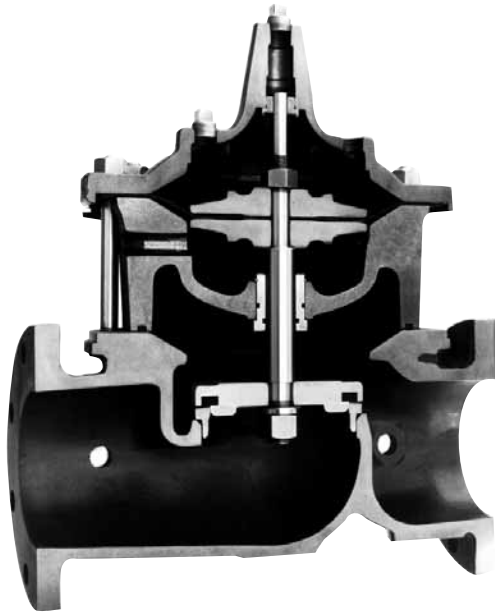




— MODEL — **100-02**  
(Full Internal Port)

# Powertrol Valve



## DESCRIPTION

This manual contains information for installation, operation and maintenance of the Cla-Val Co. 100-02 Powertrol, an automatic valve designed for use where independent operating pressure is desired, or when line fluid is unsuitable as an operating medium.

This valve is a hydraulically operated, diaphragm type, globe or angle pattern valve. It is single seated and incorporates into its design two operating chambers sealed from one another by a flexible synthetic rubber diaphragm. Pressure applied to the upper chamber closes the valve; when applied to the lower chamber, it opens the valve.

With proper pilot controls, the valve can be held in any intermediate position between fully open and tightly closed.

## INSTALLATION

1. Allow sufficient room around the valve assembly to make adjustments and for disassembly.

**NOTE: BEFORE THE VALVE IS INSTALLED, PIPE LINES SHOULD BE FLUSHED OF ALL CHIPS, SCALE AND FOREIGN MATTER.**

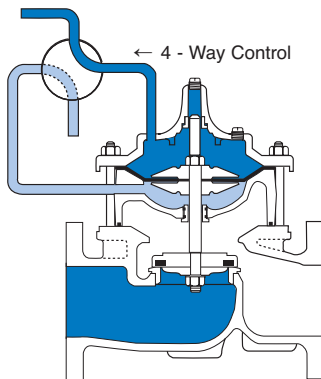
2. It is recommended that gate or block valves be installed on both the upstream and downstream sides of the 100-02 to facilitate isolating the valve for preventative maintenance.
3. Place the valve in the line with flow through the valve in the direction indicated on the inlet name plate or by flow arrows.
4. Cla-Val Powertrol Valves operate with maximum efficiency when mounted in horizontal piping with cover "UP," however, other positions are acceptable. Due to the size and weight of the cover and internal assembly of 4" and larger valves, installation with the cover "UP" is advisable. This makes periodic inspection of internal parts readily accessible.
5. When a pilot control system is installed on the Powertrol Valve, use care to prevent damage. If it is necessary to remove fittings or components, be sure they are kept clean and replaced in the exact order of removal.
6. After the valve is installed and the system is first pressurized, vent air from the cover chamber and tubing by loosening "fit" rings at all high points.

## TROUBLE SHOOTING

The following trouble shooting information deals strictly with the Powertrol Valve; however some "impossible causes" will refer to components that may exist in the variety of control systems available for the valve. All trouble shooting is possible without removing the valve from the line.

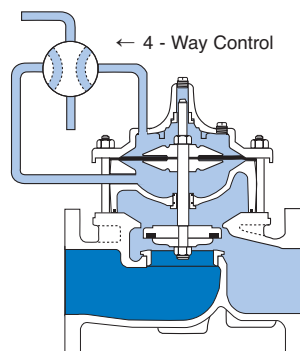
**CAUTION:** Extreme care should be taken when servicing the valve. Gate or line block valves must be closed upstream and downstream of the valve before starting disassembly. When there are no block or gate valves to isolate the Powertrol Valve it should be realized that the valve cannot be serviced under pressure. Steps must be taken to remedy this situation before proceeding.

## Principle of Operation



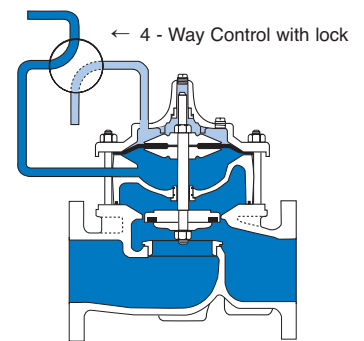
**Full Open Operation**

When operating pressure below the diaphragm is applied and operating pressure is relieved from the cover chamber, the valve is held open, allowing full flow.



**Tight Closing Operation**

When pressure below the diaphragm is relieved and operating pressure is applied to the cover chamber, the valve closes drip-tight.



**Modulating Action**

The valve holds any intermediate position when operating pressure is equal above and below the diaphragm. A Cla-Val four-way pilot control with "lock" position can maintain this balance by stopping flow in the pilot control system.

SYMPTOM	*POSSIBLE CAUSE	TEST PROCEDURE	REMEDY
Valve fails to close.	Stem stuck in open position.	Vent power unit chamber. Apply pressure to cover chamber. Valve should close.	Disassemble, examine all internal parts for cause of the sticking condition and clean off scale deposits.
	Worn diaphragm or loose upper stem nut	Apply pressure in power unit chamber and vent cover. Continuous flow from cover indicates this trouble.	Disassemble and replace diaphragm or tighten the valve stem nut.
	Foreign object on valve seat.	Valve opens okay but only closes part way.	Try operating valve a few times. This might dislodge the object. If this fails, disassemble and remove the obstruction.
	Pressure not being released from power unit chamber.	Make sure pressure is being released by opening a fitting into the chamber. If valve then closes refer to remedy.	Check control system. Tube line or nipple might be plugged up.
	Operating pressure not getting into valve cover.	Use pressure gauge or loosen cover plug to check for pressure.	Clean tubing or pipe fittings into cover chamber. Open CK2 Isolation Valve in control lines.
	Insufficient line pressure.	Check line pressure.	Establish line pressure.
Valve fails to open.	Stem stuck in closed or semi-open position.	Vent cover. Apply pressure to power unit chamber.	Disassemble, examine all internal parts for cause of the sticking pro bleary, and clean off scale deposits.
	Worn diaphragm or loose upper stem nut.	Apply pressure in power unit chamber and vent cover. Continuous flow from cover indicates this pro bleary.	Disassemble and replace diaphragm or tighten valve stem nut.
	Foreign object on top of disc retainer	Valve closed okay but won't open all the way.	Try operating valve a few times. This might dislodge the object. if this fails disassemble and remove the obstruction.
	Pressure not being released from cover chamber.	Open a fitting or remove a plug from cover chamber if cover chamber vents and valve opens, see remedy.	Check control system. Check lines or pipe fittings. Clean out any plugged lines.
	Operating pressure not applied into power unit chamber.	Loosen a fitting in this chamber to check for pressure at this point.	Clean tubing or pipe fittings into power unit chamber.
	Valve closes but leakage occurs.	Worn disc or seat.	The best procedure here is to disassemble the valve and inspect these parts.
O-Ring failure	Mineral deposits on stem cause abrasion on ring.	Remove pressure from both cover and power unit chambers and apply line pressure to valve. Open line from power unit chamber and observe continuous flow.	Disassemble and replace O-ring.

\*Assuming control system is functioning properly.

## FREEDOM OF MOVEMENT

The following procedures can be used to determine if the valve opens and closes fully. During this test the diaphragm can be checked for damage.

1. The Powertrol Valve will have a control to open and close the valve. Position the control so that pressure is applied to the cover chamber (above the valve diaphragm). This will close the Powertrol Valve. Check the drain from the control that discharges to atmosphere.

Once the liquid from the lower diaphragm chamber is drained the discharge should stop. If the discharge continues after the normal time it takes to drain then the diaphragm is damaged, or the stem nut is loose, or the stem o-ring is leaking. If the discharge is continuous from both chambers then there is a possibility that the diaphragm or the pilot control is damaged.

If the valve is equipped with a "Dry Drain" (control drain piped to downstream end of the valve) then same procedure is followed except the CK2 Shutoff Cock on the downstream end of the valve must be closed and the drain line disconnected and drained to atmosphere. It can then be checked as above.

Measurement of the vertical travel of the stem (diaphragm assembly) will make it possible to determine if the travel, or stroke is restricted. The following chart provides this measurement. It is necessary to have either the X101 Valve Position Indicator or X105 Limit Switch Assembly installed on the valve to visually check the travel.

Mark the position of the stem on the X101 or X105 when the valve is closed. Reposition the control so that pressure is applied below the diaphragm and the cover chamber is drained. Determine the extent of the stem travel. Check this movement with the stem travel chart. If the stroke is different than listed (5% to 10%) then there is good reason to believe something is mechanically restricting the stroke of the valve at one end of its travel. If it is determined that flow does not stop through the valve when in the indicated "closed" position, the obstruction probably is between the disc and the seat, or in the power unit chamber below the diaphragm. If the flow stops, the obstruction is likely in the cover chamber above the diaphragm or possibly above the disc retainer. Refer to the sectional view under Principle of Operation.

If operation of the valve a few times does not dislodge the foreign object obstructing the diaphragm assembly (stem) movement then the valve must be disassembled and the problem located and corrected. See disassembly instructions.

STEM TRAVEL (Fully open to fully closed)			
VALVE SIZE		VALVE SIZE	
INCHES	MM	INCHES	MM
1	25	0.3	8
1 1/4	32	0.4	10
1 1/2	40	0.4	10
2	50	0.6	15
2 1/2	65	0.7	18
3	80	0.8	20
4	100	1.1	23
6	150	1.7	43
8	200	2.3	58
10	250	2.8	71
12	300	3.4	86
14	350	3.9	99
16	400	4.5	114

## MAINTENANCE

### Preventative Maintenance

The Cla-Val Co Powertrol Valves require no lubrication or packing and a minimum of maintenance. However, a periodic inspection schedule should be established to determine how the fluid velocity as well as the substances occurring in natural waters are affecting the valve. These substances can be dissolved minerals, colloidal and suspended particles. Effect of these actions or substances must be determined by inspection.

### DISASSEMBLY

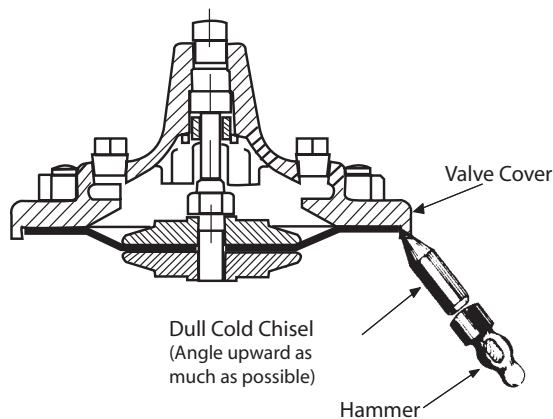
1. First mark the side of the valve cover, power unit body and valve body so that reassembly of these parts will be exactly as removed.

2. The Powertrol Valve inspection or maintenance can be accomplished without removal of the valve body from the line. Shut off pressure to the valve, both inlet, outlet and independent operating pressure when used.

**WARNING:** Maintenance personnel can be injured and equipment and property damaged if disassembly is attempted with pressure in the system.

3. After pressure has been released from the valve control system and operating chambers of the valve, remove the controls and tubing. Obtain a schematic of the assembly or note and sketch position of tubing and controls for reassembly. Replacing tubing into the control ports exactly as removed is necessary. Failure to reassemble properly will cause the valve to malfunction and possibly cause serious damage.

4. Remove cover nuts and cover. If the valve has been in service for any length of time, chances are the cover will have to be loosened by driving upward along the edge of the cover with a dull cold chisel. See Figure 1.



When block and tackle or a power hoist is to be used to lift the valve cover insert a proper size eye bolt in place of the center cover plug. Pull cover straight up to keep from damaging the power unit stem bearing and upper stem.

On valves 1" and larger remove the power unit retaining nuts. The power unit body can now be lifted from the valve body. The stem with diaphragm assembly and disc retainer assembly will be removed with the power unit body.

**CAUTION:** During service performed on the stem assembly, the stem surfaces must not be damaged. If a vice or other holding device is used to grip the stem, soft jaws of brass or copper must be used to protect the precision ground surface of the stainless steel stem. If the stem is marred no amount of careful dressing can restore the stem to its original condition.

6. Inspect the threads on the stem. Mineral deposits that prevent the nuts from turning must be cleaned from the threads. A 5% solution of muriatic acid will soften mineral or scale deposits to assist in removal of nuts and general cleaning of parts. Flush the parts thoroughly with water immediately after cleaning.

Care must always be exercised when handling acid. Read the warning label on the acid container to be sure of correct method of use and disposal after use.

7. Remove the upper stem nut, upper diaphragm washer, diaphragm and lower diaphragm washer. The stem with the disc retainer assembly can now be removed from the power unit body.

8. Hold the stem in a vice with soft jaws and remove the lower stem nut. Remove the lock washer, disc retainer, space washer(s) and disc. Refer to the sectional view of the valve size being serviced. This will assist in the disassembly procedure outlined above. The reassembly instructions outlining proper procedure and quantity of space washers. This is especially important if the disc is replaced.

### Inspection of Parts

1. Returning to the valve body in the line, the seat should now be inspected for damage. If the seat requires removal use the following tools. Seats in valve sizes 1/2" and 3/4" can be removed with a hex socket wrench. Seats in valve sizes 1" through 6" should be removed with accessory X-109 Seat Removing Tool available from the factory. Seats in valve sizes 3" through 16" may be removed with a screw driver. If upon removal of the screws the seat cannot be lifted out, it will be necessary to use a hard rubber mallet and tap the seat loose.

2. Any buildup of mineral or scale should be cleaned from the valve body at this time. Inspection of the cover and power unit body surfaces that contact the diaphragm is important. Clean and smooth, with wet or dry emery paper, any roughness that could damage the diaphragm. Inspect and recondition the surface on the upper and lower diaphragm washers. The perimeter of the diaphragm washers is the most likely area to cause diaphragm wear if the surface is not smooth. Take extra care to make this a smooth finish.

3. Inspect the power unit body bearing insert o-ring that is in contact with the stem. If it is worn, nicked or cut, replace it.

4. Inspect the diaphragm for cracks or chafing. Replace the diaphragm if damaged.

Inspect the disc and replace if the surface is damaged or worn. If a new disc is not available, the existing disc can be turned over, exposing the unused surface for contact with the seat.

6. The disc guide should be checked and cleaned of scales and mineral deposits. Due to the close tolerance between the outer periphery of the disc guide and the inner area of the valve seat, no scale or mineral deposits should be overlooked.

## REASSEMBLY

To reassemble, reverse the order of disassembly.

1. If the disc has been removed, it is important that correct pressure be on the disc from the disc guide when the lower stem nut is tight. Use sufficient spacer washers to obtain slight pressure (by visual indentation) on the disc. This applies to 1" through 16" valves. Refer to seat and disc detail drawings for location of spacer washers for various valve sizes.

**Note:** New discs will usually require a different number of spacer washers to obtain the right amount of 'grip' (slight indentation) on the disc.

1. If the disc has been removed, it is important that correct pressure be on the disc from the disc guide when the lower stem nut is tight. Use sufficient spacer washers to obtain slight pressure (by visual indentation) on the disc. Indentation should be slight and no looseness evident. This adjustment applies to 1 " through 16". Refer to seat and disc detail drawings for location of spacer washers for various valve sizes.

NOTE: New discs will usually require a different number of spacer washers to obtain the right amount of "grip" on the disc.

2. The stem, with the disc assembly, can now be inserted through the power unit body. Note sectional view for correct position of the power unit body and stem assembly

3. Install on the cover end of the stem the lower diaphragm washer, the diaphragm, the upper diaphragm washer, then screw on the upper stem nut.

4. Tighten the upper stem nut securely so the diaphragm and upper and lower diaphragm washer cannot be turned on the stem. During the tightening of the upper stem nut the lower stem nut can be held in a vice, or with a second wrench.

5. Replace the gasket on the body. If an o-ring seal is used as a gasket, valve size 4" through 16", a light coating of grease can be applied to the power unit body groove to hold the o-ring in place while installing on the body. The power unit body must be replaced so that the index marks applied in Disassembly Step 1 align. The control tubing will then be able to be reassembled without difficulty.

6. Replace cover chamber spring on the upper diaphragm washer. NOTE: Some valves may not have a cover chamber spring.

7. Place the cover on the power unit body aligning the index marks. Secure the cover with 8 stud nuts. Tighten the nuts firmly with a cross-over pattern until all nuts are tight:

8. Reinstall the control system and tubing exactly as it was before disassembly.

9. The Powertrol Valve can be tested for tight closure as well as the tightness of the seal across the diaphragm.

a. The downstream or outlet shutoff valve remains closed

b. If the control system has a pilot or control that can position the valve to a closed position, put the control in a position to close the Powertrol. Lacking a control, inlet pressure must be tubed to the Powertrol cover.

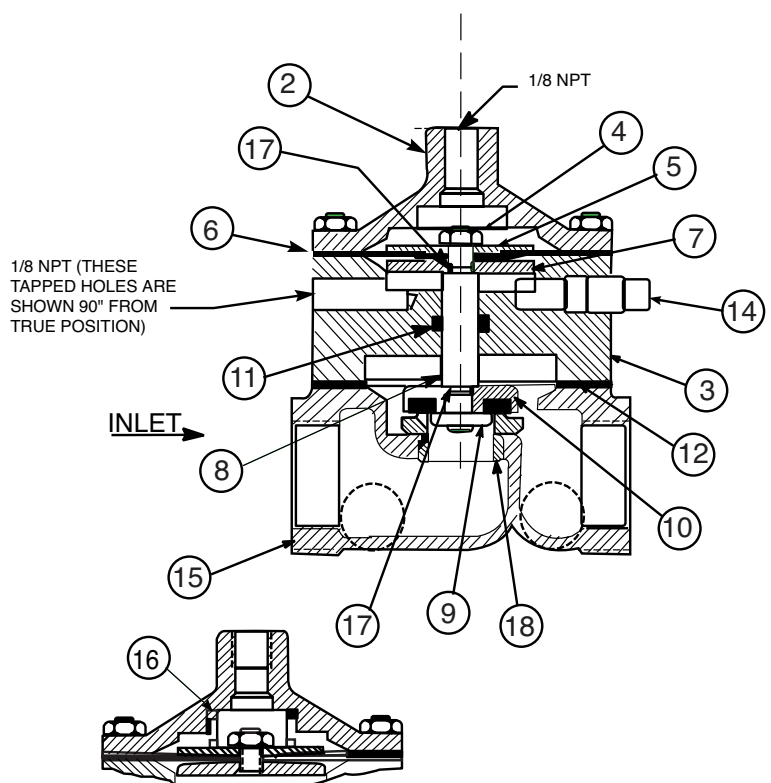
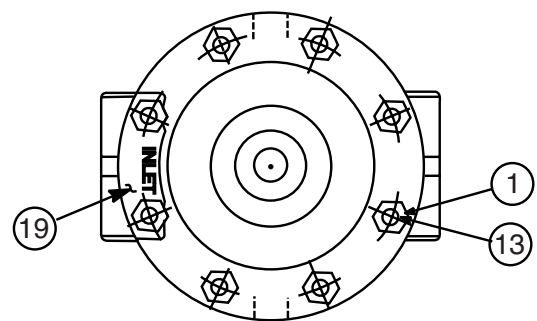
c. Open upstream gate or line block valve just enough to allow flow.

d. Have the power unit body, center section, open to atmosphere. The power unit body will be atmospheric if the control is being used.

e. Partially disconnect a fitting on the discharge side of the valve. Do not remove fully unless there is no pressure.

f. After the valve is in the closed position for a few minutes, all draining of the power unit body should stop. This will indicate a good seal across the valve seat and the diaphragm.

**100-02 POWERTRON  
VALVE SIZES 1/2" & 3/4"**



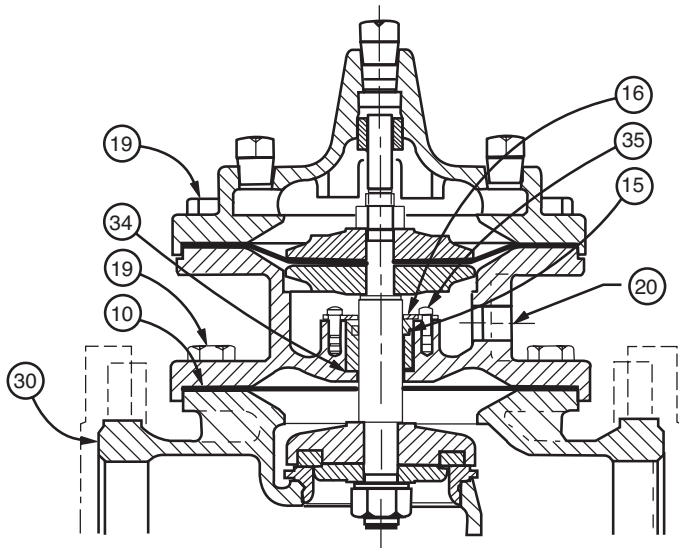
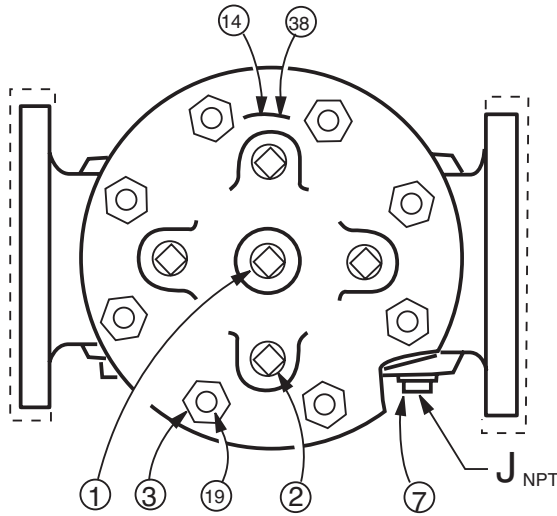
ITEM NO.	DESCRIPTION
1	HEX NUT 10-32 (8)
2	COVER
3	POWER UNIT BODY
4	HEX NUT 1/4-28-NF-2 A.S.F. JAM
5	DIAPHRAGM WASHER (UPPER)
6	DIAPHRAGM
7	DIAPHRAGM WASHER (LOWER)
8	STEM
9	DISC GUIDE
10	DISC RETAINER ASSEMBLY
11	"O" RING
12	BODY TO BODY GASKET
13	STUD 10-32 (8)
14	PIPE PLUG 1/8 NPT
15	BODY
16	SPRING (USED ON 100-02KHR & 100-02 KHX)
17	"O" RING
18	SEAT
19	NAMEPLATE

**USEFUL INFORMATION OR HINTS**

1. The approximate volume of liquid discharged from the chamber above the diaphragm when the valve moves from the fully closed positions to the fully open position is as follows:

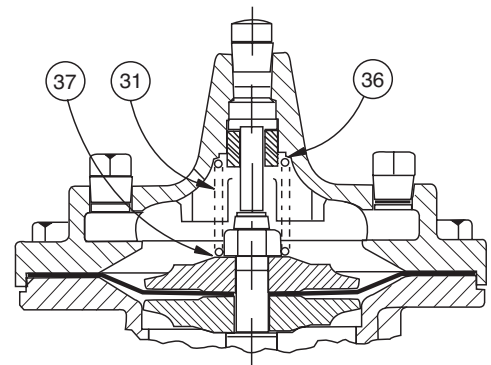
VALVE SIZE	DISPLACEMENT	
1/2"	0.340 Fl. Oz.	.01 Liters
3/4"	0.340 Fl. Oz.	.01 Liters
1"	0.700 Fl. Oz.	.02 Liters
1 1/4"	0.020 Gal.	.10 Liters
1 1/2"	0.020 Gal.	.10 Liters
2"	0.032 Gal.	.10 Liters
2 1/2"	0.043 Gal.	.20 Liters
3"	0.080 Gal.	.30 Liters
4"	0.169 Gal.	.60 Liters
6"	0.531 Gal.	2.00 Liters
8"	1.260 Gal.	4.75 Liters
10"	2.510 Gal.	9.50 Liters
12"	4.000 Gal.	15.14 Liters
14"	6.500 Gal.	24.60 Liters
16"	9.570 Gal.	36.20 Liters

**100-02 POWERROL  
VALVE SIZES 1" - 3"**

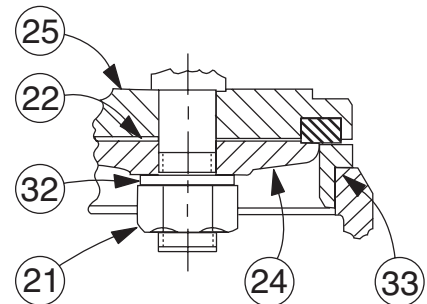


ITEM NO.	PART DESCRIPTION
1	CENTER COVER PLUG
2	COVER PLUG
3	STUD NUT
7	PLUG, PIPE, BODY
10 *	GASKET "O" RING
14	NAMEPLATE
15 *	O-RING, STEM
16	RETAINER BEARING (1"-3" ONLY)
19	BOLT, HEX HD. (1"-3" ONLY)
20	POWERUNIT BODY
21	LOWER STEM NUT
22	SPACER WASHER
24	DISC GUIDE
25	DISC RETAINER
30	BODY
31	SPRING (100-02KH/100PAKH ONLY)
32	LOCK WASHER - SPRING
33 *	SEAT O-RING
34 *	GASKET BEARING GASKET (1"-3" ONLY)
35	Screw Fil. HD. (1'-2 1/2") / BOLT HEX. (3")
36	UPPER WASHER SPRING (100PKCH)
37	LOWER WASHER SPRING (100PAKCH)
38	DRIVE SCREW

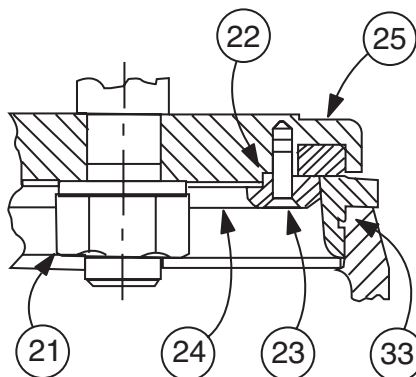
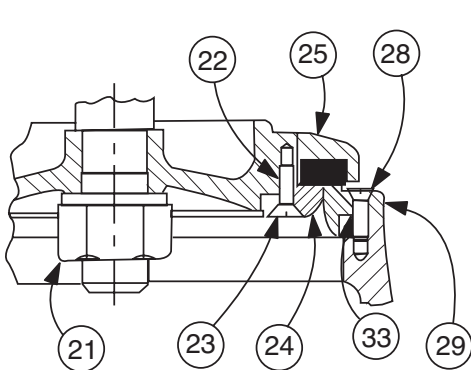
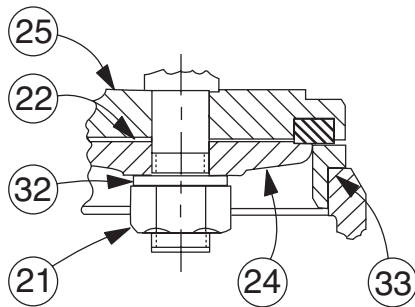
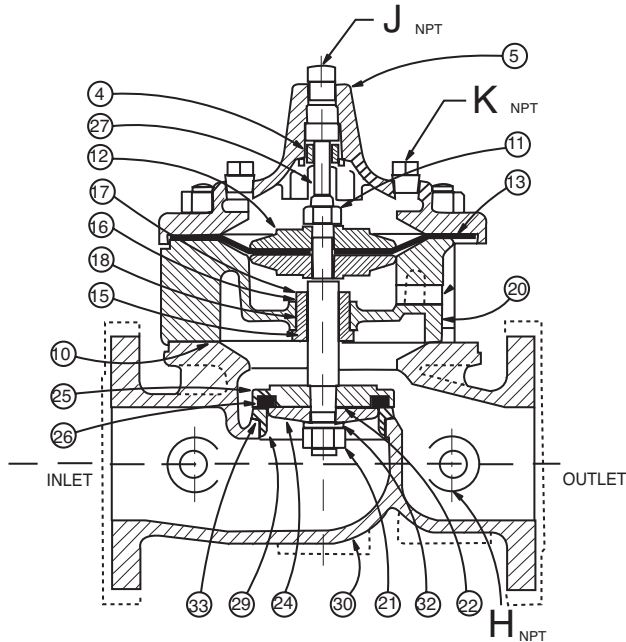
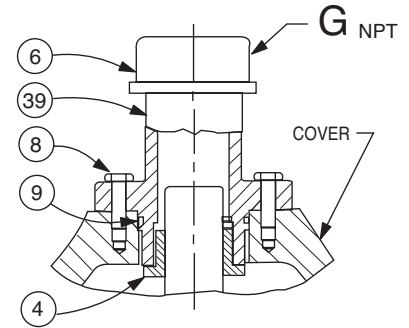
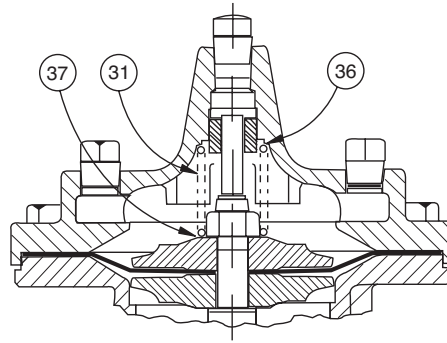
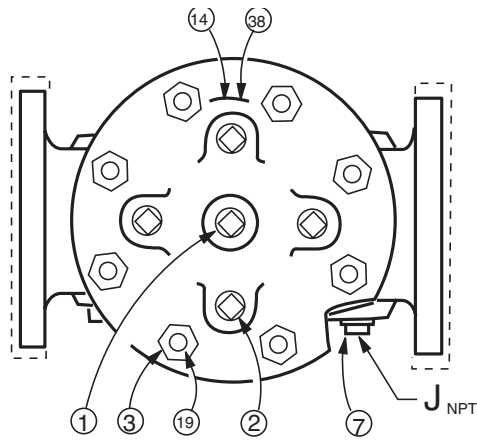
\* RECOMMENDED SPARE PARTS



**Model 100-02KH**



**Seat & Disc Details**



ITEM NO. PART DESCRIPTION

1	CENTER COVER PLUG
2	COVER PLUG
3	STUD NUT
4	COVER BEARING
5	COVER
6	PIPE CAP (16" ONLY)
7	PLUG, PIPE, BODY
8	BOLT HEX HD (16" ONLY)
9 *	O-RING (16" ONLY)
10 *	GASKET "O" RING
11	UPPER STEM NUT
12	UPPER DIAPHRAGM WASHER
13 *	DIAPHRAGM
14	NAMEPLATE
15 *	O-RING, STEM
16	RETAINER BEARING (1"-3" ONLY)
	RING RETAINER BEARING (4"-16" ONLY)
17	POWERUNIT BEARING
18 *	O-RING BEARING (4"-16" ONLY)
19	BOLT, HEX HD. (1"-3" ONLY)
	STUD (4"-16" ONLY)
20	POWERUNIT BODY
21	LOWER STEM NUT
22	SPACER WASHER
23	DISC GUIDE SCREW (6" - 16" ONLY)
24	DISC GUIDE
25	DISC RETAINER
26 *	DISC
27	STEM
28	SEAT SCREW (8"-16" ONLY)
29	SEAT
30	BODY
31	SPRING (100-02KH/100PAKH ONLY)
32	LOCK WASHER - SPRING
33 *	SEAT O-RING
34 *	GASKET BEARING GASKET (1"-3" ONLY)
35	Screw Fil. HD. (1'-2 1/2") / BOLT HEX. (3")
36	UPPER WASHER SPRING (100PKCH)
37	LOWER WASHER SPRING (100PAKCH)
38	DRIVE SCREW
39	COVER BEARING HOUSING (16" ONLY)

\* RECOMMENDED SPARE PARTS