), make sure the ball is closed while you install or tighten new packing. Insert a screwdriver, pry bar, or similar tool between the lower ear of the ball and the valve body. Use the pry to move the ball tightly against the bearing on the actuator side of the valve (see figure 5). Keep the ball in that position until you have completed packing installation and adjustment.
2. Install the new packing parts using the parts sequence shown in figure 4. Install the packing follower (key 17).
3. Secure the packing follower with the packing follower nuts (key 20). Tighten the nuts far enough to stop leakage under operating conditions.

Note

If the valve is equipped with a bonding strap assembly (figure 2), re-install the assembly.

4. Reconnect the actuator and lever in accordance with the orientations that were noted in step 3 of the disassembly procedures. If necessary, use figure 10 to identify the correct index marks.
5. Refer to the appropriate actuator instruction manual to complete actuator assembly and adjustment.
6. When the control valve is in operation, check the packing follower for leakage and re-tighten the packing follower nuts (key 20) as necessary.

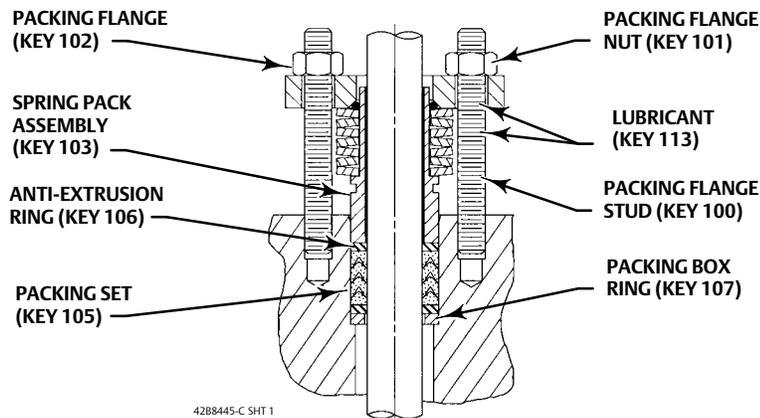
Figure 4. Packing Arrangements



NOTE:
① INCLUDES ZINC WASHERS (KEY 36) FOR GRAPHITE RIBBON PACKING ONLY.

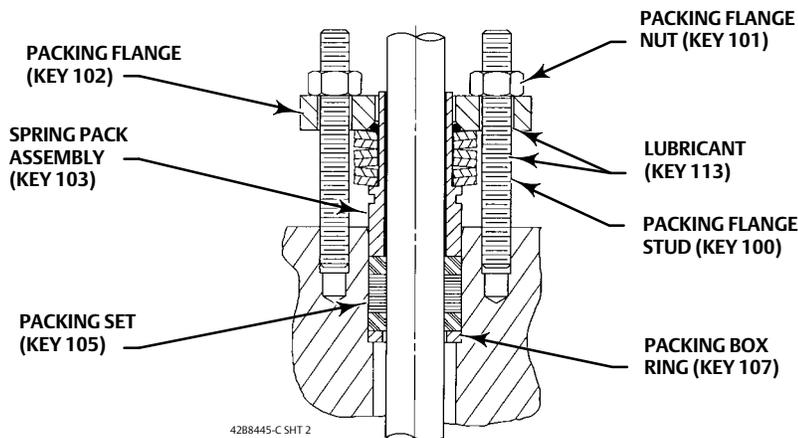
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STANDARD PACKING



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ENVIRO-SEAL PTFE PACKING SYSTEM

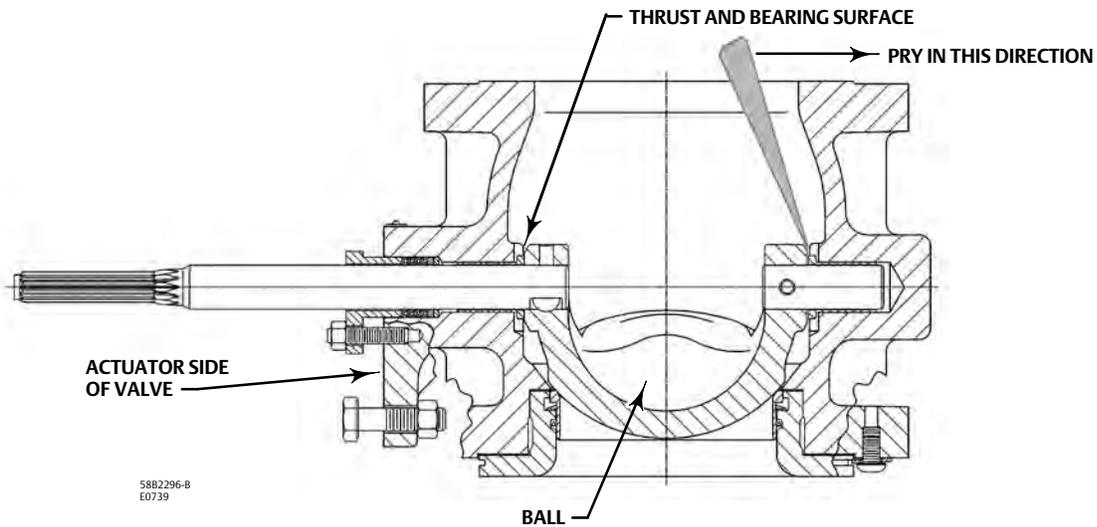


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ENVIRO-SEAL GRAPHITE PACKING SYSTEM

Figure 5. Typical Vee-Ball Valve Showing Pry Bar

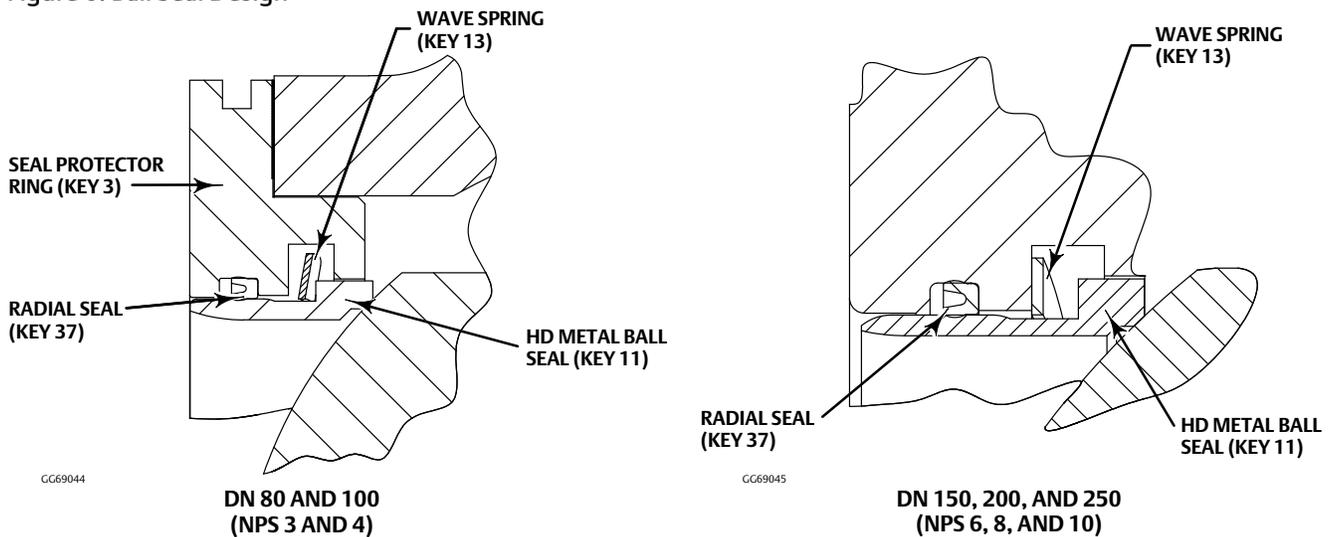


Replacing the HD Ball Seal

Perform this procedure if the control valve is not shutting off properly or if seal inspection is necessary.

The valve / actuator assembly must be removed from the pipeline. To avoid potential interference with the valve outlet end pipe flange, the V200U ball should be in the closed position prior to removal. For DN 80 and 100 (NPS 3 and 4), the actuator may remain mounted on the valve for ball seal replacement. For DN 150 through 250 (NPS 6 through 10), the actuator must be removed from the valve to replace the ball seal. Key numbers are shown in figures 14 and 15 unless otherwise indicated. Ball Seal assembly details (with key numbers) are also shown in figure 6.

Figure 6. Ball Seal Design



⚠ WARNING

Perform the steps in the **WARNING** at the beginning of the Maintenance section of this manual.

Removing the HD Seal

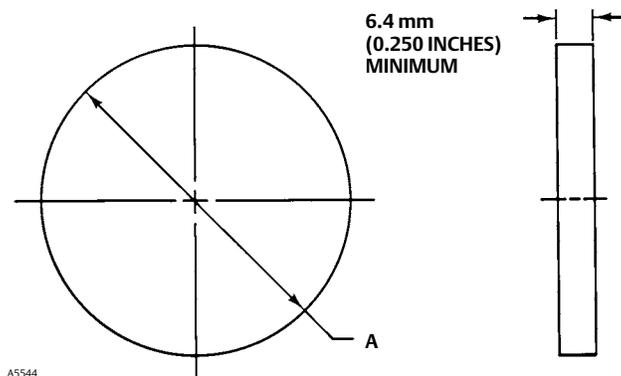
1. Remove line bolting, remove the control valve from the pipeline, remove the actuator (as discussed in the packing section), and place the valve body on a flat work surface.
 - a. For DN 80 and 100 (NPS 3 and 4), remove protector ring screws and washers (keys 21 and 22). Carefully remove the seal protector ring (keys 3) and gasket (keys 15).
 - b. For DN 150, 200, and 250 (NPS 6, 8, and 10), the ball must be removed to access the seal. See the Bearing and Ball Maintenance Disassembly section of this manual. Then return to this procedure and continue with the next steps.
2. Remove HD seal from related component.
 - c. For DN 80 and 100 (NPS 3 and 4), once the protector ring (key 3) has been removed from the valve, push the metal seal (key 11) out of the seal protector ring (key 3). Remove the wave spring (key 13) and the radial seal (key 37).
 - d. For DN 150, 200, and 250 (NPS 6, 8, and 10), with the inlet side of the valve facing up, push the HD metal seal (key 11) into the valve body (key 1). Remove the wave spring (key 13) and the radial seal (key 37).

CAUTION

Exercise care to avoid damaging components in the following procedure.

- It might be necessary to remove the HD metal seal by carefully tapping it with a soft punch and hammer. Take care not to damage the seal protector ring and valve body.
- If the seal is difficult to push out, it is recommended that a seal removal plate be used to press the HD metal seal out of the valve body. Refer to figure 7 for dimensions of the seal removal plate.

Figure 7. HD Seal Removal Plate Dimensions



VALVE SIZE		DIMENSION A	
DN	NPS	Minimum-Maximum, mm	Minimum-Maximum, Inches
80	3	75.9-76.2	2.990-3.000
100	4	95.0-95.3	3.740-3.750
150	6	126.7-127.0	4.990-5.000
200	8	158.5-158.8	6.240-6.250
250	10	212.5-212.7	8.365-8.375

3. If replacement of the ball, shafts (keys 6 or 9), or bearings (key 10) is needed, proceed to the Bearing and Ball Maintenance procedure. If only the seal is to be replaced, proceed to the Installing HD Metal Seals section.

Installing HD Metal Seals

Refer to figures 6, 14, and 15 for key number locations during seal installation.

Thoroughly clean all parts that are to be re-used and obtain replacement parts. Be sure that all sealing surfaces are in good condition without scratches or wear. If the valve has been installed between line flanges and the flange studs and nuts have been tightened, always replace the gasket (key 15) with a new gasket.

1. For DN 80 and 100 (NPS 3 and 4), before installing HD metal seals, ensure ball (key 2) is installed into valve body. Ball should be in closed position while you install the seal and seal protector ring. Insert a screwdriver, pry bar, or similar tool between the lower ear of the ball and the valve body (see figure 5).
2. Use the pry to move the ball tightly against the bearing on the actuator side of the valve. Be careful, excessive force may damage the ball. Keep the ball in that position until you have completed seal or flow ring installation. Check the ball's position periodically, and re-center if necessary, during lever assembly and packing adjustments. See figure 5.

⚠ WARNING

The Vee-Ball closes with a shearing, cutting motion, which could result in personal injury. To avoid injury or property damage, keep hands, tools, and other objects away from the Vee-Ball while stroking the valve.

3. Lubricate and install the radial seal (key 37) into the appropriate groove in the seal protector ring making sure the open side of the radial seal faces away from the ball.
4. Install the wave spring (key 13) into the seal protector ring (key 3).

5. Install the HD seal (key 11) into the seal protector ring (key 3), past the radial seal. While pushing it past the radial seal, make sure the HD seal is level.
 6. Install a replacement gasket (key 15) on the valve body (key 1). Install the HD ball seal/seal protector ring assembly into the valve body (key 1).
 7. Install clips and screws that clamp the seal protector ring to the valve body (keys 3, 21, and 22).
 8. If necessary, refer to the Packing Maintenance procedures to install the packing. Install the actuator using the Actuator Mounting procedures or to the appropriate actuator instruction manual.
1. For DN 150, 200, and 250 (NPS 6, 8, and 10), position the valve body on a flat surface with the outlet side of the valve facing up.
 2. Lubricate the radial seal (key 37) and install into the appropriate groove in the valve body, making sure the open side of the radial seal faces away from the ball.
 3. Install the wave spring (key 13) into the appropriate groove in the valve body.
 4. The HD seal can be installed by pushing the HD seal past the wave spring and radial seal, making sure the HD metal seal remains level. Following this, install the remaining trim components as explained under the Bearing and Ball Maintenance Assembly section of this manual.
 5. Use the pry bar or similar tool to move the ball tightly against the bearing on the actuator side of the valve to help ensure correct side-to-side centering of the ball (key 2) on the seal (key 11). See figure 5.
 6. Be sure that the HD seal is fully installed in the valve. Carefully rotate the ball to engage the HD seal while applying force across the middle of the seal to compress the wave spring until the ball is fully engaged. Be cautious during this process, knowing that excessive force may damage the ball. Keep the ball in the engaged position going forward.
 7. Continue to check the ball's position and re-center if necessary during actuator mounting and packing adjustments.

HD Ball Seal Lubrication

To assist with break-in of the HD seals, it is required that the ball and seal be lubricated with dry film lubricant or equivalent moly disulfide.

Bearing and Ball Maintenance

⚠ WARNING

Before performing the steps in this section, observe the WARNING at the beginning of the Maintenance section of this manual.

Procedures for disassembly and assembly of the bearings and ball cannot be accomplished until the shaft and valve packing are removed from the valve.

Refer to the Replacing Packing procedures to remove the actuator, and to remove the packing flange and packing follower from the valve. When the packing disassembly steps are complete, return to this section.

Disassembly

⚠ WARNING

When the actuator is removed from the valve, the ball/shaft assembly may suddenly rotate, with a shearing, cutting motion, which could result in personal injury. To avoid injury, carefully rotate the ball to a stable position at the bottom of the valve body cavity. Make sure the ball will not rotate.

Key numbers in this procedure are shown in figures 6, 14, and 15, unless otherwise indicated.

1. For DN 80 and 100 (NPS 3 and 4), seal protector ring (key 3) and HD seal (key 5) should be removed first, refers to procedure of Removing HD Seal on page 12. For DN 150, 200, and 250 (NPS 6, 8, and 10), HD seal will be removed after ball (key 2) is removed in this procedure.
2. A taper key (key 4) is used to connect the ball and drive shaft.
3. Carefully rotate the ball to the open position after the actuator is disconnected. Make sure the ball will not rotate (see warning above). Provide support for the ball during the following disassembly.
4. Working from the small end of the groove pin (key 7), use a pin punch to drive the groove pin out of the ball ear and follower shaft.

For tack welded taper keys, driving the taper key out of the ball ear will shear the tack welding.

5. Locate the small end of the taper key (key 4). Using a pin punch on the smaller end of the taper key, drive it out of the ball (key 2) and drive shaft (key 6). Note: driving the taper key in the wrong direction will tighten it.
6. Pull the drive shaft (key 6) out of the actuator side of the valve body.

CAUTION

Exercise care to avoid damaging components in the following procedure.

7. The ball will be free to move when both shafts are removed. Make sure the sealing surface of the ball is not damaged while removing the follower shaft.
8. Use a piece of continuous threaded rod as a removal rod when moving the follower shaft (key 9) into the center of the ball. Refer to table 5 for a description of the size threaded rod needed. The length of the rod should allow easy working room from the valve body.

Table 5. Continuous Threaded Rod

Valve Size, DN	Valve Size, NPS	Threaded Rod Thread Size	Thread Depth in Follower Shaft, Inch
80	3	1/4-20	0.5
100	4	1/4-20	0.5
150	6	1/4-20	0.5
200	8	5/16-18	0.62
250	10	5/16-18	0.62

9. Carefully remove the follower shaft.
10. For DN 80 and 100 (NPS 3 and 4), the ball (key 2) should be removed from the inlet opening of the valve body. Lift the ball to clear the bearings (key 10). Engage the ball drive shaft side ear with the body as shown in figure 8 and carefully lift the ball by the follower side ear to remove.

For DN 150, 200, and 250 (NPS 6, 8, and 10), the ball (key 2) should be removed from the outlet opening of the valve body. Lift the ball to clear the bearings (key 10). Engage the ball drive shaft side ear with the body as shown in figure 9 and carefully lift the ball by the follower side ear to remove.

11. The bearings are not pressed in, so they can be removed with minimal force. Be careful not to damage the machined surfaces of the bearing bore if prying is required.

For HD seal removal, follow the steps outlined under Removing HD Seal of this manual.

Figure 8. DN 80 and 100 (NPS 3 and 4) Ball Removal

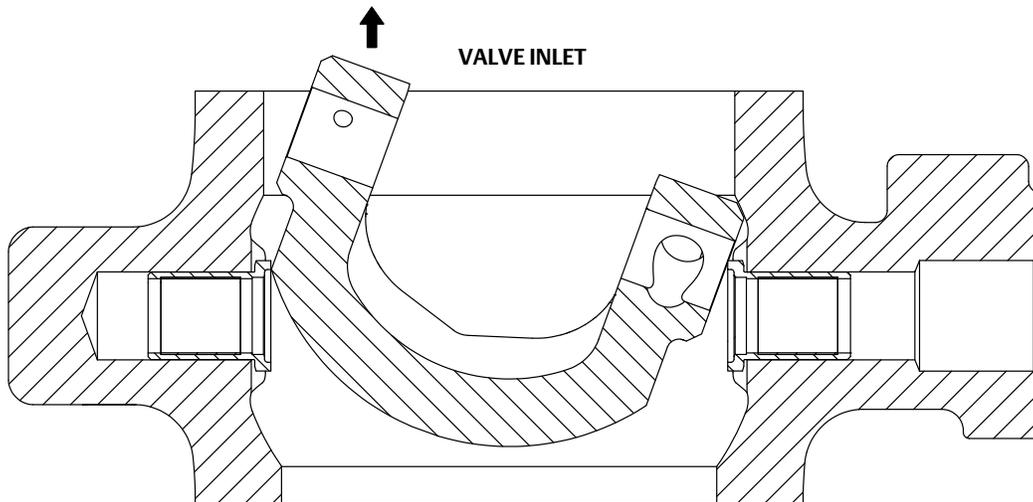
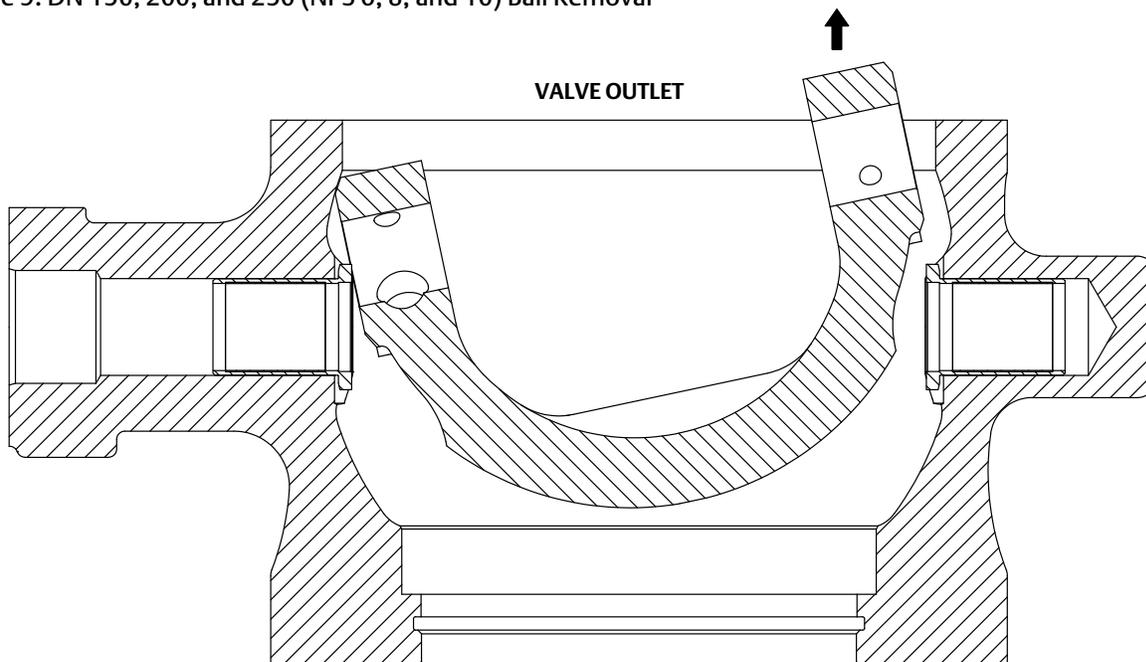


Figure 9. DN 150, 200, and 250 (NPS 6, 8, and 10) Ball Removal



Assembly

1. Inspect all sealing surfaces to ensure they are in good condition and without scratches or wear.

For DN 150, 200, and 250 (NPS 6, 8, and 10), install the HD ball seal. See Installing the HD Seal of this manual and follow steps 1 through 4. Then return to this procedure and continue with the next steps.

2. Install the replacement bearings (key 10) by hand. The bearing flanged end should touch the valve body.

3. **Installing the Vee-Ball:** Lubrication will assist with break-in of the HD metal seals and with assembly. It is required that both the ball surface and seal be lubricated with dry film lubricant or equivalent moly disulfide.

⚠ WARNING

The ball might be damaged if it is allowed to fall into the valve body. To avoid personal injury or damage to the sealing surfaces, support the ball to prevent it from falling into or out of the valve body cavity.

Place the valve body on a table or bench.

- For DN 80 and 100 (NPS 3 and 4), the ball (key 2) should be installed from the inlet opening of the valve body. The follower shaft (key 9) should be inserted into the ball before the ball is installed. Engage the ball drive shaft side ear with the body as shown in figure 8 then lower the follower side ball ear into the body and position the ball between the bearings.
 - For DN 150, 200, and 250 (NPS 6, 8, and 10), the ball (key 2) should be installed from the outlet opening of the valve body. Engage the ball drive shaft side ear with the body as shown in figure 9 then lower the follower side ball ear into the body and position the ball between the bearings.
4. **Installing the Follower Shaft (key 9):**
 - For DN 80 and 100 (NPS 3 and 4), the follower shaft (key 9) should already have been inserted into the ball before the ball was put into the valve body. Insert the follower shaft (key 9) into the valve body bearing (key 10).
 - For DN 150, 200, and 250 (NPS 6, 8, and 10), with the ball rotated open and not in contact with the HD seal, insert the follower shaft (key 9) through the ball, and into the valve body bearing (key 10).
 5. Align the hole in the follower shaft with the holes in the ball. Insert the small end of the groove pin (key 7) into the hole in the ball and into the follower shaft. The pin will hold the parts in place while the drive shaft (key 6) is being installed.
 6. **Installing the Drive Shaft (key 6):**

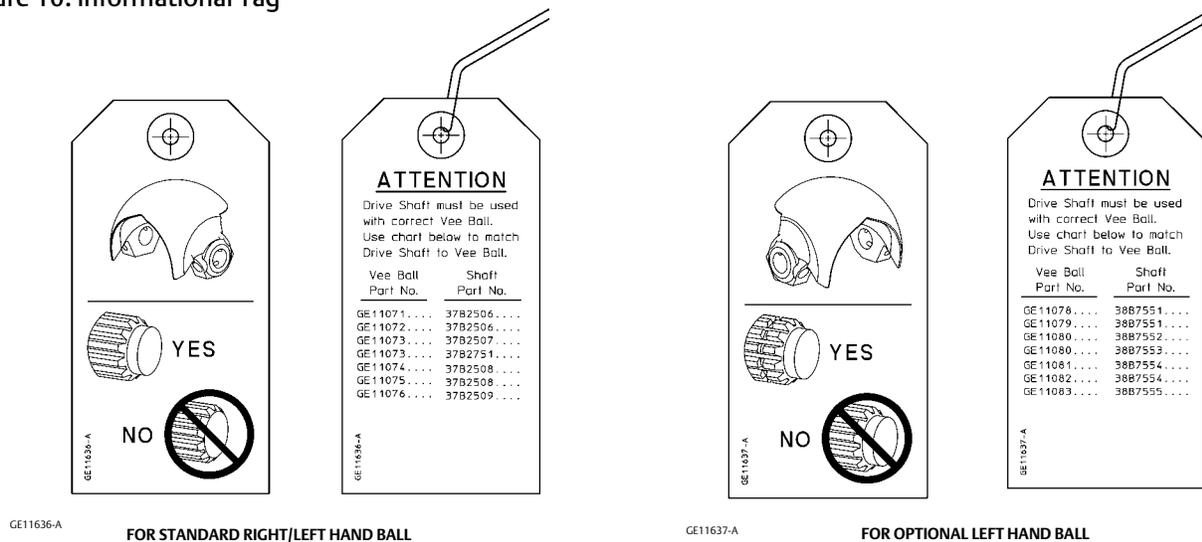
CAUTION

The drive shaft must be used with the correct Vee-Ball. Refer to the tag (see figure 10) attached to the Vee-Ball and to the drive shaft.

Failure to use the correct Vee-Ball/shaft combination may result in the ball not being in the position indicated by the slash mark on the end of the shaft. If the ball is not properly aligned with the slash mark, the valve will not function correctly and seal damage may result.

Make sure the drive shaft is free of oil or grease, otherwise the taper pin or taper key will not seat properly. Failure to properly set the taper pin or taper key could result in it coming loose while in service. Loosening of the taper key in service could result in improper valve function and equipment damage.

Figure 10. Informational Tag



7. Install the drive shaft (key 6) into the valve body through the valve body bearing and into the ball.
8. Insert the taper key (key 4) into ball and drive shaft (keys 2 and 6) as shown in figure 11. The taper key inserts with the flat side of the key facing the drive shaft (key 6).
9. Using a flat end punch, drive the groove pin (key 7) into the ball ear and follower shaft until it is flat with the ball ear surface. Stake both ends of the pin hole with a center punch to ensure the groove pin does not come out.
10. Using a flat end punch, drive the taper key (key 4) into the ball ear and drive shaft (key 6) until solid, heavy contact is obtained between the key and shaft.
11. Measure the position of the taper key head.
12. Drive the taper key in further using the minimum distance shown in table 6.
13. Inspect the ball/shaft taper key connection to verify that the taper key spans the entire shaft flat width. If not, the taper key must be driven in further until this condition is satisfied. However, do not exceed the maximum depths shown in table 7.

Note

All valve taper keys are tack welded, except titanium.

14. When the above conditions are met, tack weld the taper key (key 4) to the ball ear on the head end of the key (see figures 14 and 15). Use a:
 - 1/8-inch diameter weld on DN 80, 100, and 150 (NPS 3, 4, and 6) valves
 - 3/16-inch diameter weld on DN 200 and 250 (NPS 8 and 10) valves
15. Use the pry bar or similar tool to move the ball tightly against the bearing on the actuator side of the valve to help ensure correct side-to-side centering of the ball (key 2) on the seal (key 11). See figure 5.
16. Be sure that the HD seal is fully installed in the valve. Carefully rotate the ball to engage the HD seal while applying force across the middle of the seal to compress the wave spring until the ball is fully engaged. Be cautious during this process, knowing that excessive force may damage the ball. Keep the ball in the engaged position going forward.

17. Continue to check the ball's position and re-center if necessary during actuator mounting and packing adjustments. For all constructions, refer to Packing Maintenance, and other procedures as necessary to complete the assembly of the valve.

Figure 11. Taper Key Installation

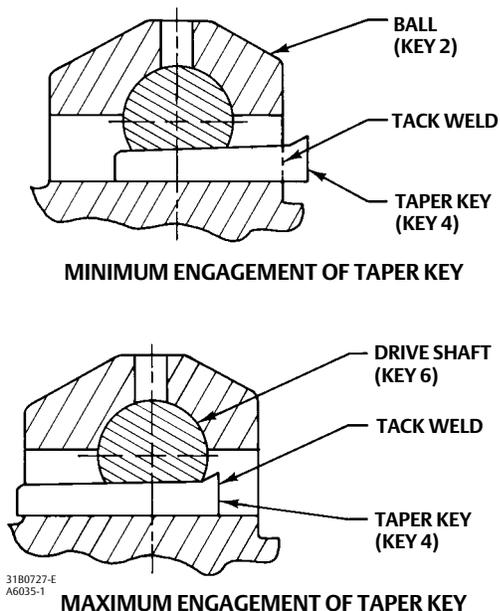


Table 6. Taper Key Minimum Depth

Valve Size, DN	Valve Size, NPS	Minimum Depth To Drive Taper Key After Initial Solid Contact, mm (Inches)
80, 100, 150	3, 4, 6	4.8 (0.188)
200, 250,	8, 10,	5.6 (0.219)

Table 7. Taper Key Maximum Depth

Valve Size, DN	Valve Size, NPS	Maximum Depth To Drive Taper Key After Initial Solid Contact, mm (Inches)
80, 100	3, 4	7.1 (0.281)
150	6	7.9 (0.312)
200, 250	8, 10	9.5 (0.375)

Actuator Mounting

Use the appropriate actuator instruction manual, this section of this manual, and figure 12 of this manual when mounting the actuator or changing actuator styles and positions.

1. To help ensure correct centering of the Vee-Ball (key 2) on the seal (key 11), be sure the ball is closed when mounting the actuator (for applications other than Spring Return Fail-Open).
2. Clean the valve shaft and actuator lever splines to be sure the actuator lever will slide on easily. Only drive the lever in if absolutely necessary.
3. Carefully wedge the ball solidly against the actuator-side bearing, using a pry bar or similar tool inserted between the lower ear of the ball and the valve body. This will center the ball. See figure 5.

4. Keep the wedge in place while installing the lever, if necessary. Remove the wedge after you have clamped the actuator lever on the valve shaft and have connected the lever to the actuator piston rod or diaphragm rod.

Determining Mounting Position

The actuator can be either right or left-hand mounted, with the actuator on the right or left side when viewed from upstream (see figure 12).

The Series B Vee-Ball has one V-notch. For **right-hand mounting (standard)**, the ball will be in the top of the valve body when the valve is open and the shaft is horizontal. In this position the ball rotates CCW to Close. For **left-hand mounting (standard)**, the ball will be in the bottom of the valve body when the valve is open and the shaft is horizontal. In this position the ball rotates CCW to Close. An optional ball for **left-hand mounting**, which rotates into the top of the valve body when the shaft is horizontal, is also available. In this position the ball rotates CW to Close.

Determining Closed Position

1. The valve must be removed from the line to check the position of the ball.

⚠ WARNING

The Vee-Ball closes with a shearing, cutting motion. To avoid personal injury, keep hands, tools, and other objects away from the ball while stroking the valve.

2. Rotate the ball to the closed position.
3. Position the ball in the proper location:

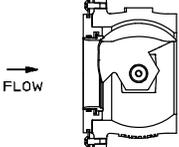
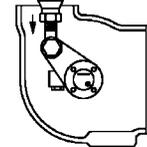
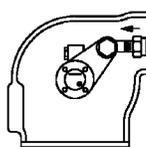
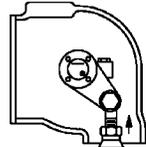
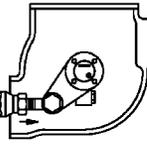
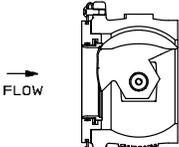
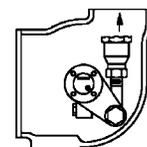
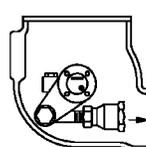
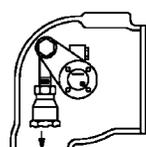
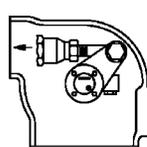
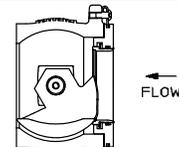
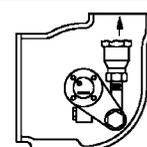
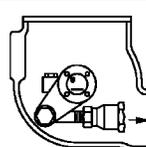
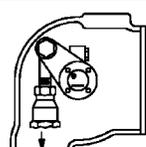
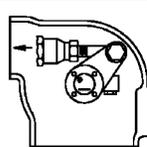
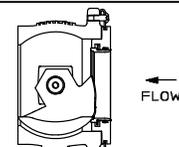
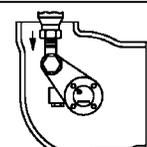
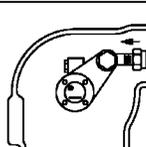
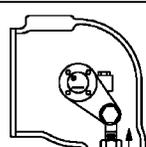
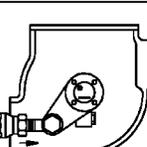
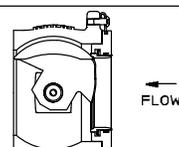
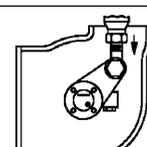
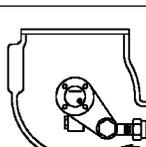
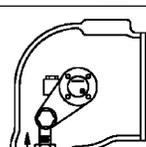
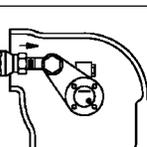
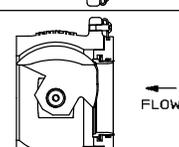
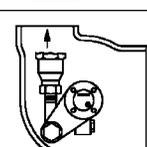
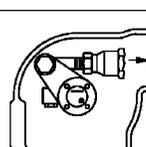
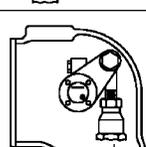
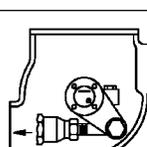
When viewed from the valve body inlet, the ball is in the proper position when the flat spot on the top of the ball is exactly in the center of the seal package.

Make a copy of the centering template in figure 13 out of a suitable stiff material. Place the centering template in the opening at the seal (see figure 13). Find the center of the template and make sure the spot on the ball is centered directly below it.

4. Adjust the actuator as described in the appropriate actuator instruction manual until the ball is centered in the closed position. A line is stamped on the actuator end of the drive shaft (see figure 12) to indicate the ball position.

Use the appropriate actuator instruction manual and figure 12 of this manual when mounting the actuator or changing actuator styles and positions.

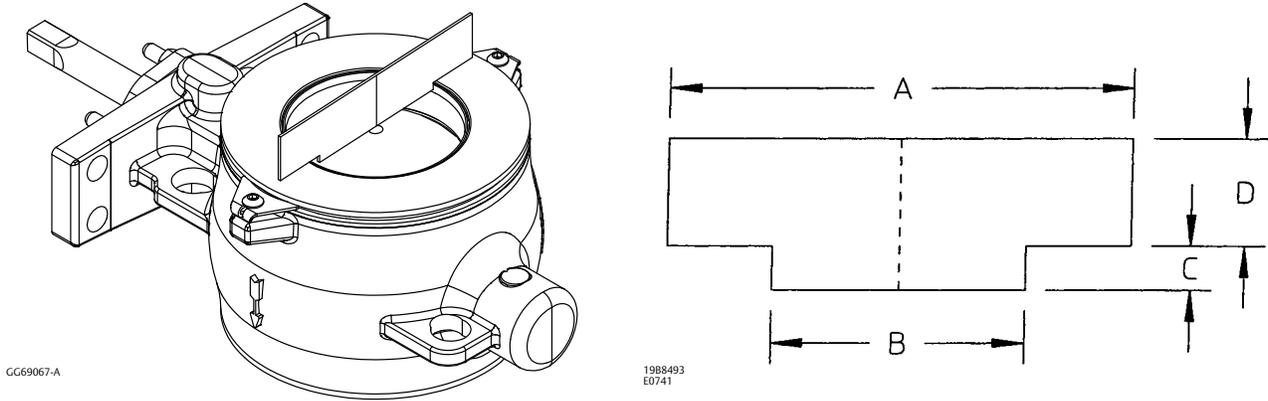
Figure 12. V200U Index Marks for Actuator Lever Orientation

ACTUATOR		VALVE OPEN	ACTUATOR POSITION			
MOUNTING	STYLE		1	2	3	4
(STANDARD) RIGHT-HAND	STYLE A PUSH DOWN TO CLOSE					
	BALL ROTATES COUNTER-CLOCKWISE TO CLOSE					
(STANDARD) LEFT-HAND	STYLE C PUSH DOWN TO OPEN					
	BALL ROTATES COUNTER-CLOCKWISE TO CLOSE					
(OPTIONAL) LEFT-HAND	STYLE C (2) PUSH DOWN TO CLOSE					
	BALL ROTATES CLOCKWISE TO CLOSE					

NOTE:
1. ARROW ON LEVER INDICATES DIRECTION OF ACTUATOR THRUST TO CLOSE VALVE.
2. THE OPTIONAL LEFT-HAND ORIENTATION IS NOT AVAILABLE FOR MICRO-NOTCH VEE-BALLS.

E1842

Figure 13. Centering Template in Use and Template Dimensions



VALVE SIZE, DN	VALVE SIZE, NPS	A	B ⁽¹⁾	C	D ⁽¹⁾
mm					
80	3	127	63	5	38
100	4	157	82	3	44
150	6	216	117	2	51
200	8	270	139	13	57
250	10	324	203	3	60
Inches					
80	3	5.00	2.50	0.20	1.50
100	4	6.19	3.25	0.12	1.75
150	6	8.50	4.62	0.08	2.00
200	8	10.62	5.50	0.51	2.25
250	10	12.75	8.00	0.12	2.38

1. These dimensions are the same for ASME and DIN valves.

Parts Ordering

A serial number is assigned to each valve and stamped on the nameplate. Always refer to the valve serial number when corresponding with your [Emerson sales office](#) regarding spare parts or technical information. When ordering replacement parts, also specify the key number, part name, and desired material using the parts list.

⚠ WARNING

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

Retrofit Kits for ENVIRO-SEAL Packing

Retrofit kits include parts to convert existing V200U valves with shallow (single packing depth) packing box to the ENVIRO-SEAL packing box construction. Retrofit kits include single PTFE packing. See following table.

ENVIRO-SEAL Packing Retrofit Kits

SHAFT DIAMETER ⁽¹⁾		PART NUMBER	
mm	Inches	Single PTFE	Graphite
19.1	3/4	RRTYXRT0032	RRTYXRT0332
25.4	1	RRTYXRT0052	RRTYXRT0352
31.8	1-1/4	RRTYXRT0062	RRTYXRT0362
Parts Included in Kit			
Key	Description	Quantity	
100	Packing stud	2	2
101	Packing nut	2	2
102	Packing flange	1	1
103	Spring pack assembly	1	1
105	Packing set	1	1
106	Anti-extrusion washer	2	---
107	Packing box ring ⁽²⁾	1	1
---	Tag	1	1
---	Tie Cable	1	1

1. Diameter through the packing box.
2. Not required for all sizes of V150E with 1-1/4 inch diameter shafts.

Repair Kits for ENVIRO-SEAL Packing

Repair kits include valves parts for shallow (single packing depth) for ENVIRO-SEAL packing box construction. Repair kits include single PTFE or graphite packing. See following table.

ENVIRO-SEAL Packing Repair Kits

SHAFT DIAMETER ⁽¹⁾		PART NUMBER	
mm	Inches	PTFE	Graphite
19.1	3/4	RRTYX000032	13B8816X052
25.4	1	RRTYX000052	13B8816X092
31.8	1-1/4	RRTYX000062	13B8816X112
Parts Included in Kit			
Key	Description	Quantity	
105	Packing set	1	1
106	Anti-extrusion washer	2	--- ⁽²⁾

1. Diameter through the packing box.
2. Included in key 105.

Parts List

Note

Contact your [Emerson sales office](#) for Part Ordering information.

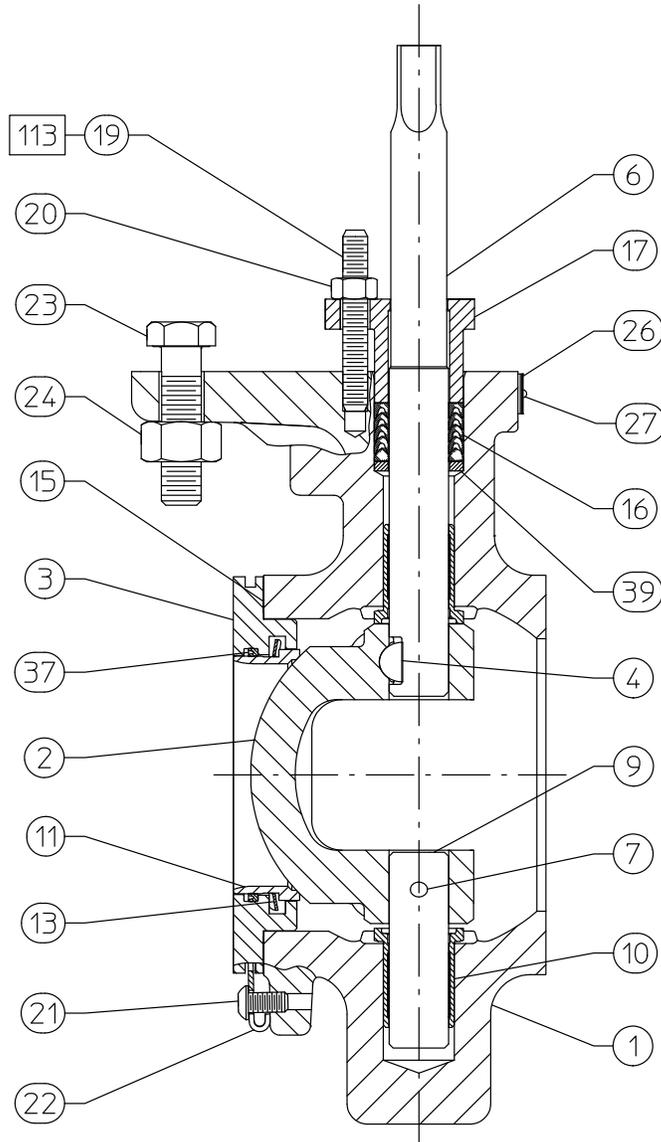
Common Parts (figures 14 and 15)

Key	Description
1	If you need a valve body as a replacement part, order by valve size, serial number, and desired valve body material. Contact your Emerson sales office for assistance.
2*	Ball
3	Seal Protector Ring, DN 80 and 100 (NPS 3 and 4)
4*	Taper Key
6*	Drive Shaft
7*	Groove Pin
9*	Follower Shaft
10*	Bearing (2 req'd)
11*	Ball Seal
13*	Wave Spring
15*	Gasket
16*	Packing Set
17	Packing Follower
19	Packing Follower Stud
20	Packing Follower Nut
21	Seal Protector Ring Screw , DN 80 and 100 (NPS 3 and 4)
22	Seal Protector Ring Clip , DN 80 and 100 (NPS 3 and 4)
23	Actuator Mounting Screw
24	Actuator Mounting Nut
26	Identification Nameplate
27	Drive Screw
28	Flow Arrow
30	Nameplate
31	Nameplate Wire (not shown)
37*	Radial Seal
39*	Packing Box Ring
40	Packing Flange
41	Retaining Ring
130	Clamp
131	Bonding Strap Assembly

ENVIRO-SEAL Packing System (Parts in all Type Vee-Ball Valves) (figure 4)

Key	Description
100	Packing Flange Stud
101	Packing Flange Nut
102	Packing Flange
103	Spring Pack Assembly
105*	Packing Set
106*	Anti-Extrusion Ring (2 req'd)
107*	Packing Box Ring
108*	Packing Ring (2 req'd)
109*	Anti-Extrusion Ring (2 req'd)
110	Lantern Ring
111	Tag
112	Tie Cable
113	Lubricant, anti-seize (not furnished with packing system)

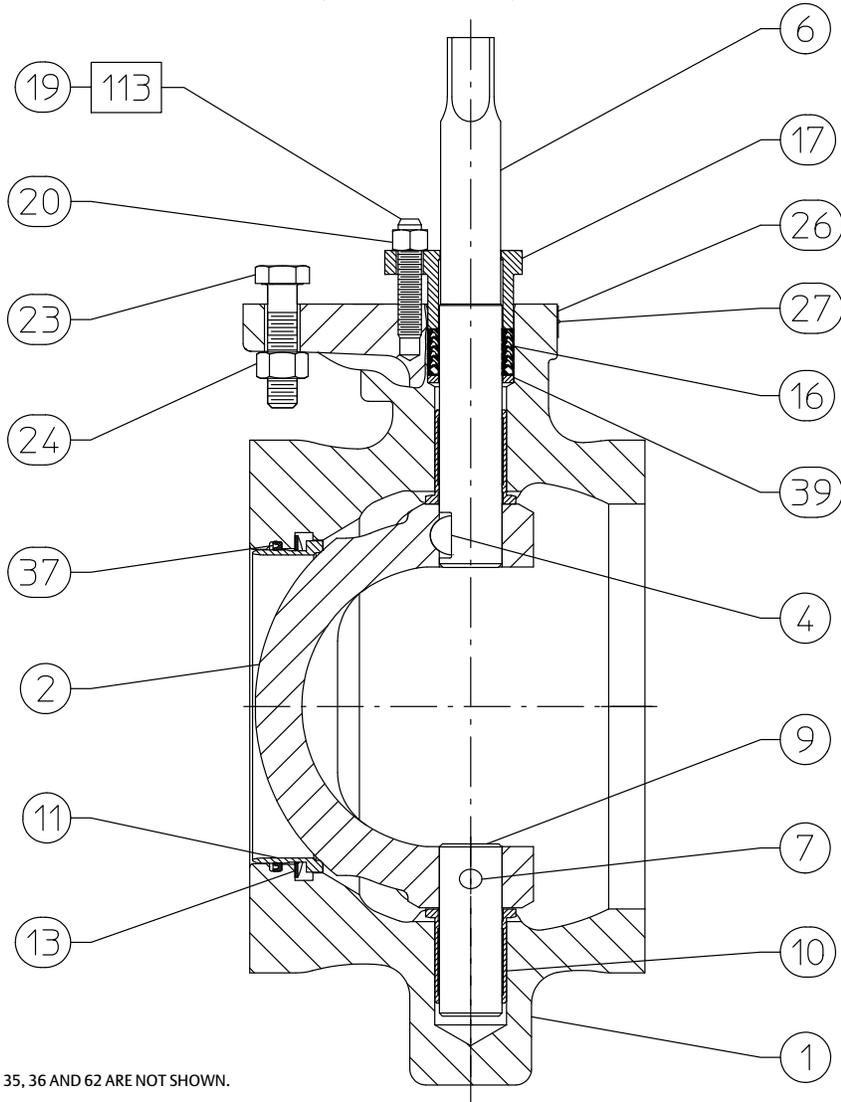
Figure 14. Fisher V200U DN 80 and 100 (NPS 3 and 4) Cross Sectional View



CG67035

NOTE:
KEYS 28, 30, 31, 32, 35, 36 AND 62 ARE NOT SHOWN.

Figure 15. Fisher V200U DN 150, 200, and 250 (NPS 6, 8, and 10) Cross Sectional View



GG67091

NOTE:
KEYS 28, 30, 31, 32, 35, 36 AND 62 ARE NOT SHOWN.

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