
CLA-VAL

AUTOMATIC CONTROL VALVES

61-02/661-02

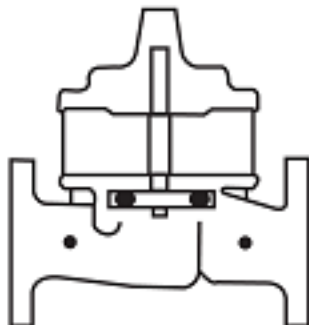
Place this manual with personnel responsible
for maintenance of this valve



Installation



Operation



Maintenance





NEWPORT BEACH, CALIFORNIA

CATALOG NO.
61-02/661-02

DRAWING NO.
96380

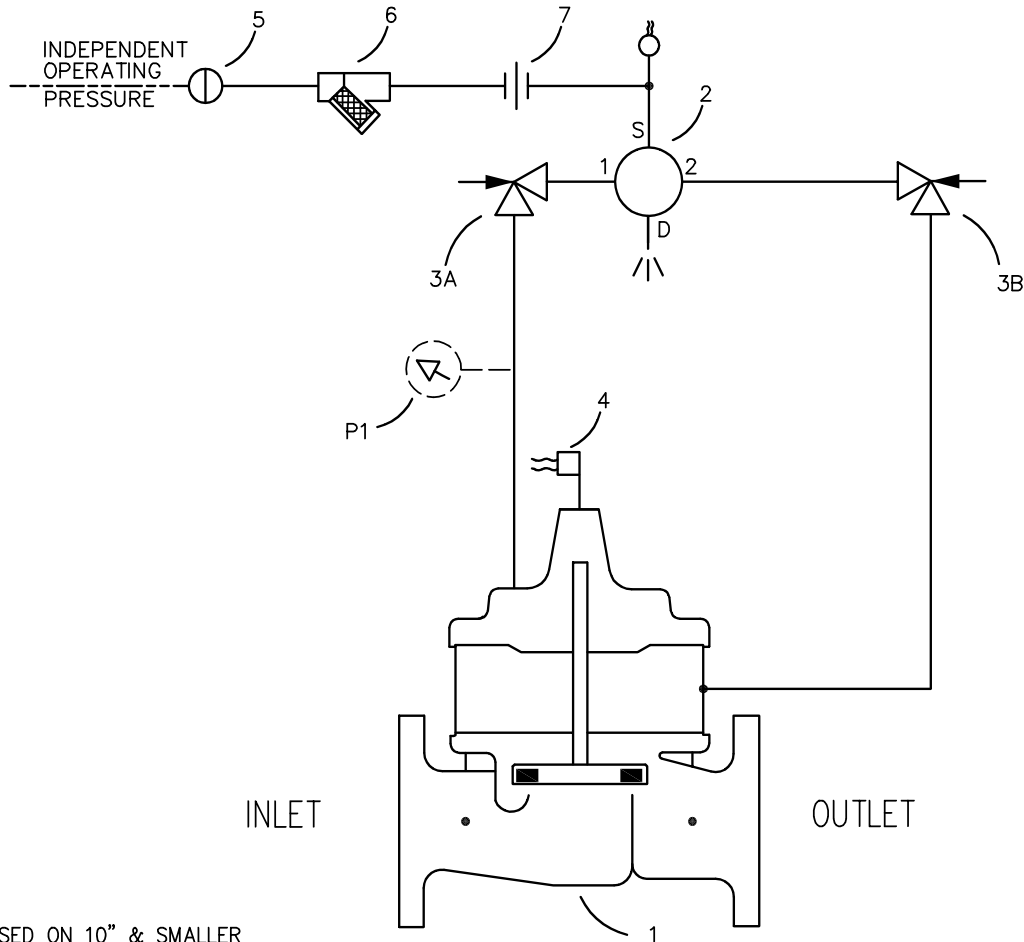
REV.
B

TYPE OF VALVE AND MAIN FEATURES

DEEP WELL PUMP CONTROL VALVE

DESIGN		
DRAW	JD	6-2-78
CHK'D	CH	6-7-78
APVD	HWE	6-7-78

----- NOT FURNISHED BY CLA-VAL CO. ----- OPTIONAL FEATURES



* USED ON 10" & SMALLER
** USED ON 12" & SMALLER

ITEM NO.	BASIC COMPONENTS	QTY
1	*100-02 POWERROL (61-02) MAIN VALVE	1
	**100-21 POWERROL (661-02) MAIN VALVE	
2	CSM11-A2-2 SOLENOID CONTROL	1
3	CV FLOW CONTROL	2
4	X105LOW SWITCH ASSEMBLY	1
5	CK2 COCK (ISOLATION VALVE)	1
6	X43 "Y" STRAINER	1
7	UNION	1

OPTIONAL FEATURE SUFFIX		ADDED TO CATALOG NUMBER	
P	X141 PRESSURE GAUGE	1	

AK 01-28-10

B ADDED OPTIONAL FEATURE P (ECO 21821)

LTR	DESCRIPTION	BY	DATE
		EK	10-17-96

CAD REVISION RECORD - DO NOT REVISE MANUALLY

A REDRAW ON CAD; ADDED CAT NO. 661-02 & 100-21 HYTROL TO ITEM 1; ADDED SIZE LIMITS (ECO 16108)

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CHK'D CH 6-7-78

APVD HWE 6-7-78

OPERATING DATA

I. SOLENOID CONTROL FEATURE:

SOLENOID CONTROL (2) IS A DIRECT ACTING 4-WAY SOLENOID CONTROL THAT CHANGES POSITION WHEN THE COIL IS ENERGIZED OR DE-ENERGIZED. THIS APPLIES OR RELIEVES PRESSURE IN THE COVER CHAMBER OR POWERROL CHAMBER OF THE MAIN VALVE (1) PROVIDING THE OPERATION SHOWN IN THE FOLLOWING TABLE:

SOLENOID CONTROL (2)		MAIN VALVE (1)		
POSITION	PORTS CONNECTED	POWERUNIT CHAMBER	COVER CHAMBER	POSITION
ENERGIZED	"S" & "1" "2" & "D"	PRESSURE RELIEVED	PRESSURE APPLIED	CLOSED
DE-ENERGIZED	"S" & "2" "1" & "D"	PRESSURE APPLIED	PRESSURE RELIEVED	OPEN

II. SOLENOID MANUAL OPERATOR:

TO MANUALLY OPERATE THE SOLENOID, PRESS DOWN ON THE KNURLED KNOB LOCATED ON TOP OF THE COIL ENCLOSURE AND TURN CLOCKWISE 1/4 TURN. TO RETURN THE SOLENOID TO ELECTRICAL CONTROL, TURN THE KNURLED KNOB CLOCKWISE 1/4 TURN AND THE KNURLED KNOB WILL RETURN TO THE ORIGINAL POSITION.

III. OPENING SPEED CONTROL:

CV FLOW CONTROL (3A) CONTROLS THE OPENING SPEED OF THE MAIN VALVE. TURN THE ADJUSTING STEM CLOCKWISE TO MAKE THE MAIN VALVE OPEN SLOWER.

IV. CLOSING SPEED CONTROL:

CV FLOW CONTROL (3B) CONTROLS THE CLOSING SPEED OF THE MAIN VALVE. TURN THE ADJUSTING STEM CLOCKWISE TO MAKE THE MAIN VALVE CLOSE SLOWER.

V. SWITCH ASSEMBLY FEATURE:

SWITCH ASSEMBLY (4) IS ACTUATED BY A STEM EXTENSION ATTACHED TO THE MAIN VALVE STEM. THE SWITCH ASSEMBLY IS FACTORY ADJUSTED TO ACTUATE A SINGLE-POLE, DOUBLE-THROW SWITCH WHEN THE MAIN VALVE IS ALMOST OPENED. WHEN THE MAIN VALVE STARTS TO CLOSE, THE SPRING LOADED SWITCH ACTUATING LEVER IS RELEASED AND RETURNS THE SWITCH TO ITS NORMAL POSITION.

CAD REVISION RECORD - DO NOT REVISE MANUALLY
 DESCRIPTION
 BY
 DATE
 LTR
 SEE SHEET 1.



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NEWPORT BEACH, CALIFORNIA

CATALOG NO.

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DRAWING NO.

96380

REV.

B

TYPE OF VALVE AND MAIN FEATURES

DEEP WELL PUMP CONTROL VALVE

DESIGN

DRAW JD 6-2-78

CHK'D CH 6-7-78

APVD HWE 6-7-78

OPERATING DATA-CONTINUED

VI. OPTIONAL FEATURE OPERATING DATA:

SUFFIX P (PRESSURE GAUGE):

PRESSURE GAUGE (P) PROVIDE PRESSURE READING IN THE INLET, OUTLET AND COVER CONNECTIONS.

VII. CHECK LIST FOR PROPER OPERATION:

- () SYSTEM VALVES OPEN UPSTREAM AND DOWNSTREAM.
- () AIR REMOVED FROM THE MAIN VALVE COVER AND PILOT SYSTEM AT ALL HIGH POINTS.
- () PERIODIC CLEANING OF STRAINER (6) IS RECOMMENDED.
- () CK2 COCK (5) OPEN DURING NORMAL OPERATION.
- () CORRECT VOLTAGE TO SOLENOID CONTROL (2).
- () MANUAL OPERATOR OF SOLENOID CONTROL (2) DISENGAGED.
- () INDEPENDENT OPERATING PRESSURE LINE PROPERLY CONNECTED.
- () CV FLOW CONTROL (3A) & (3B) OPEN AT LEAST 4 TURNS.

CAD REVISION RECORD - DO NOT REVISE MANUALLY

DATE

BY

DESCRIPTION

SEE SHEET 1.

LTR



Recommended Inspections

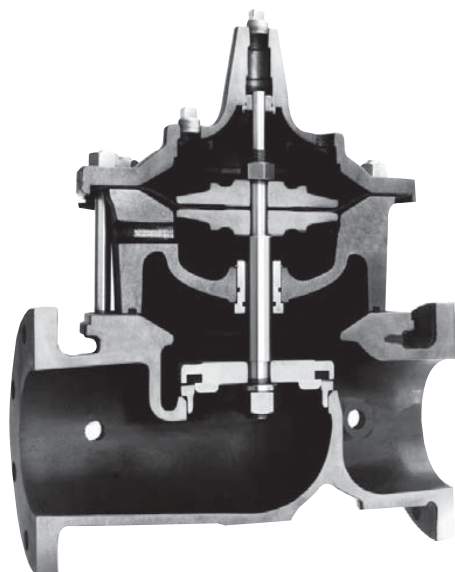
Cla-Val recommends that an inspection be performed on our products annually. The inspection should include both a visual and functional test of the main valve/component and the pilot system. The inspection ensures that no damage or premature wear occurred due to velocity, pressure, or foreign matter within the fluid that may have exceeded the valve's design. Please consult the maintenance manual for specific information on the model. Manuals are available for download at Cla-Val.com, as well as contact information for a company representative.

Accurate record-keeping is a best practice for any preventative maintenance program, and Cla-Val strongly recommends this action through an asset management program. Cla-Val provides a free asset management tool, Link2Valves [Link2Valves - Cla-Val \(cla-val.com\)](http://Link2Valves - Cla-Val (cla-val.com)), to assist in preventative maintenance record-keeping and scheduling.



— 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.

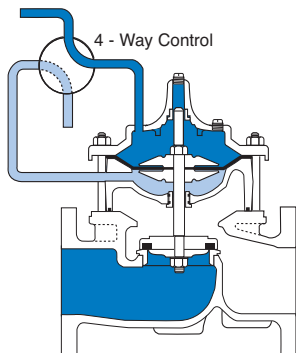
2. It is recommended that gate or block valves be installed on both the upstream and downstream sides of the 100-02 to facilitate isolating the valve for preventative maintenance.
3. Place the valve in the line with flow through the valve in the direction indicated on the inlet name plate or by flow 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 "sings" 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.

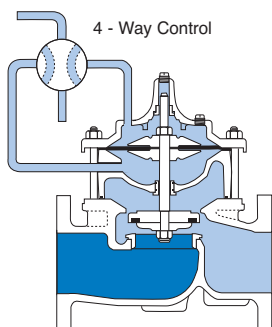
CAUTION: Extreme care should be taken when servicing the valve. Gate or line block valves must be closed upstream and downstream of the valve before starting disassembly. When there are no block or gate valves to isolate the Powertrol Valve it should be realized that the valve cannot be serviced under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

Principle of Operation



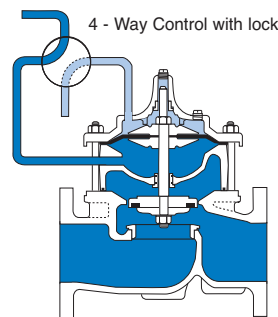
Full Open Operation

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 problem, 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 problem.	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.	Replace worn 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 Powerrol 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 Powerrol 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)

INCHES	VALVE SIZE		INCHES	MM
	MM	VALVE SIZE		
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

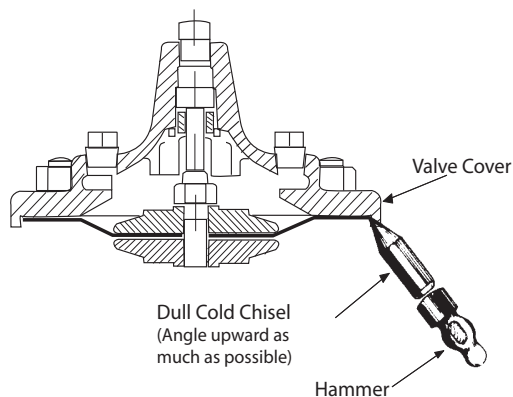
1. First mark the side of the valve cover, power unit body and valve body so that reassembly of these parts will be exactly as removed.

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 5C.h 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.

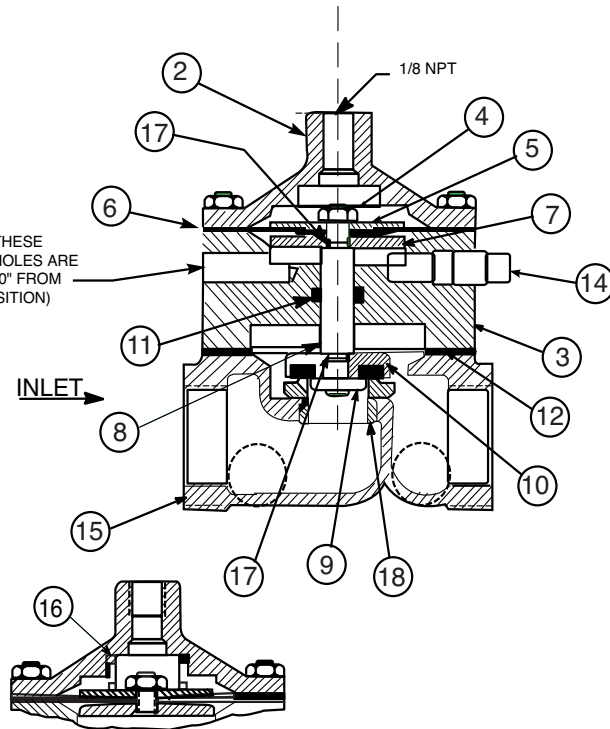
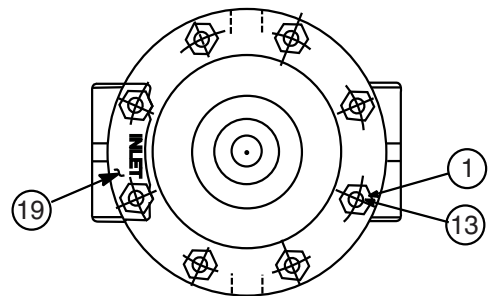
c. Open upstream gate or line block valve just enough to allow flow.

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"



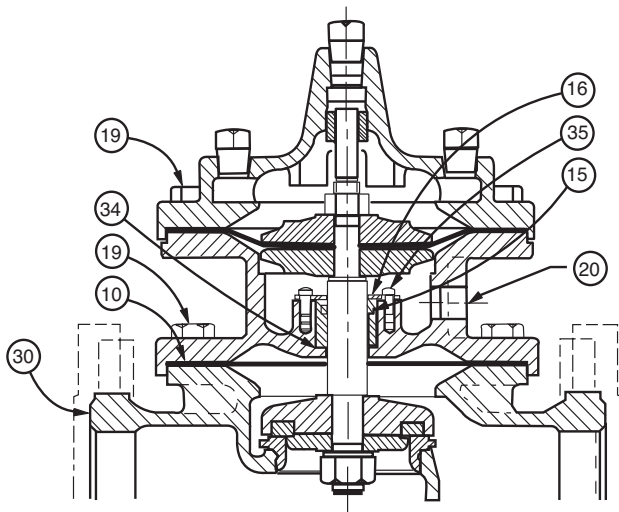
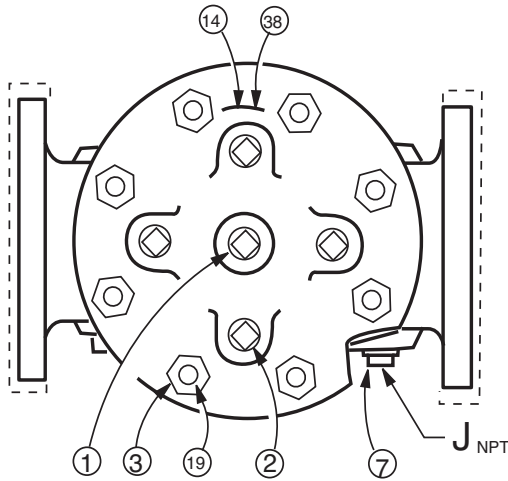
ITEM NO.	DESCRIPTION
1	HEX NUT 10-32 (8)
2	COVER
3	POWER UNIT BODY
4	HEX NUT 1/4-28-NF-2 A.S.F. JAM
5	DIAPHRAGM WASHER (UPPER)
6	DIAPHRAGM
7	DIAPHRAGM WASHER (LOWER)
8	STEM
9	DISC GUIDE
10	DISC RETAINER ASSEMBLY
11	"O" RING
12	BODY TO BODY GASKET
13	STUD 10-32 (8)
14	PIPE PLUG 1/8 NPT
15	BODY
16	SPRING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

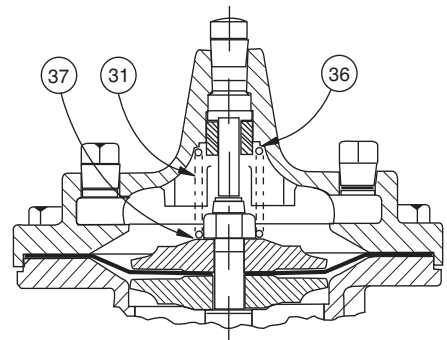
VALVE SIZE	DISPLACEMENT	
1/2"	0.340 Fl. Oz.	.01 Liters
3/4"	0.340 Fl. Oz.	.01 Liters
1"	0.700 Fl. Oz.	.02 Liters
1 1/4"	0.020 Gal.	.10 Liters
1 1/2"	0.020 Gal.	.10 Liters
2"	0.032 Gal.	.10 Liters
2 1/2"	0.043 Gal.	.20 Liters
3"	0.080 Gal.	.30 Liters
4"	0.169 Gal.	.60 Liters
6"	0.531 Gal.	2.00 Liters
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"**

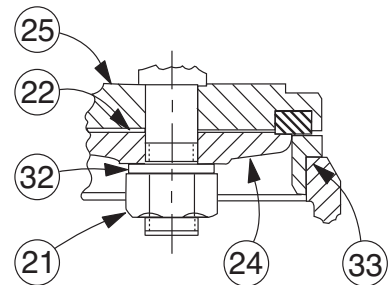


ITEM NO.	PART DESCRIPTION
1	CENTER COVER PLUG
2	COVER PLUG
3	STUD NUT
7	PLUG, PIPE, BODY
10 *	GASKET "O" RING
14	NAMEPLATE
15 *	O-RING, STEM
16	RETAINER BEARING (1"-3" ONLY)
19	BOLT, HEX HD. (1"-3" ONLY)
20	POWER UNIT BODY
21	LOWER STEM NUT
22	SPACER WASHER
24	DISC GUIDE
25	DISC RETAINER
30	BODY
31	SPRING (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

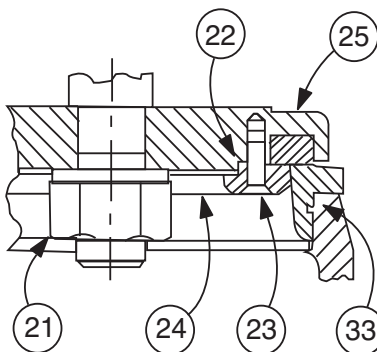
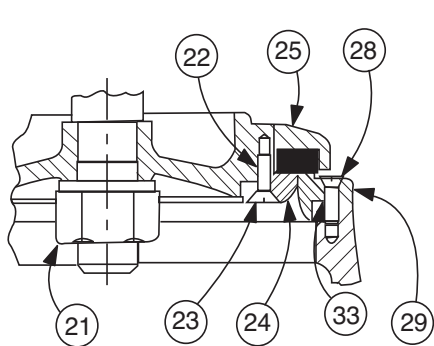
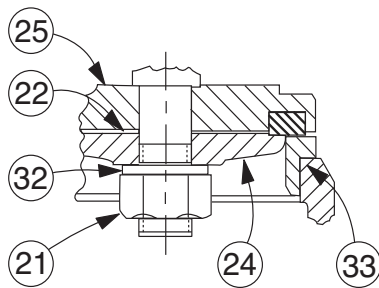
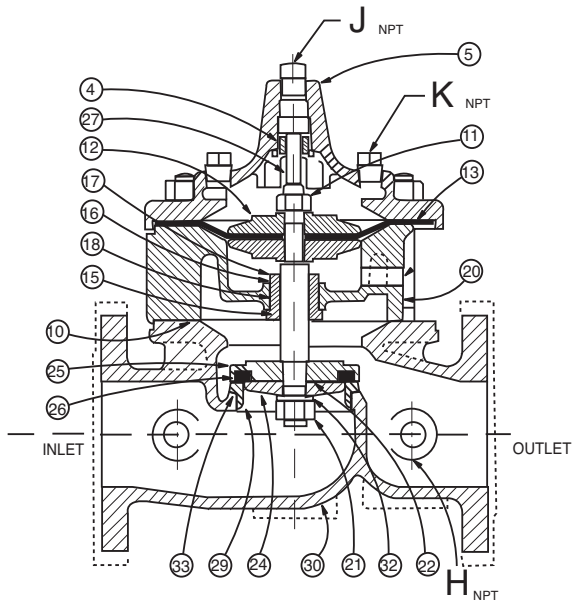
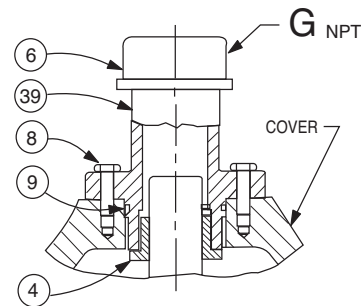
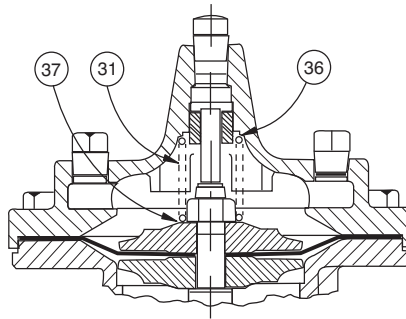
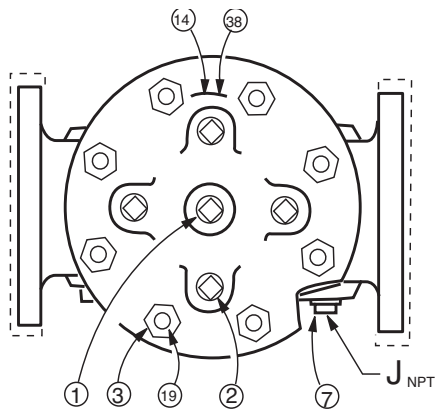
* RECOMMENDED SPARE PARTS



Model 100-02KH



Seat & Disc Details



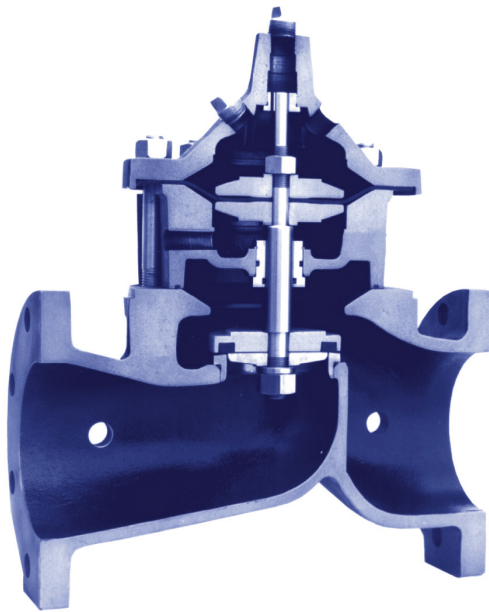
ITEM NO. PART DESCRIPTION

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	POWER UNIT BEARING
18 *	O-RING BEARING (4"-16" ONLY)
19	BOLT, HEX HD. (1"-3" ONLY)
	STUD (4"-16" ONLY)
20	POWER UNIT 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



— MODEL — **100-21**
600 Series
Powertrol Valve



- **Reduced Cavitation Design**
- **Drip-tight, Positive Seating**
- **Service Without Removal From Line**
- **Globe or Angle Pattern**
- **Every Valve Factory-Tested**

The Cla-Val Model 100-21 is a hydraulically operated, diaphragm actuated, globe or angle pattern valve. It consists of four major components: the body, intermediate chamber, diaphragm assembly and cover. The diaphragm assembly is the only moving part.

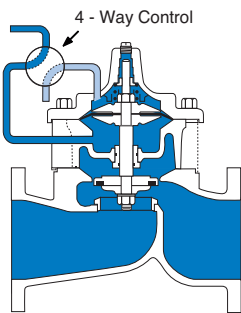
The diaphragm assembly, which is guided top and center by a precision machined stem, utilizes a non-wicking diaphragm of nylon fabric bonded with synthetic rubber. The diaphragm forms a seal between the cover chamber and intermediate chamber. A synthetic rubber disc retained on three and one-half sides forms a drip-tight seal with the renewable seat when pressure is applied above the diaphragm. As pressure above the diaphragm is relieved and pressure is applied below the diaphragm, the valve opens wide for full flow. The rate of closing or opening can be controlled by modulating the pressure above or below the diaphragm.

The Model 100-21 is recommended where independent operating pressure is desired. The valve's packless construction and simplicity of design assures a long life and dependable operation. Available in various materials and in a wide range of sizes. Its applications are many and varied.



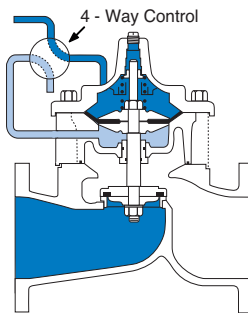
see page 2 for approvals

Principle of Operation



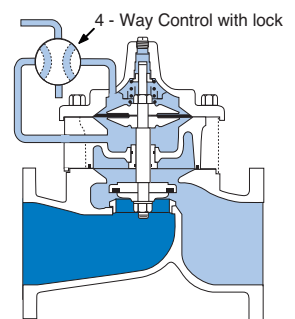
Full Open Operation

When operating pressure below the diaphragm is greater than the pressure in 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.

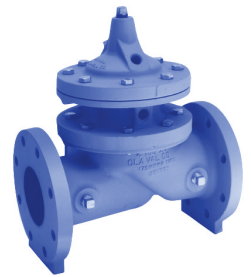
100-21 Powerrol Main Valve Specifications

Available Sizes

Pattern	Flanged
Globe (inches)	3", 4", 6", 8", 10", 12", 14", 16", 18", 20", 24", 30"
Globe (mm)	80mm - 750mm (all sizes)
Angle (inches)	4", 6", 8"
Angle (mm)	100, 150 and 200 mm

Operating Temp. Range

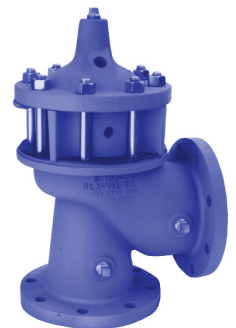
Fluids
-40° to 180° F -40° to 82° C



4 1/2"/100 mm Globe, Flanged



6"/150 mm Globe, Flanged



6"/150 mm Angle, Flanged

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 Class	300 Class
ASTM A536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
UNS 87850	Bronze	B16.24	225	400

Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
Valves for higher pressure are available; consult factory for details

Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes (inches)	3" - 30"	3" - 16"	3" - 16"
Available sizes (mm)	80 - 750 mm	80 - 400 mm	80 - 400 mm
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Bronze is Standard Stainless Steel is optional		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		

For material options on sizes not listed, consult factory.
Cla-Val manufactures valves in more than 50 different alloys.

Options

Epoxy Coating - suffix KC

An FDA approved fusion bonded epoxy coating for use with cast iron, ductile iron or steel valves. This coating is resistant to various water conditions, certain acids, chemicals, solvents and alkalies. Epoxy coatings are applied in accordance with AWWA coating specifications C116-03. Do not use with temperatures above 175°F/80° C.

Viton® Rubber Parts - suffix KB

Optional diaphragm, disc and o-ring fabricated with Viton® synthetic rubber. Viton® is well suited for use with mineral acids, salt solutions, chlorinated hydrocarbons, and petroleum oils; and is primarily used in high temperature applications up to 250° F/120°C. Do not use with epoxy coating above 175°F/80° C.

Heavy Spring - suffix KH

The heavy spring option is used in applications where there is low differential pressure across the valve, and the additional spring force is needed to help the valve close. This option is best suited for valves used in on-off (non-modulating) service.

For assistance in selecting appropriate valve options or valves manufactured with special design requirements, please contact our Regional Sales Office or Factory.

Approvals



NSF/ANSI 372: National Lead Free Mandate "Reduction of Lead in Drinking Water Act"



NSF International recognizes Cla-Val as complying with NSF/ANSI 61 and all applicable requirements.

Valve Size	Inches	3	4	6	8	10	12	14	16	18	20	24	30	
	mm	80	100	150	200	250	300	350	400	460	510	610	750	
C _V Factor	Globe Pattern	Gal./Min. (gpm.)	62	136	229	480	930	1458	1725	2110	2940	3400*	3500*	7900*
		Litres/Sec. (l/s.)	15	32.5	55	115	223	350	414	506	705	816	840	1895
	Angle Pattern	Gal./Min. (gpm.)	—	135	233	545	—	—	—	—	—	—	—	—
		Litres/Sec. (l/s.)	—	32	56	132	—	—	—	—	—	—	—	—
Equivalent Length of Pipe	Globe Pattern	Feet (ft.)	293	251	777	748	621	654	750	977	983	1125	3005	2130
		Meters (m.)	89.3	76.4	237.1	228.1	189.5	199.4	228.7	298.1	299.9	343.2	916.6	649.6
	Angle Pattern	Feet (ft.)	—	254	751	580	—	—	—	—	—	—	—	—
		Meters (m.)	—	77.6	229	176.9	—	—	—	—	—	—	—	—
K Factor	Globe Pattern	20.6	12.7	23.1	15.7	10.4	8.5	8.9	10.2	8.4	8.8	19.1	10.5	
	Angle Pattern	—	12.9	22.3	12.2	—	—	—	—	—	—	—	—	
Liquid Displaced from Diaphragm Chamber When Valve Opens	Fl. Oz	—	—	—	—	—	—	—	—	—	—	—	—	
	U.S. Gal.	.032	.08	.17	.53	1.26	2.51	4	4	9.6	9.6	9.6	29.0	
	ml	—	—	—	—	—	—	—	—	—	—	—	—	
	Litres	.12	.30	.64	2.0	4.8	9.5	15.1	15.1	36.2	36.2	36.2	110	

*Estimated

C_V Factor

Formulas for computing C_V Factor, Flow (Q) and Pressure Drop (ΔP):

$$C_V = \frac{Q}{\sqrt{\Delta P}} \quad Q = C_V \sqrt{\Delta P} \quad \Delta P = \left(\frac{Q}{C_V}\right)^2$$

K Factor (Resistance Coefficient)

The Value of K is calculated from the formula: $K = \frac{894d^4}{C_V^2}$ (U.S. system units)

Equivalent Length of Pipe

Equivalent lengths of pipe (L) are determined from the formula: $L = \frac{Kd}{12f}$ (U.S. system units)

Fluid Velocity

Fluid velocity can be calculated from the following formula: $V = \frac{.4085 Q}{d^2}$ (U.S. system units)

Where:

C_V = U.S. (gpm) @ 1 psi differential at 60° F water
or
= (l/s) @ 1 bar (14.5 PSIG) differential at 15° C water

d = inside pipe diameter of Schedule 40 Steel Pipe (inches)

f = friction factor for clean, new Schedule 40 pipe (dimensionless) (from Cameron Hydraulic Data, 18th Edition, P 3-119)

K = Resistance Coefficient (calculated)

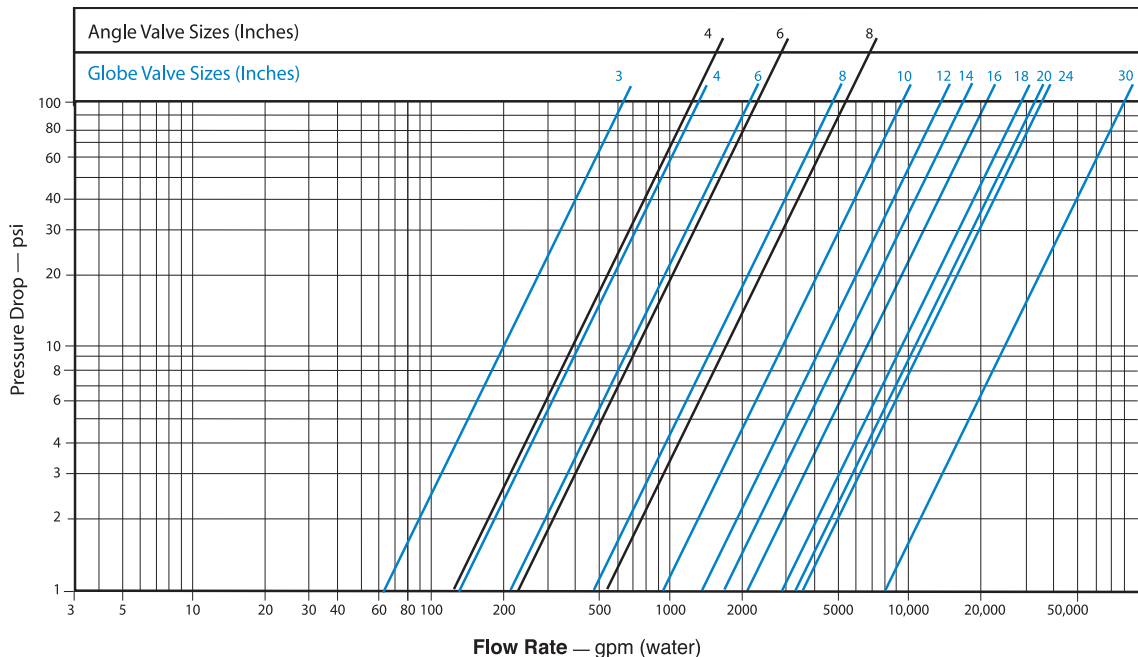
L = Equivalent Length of Pipe (feet)

Q = Flow Rate in U.S. (gpm) or (l/s)

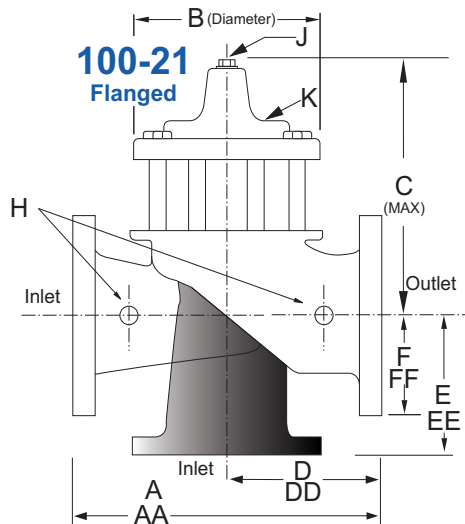
V = Fluid Velocity (feet per second) or (meters per second)

ΔP = Pressure Drop in (psi) or (bar)

Model 100-21 Flow Chart (Based on normal flow through a wide open valve)



Cla-Val 100-21 Powerrol Main Valve Dimensions



Valve Size (Inches)	3	4	6	8	10	12	14	16	18	20	24	30
A 150 ANSI	10.25	13.88	17.75	21.38	26.00	30.00	34.25	35.00	42.12	48.00	48.00	63.25
AA 300 ANSI	11.00	14.50	18.62	22.38	27.38	31.50	35.75	36.62	43.62	49.62	49.75	—
B Diameter	6.62	9.12	11.50	15.75	20.00	23.62	28.00	28.00	35.44	35.44	35.44	53.19
C Maximum	9.25	11.75	15.25	20.25	23.75	27.25	29.31	34.12	35.00	40.25	40.25	56.50
D 150 ANSI	—	6.94	8.88	10.69	—	—	—	—	—	—	—	—
DD 300 ANSI	—	7.25	9.38	11.19	—	—	—	—	—	—	—	—
E 150 ANSI	—	5.50	6.75	7.25	—	—	—	—	—	—	—	—
EE 300 ANSI	—	5.81	7.25	7.75	—	—	—	—	—	—	—	—
F 150 ANSI	3.25	4.50	5.50	6.75	8.00	9.50	11.00	11.75	15.88	14.56	17.00	19.88
FF 300 ANSI	4.12	5.00	6.25	7.50	8.75	10.25	—	12.75	15.88	16.06	19.00	—
H NPT Body Tapping	0.38	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
J NPT Cover Center Plug	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.25	2.00	2.00	2.00	2.00
K NPT Cover Tapping	0.38	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stem Travel	0.60	0.80	1.10	1.70	2.30	2.80	3.40	3.40	4.50	4.50	4.50	6.50
Approx. Ship Weight (lbs)	70	135	230	480	785	1410	2215	2215	2300	3400	3600	7700

Valve Size (mm)	80	100	150	200	250	300	350	400	450	500	600	750
A 150 ANSI	260	353	451	543	660	762	870	889	1070	1219	1219	1607
AA 300 ANSI	279	368	473	568	695	800	908	930	1108	1260	1264	—
B Diameter	168	232	292	400	508	600	711	711	900	900	900	1351
C Maximum	235	298	387	514	603	692	744	867	889	1022	1022	1435
D 150 ANSI	—	176	226	272	—	—	—	—	—	—	—	—
DD 300 ANSI	—	184	238	284	—	—	—	—	—	—	—	—
E 150 ANSI	—	140	171	184	—	—	—	—	—	—	—	—
EE 300 ANSI	—	148	184	197	—	—	—	—	—	—	—	—
F 150 ANSI	95	114	140	171	203	241	279	298	403	370	432	505
FF 300 ANSI	105	127	159	191	222	260	—	324	403	408	483	—
H NPT Body Tapping	0.38	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
J NPT Cover Center Plug	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.25	2.00	2.00	2.00	2.00
K NPT Cover Tapping	0.38	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stem Travel	15	20	28	43	58	71	86	86	86	114	114	165
Approx. Ship Weight (kgs)	32	61	104	218	356	640	1006	1006	1044	1544	1634	3496

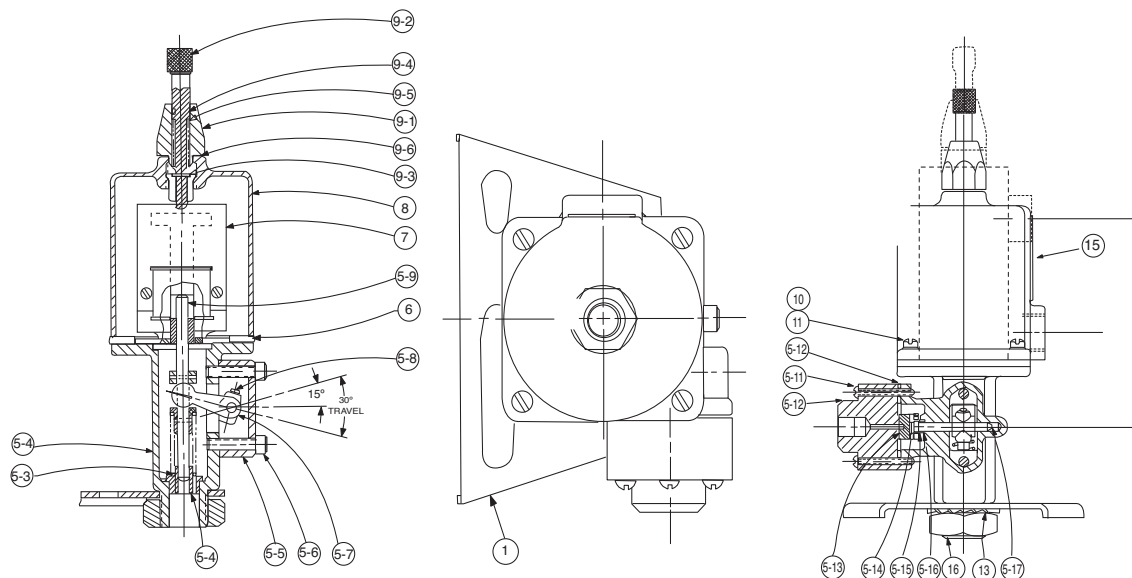
Service and Installation

Cla-Val Control Valves operate with maximum efficiency when mounted in horizontal piping with the main valve cover UP, however, other positions are acceptable. Due to component size and weight of 10 inch/250 mm and larger valves, installation with cover UP is advisable. We recommend isolation valves be installed on inlet and outlet for maintenance. Adequate space above and around the valve for service personnel should be considered essential. A regular maintenance program should be established based on the specific application data. However, we recommend a thorough inspection be done at least once a year. Consult factory for specific recommendations.



CSM-11

Solenoid Control



Item	Description	Item	Description
1	Mounting Bracket	7	Solenoid Assy. (See table other side)
5	Mechanical Parts Assy.	8	Cover
5-2	Housing	9	Manual Operator Assy.
5-3	Spring	9-1	Housing, Manual Operator
5-4	Guide	9-2	Plunger
5-5	Side Housing	9-3	Pin, groove-3/8"
5-6	Cap Screw 1/4"	9-4	"O"- Ring
5-7	Lever Arm	9-5	Spring, Manual Operator
5-8	Lever Screw	9-6	Gasket, Manual Operator
5-9	Stem Assy. (Solenoid)	10	Machine Screw Fil. Hd. 10/32 x 5/8 (4 reqd)
5-10	Distributor Gasket		Lockwasher
5-11	Machine Screw, RDH (6/32 x 1 1/4 - 6 reqd.)	11	Machine Screw Fil. Hd.
5-12	Distributor (CSM11-A2-2)	12	
5-13	Disc Assy.		Lockwasher
5-14	Spring (Disc Assy.)	13	Lockwasher
5-15	Thrust Washer	14	Coil only: (See table other side)
5-16	"O"- Ring	15	Nameplate
5-17	Stem Assy. (Pilot)	16	Hex Nut, Jam 1-14 UNS
6	Spacer Gasket		

When ordering parts, please specify:

- All Nameplate Data
- Part Description
- Item Number
- Part Material

Recommended Spare Pilot valve sub-assembly (Part of item 5) for model CSM11-A2-2, Standard materials, P/N 18053K

•Recommend Factory repair or replace pilot valve when worn.

CSMII CONTROL ASSEMBLY						SOLENOID ASSEMBLY & COILS	
VOLTAGE	CSMII-A2-2		CSMII-N2-4	CSMII-CZ2-4	CSMII-CQ2-4	SOLENOID PART No.	COIL PART No.
	STANDARD	SEA-WATER SERVICE	STANDARD	STANDARD	STANDARD		
	STOCK No.	STOCK No.	STOCK No.	STOCK No.	STOCK No.		
24/60 Hz	10023-01J	—	10031-01B	10039-01E	10038-01G	87573-01A	73342J
115/60 Hz	10023-02G	10046-01K	10031-02K	10039-02C	10038-02E	—	—
120/60 Hz	10023-02G	10046-01K	10031-02K	10039-02C	10038-02E	87573-02J	73343G
208/60 Hz	10023-03E	—	10031-03H	10039-03A	10038-03C	87573-03G	73344E
230/60 Hz	10023-04C	—	10031-04F	10039-04J	—	—	—
240/60 Hz	10023-04C	—	10031-04F	10039-04J	10038-04A	87573-04E	73345B
440/60 Hz	10023-09B	—	10031-09E	10039-09H	10038-09K	87573-09D	82542C
460/60 Hz	10023-05K	—	10031-05C	10039-05F	—	—	—
480/60 Hz	10023-05K	—	10031-05C	10039-05F	10038-05H	87573-05B	73346K
110/50 Hz	10023-06H	—	10031-06A	10039-06D	10038-06K	87573-06K	73347H
220/50 Hz	10023-07F	—	10031-07J	10039-07B	10038-07D	87573-07H	73348F
240/50 Hz	10023-08D	—	10031-08G	10039-08K	10038-08B	87573-08F	73349D

The solenoid is rated for continuous duty. It can be held energized continuously in normal ambient temperatures without overheating. Solenoid overheating is often due to over voltage conditions. AC voltage solenoids should not be used with less than 85% of rated voltage.

Solenoid Protection

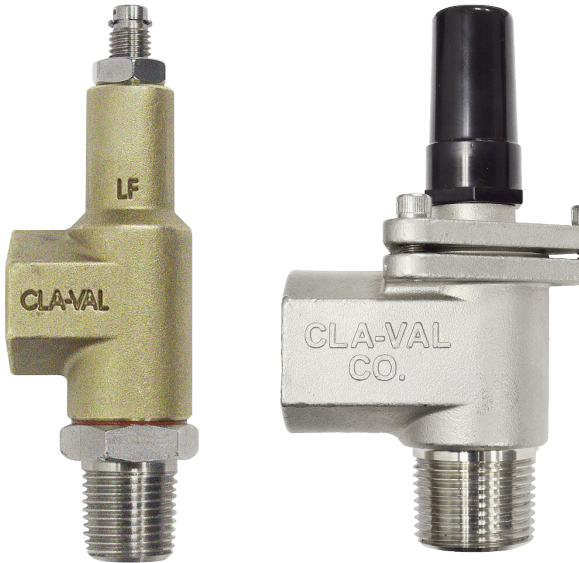
If a solenoid is mechanically blocked in the energized position the coil soon burns out. Protect it with a "slow blow" fuse with an ampere rating of 1.5 times the solenoid "holding" current shown. Solenoid ratings are based on 115 VAC where holding current is 0.6 amp and solenoid VA rating is 69 volt amperes. Current for other voltages is inversely proportional to voltage.

Examples: A.) Given 115 VAC supply to the solenoid, then 1.5 times .6 = .9 Amp. Select one amp slow blow fuse. B.) Given 24 VAC supply to the solenoid, then 1.5 times 2.88 = 4.32 Amp. Select 4.5 Amp slow blow fuse. C.) Given 240 VAC supply to the solenoid, then 1.5 times 0.288 = 0.432 Amp. Select 0.5 Amp slow blow fuse.

Volts	Amperes		Coil Resistance
	Holding	Inrush	Ohms
(AC 60 Hz)			
24	2.88	25.4	0.5
120	.575	5.1	14.1
208	.330	2.93	40
240	.288	2.54	58
440	.156	1.38	174
480	.143	1.27	233
Volts	Amperes		Coil Resistance
(AC 50 Hz)	Holding	Inrush	Ohms
110	.48	4.6	15.7
220	.24	2.3	66
240	.22	2.1	88



—MODEL— **CV**
Flow Control



DESCRIPTION

The CV Control is an adjustable restriction which acts as a needle valve when flow is in the direction of the stem. When flow is in the reverse direction, the port area opens fully to allow unrestricted flow. When installed in the control system of a Cla-Val automatic valve, it can be arranged to function as either an opening or closing speed control.

OPERATION

The CV Flow Control permits full flow from port A to B, and restricted flow in the reverse direction. Flow from port A to B lifts the disc from seat, permitting full flow. Flow in the reverse direction seats the disc, causing fluid to pass through the clearance between the stem and the disc. This clearance can be increased, thereby increasing the restricted flow, by screwing the stem out, or counter-clockwise. Turning the stem in, or clockwise reduces the clearance between the stem and the disc, thereby reducing the restricted flow.'

INSTALLATION

Install the CV Flow Control as shown in the valve schematic. All connections must be tight to prevent leakage.

DISASSEMBLY

Follow the sequence of the item numbers assigned to the parts in the cross sectional illustration for recommended order of disassembly.

Use a scriber, or similar sharp-pointed tool to remove O-ring from the stem.

INSPECTION

Inspect all threads for damage or evidence of cross-threading. Check mating surface of seat and valve disc for excessive scoring or embedded foreign particles. Check spring for visible distortion, cracks and breaks. Inspect all parts for damage, corrosion and cleanliness.

CLEANING

After disassembly and inspection, cleaning of the parts can begin. Water service usually will produce mineral or lime deposits on metal parts in contact with water. These deposits can be cleaned by dipping the parts in a 5-percent muriatic acid solution just long enough for deposits to dissolve. This will remove most of the common types of deposits. **Caution: use extreme care when handling acid.** If the deposit is not removed by acid, then a fine grit (400) wet or dry sandpaper can be used with water. Rinse parts in water before handling. An appropriate solvent can clean parts used in fueling service. Dry with compressed air or a clean, lint-free cloth. Protect from damage and dust until reassembled.

REPAIR AND REPLACEMENT

Minor nicks and scratches may be polished out using a fine grade of emery or crocus cloth; replace parts if scratches cannot be removed.

Replace O-ring packing and gasket each time CV Flow Control is overhauled.

Replace all parts which are defective. Replace any parts which create the slightest doubt that they will not afford completely satisfactory operation. Use Inspection steps as a guide.

REASSEMBLY

Reassembly is the reverse of disassembly; no special tools are required.

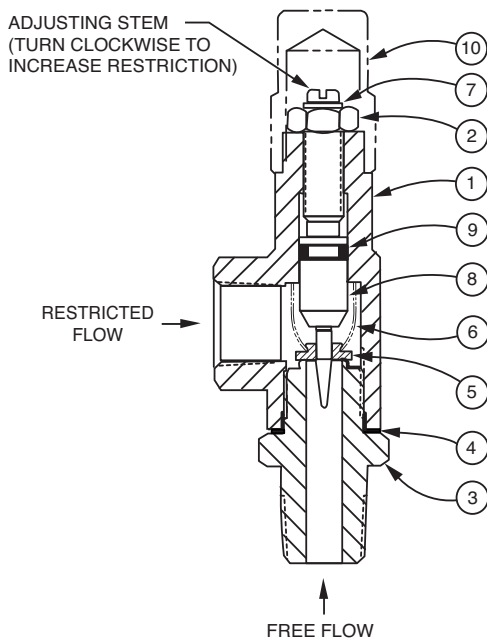
TEST PROCEDURE

No testing of the flow Control is required prior to reassembly to the pilot control system on Cla-Val Main Valve.



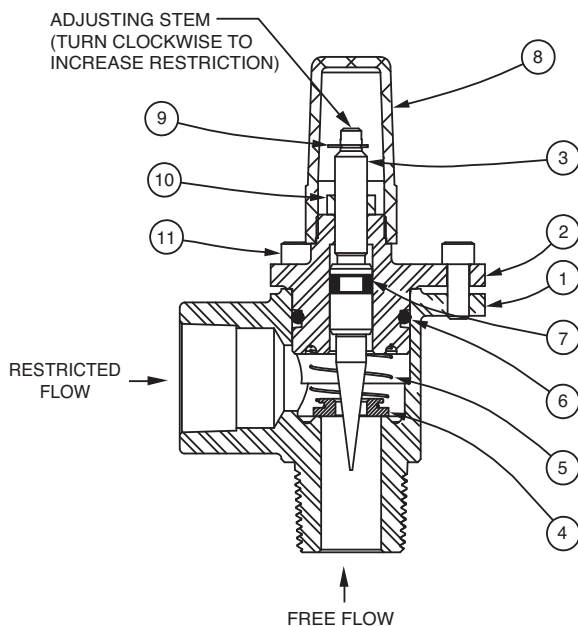
CV Flow Control

3/8" CV Flow Control



ITEM	DESCRIPTION	QTY
1	Housing	1
2	Nut, Jam	1
3	Seat	1
4	Gasket	1
5	Disc	1
6	Spring	1
7	Ring, Retaining	1
8	Stem	1
9	O-Ring	1
10	Cap (SS only)	1

1/2", 3/4", 1" CV Flow Control



When ordering parts, please specify:

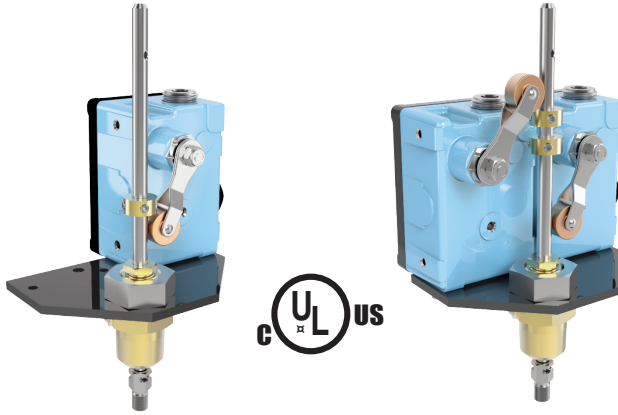
- Number Stamped on Side
- Description (CV Flow Control)
- Part Description
- Material

ITEM	DESCRIPTION	QTY
1	Body	1
2	Cover	1
3	Stem	1
4	Disc	1
5	Spring	1
6	O-Ring	1
7	O-Ring	1
8	Cap	1
9	Ring, Retaining	1
10	Nut, Jam	1
11	Socket Head Cap Screw	3



— MODELS — **X105L**
X105L2

Limit Switch Assemblies

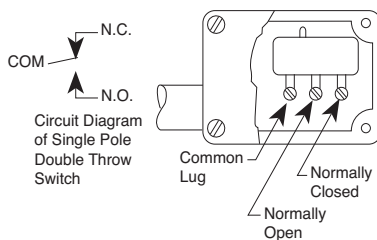


- **UL/ULC Listed**
- **Positive Action**
- **Rugged and Dependable**
- **Weather Proof or Explosion Proof**
- **Easy To Adjust**

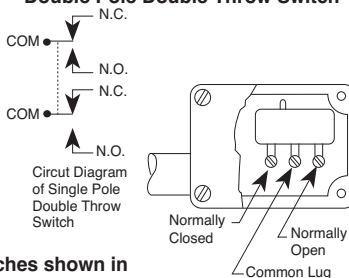
The Cla-Val Model X105L/X105L2 Limit Switch Assembly is a rugged, dependable and positive acting switch assembly actuated by the opening or closing of a Cla-Val control valve on which it is mounted. The single pole, double throw micro switch can be connected either to open or to close an electrical circuit when actuated. By loosening the allen screw on the actuating collar and raising or lowering the collar on the stem, the X105L is easily adjusted to signal that the valve has fully reached the desired position (open or closed).

Installation

Single Pole Double Throw Switch

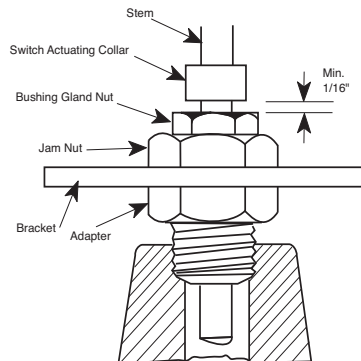


Double Pole Double Throw Switch



Switches shown in unactivated position.

1. Remove plug in top of valve cover.
2. Screw actuating stem into main valve stem.
3. Slip adapter down over stem and screw into place on valve cover.
4. Attach micro switch housing and bracket to adapter with jam nut.
5. Bring electrical supply circuit into unit through the 1/2" tapping in micro switch housing.
6. Adjust switch collars. (Set collar to trip switch after valve is positioned fully open or fully closed)



Actuating Collar Adjustment Minimum Setting

When adjusting actuating collar for proper switch action, a clearance of at least 1/16" (1/8" for 48" valve) must be provided between the collar and the bushing gland nut when valve is in the fully closed position.

Purchase Specifications

The assembly shall be bracket-mounted to exterior of an adapter attached to the center of the main valve cover. A stainless steel actuating stem with a swivel adapter shall be fastened directly to the main valve stem and move vertically through an adapter and gland with two O-ring seals as the valve moves. An adjustable collar located on the actuating stem shall actuate the sensor arm of a switch when valve has fully reached the open or closed (specify) position. The rotary-type position sensor arm shall actuate SPDT or DPDT type (specify) micro-switches mounted inside protective housing either weather-tight or explosion-proof NEMA rated (specify).

Provisions shall be made for bleeding air from valve cover through a small bleed screw and washer located on one wrench flat of adapter. All assemblies shall be capable of accommodating up to three switches. Standard materials in contact with operating fluid are brass, stainless steel, Monel and Buna-N.

A conduit hub opening in the switch enclosure shall be provided for attaching protective weatherproof conduit for the electrical switch wires (wiring and conduit supplied by others). A sealing plug shall be provided to protect conduit opening during shipping or storage.

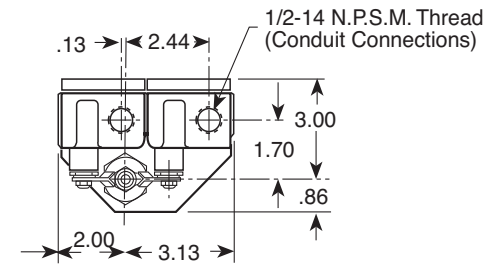


Fig. 1
Valve Size
1 1/4" Thru 8"
X105L2W
X105L2X

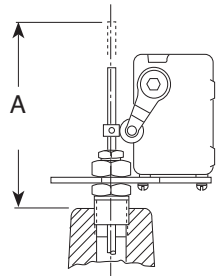


Fig. 2
Valve Size
1 1/4" Thru 14"
X105LCW
X105LCX

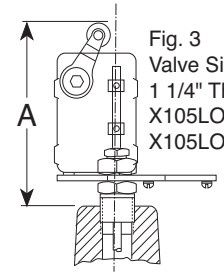


Fig. 3
Valve Size
1 1/4" Thru 8"
X105LOW
X105LOX

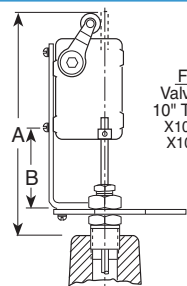


Fig. 4
Valve Size
10" Thru 14"
X105LOW
X105LOX

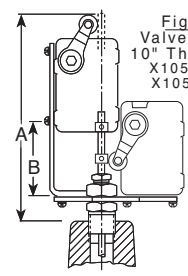
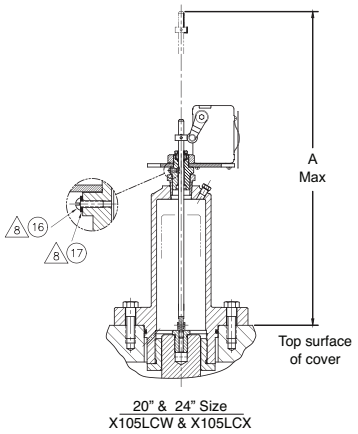
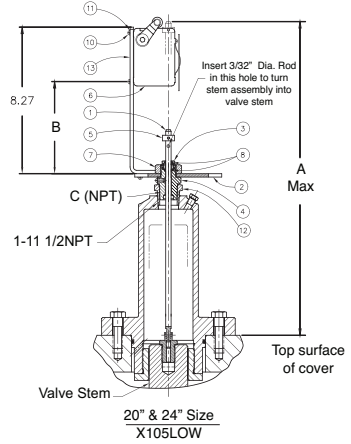


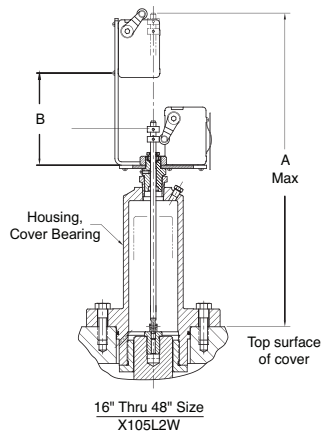
Fig. 5
Valve Size
10" Thru 14"
X105L2W
X105L2X



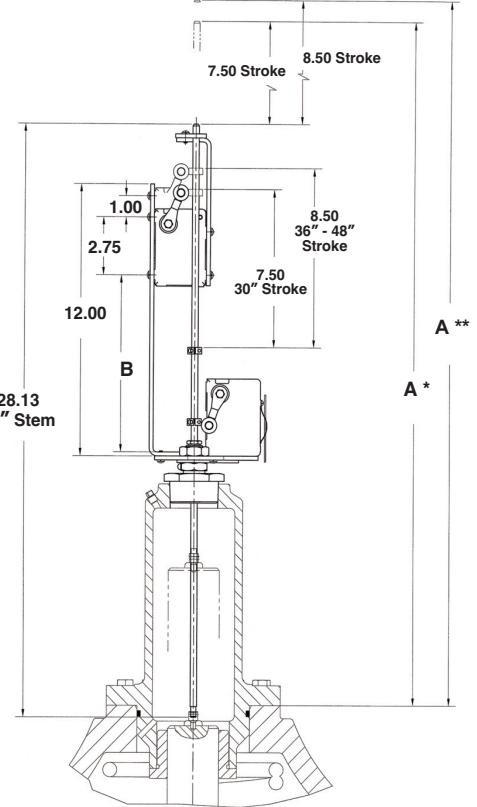
20" & 24" Size
X105LCW & X105LCX



20" & 24" Size
X105LOW



16" Thru 48" Size
X105L2W



A* - 30" • A** - 36", 42" & 48" Size

X105 Series Dimensions (In Inches)

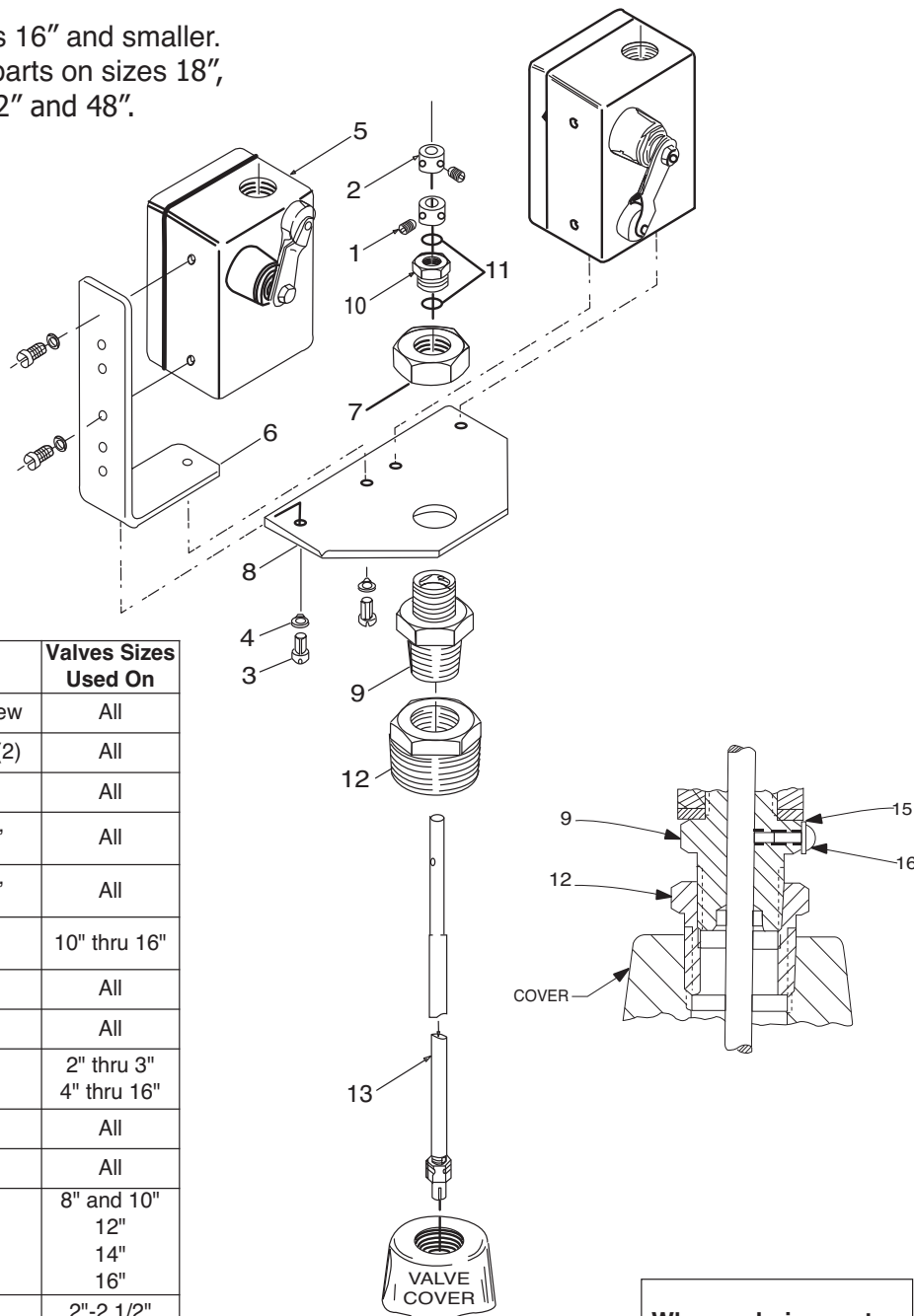
BasicValve 100-01	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30	36*	42*	48*
Dimension "A"	10.19	10.19	7.16	7.16	7.34	7.00	6.69	6.91	9.88	9.59	9.16	10.78	10.78	18.23	19.10	35.07	36.07	36.07	36.07
Dimension "B"							1.69	1.69	2.44	2.94	2.94	2.94	2.94	4.32	5.19	8.40	8.40	8.40	8.40
C (NPT)	1/4	1/4	1/2	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/2	2	2	3/4	3/4	2	2	2	2
BasicValve 100-20					3	4	6	8	10	12	14	16	18	20	24	30	36*	42*	48*
Dimension "A"					7.16	7.34	7.00	6.69	6.91	9.88	9.59	9.59	10.78	10.78	10.78	11.30	35.07	36.07	36.07
Dimension "B"								1.69	1.69	2.44	2.94	2.94	2.94	2.94	2.94	5.19	8.40	8.40	8.40
C (NPT)					1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	2	2	2	1	2	2	2



X105L

Limit Switch Assembly

Parts list shown is for sizes 16" and smaller.
Please consult factory for parts on sizes 18",
20", 24", 30", 36", 42" and 48".

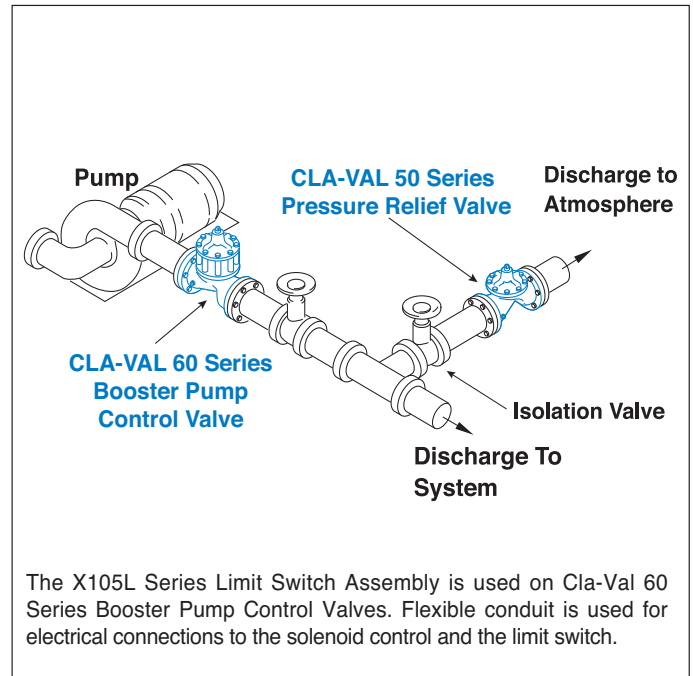
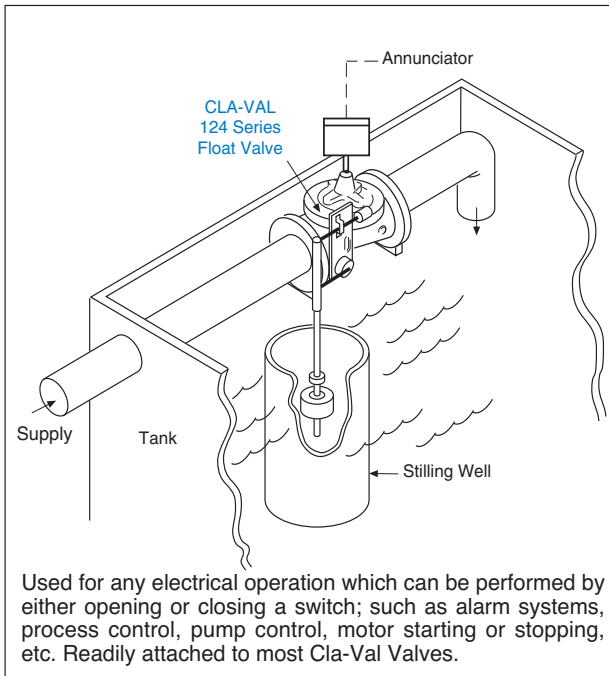


Item	Part Number	Description	Valves Sizes Used On
1-2	20441701E	Collar W/Set Screw	All
3	67578-21B	Screw, Machine (2)	All
4	67584-23F	Washer, Lock (2)	All
5	34637K	Switch Assembly, Weather Proof	All
	34633J	Switch Assembly, Explosion Proof	All
6	64310G	Bracket Switch Mounting	10" thru 16"
7	67815-06J	Nut, Jam	All
8	63674G	Plate, Mounting	All
9	2838201J	Adapter	2" thru 3"
	2838202G	Adapter	4" thru 16"
10	63398C	Bushing, Gland	All
11	00951E	O-Ring (2)	All
12	6764417K	Bushing	8" and 10"
	6764418H	Bushing	12"
	6764419F	Bushing	14"
	6764491J	Bell Reducer	16"
13	8970101F	Stem, Actuating	2"-2 1/2"
	8970102D	Stem, Actuating	3"-4"
	8970103B	Stem, Actuating	6"-8"
	8970104K	Stem, Actuating	10"-12"-14"
	8970105G	Stem, Actuating	16"
15	6551201H	Fiber Washer	All
16	6824421K	Screw 8-32 x 3/8	All

When ordering parts, please specify:

- Item Number
- Description
- Part Number

Typical Applications



Specifications

Materials: Aluminum switch housing
Steel bracket and brass adapter
Stainless steel stem

Electrical: 1/2" Conduit connection

Switch Type: SPDT UL, File No. E12252,
CSA Certified, File No. LR57325
Weather proof
NEMA 1,3,4, and13

Switch Rating: UL/CSA rating: L96
15 amp. 125, 250, or 480 volts AC
1/2 amp. 125 volts DC
1/4 amp. 250 volts DC

Switch Options: DPDT switches available on request
UL/CSA Rating: L59, 10 amps

Explosion proof micro switches are
NEMA 1,7, and 9
UL Listed, File No. E14274 and CSA
Certified, File No. LR57324: Class I,
Group C and D and Class II, Group
E, F and G.

When Ordering, Please Specify

1. Valve Size and Basic Valve Model Number
2. Catalog Number from Table Below
3. All Valve Name Plate Data
4. Select Single or Double Pole Switch
5. Explosion Proof or Weather Proof Type Enclosure
6. Amperes and Voltage, AC or DC
7. Actuating Position (Valve Open or Closed)

CATALOG NO.	ACTUATION POSITION	SWITCH ENCLOSURE
X105LCW	Valve Closed	Weather Proof
X105LCX	Valve Closed	Explosion Proof
X105LOW	Valve Open	Weather Proof
X105LOX	Valve Open	Explosion Proof
X105L2W	Dual	Weather Proof
X105L2X	Dual	Explosion Proof



CLA-VAL

1701 Placentia Avenue • Costa Mesa, CA 92627

800-942-6326 • Fax: 949-548-5441 • Web Site: cla-val.com • E-mail: info@cla-val.com

CLA-VAL CANADA

4687 Christie Drive
Beamsville, Ontario
Canada L0R 1B4
Phone: 905-563-4963
E-mail sales@cla-val.ca

CLA-VAL EUROPE

Chemin des Mésanges 1
CH-1032 Romanel/
Lausanne, Switzerland
Phone: 41-21-643-15-55
E-mail: cla-val@cla-val.ch

CLA-VAL UK

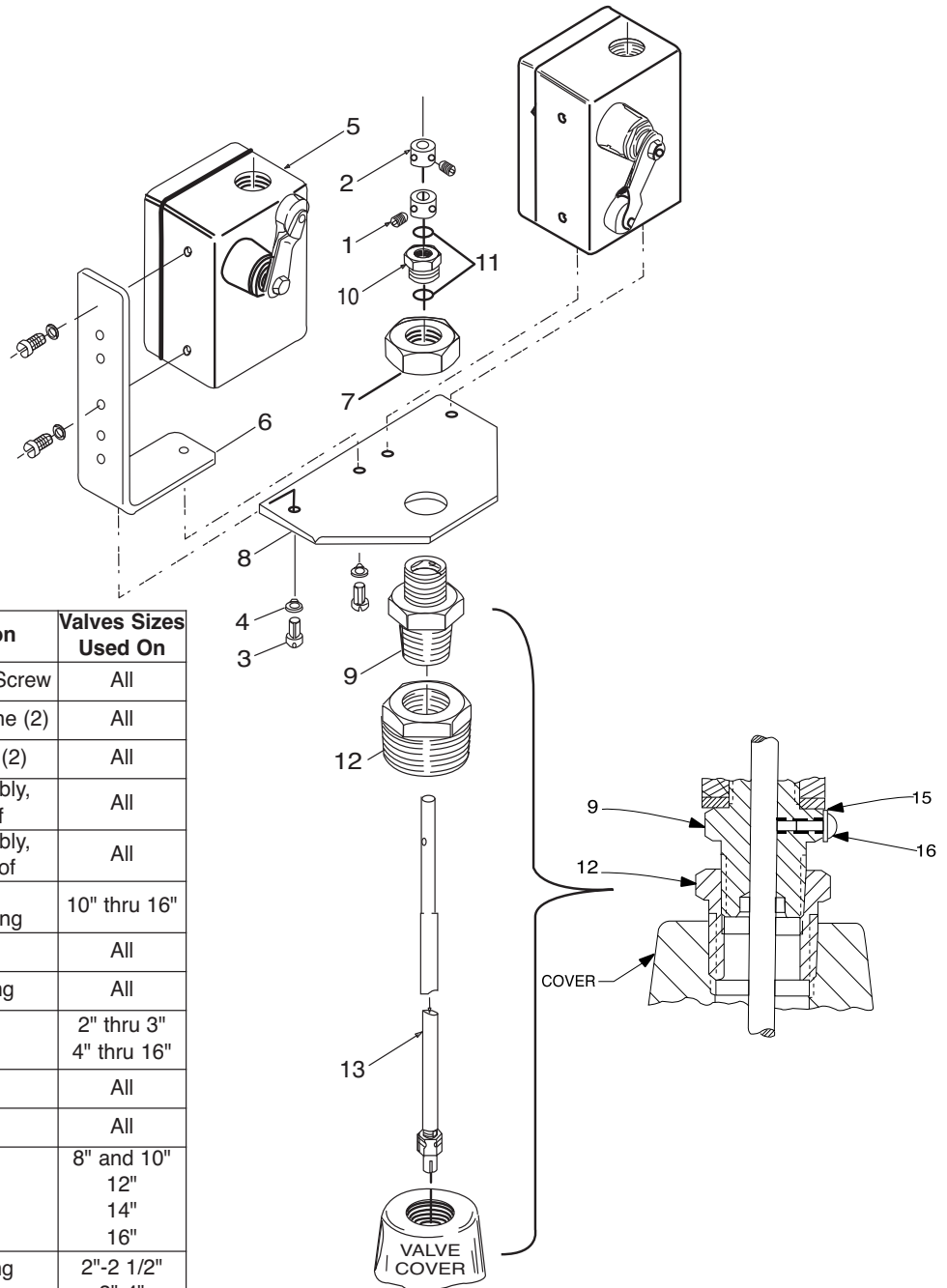
Dainton House, Goods Station Road
Tunbridge Wells
Kent TN1 2 DH England
Phone: 44-1892-514-400
E-mail: info@cla-val.co.uk

CLA-VAL FRANCE

Porte du Grand Lyon 1
ZAC du Champ du Périon
France - 01700 Neyron
Phone: 33-4-72-25-92-93
E-mail: cla-val@cla-val.fr

CLA-VAL PACIFIC

45 Kennaway Road
Woolston, Christchurch, 8023
New Zealand
Phone: 64-39644860
www.cla-valpacific.com
E-mail: info@cla-valpacific.com


X105L**Limit Switch Assembly**

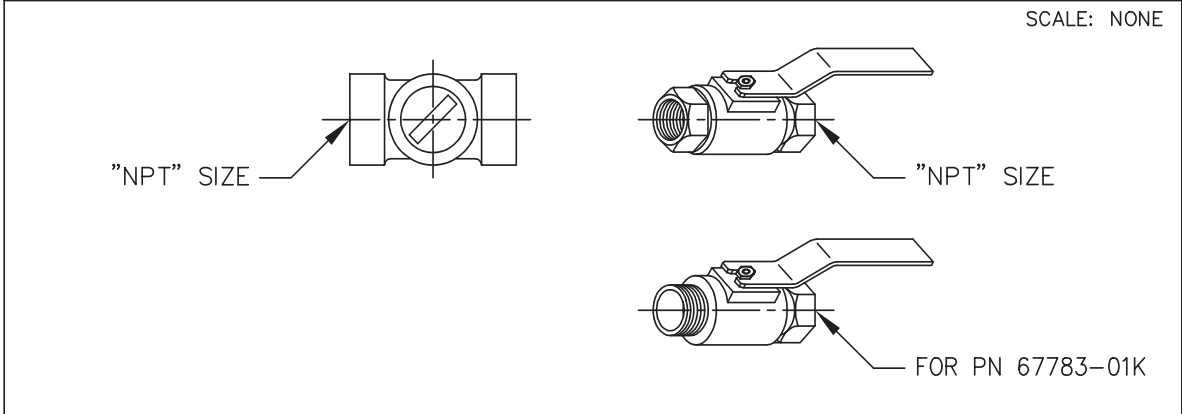
Item	Part Number	Description	Valves Sizes Used On
1-2	20441701E	Collar W/Set Screw	All
3	67578-21B	Screw, Machine (2)	All
4	67584-23F	Washer, Lock (2)	All
5	34637K	Switch Assembly, Weather Proof	All
	34633J	Switch Assembly, Explosion Proof	All
6	64310G	Bracket Switch Mounting	10" thru 16"
7	67815-06J	Nut, Jam	All
8	63674G	Plate, Mounting	All
9	2838201J 2838202G	Adapter Adapter	2" thru 3" 4" thru 16"
10	63398C	Bushing, Gland	All
11	00951E	O-Ring (2)	All
12	67644-17K 67644-18H 67644-19F 67644-91J	Bushing Bushing Bushing Bell Reducer	8" and 10" 12" 14" 16"
13	89701-01F 89701-02D 89701-03B 89701-04K 89701-05G	Stem, Actuating Stem, Actuating Stem, Actuating Stem, Actuating Stem, Actuating	2"-2 1/2" 3"-4" 6"-8" 10"-12"-14" 16"
15	6551201H	Fiber Washer	All
16	6824421K	Screw 8-32 x 3/8	All

When ordering parts, please specify:

- Item Number
- Description
- Part Number

AK	07-10-08	BB	ADDED PN'S 67783-62B (NED 62200)
AK	08-14-08	BC	ADDED PN'S 67783-63K (NED 62218)
PC	10-1-2008	BD	ADDED PN 67783-64H (NED 62446)
CAD REVISION RECORD - DO NOT REVISE MANUALLY		BY	DATE
LTR	DESCRIPTION		
A-AY	SEE REVISION FILE		
BA	ADDED PN'S 67783-59H, 67783-60F & 67783-61D (ECO 20434)	AK	03-14-06

 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO.	DRAWING NO.	REV
		67783	BD
TYPE OF VALVE AND MAIN FEATURES		DESIGN	
<p style="text-align: center; font-size: 24px;">CK2 COCK/BALL VALVE</p>		DRAWN	MGR 4-02-80
		CHK'D	KD 4-03-80
		APV'D	CH 4-07-80



CLA-VAL PART NO. AND MATERIAL								
BRONZE WITH HANDLE	STEEL WITH HANDLE	IRON WITH HANDLE	316 SST WITH HANDLE	316 SST W/ LOCKING HANDLE	BRONZE WITH HANDLE	MONEL WITH HANDLE	MONEL W/ LOCKING HANDLE	SIZE "NPT"
67783-01K*	-09C	-17F	-25J SUPSD BY-26G		-41F SUPSD BY-01K			1/8"
-02H	-10A	-18D	-26G	-51E SUPSD BY-26G -52C	-42D SUPSD BY-02H	-55F		1/4"
-03F * -59H***	-11J	-19B	-27E	-46E SUPSD BY-27E -53A	-45G -57B * *	-48A SUPSD BY-49J	-63K	3/8"
-04D -60F ***	-12G	-20K	-28C	-54J	-43B SUPSD BY-04D	-49J	-62B	1/2"
-05A -61D ***	-13E	-21H	-29A	-64H	-44K SUPSD BY-05A	-56D		3/4"
-06J	-14C	-22F	-30J			-58K		1"
-07G	-15K	-23D	-31G					1 1/4"
-08E	-16H	-24B	-32E					1 1/2"
-50G			-47C					2"

- * SEE ENGINEERING APPROVED VENDORS TABLE (SHEET 2 OF 2).
- ** HAMMOND VALVE 8501 ONLY.
- *** WILKINS CK2 (SEE SHEET 2 OF 2)

"THIS DRAWING IS THE PROPERTY OF CLA-VAL CO. AND SAME AND COPIES MADE THEREOF, IF ANY, SHALL BE RETURNED TO IT UPON DEMAND. DELIVERY AND DISCLOSURE HEREOF ARE SOLELY UPON CONDITION THAT THE SAME SHALL NOT BE USED, COPIED OR REPRODUCED, NOR SHALL THE SUBJECT HEREOF BE DISCLOSED IN ANY MANNER TO ANYONE FOR ANY PURPOSE, EXCEPT AS HEREIN AUTHORIZED, WITHOUT PRIOR WRITTEN APPROVAL OF CLA-VAL CO. THIS DRAWING IS SUBMITTED CONFIDENTIALLY AND MAY NOT BE USED IN THE MANUFACTURE OF ANY MATERIAL OR PRODUCT OTHER THAN SUCH MATERIALS AND PRODUCTS FURNISHED TO CLA-VAL CO. WHETHER OR NOT THE EQUIPMENT OR INFORMATION SHOWN HEREON IS PATENTED OR OTHERWISE PROTECTED, FULL TITLE AND COPYRIGHTS, IF ANY, IN AND TO THIS DRAWING AND/OR INFORMATION DELIVERED OR SUBMITTED ARE FULLY RESERVED CLA-VAL CO."

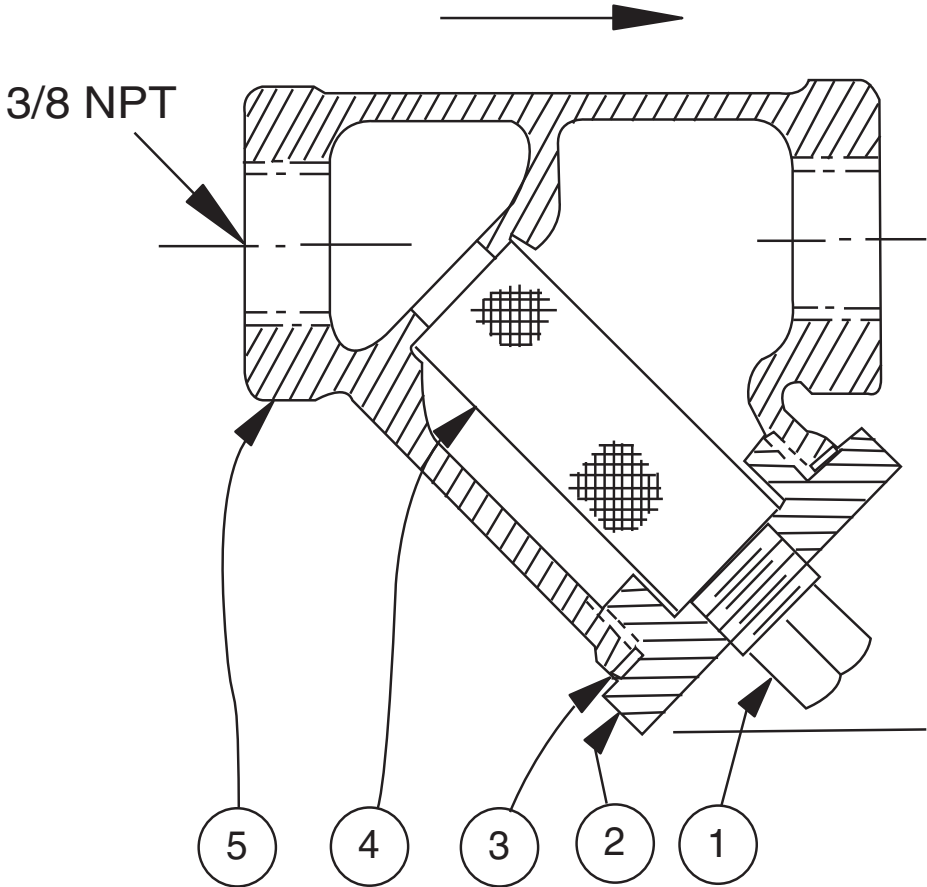


X43 Strainer

ITEM	DESCRIPTION	MATERIAL
1	Pipe Plug	Stainless Steel
2	Strainer Plug	Stainless Steel
3	Gasket	Fiber
4	Screen	Stainless Steel
5	Body	Stainless Steel
No parts available. Replacement assembly only.		

Standard 60 mesh pilot system strainer for fluid service.

Size	Stock Number
3/8 x 3/8	8850604D

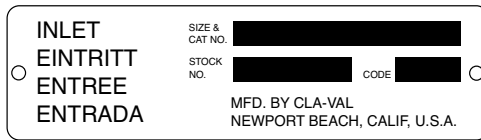


Proper Identification

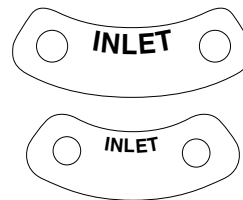
For ordering repair kits, replacement parts, or for inquiries concerning valve operation, it is important to properly identify Cla-Val products already in service by including all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details, type of pilot controls used and control adjustment ranges.

Identification Plates

For product identification, cast-in body markings are supplemented by identification plates as illustrated on this page. The plates, depending on type and size of product, are mounted in the most practical position. **It is extremely important that these identification plates are not painted over, removed, or in any other way rendered illegible.**



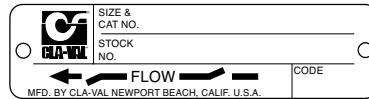
This brass plate appears on valves sized 2 1/2" and is located on the top of the inlet flange.



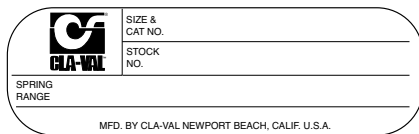
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



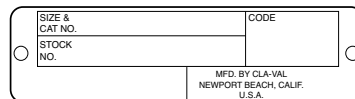
This brass plate appears on altitude valves only and is found on top of the outlet flange.



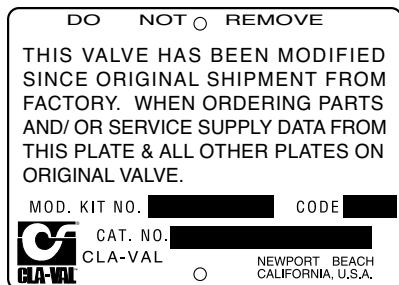
These two brass plates appear on threaded valves 1" through 3" size or flanged valves 1" through 2". It is located on only one side of the valve body.



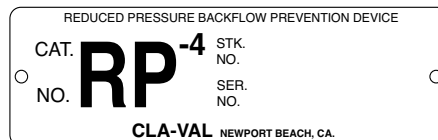
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



This brass plate is used to identify pilot control valves. The adjustment range is stamped into the plate.



This aluminum plate is included in pilot system modification kits and is to be wired to the new pilot control system after installation.



This brass plate is used on our backflow prevention assemblies. It is located on the side of the Number Two check (2" through 10"). The serial number of the assembly is also stamped on the top of the inlet flange of the Number One check.

HOW TO ORDER

Because of the vast number of possible configurations and combinations available, many valves and controls are not shown in published product and price lists. For ordering information, price and availability on product that are not listed, please contact your local Cla-Val office or our factory office located at:

P. O. Box 1325
Newport Beach, California 92659-0325
(949) 722-4800
FAX (949) 548-5441

SPECIFY WHEN ORDERING

- Model Number
- Globe or Angle Pattern
- Adjustment Range (As Applicable)
- Valve Size
- Threaded or Flanged
- Body and Trim Materials
- Optional Features
- Pressure Class

UNLESS OTHERWISE SPECIFIED

- Globe or angle pattern are the same price
- Ductile iron body and bronze trim are standard
- X46 Flow Clean Strainer or X43 "Y" Strainer are included
- CK2 Isolation Valves are included in price on 4" and larger valve sizes (6" and larger on 600 Series)

LIMITED WARRANTY

Automatic valves and controls as manufactured by Cla-Val are warranted for three years from date of shipment against manufacturing defects in material and workmanship that develop in the service for which they are designed, provided the products are installed and used in accordance with all applicable instructions and limitations issued by Cla-Val. Electronic components manufactured by Cla-Val are warranted for one year from the date of shipment.

We will repair or replace defective material, free of charge, that is returned to our factory, transportation charges prepaid, if upon inspection, the material is found to have been defective at time of original shipment. This warranty is expressly conditioned on the purchaser's providing written notification to Cla-Val immediate upon discovery of the defect.

Components used by Cla-Val but manufactured by others, are warranted only to the extent of that manufacturer's guarantee.

This warranty shall not apply if the product has been altered or repaired by others, Cla-Val shall make no allowance or credit for such repairs or alterations unless authorized in writing by Cla-Val.

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

The foregoing warranty is exclusive and in lieu of all other warranties and representations, whether expressed, implied, oral or written, including but not limited to any implied warranties or merchantability or fitness for a particular purpose. All such other warranties and representations are hereby cancelled.

Cla-Val shall not be liable for any incidental or consequential loss, damage or expense arising directly or indirectly from the use of the product. Cla-Val shall not be liable for any damages or charges for labor or expense in making repairs or adjustments to the product. Cla-Val shall not be liable for any damages or charges sustained in the adaptation or use of its engineering data and services. No representative of Cla-Val may change any of the foregoing or assume any additional liability or responsibility in connection with the product. The liability of Cla-Val is limited to material replacements F.O.B. Newport Beach, California.

TERMS OF SALE

ACCEPTANCE OF ORDERS

All orders are subject to acceptance by our main office at Newport Beach, California.

CREDIT TERMS

Credit terms are net thirty (30) days from date of invoice.

PURCHASE ORDER FORMS

Orders submitted on customer's own purchase order forms will be accepted only with the express understanding that no statements, clauses, or conditions contained in said order form will be binding on the Seller if they in any way modify the Seller's own terms and conditions of sales.

PRODUCT CHANGES

The right is reserved to make changes in pattern, design or materials when deemed necessary, without prior notice.

PRICES

All prices are F.O.B. Newport Beach, California unless expressly stated otherwise on our acknowledgement of the order. Prices are subject to change without notice. The prices at which any order is accepted are subject to adjustment to the Seller's price in effect at the time of shipment. Prices do not include sales, excise, municipal, state or any other Government taxes. Minimum order charge \$100.00.

RESPONSIBILITY

We will not be responsible for delays resulting from strikes, accidents, negligence of carriers, or other causes beyond our control. Also, we will not be liable for any unauthorized product alterations or charges accruing there from.

RISK

All goods are shipped at the risk of the purchaser after they have been delivered by to the carrier. Claims for error, shortages, etc., must be made upon receipt of goods.

EXPORT SHIPMENTS

Export shipments are subject to an additional charge for export packing.

RETURNED GOODS

1. Customers must obtain written approval from Cla-Val prior to returning any material.
2. Cla-Val reserves the right to refuse the return of any products.
3. Products more than six (6) months old cannot be returned for credit.
4. Specially produced, non-standard models cannot be returned for credit.
5. Rubber goods such as diaphragms, discs, o-rings, etc., cannot be returned for credit, unless as part of an unopened vacuum sealed repair kit which is less than six months old.
6. Goods authorized for return are subject to a 35% (\$100 minimum) restocking charge and a service charge for inspection, reconditioning, replacement of rubber parts, retesting, repainting and repackaging as required.
7. Authorized returned goods must be packaged and shipped prepaid to Cla-Val, 1701 Placentia Avenue, Costa Mesa, California 92627.



E-Product I.D. (R-3/2011)

CLA-VAL

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www.cla-val.com

Represented By:



—MODEL— **REPAIR KITS**

Model 100-01 Hytrol Main Valve

BUNA-N MATERIAL				
	RUBBER KIT	REPAIR KIT	REBUILD ASSEMBLY	STUD & NUT KIT
	STOCK NO.	STOCK NO.	STOCK NO.	STOCK NO.
3/8"	9169801K		21176614B	21176633J
1/2"	9169802H	21176602F	21176615A	21176634H
3/4"	9169802H	21176602F	21176615A	21176634H
1" Non-Guided	9169803F	21176601G	21176616K	21176636F
1"	9169804D	21176603E	21176617J	21176636F
1 1/4"	9169804D	21176603E	21176617J	21176636F
1 1/2"	9169804D	21176603E	21176617J	21176636F
2"	9169805A	21176608K	21176618H	21176637E
2 1/2"	9169811J	21176609J	21176619G	21176638D
3"	9169812G	21176604D	21176620D	21176639C
4"	9169813E	21176605C	21176621C	21176640K
6"	9169815K	21176606B	21176622B	21176641J
8"	9817901D	21176607A	21176623A	21176642H
10"	9817902B	21176610F	21176624K	21176643G
12"	9817903K	21176611E	21176625J	21176644F
14"	9817904H	21176612D	21176626H	21176645E
16"	9817905E	21176613C	21176627G	21176645E

Model 100-20 Hytrol Main Valve

BUNA-N MATERIAL				
	RUBBER KIT	REPAIR KIT	REBUILD ASSEMBLY	STUD & NUT KIT
	STOCK NO.	STOCK NO.	STOCK NO.	STOCK NO.
3"	9169805A	21176608K	21176618H	21176637E
4"	9169812G	21176604D	21176620D	21176639C
6"	9169813E	21176605C	21176621C	21176640K
8"	9169815K	21176606B	21176622B	21176641J
10"	9817901D	21176607A	21176623A	21176642H
12"	9817902B	21176610F	21176624K	21176643G
14"	9817903K	21176611E	21176625J	21176644F
16"	9817903K	21176611E	21176625J	21176644F

Consult factory for larger sizes

Rubber Kit Includes: Diaphragm, Disc, Spacer Washers

Repair Kit Includes: Diaphragm, Disc, Spacer Washers, Epoxy Coated Disc Retainer, Epoxy Coated Diaphragm Washer, Protective Washer

Rebuild Assembly Includes: Diaphragm, Disc, Spacer Washers, Epoxy Coated Disc Retainer, Epoxy Coated Diaphragm Washer, Protective Washer, Stainless Steel Bolts & Washers (6" & Below), Stainless Steel Studs, Nuts, & Washers (8" & Above), Stem, Stem Nut, Disc Guide, Standard Cover Spring, Cover Washer

Stud & Nut Kit Includes: Stainless Steel Bolts & Washers (6" & Below), Stainless Steel Studs, Nuts, & Washers (8" & Above)

Repair Kits for 100-02/100-21 Powertrol and 100-03/100-22 Powercheck Main Valves

For: Powertrol and Powercheck Main Valves—150 Pressure Class Only

Includes: Diaphragm, Disc (or Disc Assembly) and O-rings and full set of spare Spacer Washers.

Valve Size	Kit Stock Number 100-02	Valve Size	Kit Stock Number	
			100-02 & 100-03	100-21 & 100-22
3/8"	9169901H	2 1/2"	9169910J	N/A
1/2" & 3/4"	9169902F	3"	9169911G	9169905J
1"	9169903D	4"	9169912E	9169911G
1 1/4" & 1 1/2"	9169904B	6"	9169913C	9169912E
2"	9169905J	8"	99116G	9169913C
		10"	9169939H	99116G
		12"	9169937B	9169939H

Larger Sizes: Consult Factory.

Repair Kits for 100-04/100-23 Hy-Check Main Valves

For: Hy-Check Main Valves—150 Pressure Class Only

Includes: Diaphragm, Disc and O-Rings and full set of spare Spacer Washers.

Valve Size	Kit Stock Number		Valve Size	Kit Stock Number	
	100-04	100-23		100-04	100-23
4"	20210901B	N/A	12"	20210905H	20210904J
6"	20210902A	20210901B	14"	20210906G	N/A
8"	20210903K	20210902A	16"	20210907F	20210905H
10"	20210904J	20210903K	20"	N/A	20210907F
			24"	N/A	20210907F

Larger Sizes: Consult Factory.

Repair Kits for Pilot Control Valves (In Standard Materials Only)

Includes: Diaphragm, Disc (or Disc Assembly), O-Rings, Gaskets or spare Screws as appropriate.

BUNA-N® (Standard Material)				VITON (For KB Controls)	
Pilot Control	Kit Stock Number	Pilot Control	Kit Stock Number	Pilot Control	Kit Stock Number
CDB	9170006C	CFM-9	12223E	CDB-KB	9170012A
CDB-30	9170023H	CRA (w/bucking spring)	9170001D	CRA-KB	N/A
CDB-31	9170024F	CRD (w/bucking spring)	9170002B	CRD-KB (w/bucking spring)	9170008J
CDB-7	9170017K	CRD (no bucking spring)	9170003K	CRL-KB	9170013J
CDH-2	18225D	CRD-18	20275401K	CDHS-2BKB	9170010E
CDHS-2	44607A	CRD-22	98923G	CDHS-2FKB	9170011C
CDHS-2B	9170004H	CRL (55F, 55L)	9170007A	CDHS-18KB (no bucking spring)	9170009G
CDHS-2F	9170005E	CRL60/55L-60	9170033G	102C-KB	1726202D
CDHS-3C-A2	24657K	CRL60/55L60 1"	9170042H		
CDHS-8A	2666901A	CRL-4A	43413E		
CDHS-18	9170003K	CRL-5 (55B)	65755B		
CDS-4	9170014G	CRL-5A (55G)	20666E		
CDS-5	14200A	CRL-18	20309801C		
CDS-6	20119301A	Universal CRL	9170041K		
CDS-6A	20349401C	CV	9170019F		
CFCM-M1	1222301C	X105L (O-ring)	00951E	Buna-N®	
CFM-2	12223E	102B-1	1502201F		
CFM-7	1263901K	102C-2	1726201F	CRD Disc Ret. (Solid)	C5256H
CFM-7A	1263901K	102C-3	1726201F	CRD Disc Ret. (Spring)	C5255K

Repair Assemblies (In Standard Materials Only)

Control	Description	Stock Number
CF1-C1	Pilot Assembly Only	89541H
CF1-CI	Complete Float Control less Ball and Rod	89016A
CFC2-C1	Disc, Distributor and Seals	2674701E
CSM 11-A2-2	Mechanical Parts Assembly	97544B
CSM 11-A2-2	Pilot Assembly Only	18053K
33A 1"	Complete Internal Assembly and Seal	2036030B
33A 2"	Complete Internal Assembly and Seal	2040830J

When ordering, please give complete nameplate data of the valve and/or control being repaired. MINIMUM ORDER CHARGE APPLIES

CLA-VAL

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N-RK (R-04/2019)