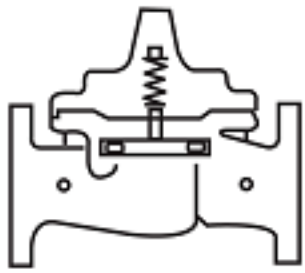
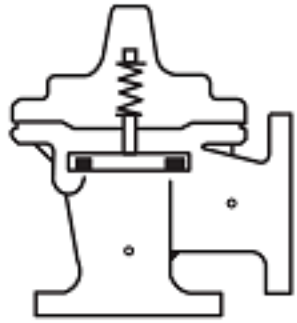
CLA-VAL
AUTOMATIC CONTROL VALVES

131-73/631-73

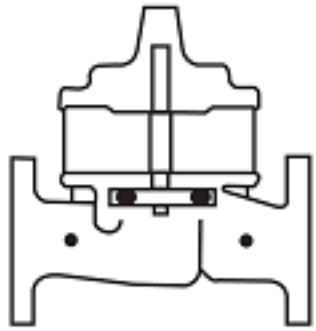
Place this manual with personnel responsible for maintenance of this valve



Installation



Operation



Maintenance

CLA-VAL • 1701 Placentia Avenue • Costa Mesa, CA 92627 • (949) 722-4800 • info@cla-val.com
CLA-VAL CANADA LTD. • 4687 Christie Drive • Beamsville, Ontario, LOR 1B4 Canada • (905) 563-4963
www.cla-val.com • info@cla-val.com

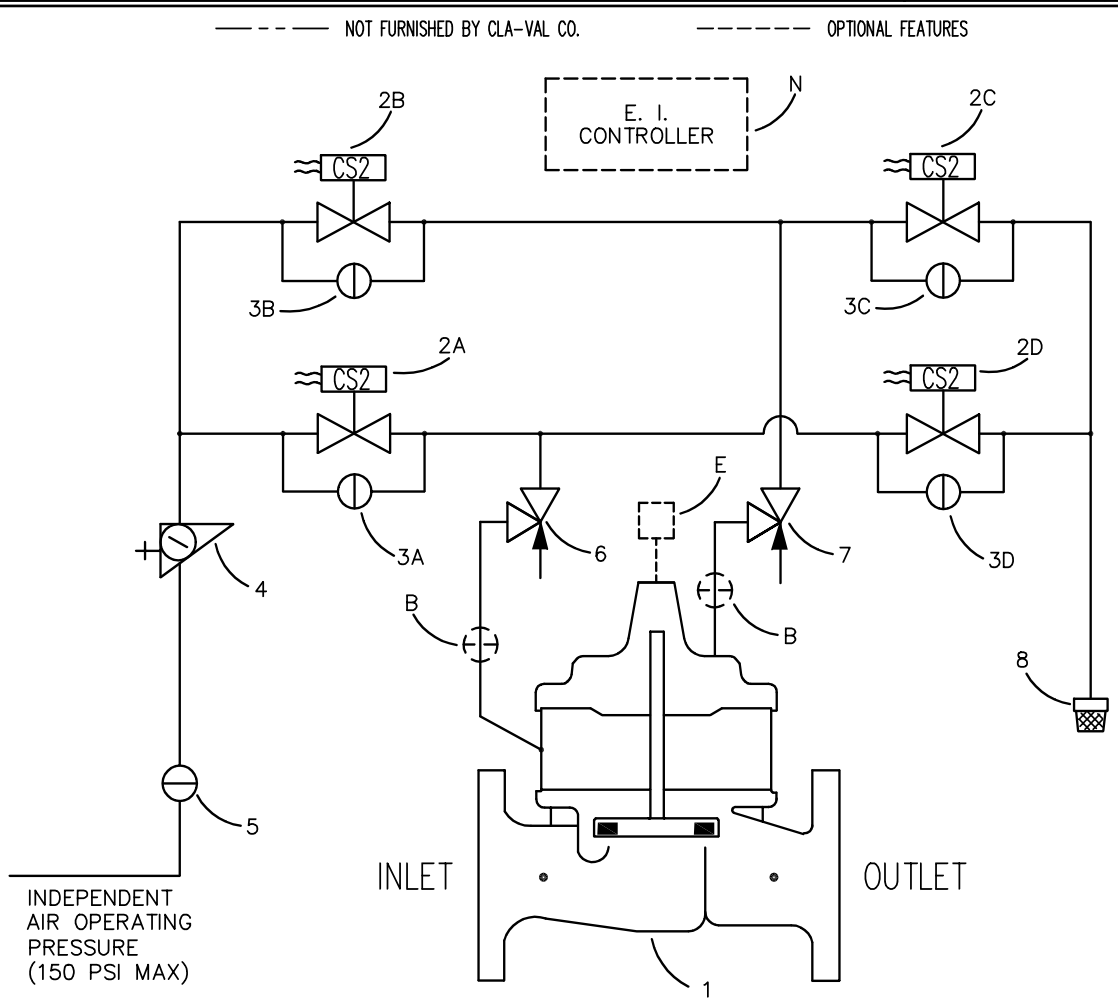
CLA-VAL CO. NEWPORT BEACH, CALIFORNIA

CATALOG NO.	DRAWING NO.	REV
131-73/631-73	201894	A

TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC INTERFACE CONTROL VALVE FOR INDUSTRIAL SERVICE (AIR OPERATED)

DESIGN		
DRAWN	AK	08-25-00
CHK'D	VL	9-01-00
APV'D	CH	9-05-00



ITEM NO.	BASIC COMPONENTS	QTY
1	100-02 POWERTROL (131-73) MAIN VALVE	1
	100-21 POWERTROL (631-73) MAIN VALVE	
2	CS2 SOLENOID CONTROL	4
3	CK2 COCK (SOLENOID BYPASS)	4
4	REGULATOR/FILTER	1
5	CK2 COCK (ISOLATION VALVE)	1
6	CV FLOW CONTROL (CLOSING)	1
7	CV FLOW CONTROL (OPENING)	1
8	EXHAUST MUFFLER	1

OPTIONAL FEATURE SUFFIX	ADDED TO CATALOG NUMBER	
B	CK2 COCK (ISOLATION VALVE)	2
E	X117D POSITION TRANSMITTER	1
N	ELECTRONIC CONTROLLER (SINGLE)	1

CAD REVISION RECORD - DO NOT REVISE MANUALLY

LTR	DESCRIPTION	BY	DATE
–	RELEASED FOR PRODUCTION (NED 45481)	AK	08-28-00
A	OPTIONAL ITEM E WAS 117C POSITION TRANSMITTER (ECO 21193)	AK	2-24-09

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CAD REVISION RECORD - DO NOT REVISE MANUALLY

LTR	DESCRIPTION	BY	DATE
	SEE SHEET 1.		

OPERATING DATA

I. ELECTRONIC INTERFACE FEATURE:

SOLENOID CONTROLS (2A), (2B), (2C) & (2D) ARE DIRECT ACTING, 2-WAY SOLENOID CONTROLS THAT CHANGE POSITION WHEN THE COILS ARE ENERGIZED OR DE-ENERGIZED BY THE ELECTRONIC INTERFACE CONTROLLER (N). FOLLOWING PARAGRAPHS DESCRIBE THE OPENING AND CLOSING CYCLES OF MAIN VALVE (1).

OPENING:

WHEN THE ELECTRONIC INTERFACE CONTROLLER (N) ENERGIZES SOLENOID CONTROLS (2A) & (2C), SOLENOID CONTROLS (2B) & (2D) ARE DE-ENERGIZED. THIS APPLIES PRESSURE TO THE POWERUNIT CHAMBER OF THE MAIN VALVE (1) AND RELIEVES MAIN VALVE (1) COVER PRESSURE. THIS ALLOWS MAIN VALVE (1) TO OPEN.

LOCKED:

WHEN THE ELECTRONIC INTERFACE CONTROLLER (N) DE-ENERGIZES SOLENOID CONTROLS (2A), (2B), (2C) & (2D), THE MAIN VALVE (1) IS LOCKED IN AN INTERMEDIATE POSITION.

CLOSING:

WHEN THE ELECTRONIC INTERFACE CONTROLLER (N) ENERGIZES SOLENOID CONTROLS (2B) & (2D), SOLENOID CONTROLS (2A) & (2C) ARE DE-ENERGIZED. THIS APPLIES PRESSURE TO THE MAIN VALVE (1) COVER CHAMBER AND RELIEVES PRESSURE FROM THE POWERUNIT CHAMBER OF THE MAIN VALVE (1), CLOSING THE MAIN VALVE (1).

II. MANUAL BYPASS FEATURE:

OPENING:

MANUALLY OPEN CK2 COCKS (3A) & (3C) AND CLOSE CK2 COCKS (3B) & (3D). THIS BYPASSES SOLENOID CONTROLS (2A) & (2C), OPENING THE MAIN VALVE (1).

LOCKED:

MANUALLY CLOSE CK2 COCKS (3A), (3B), (3C) & (3D). THIS LOCKS IN MAIN VALVE (1) IN AN INTERMEDIATE POSITION.

CLOSING:

MANUALLY OPEN CK2 COCKS (3B) & (3D) AND CLOSE CK2 COCKS (3A) & (3C). THIS BYPASSES SOLENOID CONTROLS (2B) & (2D), CLOSING THE MAIN VALVE (1).

III. REGULATOR/FILTER FEATURE:

THE REGULATOR/FILTER (4) REMOVES DIRT, OIL, WATER AND OTHER IMPURITIES FROM THE INSTRUMENT AIR SUPPLY AND REDUCES THE AIR SUPPLY PRESSURE.

CLA-VAL CO. NEWPORT BEACH, CALIFORNIA

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131-73/631-73	201894	A

TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC INTERFACE CONTROL VALVE FOR INDUSTRIAL SERVICE (AIR OPERATED)

DESIGN		
DRAWN	AK	08-25-00
CHK'D	VL	9-01-00
APV'D	CH	9-05-00

OPERATING DATA-CONTINUED

IV. CLOSING SPEED CONTROL:

CV FLOW CONTROL (6) CONTROLS THE CLOSING SPEED OF THE MAIN VALVE. TURN THE ADJUSTING STEM CLOCKWISE TO MAKE THE MAIN VALVE CLOSE SLOWER.

V. OPENING SPEED CONTROL:

CV FLOW CONTROL (7) CONTROLS THE OPENING SPEED OF THE MAIN VALVE. TURN THE ADJUSTING STEM CLOCKWISE TO MAKE THE MAIN VALVE OPEN SLOWER.

VI. OPTIONAL FEATURE OPERATING DATA:

SUFFIX B (ISOLATION VALVES)

CK2 COCKS (B) ARE USED TO ISOLATE THE PILOT SYSTEM FROM MAIN LINE PRESSURE. THESE VALVES MUST BE OPEN DURING NORMAL OPERATION.

SUFFIX E (POSITION TRANSMITTER)

POSITION TRANSMITTER (E) TRANSMITS A POSITIONAL SIGNAL FROM THE MAIN VALVE TO THE ELECTRONIC INTERFACE CONTROLLER.

SUFFIX N (ELECTRONIC INTERFACE CONTROLLER)

ELECTRONIC INTERFACE CONTROLLER (N) ENERGIZES OR DE-ENERGIZES THE SOLENOID CONTROLS, OPENING, CLOSING OR LOCKING THE MAIN VALVE (1) IN THE DESIRE POSITION.

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.
( ) CK2 COCKS (B) OPEN (OPTIONAL FEATURE).
( ) CK2 COCK (5) OPEN DURING NORMAL OPERATION.
( ) CK2 COCKS (3A), (3B), (3C), (3D) CLOSED DURING NORMAL OPERATION.
( ) CV FLOW CONTROLS (6) AND (7) OPEN AT LEAST 4 TURNS
( ) CORRECT VOLTAGE TO SOLENOID CONTROLS (2A), (2B), (2C), (2D).
( ) INDEPENDENT AIR OPERATING PRESSURE CONNECTION PROPERLY CONNECTED.

CAD REVISION RECORD - DO NOT REVISE MANUALLY

LTR	DESCRIPTION	BY	DATE
	SEE SHEET 1.		

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.

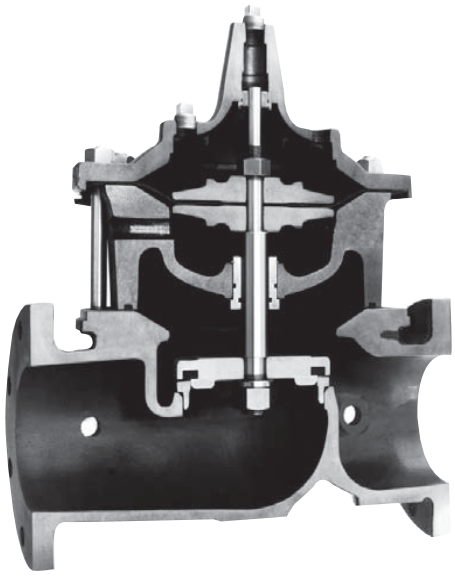
Accurate record-keeping is a best practice for any preventative maintenance program, and Cla-Val strongly recommends this action through an asset management program. Cla-Val provides a free asset management tool, Link2Valves Link2Valves - Cla-Val (cla-val.com), to assist in preventative maintenance record-keeping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

CLA-VAL®

— MODEL — 100-02

(Full Internal Port)

Powertrol Valve



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.

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.

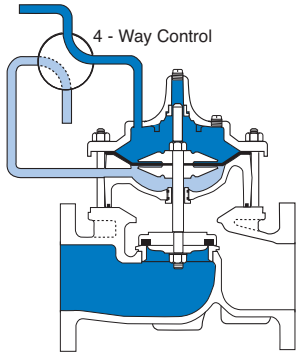
INSTALLATION

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.

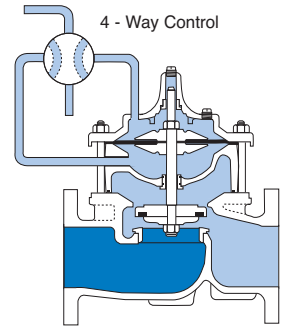
2. It is recommended that gate or block valves be installed on both the upstream and downstream sides of the 100-02 to facilitate isolating the valve for preventative maintenance.
3. Place the valve in the line with flow through the valve in the direction indicated on the inlet name plate or by flow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

Principle of Operation



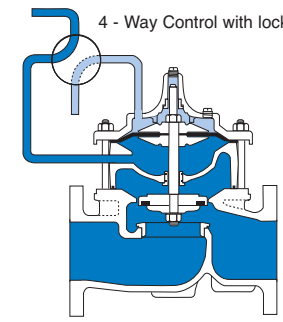
Full Open Operation

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 continuos 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

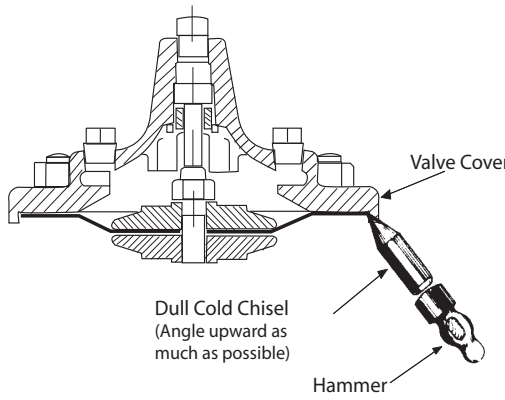
1. First mark the side of the valve cover, power unit body and valve body so that reassembly of these parts will be exactly as removed.

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 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 indention) on the disc. Indention 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.

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

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.

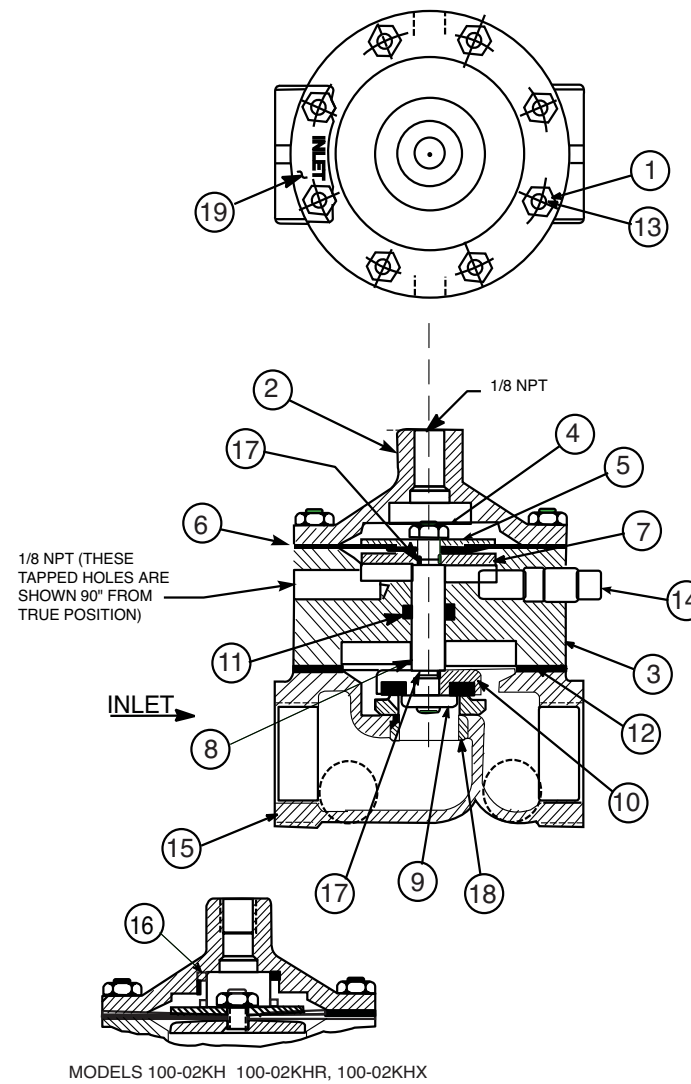
c. Open upstream gate or line block valve just enough to allow flow.

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 POWERTROL
VALVE SIZES 1/2" & 3/4"



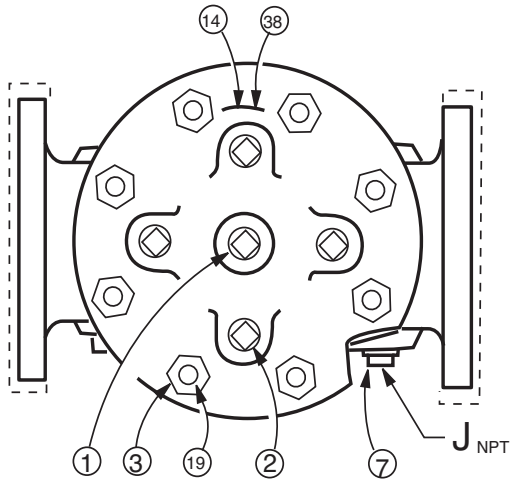
MODELS 100-02KH 100-02KHR, 100-02KHX

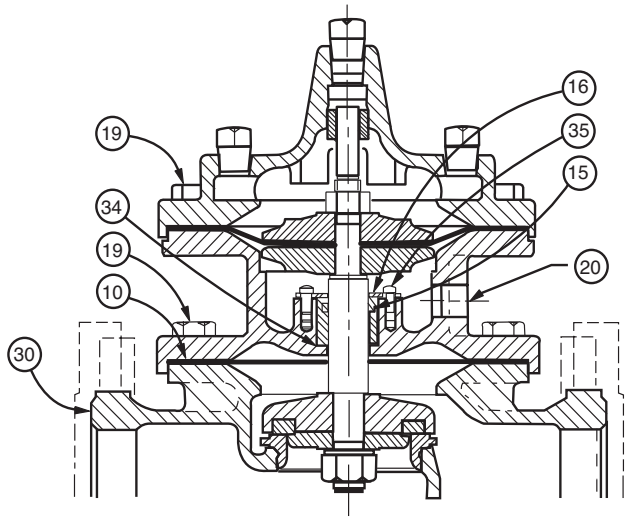
USEFUL INFORMATION OR HINTS

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

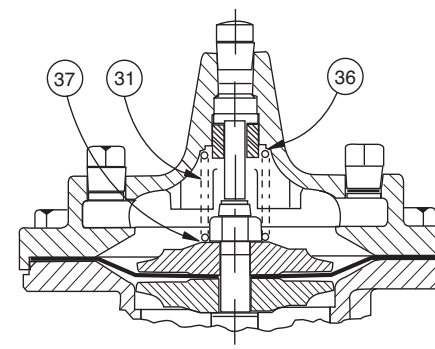
100-02 POWERTROL
VALVE SIZES 1" - 3"



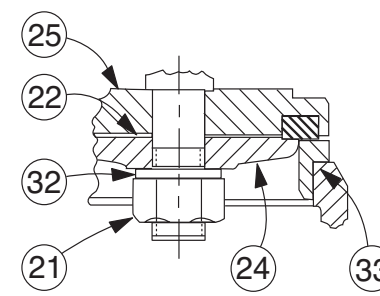


ITEM NO.	PART DESCRIPTION
1	CENTER COVER PLUG
2	COVER PLUG
3	STUD NUT
7	PLUG, PIPE, BODY
10 *	GASKET "O" RING
14	NAMEPLATE
15 *	O-RING, STEM
16	RETAINER BEARING (1"-3" ONLY)
19	BOLT, HEX HD. (1"-3" ONLY)
20	POWER UNIT BODY
21	LOWER STEM NUT
22	SPACER WASHER
24	DISC GUIDE
25	DISC RETAINER
30	BODY
31	SPRING (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 ½") / BOLT HEX. (3")
36	UPPER WASHER SPRING (100PKCH)
37	LOWER WASHER SPRING (100PAKCH)
38	DRIVE SCREW

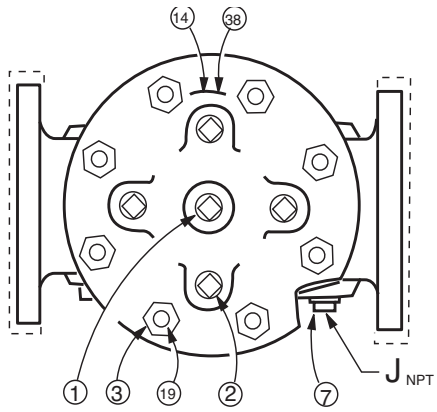
* RECOMMENDED SPARE PARTS

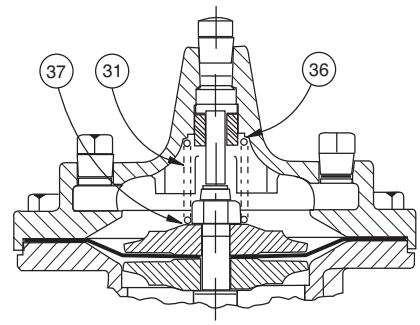


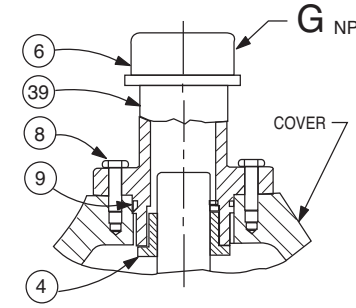
Model 100-02KH

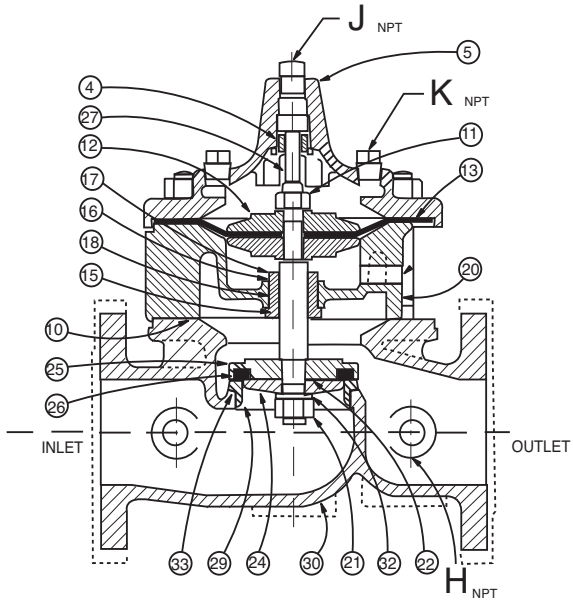


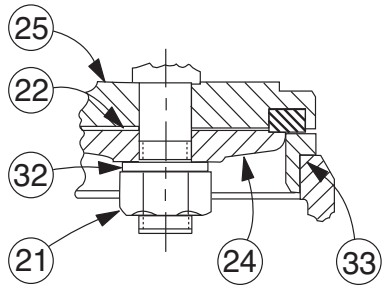
Seat & Disc Details

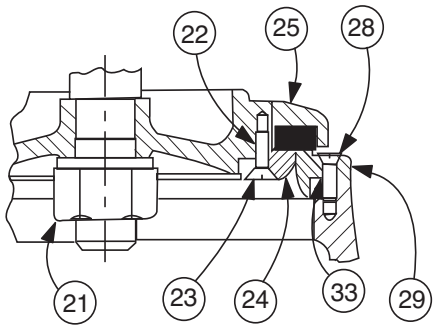


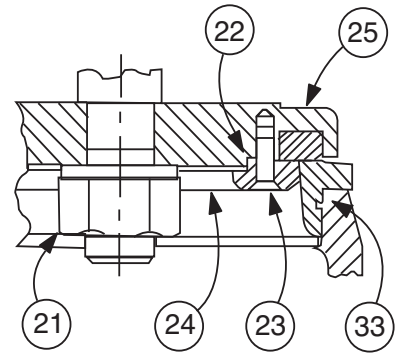












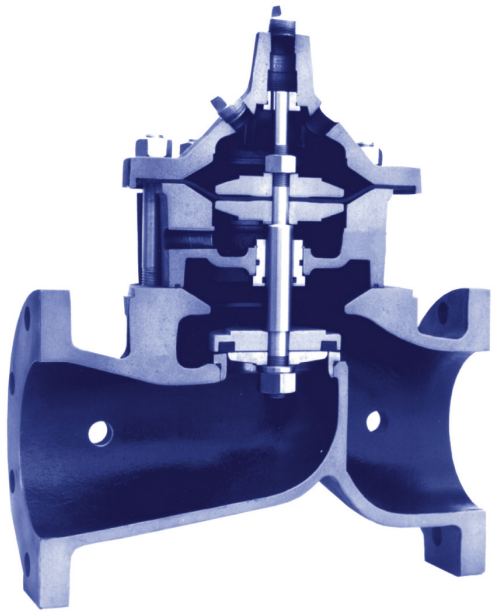
ITEM NO.	PART DESCRIPTION
1	CENTER COVER PLUG
2	COVER PLUG
3	STUD NUT
4	COVER BEARING
5	COVER
6	PIPE CAP (16" ONLY)
7	PLUG, PIPE, BODY
8	BOLT HEX HD (16" ONLY)
9 *	O-RING (16" ONLY)
10 *	GASKET "O" RING
11	UPPER STEM NUT
12	UPPER DIAPHRAGM WASHER
13 *	DIAPHRAGM
14	NAMEPLATE
15 *	O-RING, STEM
16	RETAINER 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 ½”) / 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

CLA-VAL™

MODEL **100-21**

600 Series
Powertrol Valve



see page 2 for approvals

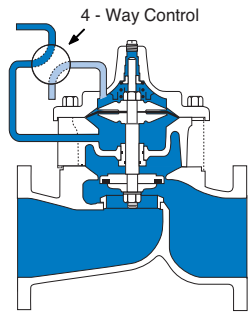
- **Reduced Cavitation Design**
- **Drip-tight, Positive Seating**
- **Service Without Removal From Line**
- **Globe or Angle Pattern**
- **Every Valve Factory-Tested**

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.

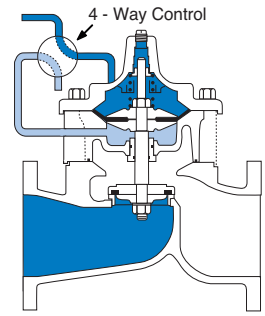
The Model 100-21 is recommended where independent operating pressure is desired. The valve's packless construction and simplicity of design assures a long life and dependable operation. Available in various materials and in a wide range of sizes. It's applications are many and varied.

Principle of Operation



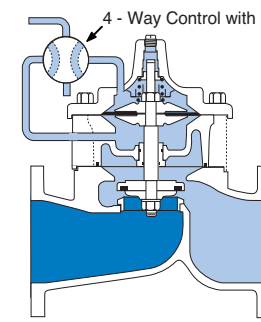
Full Open Operation

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 Powertrol 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"/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 ($\blacktriangle P$):

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

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

Equivalent Length of Pipe
Equivalent lengths of pipe (L) are determined from the formula: $L = \frac{K d}{12 f}$
(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)

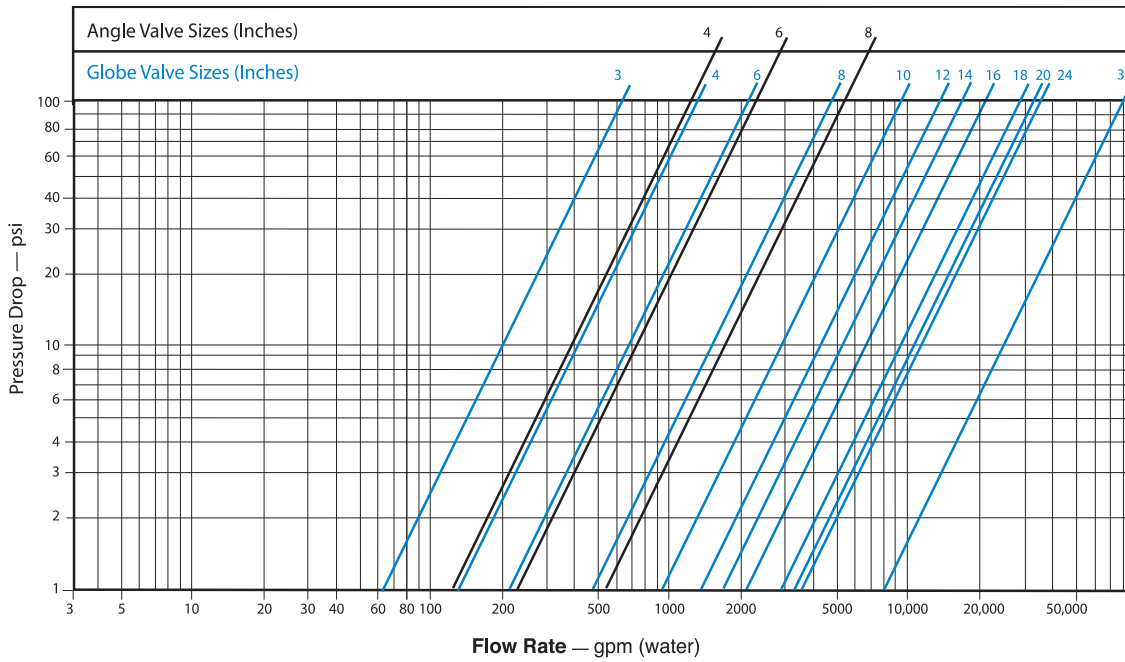
L = Equivalent Length of Pipe (feet)

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

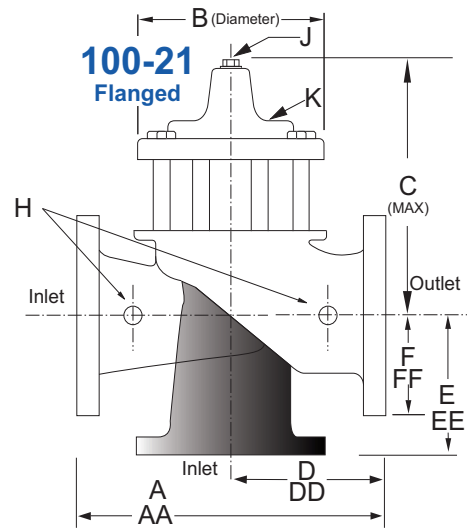
V = Fluid Velocity (feet per second) or (meters per second)

$\triangle P$ = Pressure Drop in (psi) or (bar)

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



Cla-Val 100-21 Powertrol 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.

INSTALLATION AND MAINTENANCE INSTRUCTIONS

2-WAY INTERNAL PILOT OPERATED SOLENOID VALVES DIAPHRAGM TYPE - 3/8, 1/2 AND 3/4 N.P.T. NORMALLY CLOSED OPERATION

BULLETINS
8210
8211

ASCO
FORM NO. V-5848

DESCRIPTION

Bulletin 8210's are 2-way, normally closed internal pilot operated solenoid valves. Valve bodies and bonnets are of brass construction. Standard valves have a General Purpose, NEMA Type 1 Solenoid Enclosure.

Bulletin 8211's are the same as Bulletin 8210's except the solenoids are equipped with an enclosure which is designed to meet NEMA Type 4, Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class 1, Group C or D and NEMA Type 9 (E, For G) Hazardous Locations - Class 2, Groups E, F or G. The Explosion-Proof/Watertight Solenoid Enclosures are shown on separate sheets of installation and Maintenance Instructions, Form Numbers V-5380 and V-5391.

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized and opens when solenoid is energized.

MANUAL OPERATOR (Optional)

Valves with Suffix 'MO' in the catalog number are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power. To operate valve manually, push in knurled cap and rotate clockwise 180° Disengage manual operator by rotating knurled cap counterclockwise 180° before operating electrically.

MANUAL OPERATOR LOCATION (Refer to Figures 1 and 3)

Manual operator (when shipped from factory) will be located over the valve outlet. Manual operator may be relocated at 90° increments by rotating valve bonnet. Remove bonnet screws (4) and rotate valve bonnet with solenoid to desired position. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.

If valve is installed in the system and is operational, proceed in the following manner: ***WARNING:*** Depressurize valve and turn off electrical power supply.

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. ***CAUTION:*** When metal retaining clip disengages, it will spring upwards.
2. Remove bonnet screws (4) and rotate valve bonnet to desired position.
3. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds. Replace solenoid enclosure and retaining clip or cap.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperatures, refer to chart. The temperature limitations listed are for UL applications. For non-UL applications, higher ambient and fluid temperature limitations are available. Consult factory, Check catalog number on nameplate to determine maximum temperatures.

Construction	Coil Class	Catalog Number Prefix	Max. Ambient Temp.°F	Max. Fluid Temp.°F
A-C Construction (Alternating Current)	A	None or DA	77	180
	F	DF or FT	122	180
	H	HT	140	180
D-C Construction (Direct Current)	A, F or H	None, FT or HT	77	150

POSITIONING/MOUNTING

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertical and upright so as to reduce the possibility of foreign matter accumulating in the core tube area. For mounting bracket (optional feature) dimensions, refer to Figure 2.

PIPING

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe, do not use valve as a lever, Wrenches applied to valve body or piping are to be located as close as possible to connection point.

IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning Is required depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Housings for all solenoids are provided with connections for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. ***CAUTION:*** When metal retaining clip disengages, it will spring upwards. Rotate to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) solenoids are built differently. To convert from one to the other, It Is necessary to change the complete solenoid including the solenoid base sub-assembly and core assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power supply and depressurize valve before making repairs. It Is not necessary to remove the valve from the pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate the valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts, Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies that the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses. open circuited or grounded coil. broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT (Refer to Figures 1, 2 and 3)

Turn off electrical power supply and disconnect coil lead wires. Proceed In the following manner:

1. Remove retaining cap or clip, nameplate and cover. ***CAUTION:*** When metal retaining clip disengages. it will spring upwards.
2. Slip yoke containing coil, sleeves and insulating washers off the solenoid base sub-assembly. For D-C Construction. slip spring washer. coil and insulating washers off the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place insulating washers at each end of con, If required.

VALVE DISASSEMBLY

Depressurize valve and turn off electrical power supply. For A-C Construction, refer to Figures 1 and 2. For D-C Construction, refer to Figure 3. Proceed In the following manner:

1. Disassemble valve in an orderly fashion. Pay careful attention to exploded views provided for identification of parts.
2. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. ***CAUTION:*** When metal retaining clip disengages, it will spring upwards.
3. Unscrew solenoid base sub-assembly and remove bonnet gasket. Core assembly and core spring.
4. For A-C Construction without manual operator. remove valve bonnet screws (4). Remove solenoid base sub-assembly. core assembly and core spring.
5. Remove diaphragm spring (A-C Construction only). diaphragm assembly and body gasket.
6. For normal maintenance, it is not necessary to disassemble the manual operator unless external leakage is evident To disassemble, remove stem pin. manual operator stem. stem spring and stem gasket.
7. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

VALVE REASSEMBLY

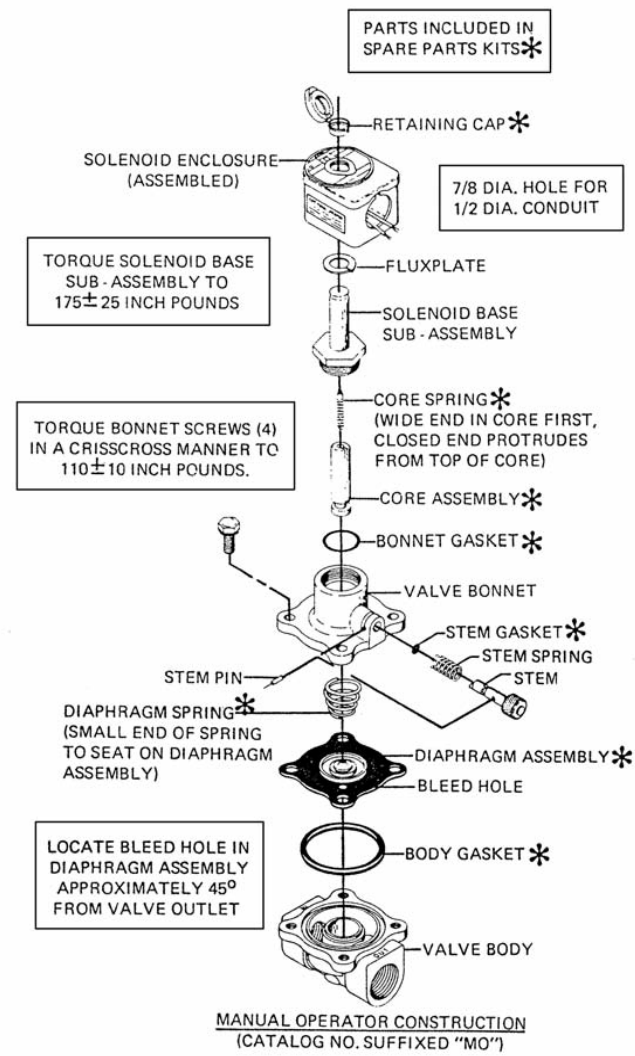
1. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
2. Replace body gasket and diaphragm assembly. Locate bleed hole in diaphragm assembly approximately 45° from valve outlet.
3. Replace valve bonnet and bonnet screws. Torque bonnet screws (4) in a crisscross manner to 110 ± 10 inch pounds.
4. For A-C Construction, the diaphragm spring. core assembly and core spring must be installed prior to assembly of bonnet as this is the solenoid base sub-assembly. Be sure diaphragm spring is installed properly. Closed turns of spring to seat on diaphragm assembly. For valves with a manual operator (see Figure 1), the small end of diaphragm spring seats on diaphragm assembly.
5. Install core spring in core assembly. Be sure core spring is inserted into core assembly with wide end in first. Closed end protrudes from top of core assembly.
6. Replace bonnet gasket, core assembly, core spring and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 inch pounds
7. If removed, replace manual operator stem gasket. stem spring, stem and stem pin.
8. Replace solenoid enclosure and retaining cap or clip.
9. After maintenance, operate the valve a few times to be sure of proper opening and closing.

Spare Parts Kits

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with an (*) are supplied in Spare Parts Kits

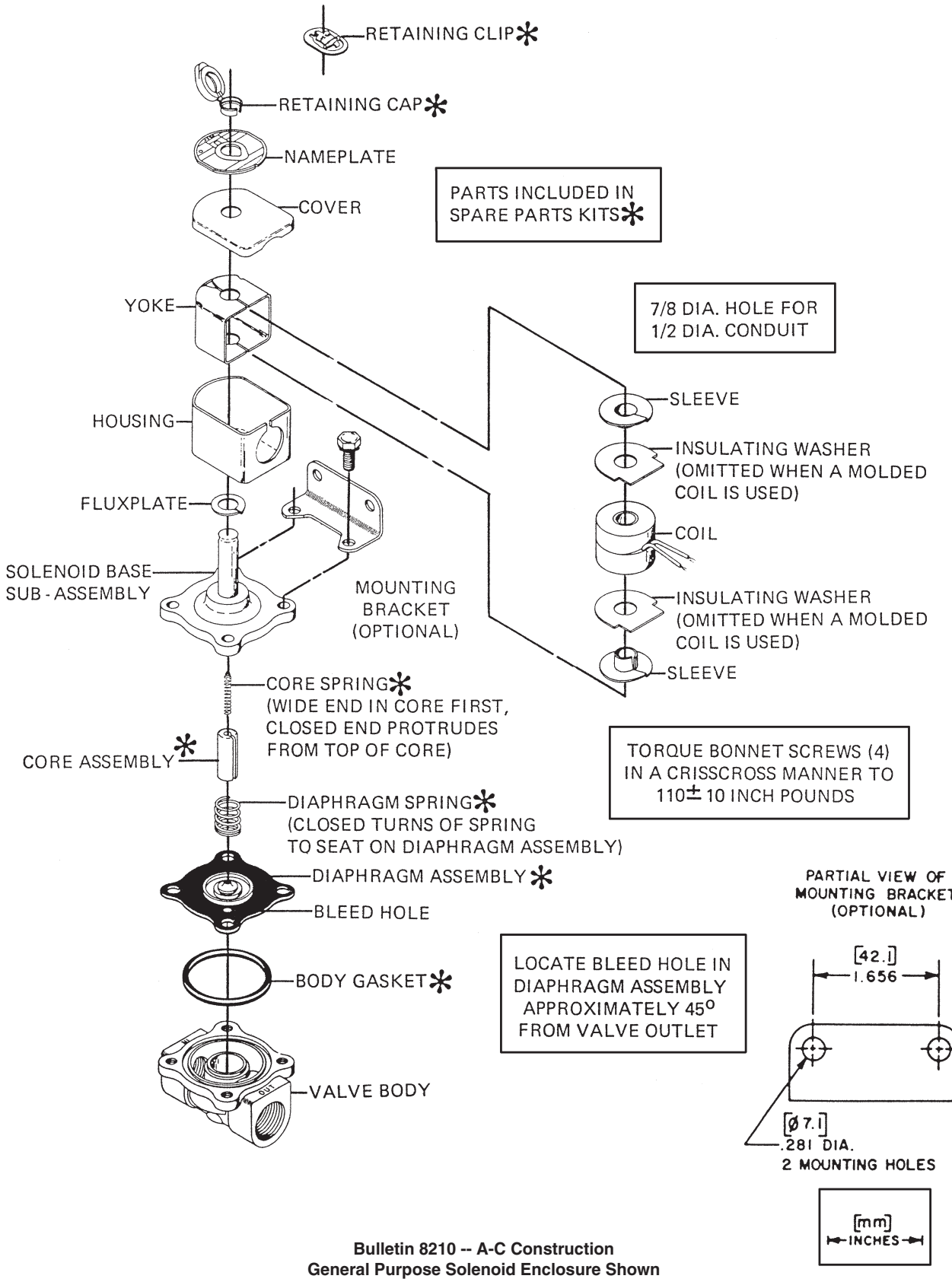
ORDERING INFORMATION
FOR SPARE PARTS KITS

When Ordering Spare Parts Kits or Coils
Specify Valve Catalog Number,
Serial Number and Voltage



Bulletin 8210 -- A-C Construction
Manual Operator
(Catalog Number Suffixed "MO")

Figure 1.

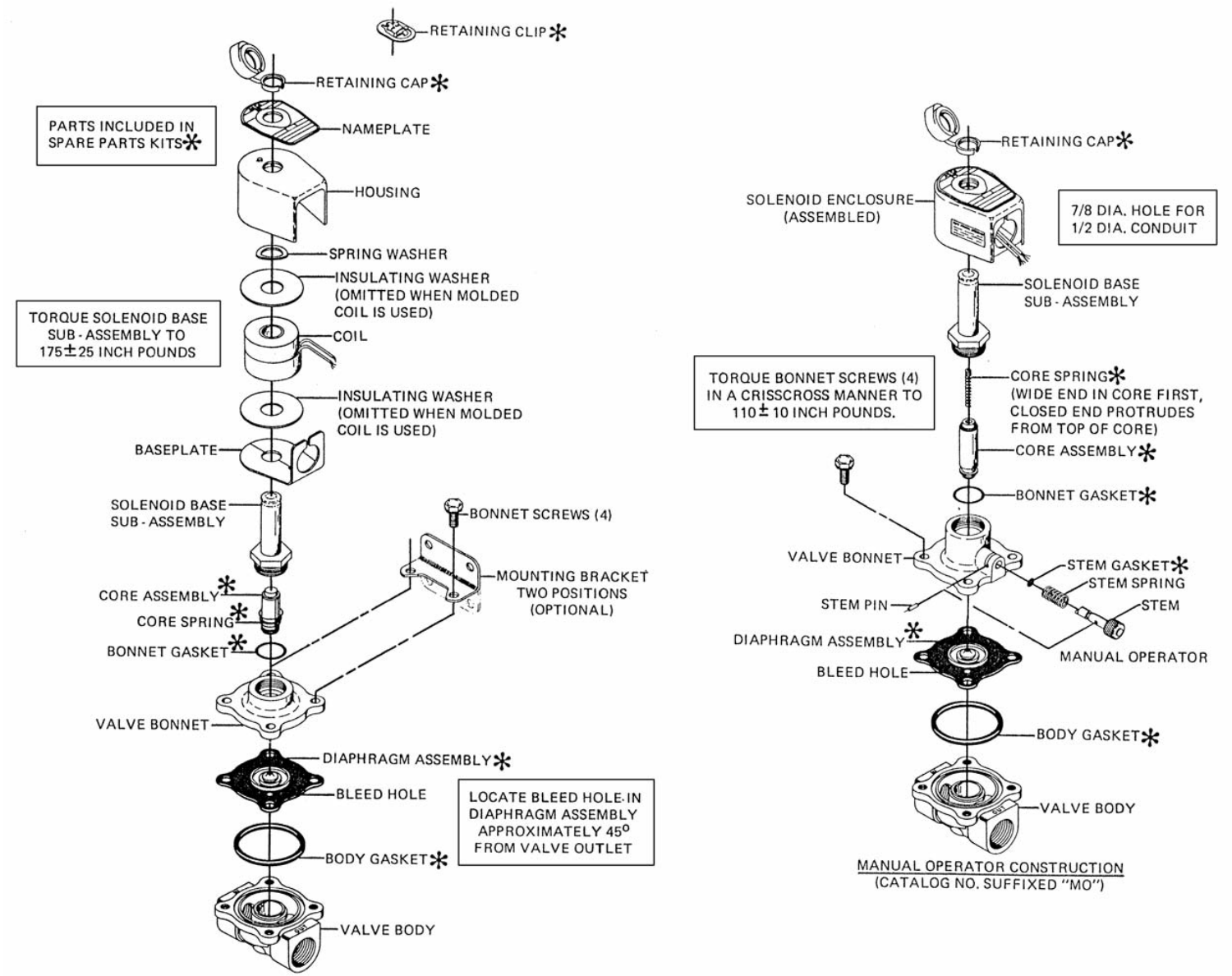


Bulletin 8210 -- A-C Construction
General Purpose Solenoid Enclosure Shown

Figure 2. **For Explosion-Proof/Watertight Solenoid Enclosure used on Bulletin 8211, see Form No. V-5391.**

CLA-VAL P.O. Box 1325 • Newport Beach, CA 92659-0325 • Phone: 949-722-4800 • Fax: 949-548-5441 • E-mail: claval@cla-val.com • Website cla-val.com

N-V5848 (R-3/2011)



Bulletin 8210 -- D-C Construction
General Purpose Solenoid Enclosure Shown

Figure 3. **For Explosion-Proof/Watertight Solenoid Enclosure used on Bulletin 8211, see Form No. V-5390.**

INSTALLATION AND MAINTENANCE INSTRUCTIONS

2-WAY DIRECT ACTING SOLENOID VALVES
NORMALLY CLOSED OPERATION -- 1/4 N.P.T.

BULLETINS 8262

ASCO FORM NO. V-5927

DESCRIPTION

Bulletin 8262's are 2-way normally closed, direct acting solenoid valves having bodies of brass construction. Standard valves have a General Purpose NEMA Type 1 Solenoid Enclosure. Valves may also be equipped with a solenoid enclosure which is designed to meet NEMA Type 4 Watertight, NEMA Type 7 (C or D) Hazardous Locations-Class 1, Groups C or D and NEMA Type 9 (E, For G) Hazardous Locations Class 2, Groups E, F or G. Installation and Maintenance Instructions for Explosion-Proof/Watertight Solenoid Enclosures are shown on Form Nos. V-5391 or V-5380.

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized. Valve opens when solenoid is energized.

NOTE: Inlet port will either be marked "1" or "1N." Outlet port will be marked "2."

IMPORTANT: **No minimum operating pressure required.**

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperature, refer to chart below. For higher ambient and fluid temperatures, consult factory. Check catalog number and watt rating on nameplate to determine the maximum temperatures.

Wattage	Catalog Number Prefix	Coil Class	Max. Ambient Temp.°F	Max. Fluid Temp.°F
6	None	A	77	180
	FT	F	122	200
	HT	H	140	200
9	None	F	77	180
9.7	None, FT or HT	A, F or H	77	120
11.2*	None, FT or HT	A, F or H	77	150
16.7*	None	F	77	200

*Catalog Nos. 8262C200 and 8262B200 and valves with suffix "W" in the catalog number are limited to 140°F fluid temperature.

POSITIONING

Valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertical and upright so as to reduce the possibility of foreign matter accumulating in the core tube area.

MOUNTING

For valve body and mounting bracket mounting dimensions, refer to Figures 1 and 2.

PIPING

Connect piping according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe, do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point.

IMPORTANT: For the protection of the solenoid valve. install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending upon service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Solenoid housings are provided with a 7/8 diameter hole for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. ***CAUTION:*** When metal retaining clip disengages, it will spring upward. Rotate enclosure to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the core assembly and solenoid base sub-assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand only for an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power supply and depressurize valve before making repairs. It is not necessary to remove the valve from the pipe line for repairs.

CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary depending upon media and service conditions in general, if the voltage to the coil is correct. sluggish valve operatIon, excessive noise or leakage will indicate that cleaning is required. Clean valve strainer or filter when cleaning solenoid valve.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate the valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blownout fuses, open-circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across the coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT

Turn off electrical power supply and disconnect coil lead wires. Refer to watt rating stamped on nameplate for identification of solenoid construction. When you have determined the watt rating of solenoid, select the correct paragraph below.

FIGURE 3 SHOWS A SOLENOID WITH A WATT RATING OF 6 A-C, 9.7 D.C,OR 9 A-C.

1. Remove retaining cap or clip, nameplate and cover. ***CAUTION:*** When metal retaining clip disengages, it will spring upward.
2. Slip the yoke containing a coil, sleeves and insulating washers off the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Slip coil, sleeves and insulating washers from yoke. 4. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.

FIGURE 4 SHOWS A SOLENOID WITH A WATT RATING OF 105 A-C, 11.2 D.C OR 16.7 A.C

1. Remove retaining cap or clip, nameplate and housing. ***CAUTION:*** When metal retaining clip disengages, it will spring upward.
2. Slip spring washer, insulating washer and coil off the solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place an insulating washer at each end of coil, if required.

VALVE DISASSEMBLY AND REASSEMBLY

Depressurize valve and turn off electrical power supply. For valves with a watt rating of 6 A-C, 9.7 D-C or 9 A-C, refer to Figure 3. For valves with a watt rating of 10.5 A-C, 11.2 D-C or 16.7 A-C, refer to Figure 4.

Proceed in the following manner:

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. ***CAUTION:*** When metal retaining clip disengages, it will spring upward.
2. Unscrew solenoid base sub-assembly and remove core assembly, core spring and body gasket.
3. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Pans Kit for best results.
4. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of pans.
5. Replace body gasket, core assembly, core spring and solenoid base sub-assembly. Torque solenoid base sub-assembly to 175 ± 25 inch pounds.
6. After maintenance, operate the valve a few times to be sure of proper operation.

SPARE PARTS KITS

Spare Parts Kits and Coils arc available for ASCO valves.
Parts marked with an asterisk (*) are supplied in Spare Parts Kit.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Pans Kits or Coils,
Specify Valve Catalog Number,
Serial Number and Voltage.

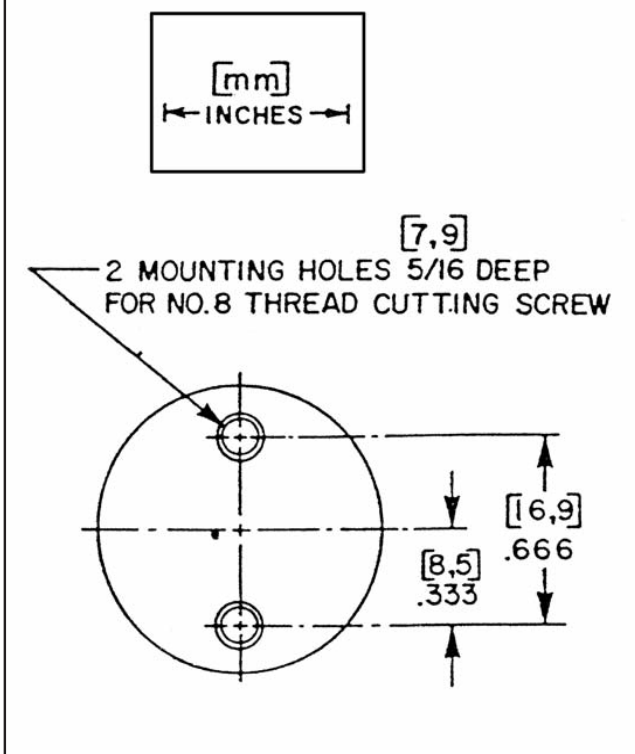


Figure 1 Body Molding

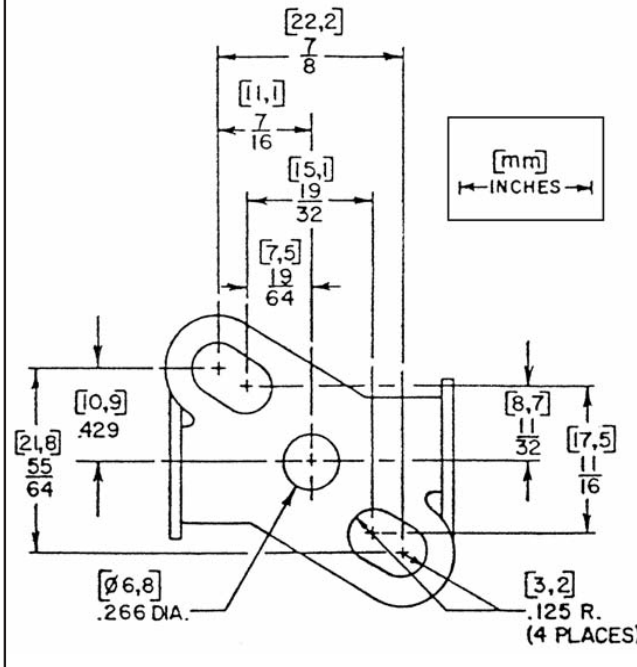
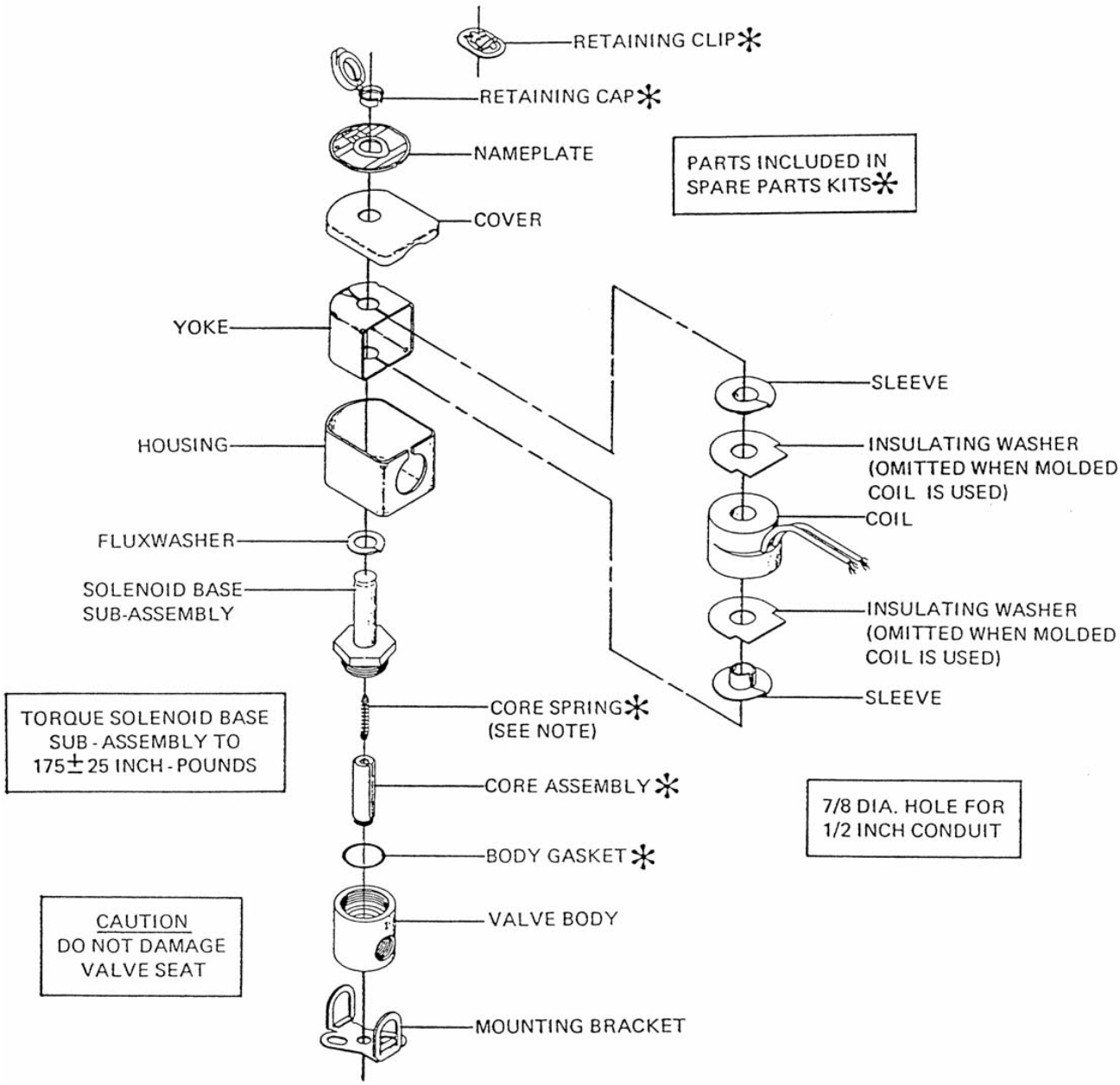
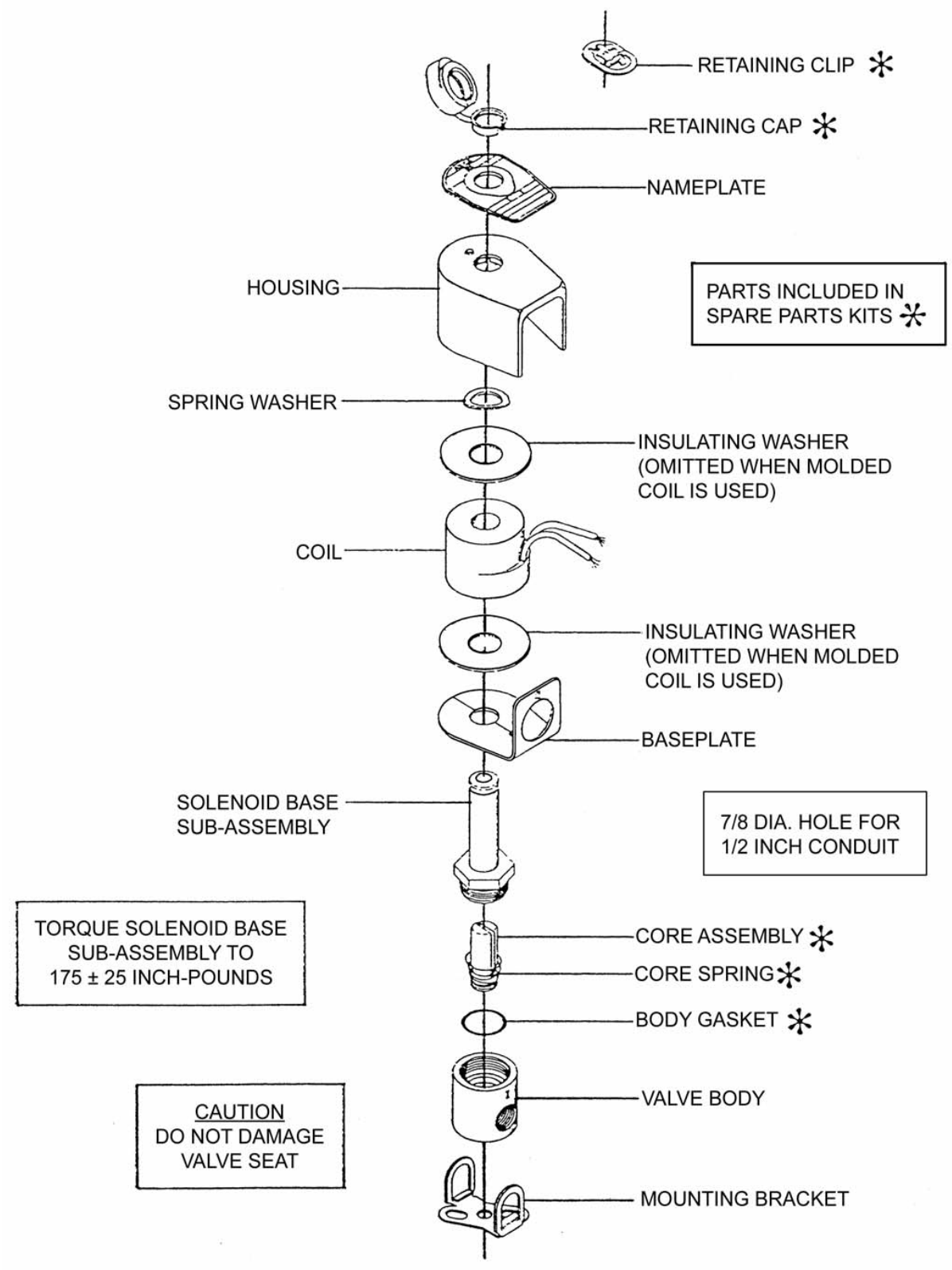


Figure 2 Mounting Bracket Mounting Dimensions



NOTE: A-C (ALTERNATING CURRENT) CONSTRUCTION SHOWN. FOR A-C CONSTRUCTION, EITHER END OF THE SPRING MAY BE INSTALLED INTO TOP OF CORE ASSEMBLY. FOR D-C (DIRECT CURRENT) CONSTRUCTION, INSTALL WIDE END OF CORE SPRING IN CORE ASSEMBLY FIRST, CLOSED END OF CORE SPRING PROTRUDES FROM TOP OF CORE ASSEMBLY.

Bulletin 8262 (6 A-C, 9.7 D-C or 9 Watts A-C)
General Purpose Solenoid Enclosure Shown
Figure 3 For Explosion-Proof/Watertight Solenoid Enclosure, See Form No. V-5391



Bulletin 8262 (10.5 A-C, 11.2 D-C or 16.7 Watts A-C)
General Purpose Solenoid Enclosure Shown
Figure 3 For Explosion-Proof/Watertight Solenoid Enclosure, See Form No. V-5380

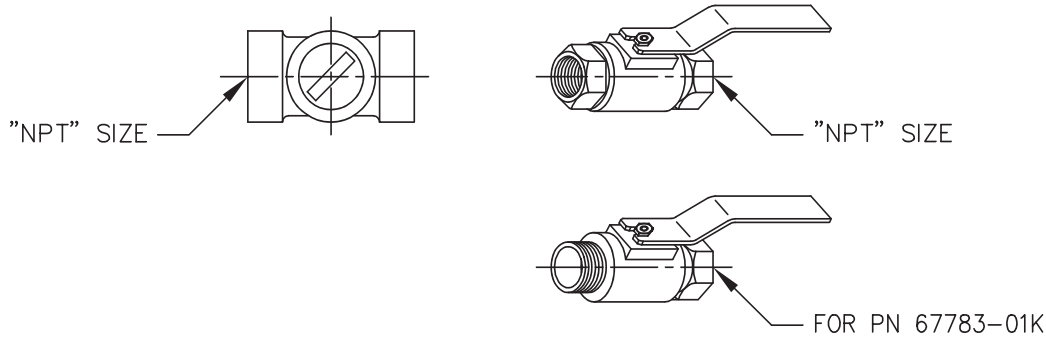
CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO.	DRAWING NO. 67783	REV BD

TYPE OF VALVE AND MAIN FEATURES

CK2 COCK/BALL VALVE

DESIGN		
DRAWN	MGR	4-02-80
CHK'D	KD	4-03-80
APV'D	CH	4-07-80

SCALE: NONE



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)

CAD REVISION RECORD - DO NOT REVISE MANUALLY

LTR	DESCRIPTION	BY	DATE
A-AY	SEE REVISION FILE		
BA	ADDED PN'S 67783-59H, 67783-60F & 67783-61D (ECO 20434)	AK	03-14-06
BB	ADDED PN'S 67783-62B (NED 62200)	AK	07-10-08
BC	ADDED PN'S 67783-63K (NED 62218)	AK	08-14-08
BD	ADDED PN 67783-64H (NED 62446)	PC	10-1-2008

CLA-VAL CO. NEWPORT BEACH, CALIFORNIA

CATALOG NO.

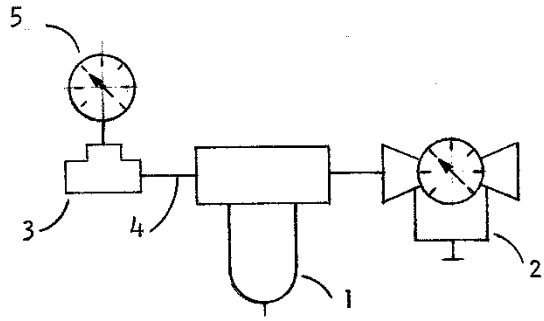
DRAWING NO. 86883

REV.

DIST. CODE 007*

DESIGN	9-19-73	CH
DRAWN	9-19-73	MF
CHK'D.	9-19-73	CTB
APP'D.		
SCALE	NONE	

AIR REGULATOR ASSEMBLY



ITEM NO.	DESCRIPTION	QUAN.	ITEM NO.	DESCRIPTION	QUAN.
1 } 2	FILTER-REGULATOR COMBO	1			
3	TEE	1			
4	NIPPLE	1			
5	GAGE	1			

REVISION RECORD

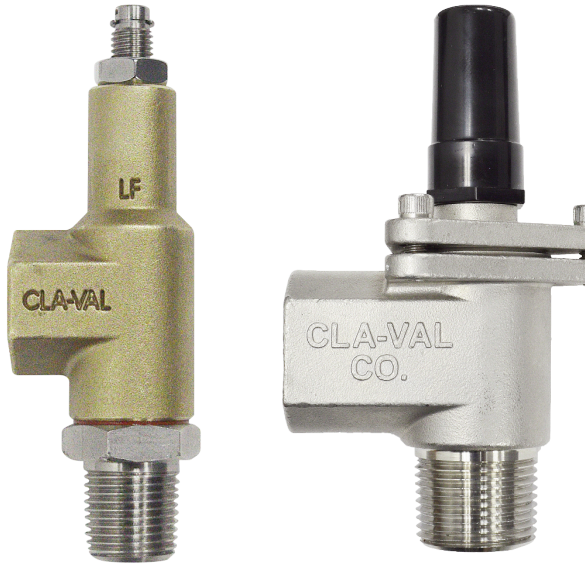
LTR	DESCRIPTION	BY	DATE

86883

FORM F-5 REV 1-62 PRINTED IN U.S.A.

CLA-VAL

—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.

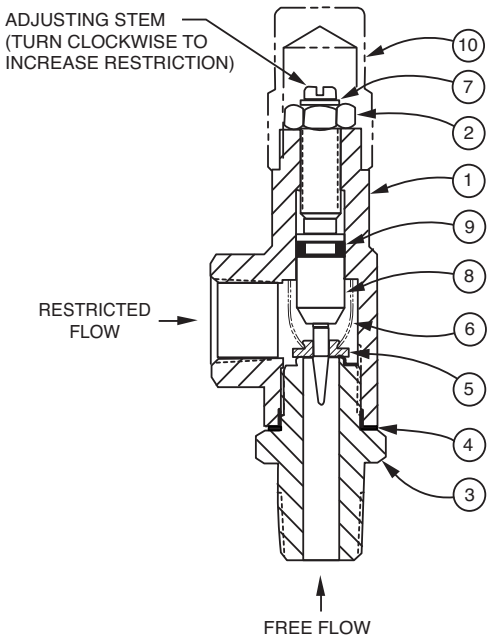
Replace all parts which are defective. Replace any parts which create the slightest doubt that they will not afford completely satisfactory operation. Use Inspection steps as a guide.

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

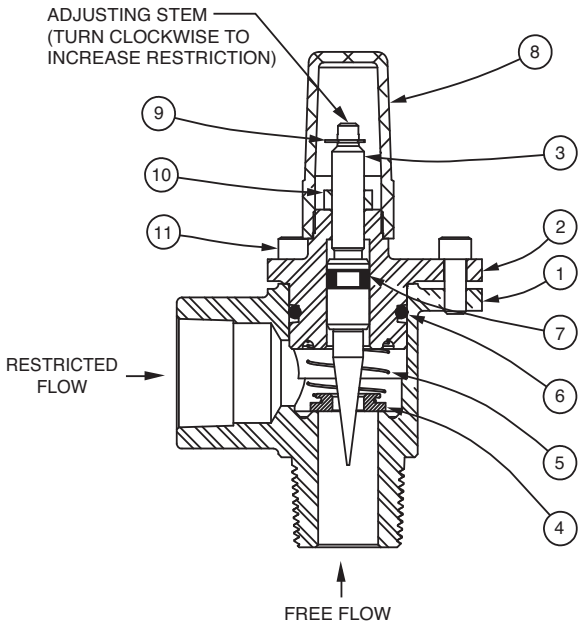


ITEM	DESCRIPTION	QTY
1	Housing	1
2	Nut, Jam	1
3	Seat	1
4	Gasket	1
5	Disc	1
6	Spring	1
7	Ring, Retaining	1
8	Stem	1
9	O-Ring	1
10	Cap (SS only)	1

When ordering parts, please specify:

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

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



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

CLA-VAL

— MODEL — **X117C**

Valve Position Transmitter

DESCRIPTION

The Model X117C Valve Position Transmitter is designed to provide analog signal (4 - 20 mA, 2 wire) output of valve position for Cla-Val Main Valves. A stem extension is fitted to the main valve stem with the position transmitter mechanically linked to it. The valve stem is mechanically linked to the electronics for an output signal that is in direct proportion to valve position. Optional limit switches (2 SPDT or 2 DPDT) are provided on the Model X117CLS for signaling when valve has reached fully open or closed position. Provisions are made for bleeding air from valve cover through a small bleed screw and washer located on one wrench flat of adapter.

INSTALLATION

Normally, the X117C is supplied mounted on the Cla-Val main valve. If X117C has not been installed at factory, then install stem, adapter, mounting bracket and transmitter (in order) as shown on drawing 16767. Necessary field setting of the X117C requires some adjustment to the position of the transmitter relative to the stem and the spool, so you may need to loosen transmitter on the bracket. Refer to Drawing No. 16767.

OPERATION

The signal from the position sensing linkage mechanism is converted to a two-wire 4 to 20 mA current output appearing at the output terminals. The voltage compliance range is 12.5 to 40 Volts DC. Initial resistance will range from 975 ohms at transmitter full over-travel (Valve open) to 500 ohms at transmitter free position (Valve closed)

Wiring

Orient transmitter and bracket to conduit. Loosen jam nut holding transmitter and bracket to adapter for connecting transmitter to field wiring conduit. Tighten jam nut after connection is made. After unthreading housing from transmitter connect wires to OUTPUT screw terminals. DO NOT USE HOUSING AS WIRING PULLBOX.

Use good field wiring practices for low voltage DC analog instrumentation wiring (suggest 18-gage multistrand wire minimum). Avoid potential ground loops. See drawing for typical wiring connections. Calibration of transmitter should be done with a temporary hookup of test equipment before final wiring connections are made. The enclosure is NEMA rated 1, 3, 4, 4X, 6, 6P, 7, 9, and 13. Appropriate measures should be taken to avoid internal condensation.

CALIBRATION

1. When properly adjusted, the transmitter arm TOTAL arc of travel, as valve moves from full closed to full open will be approximately 60 to 70 degrees. Thus, the transmitter-actuating arm will be horizontal when the valve is halfway open (approximately 30 degrees up and 30 degrees down). At valve closed position the transmitter will have a 4 mA output and at fully open position the transmitter will have a 20 mA output.

2. You will need the following tools to calibrate and align the X117C:
   A.) A small flat blade screwdriver to fit the span and null potentiometers.
   B.) A ruler for measuring location of transmitter arm and valve actuating stem and spool.

   C.) A 4-20 mA calibration/tester or multiamp-tester/meter or some means of measuring the 4-20 mA transmitter output,
   D.) A small (9/64 inch) hexagon key wrench to fit the transmitter adjustable roller arm,
   E.) A small (3/32 inch) hexagon key wrench to fit the spool setscrew,
   F.) Hand tools to tighten X117C assembly after calibration is complete.

IMPORTANT CAUTION: The transmitter does not have overtravel stops. Use care to insure that rotary travel does not exceed 80 degrees from "center" (free) position in either direction during start up and operation. Damage to the transmitter could occur.

3. Make preliminary mechanical settings. (Refer to Drawing No. 16767) Be sure that the valve is in the fully closed position. See Technical Manual for main valve for information on this. Be sure that line isolation or block valves are closed. Be sure that the Function Switch in the transmitter is in the “CW” position.

4. Adjust bracket and transmitter to preliminary centerline distance “C” for valve size. See Table. This is distance between valve actuating stem centerline (actuates vertically up and down) and transmitter actuating arm pivot centerline (rotates vertically up and down). Install spool on actuating stem.

5. Position the actuating arm. With valve in closed position, loosen setscrews on spool and actuating arm. First, completely loosen actuating arm adjusting screw to allow the knurled shaft of the transmitter to return to "center" (free) position. Then, adjust actuating arm in or out on the knurled shaft so that the actuating arm roller is making good contact with the lower lip of the spool and does not contact the center of the spool. The actuating arm should be about 30 degrees down from pivot horizontal centerline.

After loosening the setscrew, move the spool by hand (up and down) to check that the roller and spool are in alignment throughout entire valve stroke. The actuating arm should not be moved more than 30 degrees up or down from horizontal centerline of knurled shaft. The centerline of the roller should not be past the lower lip or rim of the spool at any valve position. You may have to adjust the length of the actuating arm when doing this.

You will feel the spring restoring force of the transmitter as you do this step. This restoring force allows the roller to maintain contact with the lower lip of the spool throughout the entire valve stroke. The spool must now be adjusted into place by moving the spool slightly (approximately 1/4") upward to engage this spring force. Tighten spool setscrew when the actuating arm is angled about 30 degrees downward.

6. Remove transmitter cover and temporarily connect calibration wiring equipment (milliamp meter and power supply or portable instrumentation calibrator/tester to transmitter screw terminals.).

Refer to calibration equipment and adjust potentiometer marked "NULL" until the meter reads 4 mA. A clockwise turn increases output. Use care in adjusting the potentiometer by not pressing in on the adjusting stem while turning the screwdriver. This will affect the reading.

ALTERNATE METHOD: Loosen setscrew on spool and adjust until its centerline is lined up with centerline of transmitter actuating arm pivot centerline (actuating stem and actuating arm should be at 90 degrees to each other). Mark top and bottom of spool location on stem at this 'halfway' position. Determine valve stroke by multiplying .281 times the valve seat diameter. Measure half the valve stroke down from bottom of the spool and mark the stem. Move the spool down until the bottom of the spool is aligned with the new mark on the stem. Tighten the spool setscrew. Loosen the screw that holds roller arm in place and move roller arm end into spool. Adjust location of transmitter on bracket so that roller is in place inside spool and slightly touching the bottom lip or rim of spool. The transmitter spring restoring force helps locate the roller on the lower lip of the spool throughout the entire valve stroke. The roller arm should be at an angle of between 30 and 40 degrees below the horizontal centerline of the pivot arm.

7. For the most accurate calibration it is necessary to open valve fully. CAUTION: This will either allow a high flow rate through the valve, or the downstream pressure will quickly increase to the inlet pressure. In some cases, this can be very harmful. Where this is the case, and there are no block valves in the system to protect the downstream piping, it should be realized that steps should be taken to remedy this situation before proceeding further. Normally, block valves are to be used to protect downstream piping while the valve is in the open position. Close downstream block valve. Vent cover chamber to atmosphere. Slightly open inlet block valve. Allow valve to open while fluid is vented from cover chamber. When flow stops valve is in the fully open position. Note: continuous leakage from cover chamber could mean additional troubleshooting of the main valve or pilot system must be done.

8. With valve in fully open position, inspect position of spool and roller arm. Actuating arm roller should be making good contact with the lower lip or rim of the spool and the centerline of the roller should not be past the lower lip or rim of the spool (see Step 5). Adjust if necessary.

Refer to calibration equipment (see Step 6) and adjust potentiometer marked "SPAN" until the meter reads 20 mA. A clockwise turn increases output. Use care in adjusting the potentiometer by not pressing in on the adjusting stem while turning the screwdriver. This can affect the reading.

ALTERNATE METHOD: If it is not possible to cycle valve position without damage, then with valve remaining in the "valve closed" position loosen the spool piece setscrew and slide spool upward to the original "halfway" marks on the stem. Adjust the "SPAN" potentiometer until the meter reads 12 mA. Slide the spool piece down until the meter reads 4 mA and tighten setscrew on spool. This method is less accurate than fully cycling valve but will work.

9. There is some interplay between: 1.) The "span" and "null" settings, 2.) The 4 to 20 mA signal and, 3.) The actual valve open and closed positions. Repeat steps above. Cycle valve from open to closed positions and check settings as necessary to achieve desired valve position signal accuracy.

10. Remove all calibration equipment and attach permanent wiring. Recheck wiring and output signals at remote location. See **Wiring** section. Reinstall housing on transmitter. Recheck and tighten all fasteners. Bleed air from main valve cover through small bleed screw and washer located on one wrench flat of adapter.

ADJUSTING OPTIONAL LIMIT SWITCHES

These switches are supplied with X117CLS models and are factory set to operate at valve closed position.

1. Lift cam follower arm.

2. Move cam wheel axially to disengage teeth on wheel from teeth on shaft disc.

3. Turn cam wheel to desired position. Turning in direction of shaft rotation advances operate point. Pretravel **decreases** and overtravel thereby **increases**. Each notch on the cam wheel represents an operating point change of 7 degrees 20 seconds arc. The symbols on the cam wheel simplify changing rotation from clock wise to counterclockwise to center neutral, or vice versa.

The switch operates on clockwise **and** counterclockwise rotation, the pointer on the cam follower lines up with symbol [I\ ] or symbol [/I] on the cam wheel. Maximum pretravel of 15 degrees occurs when symbol [/I] lines up. Maximum pretravel of 80 degrees occurs when symbol [I\ ] lines up. Operation is in the direction of the inclined surface of the symbol when [I\ ] or [/I] lines up with the pointer on the cam follower.

4. When cam wheel has been rotated to desired location, release cam wheel to engage with mating shaft disc.

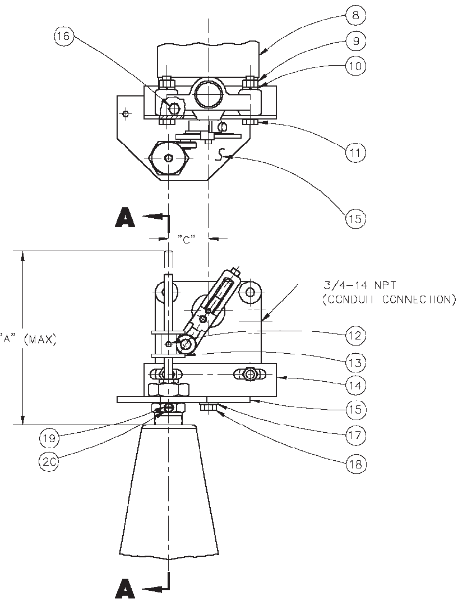
5. Release cam follower arm.

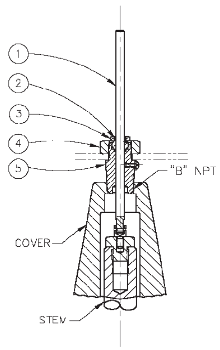
CATALOG NUMBER	SWITCH
X117C	ANALOG OUTPUT ONLY, SHORT HOUSING
X117CLS	ANALOG, 15 AMPS SPOT EXPLOSION PROOF

DWG NO. 16767 SH 1 REV. C

REVISIONS

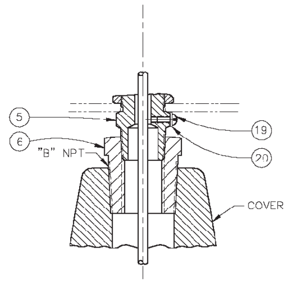
REV	DESCRIPTION	DATE	APPROVED
A-B	SEE REVISION FILE.		
C	REDRAWN ON CAD, ADDED ITEMS 19 & 20. (ECO 16671)	8-20-97	MW



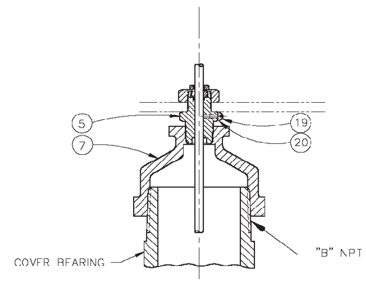


2" THRU 6" SIZES
(6" SIZE SHOWN)

SECTION **A - A**
(ROTATED 90° C.C.W.)



8", 10", 12" & 14" SIZES ONLY



16" SIZE ONLY

ITEM NO.	Q Y REQD	NOMENCLATURE OR DESCRIPTION
20	1	WASHER, FIBER
19	1	SCREW, RDH 8-32 X 3/8"
18	2	NUT, HEX 1/4-20
17	2	WASHER, SPRING LOCK 1/4"
16	2	BOLT, HEX 1/4-20 X 3/4"
15	1	PLATE, SWITCH MTG.
14	1	BRACKET, ANGLE MTG.
13	1	ROLLER GUIDE
12	1	SET SCREW, 10-32 UNF
11	2	BOLT, HEX 5/16-18 X 1 1/2"
10	2	WASHER, SPRING LOCK 5/16
9	2	NUT, HEX 5/16-18
8	1	MICRO SWITCH ASSEMBLY
7	1	REDUCER, BELL, PIPE (16" SIZE ONLY)
6	1	BUSHING, PIPE, HEX (8" THRU 14" SIZES ONLY)
5	1	ADAPTER
4	1	NUT, HEX (ASF JAM)
3	1	BUSHING, GLAND
2	2	O-RING
1	1	STEM, ASSEMBLY

PARTS LIST

VALVE SIZE	1 1/4" 1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	16"
"A" MAX	10.19	7.16	7.16	7.34	7.00	6.69	6.91	9.88	9.09	9.16	10.78
"B" NPT	1/4"	1/2"	1/2"	1/2"	3/4"	3/4"	1"	1"	1 1/4"	1 1/2"	2"
"C"	.60	.75	.88	1.00	1.13	1.50	1.88	2.00	2.88	3.00	3.25

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ±1/32; DECIMALS .XX± .03, .XXX± .010; ANGULAR ± .5°
SURFACE FINISH 125
BREAK CORNERS .010 MAX
--DO NOT SCALE DRAWING--

CONTRACT NO. - - - - -

APPROVALS		DATE
DRAWN	KS	11-24-87
CHECKED	DF	12-17-87
APPROVED	CH	1-19-88
ENGR		

CLA-VAL CO. NEWPORT BEACH, CALIFORNIA

TITLE: X117C SERIES POS. TRANSMITTER 4 TO 20 MA. DC OUTPUT SIGNAL WITH LIMIT SWITCH

SIZE D | CAGE CODE 86184 | DWG NO. 16767 | REV. C

SCALE N.T.S. | SHEET 1 OF 1

MW 8-25-97

DIST. CODE 007A

MAINTENANCE

The X117C and X117CLS are constructed of durable materials which normally requiring no lubrication or periodic maintenance. The two 'O' rings (2) (p/n 00951E) in the adapter (5) that seal against the stainless steel actuating stem (1) will need replacement if signs of leakage at the stem occur.

For replacement circuit board use p/n 3080206A. When installing a new circuit board be sure that the small black and white plastic bearing piece connecting the X117C main shaft to the circuit board mounted potentiometer shaft remains in the transmitter housing. It is not part of the replacement circuit board.

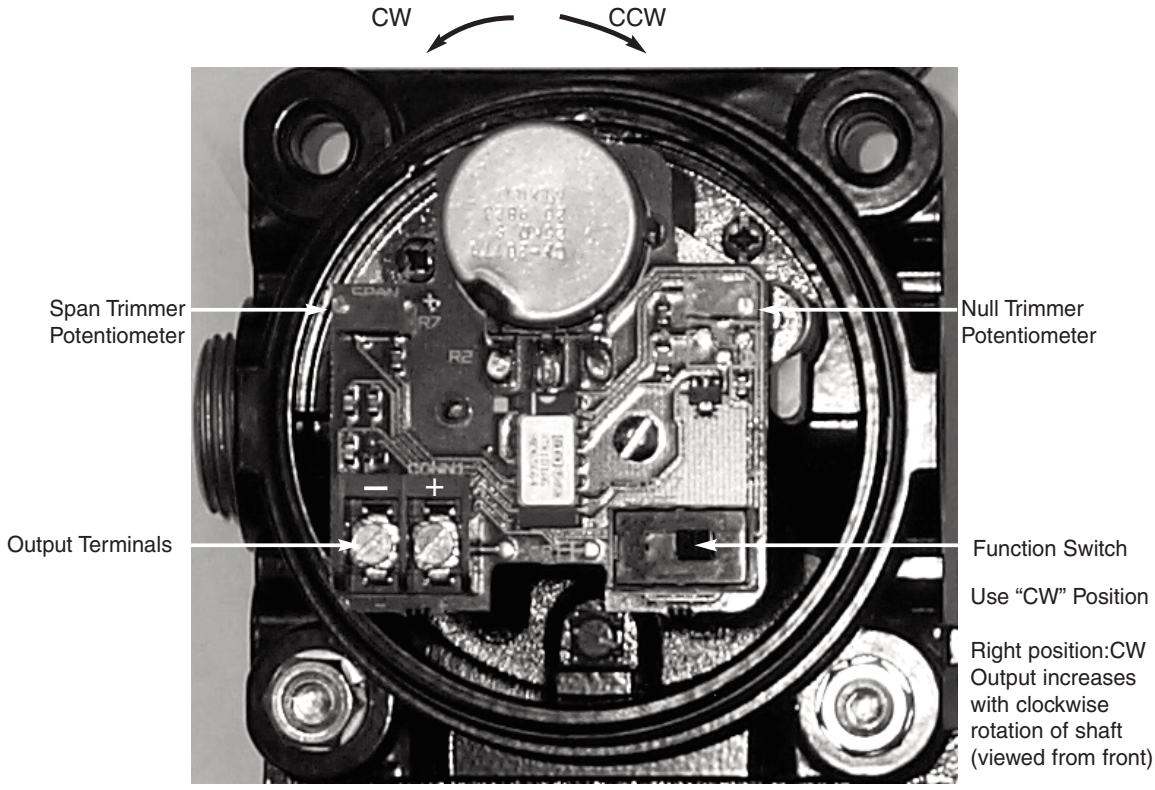


Figure 2. Rear View with Cover Removed

REFERENCE:

Valve Size (inch)		"C" Dim. (inch)
100 Series	600 Series	
1 1/4 & 1 1/2		.60
2		.75
2 1/2		.88
3	4	1.00
4	6	1.13
6	8	1.50
8	10	1.88
10	12	2.00
12	16	2.87
14		3.00
16	20 & 24	3.25

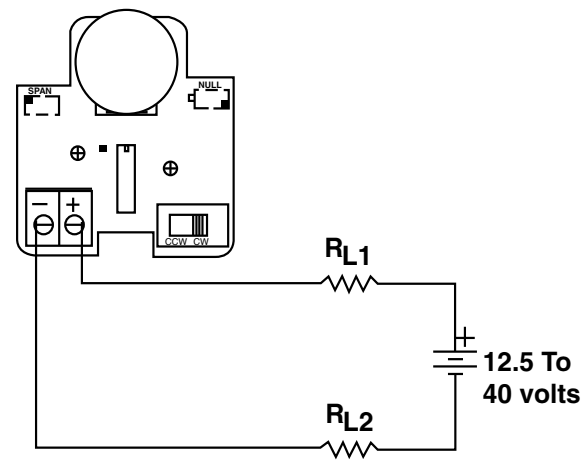
SPECIFICATIONS:

Voltage compliance range: 12.5 to 40 VDC
Maximum load resistance:

$$RL\ Max. = \frac{V\ Supply - 12.5}{20\ mA}$$

Current signal output: 4-20mA
Span: Adjustable from 15˚ to 90˚ of angular rotation
Null: 4 mA position may be set at any angular position
R_L2 is current monioring instrumentation load

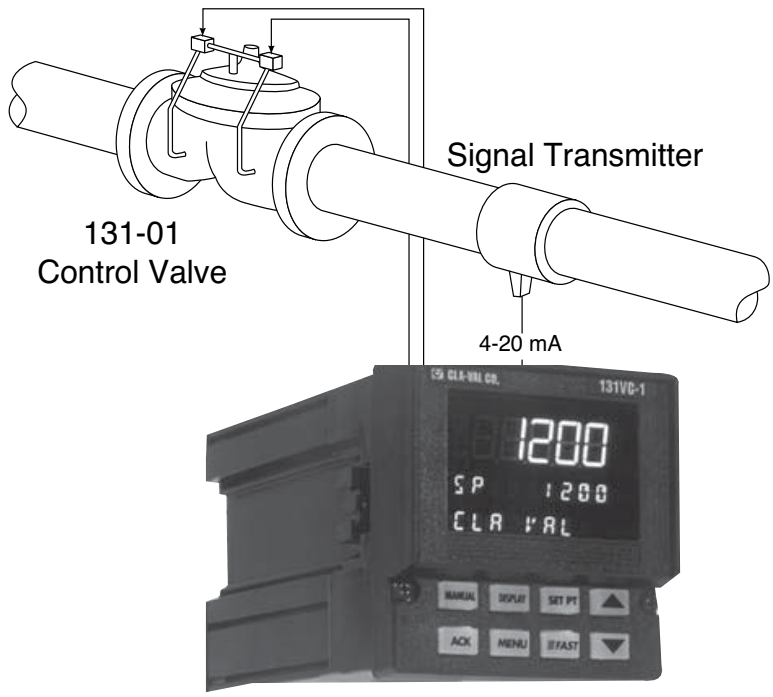
Typical Wiring Connections:



CLA-VAL™

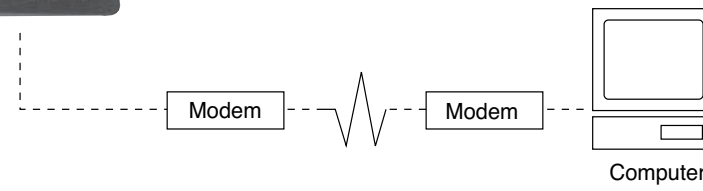
— SERIES — 131VC

Electronic Control Systems



- **Electronic Control of Hydraulic Cla-Val Valves**
- **Programmable Monitoring and Control of Flow, Pressure, Delta P, Level or Valve Position**
- **Accurate Control of Valve Speed and Response**
- **Remote Set-Point Control**
- **Security System - Prevents Unauthorized Changes**
- **Control Backup Systems in the Event of an Emergency**

The Cla-Val 131VC-1 Electronic Control System is designed to achieve unprecedented valve control accuracy and stability. Ideal for remote valve control, the 131VC-1 Electronic Control System provides the interface between SCADA system computers and hydraulic control valves sites.



Electronic Control of Hydraulic Valves

The 131VC-1 Electronic Control System is designed to work in conjunction with Cla-Val 131 Series hydraulic control valves—a combination that takes advantage of the simplicity of hydraulic valve operation and the control possibilities available with electronics.

The 131VC-1 Electronic Control System receives transmitted signals and activates dual solenoid pilots on the hydraulic control valve. These pilots direct hydraulic pressure within the system to position and regulate the valve. By continuously comparing system conditions to the programmed set-point, the system is automatically maintained at the desired value.

Additional important control features, unique to this type of valve control, are offered as standard. They are designed for user friendly operation and system safety and are addressed in this brochure.

Key Advantages

- **Proven reliable hydraulic control valve**
- **Low electric power requirement**
- **Solid state electronic components**
- **No motors, bearings, bushings or packings to wear out or leak**

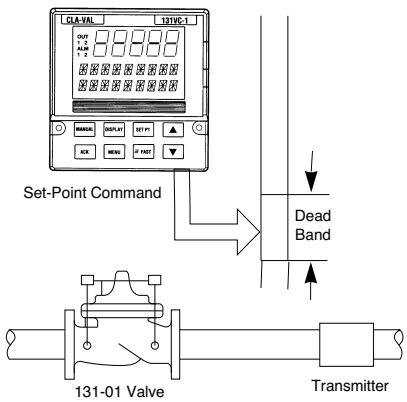
We Not Only Sell Valves—
We Provide Solutions

CLA-VAL™

How it Works

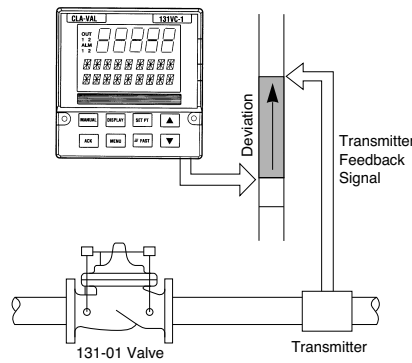
1. Set-Point Command

Set-point command is received from a remote location or entered via the key pad into the Electronic Valve Controller.



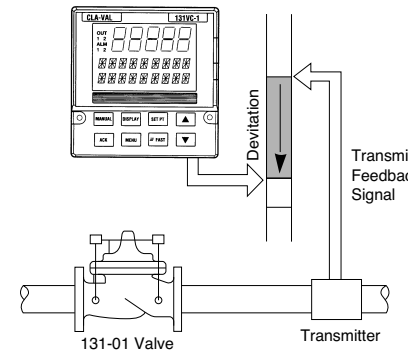
2. Feedback and Comparison

The Electronic Valve Controller compares the feedback signal from the transmitter to the set-point. If the deviation exceeds the deadband, the valve control system is activated.



3. Valve Actuation

The Electronic Valve Controller actuates the solenoid controls, causing the valve to modulate as needed to regain the set-point condition.



Keypad & Display

Display

The 131VC-1 has been engineered to be the industry's most user friendly controller. With three digital displays areas (two offering up to 9 characters of true alphanumeric), the 131VC-1 effectively eliminates cryptic messages, sub-routines and loops that could confuse even the most experienced operator. The bright, crisp display is vacuum fluorescent, and offers much better readability than any other display technology. Additional operator-friendly features include: custom programmable alarm messages, illuminated keys, and an easy-to-use menu system.

Status Indicators - Four status indicators show the controller's operating status at all times:

Manual Key Light: For manual control.

Set-point Key Light: For indication of remote control.

Output Indicator: "OUT" and indicator lights illuminate when either output 1 or 2 are on.

Alarm Indicator: "ALM" and indicator lights illuminate when either output 1 or 2 are on.

Keys Pads: All menu entry, configuration, tuning and set-point controls is entered through rugged backlit rubber keys. A simple menu system prompts the operator, step by step, through all procedures. Security system prevents unauthorized changes to all values.

Features

Alarm - Programmed to signal when system conditions exceed a desired value or in the event of a system component failure. It can be configured to be latching or non-latching, normally open or normally closed contact with deadbands.

Absolute Alarm - Activates when the process variable exceeds alarm set-point. It can be either high and/or low acting.

Deviation Alarm - Shifts as the set-point is changed. It can be symmetrical or asymmetrical.

Fault Alarm - Activates when the process variable is lost.

Set-Point Rate of Change - Prevents accidental or sudden changes in the programmed set-point. It is also invaluable when used on high differential or surge sensitive applications where valve speed of operation must be tightly controlled.

Process Variable Backup - Can automatically recognize secondary process variable or can be programmed to open or close valve or can default to backup pilot system using alarm function.

DC Power Supply - Provides source of power for signal transmitter.

Retransmission - Transmit process variable or set-point values.

Offsets - Adjusts the process variable and remote set point settings if respective signals do not match.

Filter - Stabilizes process variable signal when required.

Security System - Prevents unauthorized changes.

Input Linearization - For flow measurement across orifices, venturies, etc.

Digital Inputs - Selects specific set-points. (optional)

NEMA 4X Enclosure (optional)

Input Signals

The 131VC-1 Electronic Control System is designed to accept industry standard 4-20 mA full scale signals for pressure, flow or level control from customer supplied transmitter(s).

Flow Measurement using a differential signal requires activating the square root extractor to obtain direct flow readout.

Modulating Level Control requires the use of an optional X117 Valve Position Transmitter in addition to a level transmitter.

Valve Position Control requires an optional X117 Valve Position Transmitter installed on the valve.

Other configurations are available on a special order basis, consult the factory for details.

Specifications

Control Input:

4-20 mA full scale (others optional)

Control Parameters

Proportional Bands: 1 to 999%, settable in 0.1% increments independently for opening and closing

Deadbands: achievable up to 15% of input range

Cycle Time: 1 to 120 seconds in 1 sec. increments.

Environmental Parameters

Temperature: 0°C to 50°C (32°F to 1 22°F)

Humidity: 10 to 90%, non-condensing

Power Consumption

15 watts Max. at 120 VA, 50160 Hz

Voltage and Frequency

Universal power supply: 90 to 250 VAC, 48 to 62 Hz. 24 to 30 volts AC or DC, +/- 5%.

Noise Immunity

Common mode rejection (process input): >120 db.

Normal mode rejection (process input): >80 db.

AC line is double filtered and transient protected. Snubbers are provided for each relay output.

Construction

Case: extruded, non-perforated black anodized aluminum with ABS plastic sleeve.

Bezel: Black plastic ABS.

Chassis assembly: plug-in type.

Keys: Silicone rubber with diffusion printed graphics.

NEMA rating: front panel conforms to NEMA 4X when instrument is properly installed.

Agency Approvals

LR 84603

LISTED
Process Control Equipment
4N66

Memory Retention

Lithium battery maintains all programming for approximately ten years.

Security

There are two levels of access: restricted and full. A configurable code is used to enter the full access level. Functions not available in the restricted level are configurable.

CLA-VAL

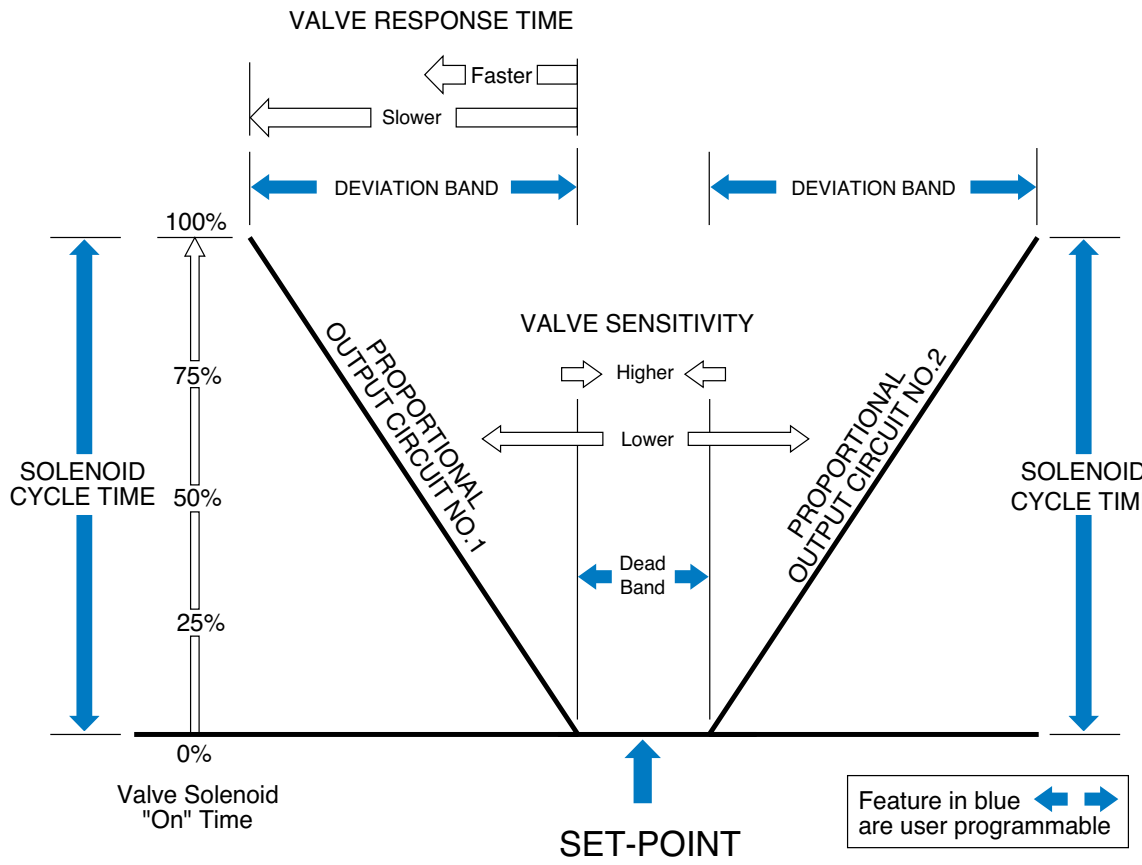
CLA-VAL

How To Order

131VC -1 [3] [3] [ ] [ ] [ ] [ ] [ ] [0] [C] [V]

	Order Code
Output 1: Control	
Mechanical Relay (5 amp)	1
Analog (milliamp)	2
Solid State Relay (triac) (1 amp)	3
Output 2: Control, Alarm, or Retransmission	
Mechanical Relay (5 amp)	1
Analog (milliamp)	2
Solid State Relay (triac) (1 amp)	3
Output 3: Control, Alarm, Retransmission, or Loop Power	
Mechanical Relay (5 amp)	1
Analog (milliamp)	2
Solid State Relay (triac) (1 amp)	3
Loop Power	5
Output 4: Alarm, Retransmission, or Loop Power	
Mechanical Relay (0.5 amp, 24 V)	1
Analog (milliamp)	2
Solid State Relay (triac) (0.5 amp, 24 V)	3
Loop Power	5
Options	
Enter "0" if not desired	
24 VAC/24 VDC Operation	F
Remote Setpoint	B
Set of Five Digital Inputs	D
CE Certification	H
Five Digital Inputs and CE Certification	J

Programmable Control Features



Full Programmable Control of Valve Sensitivity and Valve Response

Designed with duplex output circuits (one to control the valve opening solenoid and one to control the valve closing solenoid). The 131VC-1 Electronic Control System can be programmed to maintain precise control of any process. Each output circuit has an independently programmable proportional band and solenoid cycle time. By adjusting these control algorithms in combination, the response time can be varied over a wide range.

Proportional Band

The proportional band can be programmed from 1 to 999 percent of transmitter scale. Programming a narrow deviation band will result in faster valve response, whereas a wider band will result in slower response.

Proportional Response Time

The response time of the valve is proportional to how far the process variable is from the set-point. If there is only a small deviation, the solenoid “on-time” will be short and the valve will move slowly. For large deviations, the “on-time” will be longer and the valve speed will be faster.

Solenoid Cycle Time

The opening and closing solenoid pilots operate in “on-off” cycles. The cycle time is programmable to allow the valve to make a smooth transition to the set-point and avoid overshooting.

Dual Output Circuits

The two output circuits can be programmed independently to respond at different rates. For example: fast response above the set-point; slow response below the set-point.

Set-Point Rate of Change

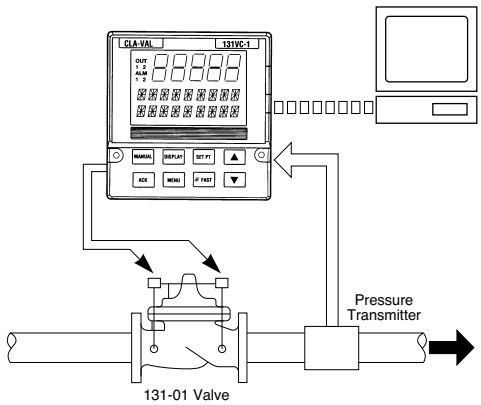
The controller has a ramping function that will further control valve speed of operation. This feature is especially useful in applications where valve speed is critical and pipeline surges are possible. When turned on, the set-point rate of change feature is operational under the following conditions:

On power up, the set-point will ramp from the process variable value to the set-point value at a specified rate.

On a transfer from manual to automatic control, the set-point will ramp from the process variable to the set-point value at a specified rate.

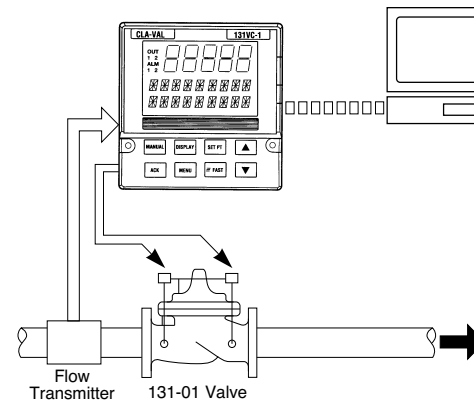
On any set-point change, the set-point will ramp from the current set-point to the new target set-point.

Applications



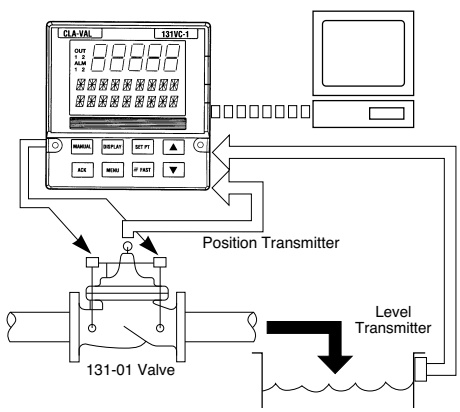
Pressure Control

Downstream pressure control is easily accomplished. The pressure transmitter range should be selected to provide the desired accuracy of pressure control. The set-point of the controller can be changed by the remote command signal or by manual adjustment at the controller panel. For pressure sustaining control, the transmitter is located upstream of the valve and the solenoid outs are reversed.



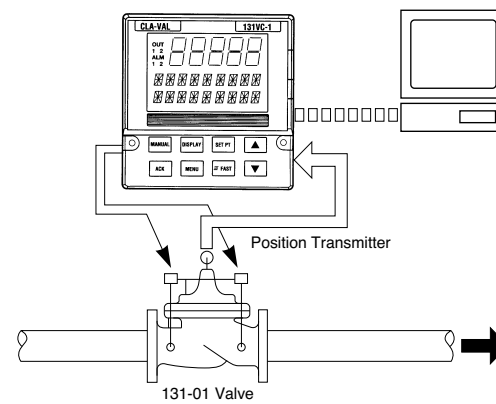
Flow Control

Flow control uses a flow transmitter in the configuration shown. The flow transmitter range should be selected to provide the desired accuracy of flow control. If desired, the transmitter may be located downstream of the valve, however, it should be a minimum of five to nine diameters downstream of the valve.



Modulating Level Control

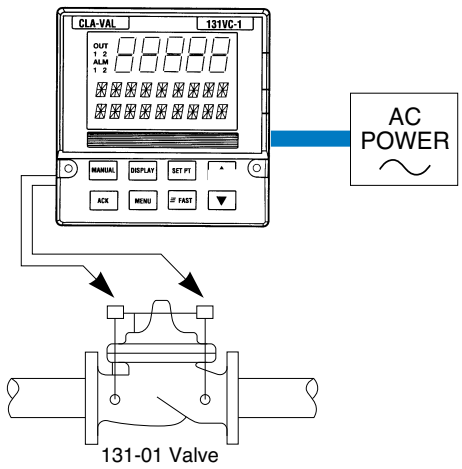
For modulating level control, the controller accepts the signal from the tank level transmitter as the remote set-point. This signal is then compared with the signal generated by an optional X117 Valve Position Transmitter to adjust the valve proportionally to the range of the level transmitter.



Position Control

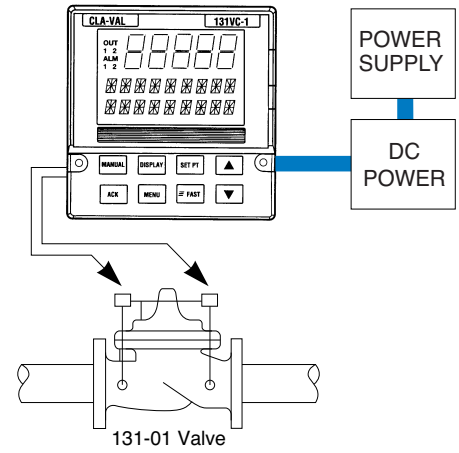
For applications requiring control of valve position, use the optional Cla-Val X117 Valve Position Transmitter. This provides the feedback signal to the controller. A computer or programmable controller (PLC) may receive inputs from other sensors and output a position command signal for use in complex control applications.

Power Failure Options



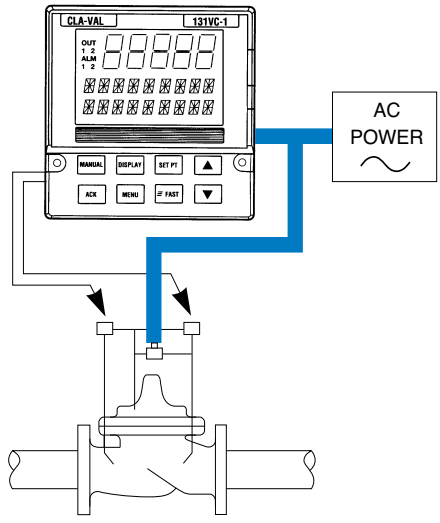
Maintain Valve Position

When there is a power failure, using the standard Model 131-01 Control Valve, the pilot control solenoids lock in the closed position and hold the main valve in the last control position.



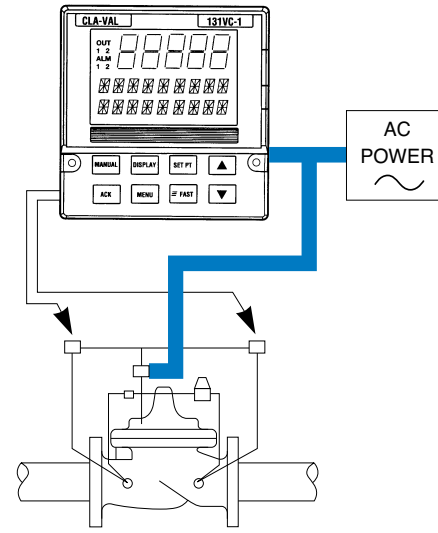
Direct Voltage Electronic Control

Customer supplied battery power, with a continuous charging system, operates the valve solenoids and controller in the event of power failure.



Open or Close Valve

Adds a third solenoid control to the pilot system which either opens or closes the main valve on power failure.



Hydraulic Backup

A second hydraulic pilot system is arranged in parallel with the electronic system. On power failure, a third solenoid switches the control from electronic to the backup hydraulic system. The hydraulic system will then modulate the valve to maintain pre-set system conditions. Virtually any hydraulic system can be used.

Transmitter Signal Failure

The 131VC-1 Electronic Control System contains several indispensible sub-routines that protect the system if there is a transmitter signal failure. The controller has, as standard, terminals for a second transmitter and can be configured to automatically default to that transmitter. The controller can also be configured to cause the valve to remain in last control position, to open or close at an electronically controlled rate, or alarm to an auxiliary hydraulic pilot system.

Remote Communications Failure

The 131VC-1 Electronic Control System is the final link in the communications system at the valve site. In the event of a failure, the controller will continues to function, maintaining the valve at the last set-point command or a pre-programmed set-point. It can also have a new set-point entered on the key pad by the Operator.

CLA-VAL

Installation

The electrical power used to energize the solenoid pilot system on the valve is routed through the 131VC-1 Electronic Control System. Because of practical limitations on wire size and distance, we recommend locating the controller near the valve itself.

Transmitter signals of 4-20 mA can travel great distances without difficulty, therefore, the controller does not need to be near the signal transmitter. For outdoor and high humidity indoor applications, we recommend installation in water-tight NEMA 4 enclosures.

Retrofitting CLA-VAL Control Valves

Existing hydraulically operated Cla-Val control valves can easily be converted to operate with the 131VC-1 Electronic Control System. The valve is modified by simply adding the Series 131 Solenoid Pilot System. The Series 131 Pilot System can be installed in parallel with the existing hydraulic pilot control for backup control in case of electrical power failure. In this case, the hydraulic pilot system must be isolated from the valve by a third solenoid valve (see Power Failure Options above).

When the existing Cla-Val control valve performs a combination of control functions (such as pressure reducing and pressure sustaining), the 131VC-1 Electronic Control System will control the primary function of the valve. The other secondary functions will continue to be controlled by the hydraulic pilot controls. Consult Factory for details.

Purchase Specifications

The Electronic Control System shall provide the interface between a remote computer system and the control valve. The controlled parameter signal shall be accepted through a 4-20 mA feedback signal. Local manual set-point control and full manual control of control valve solenoids is to be provided on the controller panel for local control.

Upon receiving the set-point command signal from the remote computer system, the controller will signal the valve to move and maintain the valve at the desired set-point. A vacuum fluorescent display of current status and set-point value in scalable engineering units shall be supplied.

The controller shall compare set-point and feedback values and adjust the valve accordingly to achieve the set-point. When the feedback signal deviates from the set-point value, the appropriate opening or closing solenoid on the control valve shall activate. As the feedback signal approaches the set-point, the solenoid output will pulse on and off to gradually return the measurement to set-point. One solid-state relay energizes for measurements condition below the set-point, while the other energizes for measurement, greater than set-point. These outputs shall be wired directly to or through intermediate relays to the opening and closing solenoids on the control valve. Solenoid output indicator lights shall illuminate when either the open or closed solenoid is activated.

The total cycle time between each pulse shall be programmable between 1 and 120 seconds. The duration of each pulse shall be directly proportional to the deviation from set-point outside of an adjustable deadband. The time proportioned outputs shall be independently adjustable for conditions above and below the set-point to properly tune valve response. The time proportional output band width shall be independently programmable between 1 and 999 percent of full scale. When the feedback signal returns within the deadband zone, the valve will maintain position. Provision shall be made to open/close/maintain position in the event of a loss of the feedback signal.

The operator interface shall consist of two rows of alphanumeric characters to display numeric values and units. Color coded alarm, status and mode indicators shall inform the operator of operating conditions. Security key codes shall protect against undesired changes to the controller. All programming shall be menu driven.

The controller shall be all solid-state construction with the internal chassis capable of being removed for inspection and adjustment. All program memory, including set-points and tuning parameters, shall be protected by an internal lithium battery rated for 10 year life.

Remote communications shall be accepted through a 4-20 mA DC analog set-point signal.When remote operation is selected, the controller shall monitor the remote set-point signal. When local control is selected, the set-point shall be changed at the controller keypad.

The Electronic Control System shall be the Cla-Val Model 131VC-1 as manufactured by Cla-Val, Newport Beach, CA.

CLA-VAL

PO Box 1325 Newport Beach CA 92659-0325
Phone: 949-722-4800 • Fax: 949-548-5441

CLA-VAL CANADA
4687 Christie Drive
Beamsville, Ontario
Canada L0R 1B4
Phone: 905-563-4963
Fax: 905-563-4040

CLA-VAL EUROPE
Chemin dés Mesanges 1
CH-1032 Romanel/
Lausanne, Switzerland
Phone: 41-21-643-15-55
Fax: 41-21-643-15-50

www.cla-val.com

E-131VC-1 (R-1/2013)

Represented By:

Cla-Val Product Identification

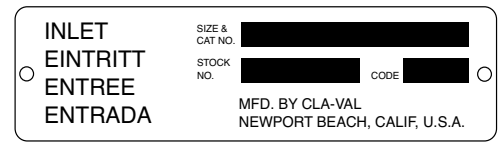
How to Order

Proper Identification

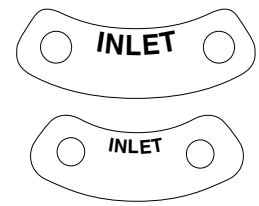
For ordering repair kits, replacement parts, or for inquiries concerning valve operation, it is important to properly identify Cla-Val products already in service by including all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details,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

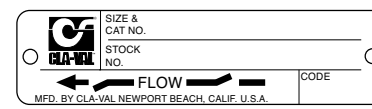


This brass plate appears on valves sized 2 1/2" and larger and is located on the top of the inlet flange.

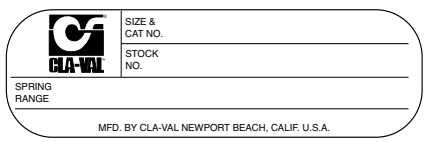


These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.

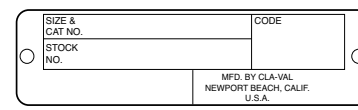
This brass plate appears on altitude valves only and is found on top of the outlet flange.



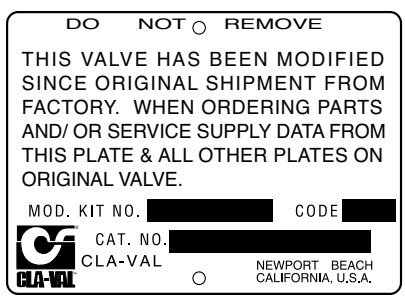
These two brass plates appear on threaded valves 1" through 3" size or flanged valves 1" through 2". It is located on only one side of the valve body.



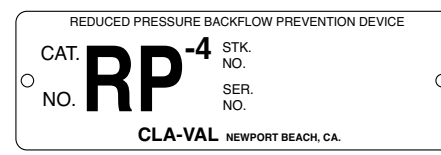
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



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 us 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.

CLA-VAL®

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

CLA-VAL
PO Box 1325 Newport Beach CA 92659-0325
Phone: 949-722-4800 • Fax: 949-548-5441

CLA-VAL CANADA
4687 Christie Drive
Beamsville, Ontario
Canada L0R 1B4
Phone: 905-563-4963
Fax: 905-563-4040

CLA-VAL EUROPE
Chemin dés Mesanges 1
CH-1032 Romanel/
Lausanne, Switzerland
Phone: 41-21-643-15-55
Fax: 41-21-643-15-50

www.cla-val.com

Represented By:

CLA-VAL®

—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
⅜"	9169901H	2½"	9169910J	N/A
½" & ¾"	9169902F	3"	9169911G	9169905J
1"	9169903D	4"	9169912E	9169911G
1¼" & 1½"	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-Cl	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