
CLA-VAL

AUTOMATIC CONTROL VALVES

390-02/3690-02

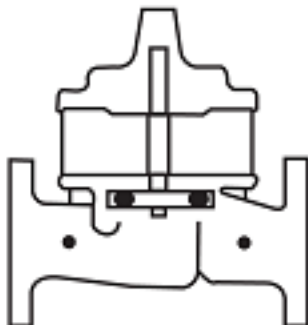
Place this manual with personnel responsible
for maintenance of this valve



Installation



Operation



Maintenance





NEWPORT BEACH, CALIFORNIA

CATALOG NO.
390-02/3690-02

DRAWING NO.
200699

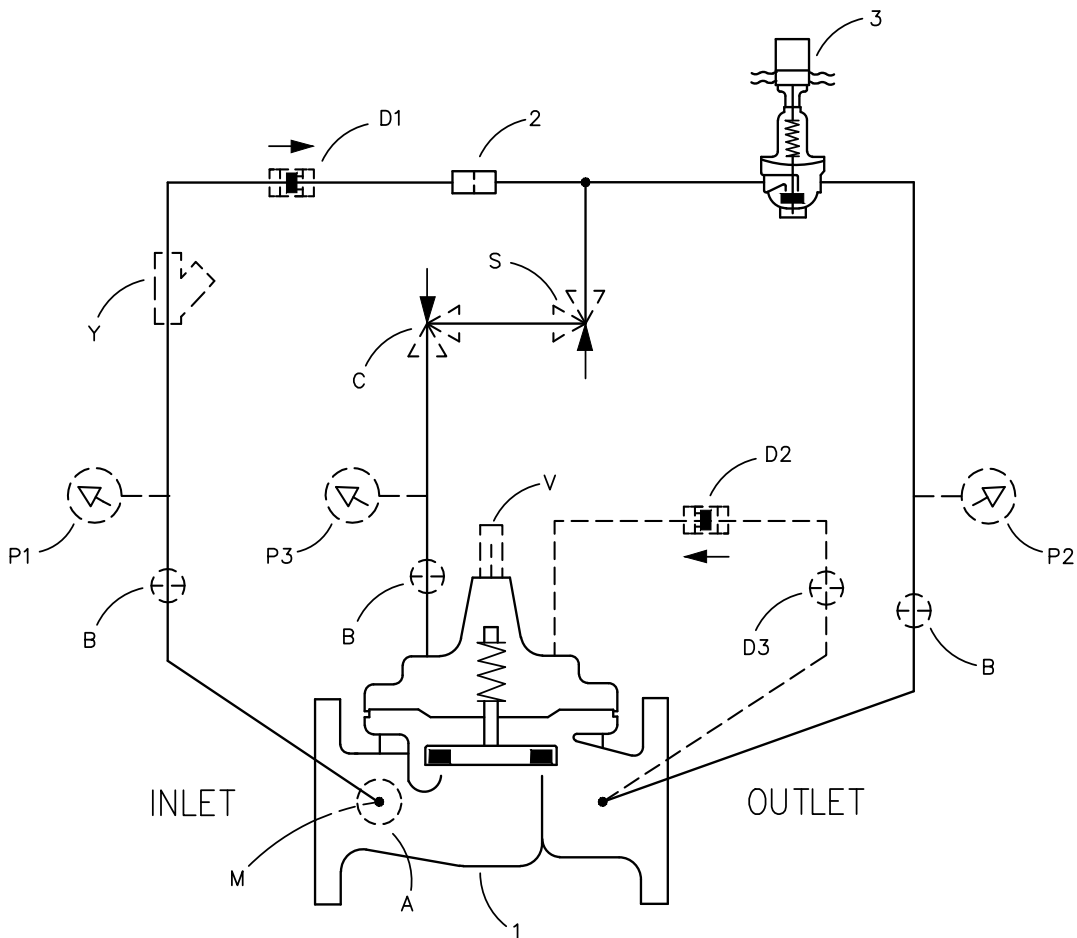
REV
C

TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC ACTUATED PRESSURE REDUCING VALVE

DESIGN		
DRAWN	AK	03-05-02
CHK'D	VL	3-06-02
APVD	CH	3-11-02

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




ITEM NO.	BASIC COMPONENTS	QTY
1	100-01 HYTROL (390-02) MAIN VALVE	1
	100-20 HYTROL (3690-02) MAIN VALVE	
2	X58C RESTRICTION ASSEMBLY	1
3	CRD33 ELECTRONIC PRESSURE REDUCING CONTROL	1

OPTIONAL FEATURE SUFFIX		ADDED TO CATALOG NUMBER	
A	X46A FLOW CLEAN STRAINER	1	
B	CK2 COCK (ISOLATION VALVE)	3	
C	CV FLOW CONTROL (CLOSING)	1	
D	CHECK VALVES WITH COCK	1	
M	X144 E-FLOW METER	1	
P	X141 PRESSURE GAUGE ASSEMBLY	3	
S	CV FLOW CONTROL (OPENING)		1
V	X101 VALVE POSITION INDICATOR		1
Y	X43 "Y" STRAINER		1

CAD REVISION RECORD - DO NOT REVISE MANUALLY
 DESCRIPTION
 DATE
 BY
 A ITEM 3 WAS CRD31 ELECTRONIC PRESSURE REDUCING;
 LTR
 I RELEASED FOR PRODUCTION (NED 46860)
 A
 03-05-02
 AK

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 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO. 390-02/3690-02	DRAWING NO. 200699	REV C
	TYPE OF VALVE AND MAIN FEATURES ELECTRONIC ACTUATED PRESSURE REDUCING VALVE		DESIGN DRAWN AK 03-05-02 CHK'D VL 3-06-02 APVD CH 3-11-02

OPERATING DATA

I. PRESSURE REDUCING FEATURE:

PRESSURE REDUCING CONTROL (3) IS A NORMALLY OPEN CONTROL THAT SENSES MAIN VALVE OUTLET PRESSURE CHANGES. AN INCREASE IN OUTLET PRESSURE TENDS TO CLOSE CONTROL (3) AND A DECREASE IN OUTLET PRESSURE TENDS TO OPEN CONTROL (3). THIS CAUSES MAIN VALVE COVER PRESSURE TO VARY AND THE MAIN VALVE MODULATES (OPENS AND CLOSES) MAINTAINING A RELATIVELY CONSTANT OUTLET PRESSURE. PRESSURE REDUCING CONTROL (3) IS EQUIPPED WITH AN ELECTRONIC ACTUATOR FOR REMOTE ADJUSTMENT.

II. OPTIONAL FEATURE OPERATING DATA:

SUFFIX A (FLOW CLEAN STRAINER):

A SELF-CLEANING STRAINER IS INSTALLED IN THE MAIN VALVE INLET BODY BOSS WHICH PROTECTS THE PILOT SYSTEM FROM FOREIGN PARTICLES.

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 C (CLOSING SPEED CONTROL):

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

SUFFIX D (CHECK VALVES WITH COCK):

WHEN OUTLET PRESSURE IS HIGHER THAN INLET PRESSURE, CHECK VALVE (D2) OPENS AND CHECK VALVE (D1) CLOSES. THIS DIRECTS THE HIGHER OUTLET PRESSURE INTO THE MAIN VALVE COVER AND THE MAIN VALVE CLOSES.

SUFFIX M (E-FLOW METER):

E-FLOW METER (M) PROVIDES ACCURATE FLOW MEASUREMENT DATA WITHOUT THE NEED OF A SEPARATE FLOW METER.


SUFFIX P (PRESSURE GAUGE):

PRESSURE GAUGES (P1), (P2), AND (P3) PROVIDE PRESSURE READING IN THE INLET, OUTLET, AND COVER CONNECTIONS.

SUFFIX S (OPENING SPEED CONTROL):

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

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

 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO. 390-02/3690-02	DRAWING NO. 200699	REV C
	TYPE OF VALVE AND MAIN FEATURES ELECTRONIC ACTUATED PRESSURE REDUCING VALVE		DESIGN DRAWN AK 03-05-02 CHK'D VL 3-06-02 APVD CH 3-11-02

OPERATING DATA-CONTINUED

SUFFIX V (VALVE POSITION INDICATOR):

VALVE POSITION INDICATOR (V) DISPLAYS A VISUAL POSITION OF THE MAIN VALVE STEM.

SUFFIX Y (Y-STRAINER):

A Y-PATTERN STRAINER IS INSTALLED IN THE PILOT SUPPLY LINE TO PROTECT THE PILOT SYSTEM FROM FOREIGN PARTICLES. THE STRAINER SCREEN MUST BE CLEANED PERIODICALLY.

III. CHECK LIST FOR PROPER OPERATION:

- () SYSTEM VALVES OPEN UPSTREAM AND DOWNSTREAM.
- () AIR REMOVED FROM THE MAIN VALVE COVER AND PILOT SYSTEM AT ALL HIGH POINTS.
- () PERIODIC CLEANING OF STRAINER (Y) IS RECOMMENDED (OPTIONAL FEATURE).
- () CV FLOW CONTROLS (C) AND (S) OPEN AT LEAST 4 TURNS (OPTIONAL FEATURE).
- () ELECTRONIC PRESSURE REDUCING CONTROL (3) PROPERLY WIRED.
- () CK2 COCKS (B) AND (D3) OPEN (OPTIONAL FEATURE).

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



MODEL 390-02

Electronic Actuated Pressure Reducing Valve



see page 3
for
approvals

- Simplified Remote Valve Set-Point Control
- Ideal for use with VC-22D Electronic Valve Controller
- 12 to 24 VDC Input Power
- Isolated Input
- Reverse Polarity Protection
- Reliable Hydraulic Operation
- IP-68 (Submersible)

The Cla-Val Model 390-02 Electronic Actuated Pressure Reducing Control Valve combines precise control of field proven Cla-Val hydraulic pilots and simple, remote valve control. The Cla-Val Model 390-02 Pressure Reducing Valve automatically reduces a higher inlet pressure to a steady lower downstream pressure regardless of changing flow rate and/or varying inlet pressure. This valve is an accurate, pilot-operated regulator capable of holding downstream pressure to a pre-determined limit. The valve uses a CRD-34 pilot control, consisting of a hydraulic pilot and integral controller, that accepts a remote set-point command input and makes set-point adjustments to the pilot.

The recommended control method is simple remote set-point change from an RTU (Remote Telemetry Unit) to the CRD-34 where the 4-20 mA command signal is ranged to specific pressure range. Very accurate control can be achieved when span does not exceed 100 psi. Since the CRD-34 is pre-ranged to the full spring range, some on-site calibration may be necessary when this control method is used. Free downloadable software is available from Cla-Val website for this purpose. The CRD-34 can also accommodate control systems where the RTU compares pressure transmitter signal to the remote set point command signal. The RTU adjusts the CRD-34 with 4-20 mA command signal containing an adequate deadband to prevent actuator dithering after the two signals agree.

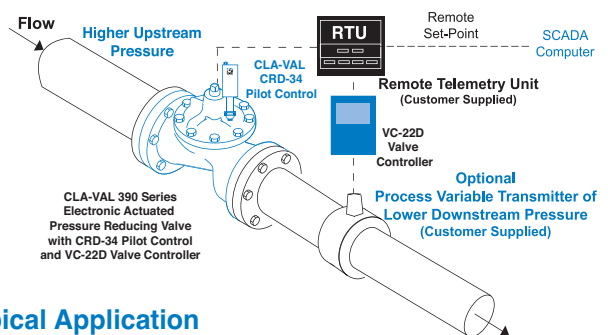
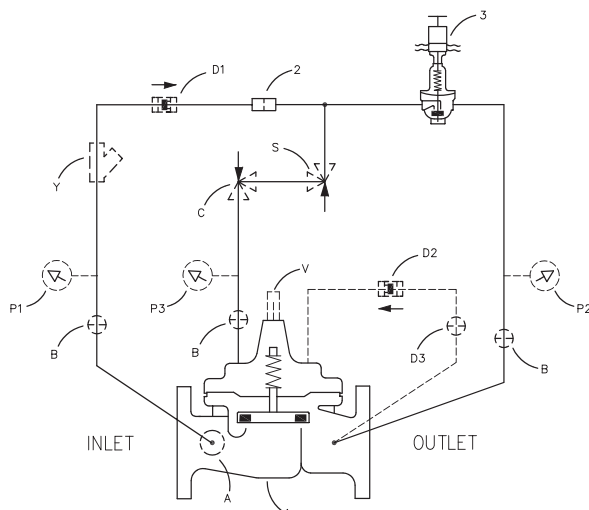
Internal continuous electronic monitoring of actuator position results in virtually instantaneous position change with no backlash or dithering when control signal is changed. In the event of a power or control input failure, the CRD-34 pilot remains in hydraulic control virtually assuring system stability under changing conditions. If check feature ("D") is added, and pressure reversal occurs, the valve closes to prevent return flow.

Schematic Diagram

Item	Description
1	Hytrol Main Valve 100-01
2	X58C Restriction Fitting
3	CRD-34 Electronic Pressure Reducing Control

Optional Features

Item	Description
A	X46A Flow Clean Strainer
B	CK2 Isolation Valve
C	CV Flow Control (Closing)
D	Check Valves with Isolation Valve
M	X144 e-FlowMeter
P	X141 Pressure Gauge
S	CV Flow Control (Opening)
V	X101 Valve Position Indicator
Y	X43 "Y" Strainer



Typical Application

The Cla-Val 390 Series valves that maintain downstream pressure and require this pressure to be changed from a remote location. It can be an effective solution for lowering costs associated with "confined space" requirements by eliminating the need for entry in valve structure for set-point adjustment. It is also ideal for pressure management, and can be programmed to minimum night time and optimum daytime pressures.

Model 390-02 (Uses Hytrol Main Valve 100-01)

Pressure Ratings (Recommended Maximum Pressure - psi)

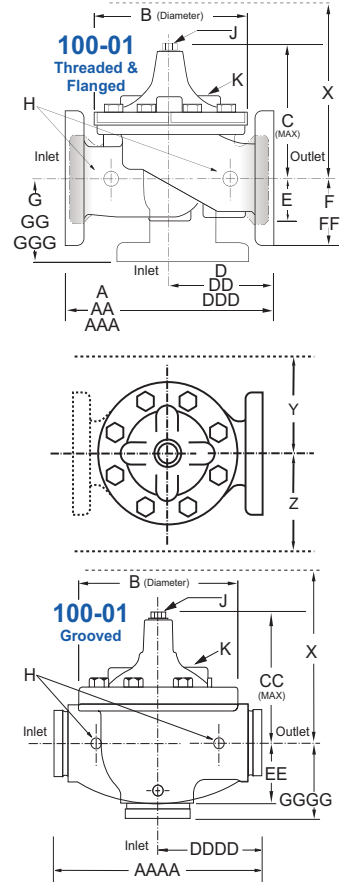
Valve Body & Cover		Pressure Class				
		Flanged		Grooved	Threaded	
Grade	Material	ANSI Standards*	150 Class	300 Class	300 Class	End† Details
ASTM A536	Ductile Iron	B16.42	250	400	400	400
ASTM A216-WCB	Cast Steel	B16.5	285	400	400	400
UNS 87850	Bronze	B16.24	225	400	400	400

Note: * ANSI standards are for flange dimensions only.
 Flanged valves are available faced but not drilled.
 † End Details machined to ANSI B2.1 specifications.
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)	1" - 36"	1" - 16"	1" - 16"
Available Sizes (mm)	25 - 900 mm	25 - 400 mm	25 - 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 not listed, consult factory.
 Cla-Val manufactures valves in more than 50 different alloys.

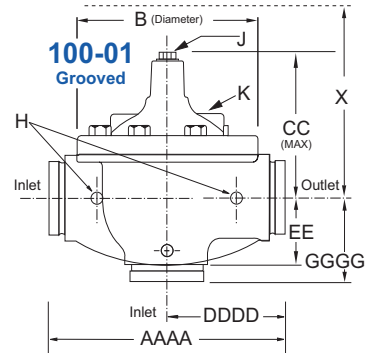
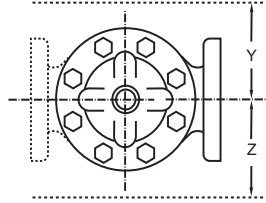
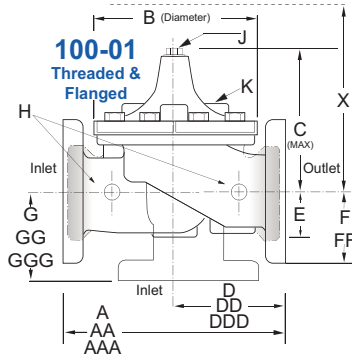


Model 390-02 Dimensions (inches)

Valve Size (Inches)	1	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30	36
A Threaded	7.25	7.25	7.25	9.38	11.00	12.50	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	41.38	46.00	52.00	61.50	63.00	72.75
AAA 300 ANSI	—	—	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	43.50	47.64	53.62	63.24	64.50	74.75
AAAA Grooved End	—	—	8.50	9.00	11.00	12.50	15.00	20.00	25.38	—	—	—	—	—	—	—	—	—
B Diameter	5.62	5.62	5.62	6.62	8.00	9.12	11.50	15.75	20.00	23.62	28.00	32.75	35.50	41.50	45.00	53.16	56.00	66.00
C Maximum	5.50	5.50	5.50	6.50	7.56	8.19	10.62	13.38	16.00	17.12	20.88	24.19	25.00	39.06	41.90	43.93	54.60	59.00
CC Maximum Grooved End	—	—	4.75	5.75	6.88	7.25	9.31	12.12	14.62	—	—	—	—	—	—	—	—	—
D Threaded	3.25	3.25	3.25	4.75	5.50	6.25	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	4.00	4.75	5.50	6.00	7.50	10.00	12.69	14.88	17.00	19.50	20.81	—	—	30.75	—	—
DDD 300 ANSI	—	—	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56	17.75	20.25	21.62	—	—	31.62	—	—
DDDD Grooved End	—	—	—	4.75	—	6.00	7.50	—	—	—	—	—	—	—	—	—	—	—
E	1.12	1.12	1.12	1.50	1.69	2.06	3.19	4.31	5.31	9.25	10.75	12.62	15.50	12.95	15.00	17.75	21.31	24.56
EE Grooved End	—	—	2.00	2.50	2.88	3.12	4.25	6.00	7.56	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	2.50	3.00	3.50	3.75	4.50	5.50	6.75	8.00	9.50	10.50	11.75	15.00	16.50	19.25	22.50	28.50
FF 300 ANSI	—	—	3.06	3.25	3.75	4.13	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.00	16.50	19.25	24.00	30.00
G Threaded	1.88	1.88	1.88	3.25	4.00	4.50	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88	15.69	—	—	22.06	—	—
GGG 300 ANSI	—	—	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62	16.50	—	—	22.90	—	—
GGGG Grooved End	—	—	—	3.25	—	4.25	5.00	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.25	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	0.40	0.40	0.40	0.60	0.70	0.80	1.10	1.70	2.30	2.80	3.40	4.00	4.50	5.10	5.63	6.75	7.50	8.50
Approx. Ship Weight (lbs)	15	15	15	35	50	70	140	285	500	780	1165	1600	2265	2982	3900	6200	7703	11720
Approx. X Pilot System	11	11	11	13	14	15	17	29	31	33	36	40	40	43	47	68	79	85
Approx. Y Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	40	45
Approx. Z Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	42	47

Note: The top two flange holes on valve size 36 are threaded to 1 1/2"-6 UNC.

Model 390-02 Metric Dimensions (Uses Main Valve Model 100-01)



Valve Size (mm)	25	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
A Threaded	184	184	184	238	279	318	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	216	238	279	305	381	508	645	756	864	991	1051	1168	1321	1562	1600	1848
AAA 300 ANSI	—	—	229	254	295	337	397	533	670	790	902	1029	1105	1210	1326	1606	1638	1899
AAAA Grooved End	—	—	216	228	279	318	381	508	645	—	—	—	—	—	—	—	—	—
B Diameter	143	143	143	168	203	232	292	400	508	600	711	832	902	1054	1143	1350	1422	1676
C Maximum	140	140	140	165	192	208	270	340	406	435	530	614	635	992	1064	1116	1387	1499
CC Maximum Grooved End	—	—	120	146	175	184	236	308	371	—	—	—	—	—	—	—	—	—
D Threaded	83	83	83	121	140	159	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	102	121	140	152	191	254	322	378	432	495	528	—	—	781	—	—
DDD 300 ANSI	—	—	108	127	149	162	200	267	337	395	451	514	549	—	—	803	—	—
DDDD Grooved End	—	—	—	121	—	152	191	—	—	—	—	—	—	—	—	—	—	—
E	29	29	29	38	43	52	81	110	135	235	273	321	394	329	381	451	541	624
EE Grooved End	—	—	52	64	73	79	108	152	192	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	64	76	89	95	114	140	171	203	241	267	298	381	419	489	572	724
FF 300 ANSI	—	—	78	83	95	105	127	159	191	222	260	292	324	381	419	489	610	762
G Threaded	48	48	48	83	102	114	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	102	83	102	102	127	152	203	219	349	378	399	—	—	560	—	—
GGG 300 ANSI	—	—	102	89	110	111	135	165	216	236	368	397	419	—	—	582	—	—
GGGG Grooved End	—	—	—	83	—	108	127	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
J NPT Cover Center Plug	0.25	0.25	0.25	0.50	0.50	0.50	0.75	0.75	1.00	1.00	1.25	1.50	2.00	1.00	1.00	1.00	2.00	2.00
K NPT Cover Tapping	0.375	0.375	0.375	0.375	0.50	0.50	0.75	0.75	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
Stem Travel	10	10	10	15	18	20	28	43	58	71	86	102	114	130	143	171	190	216
Approx. Ship Weight (kgs)	7	7	7	16	23	32	64	129	227	354	528	726	1027	1353	1769	2812	3494	5316
Approx. X Pilot System	280	280	280	331	356	381	432	737	788	839	915	1016	1016	1093	1194	1728	2007	2159
Approx. Y Pilot System	229	229	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1016	1143
Approx. Z Pilot System	229	229	229	229	254	280	305	508	559	610	661	737	762	813	864	991	1067	1194

Valve & Pilot 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.

Cla-Val fulfills the requirements described in the American Water Works Association's (AWWA) Standard for Pilot-Operated Control Valves: C530:12



Valve Options

X141 Pressure Gauge



X144 e-FlowMeter



X101AR Valve Position Indicator with Air Release



X101 Valve Position Indicator



X43H Strainer



Stainless Steel Pilot

390-02 Valve Selection	100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes																		
	Inches	1	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
	mm	25	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
Main Valve 100-01	Pattern	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G	G	G, A	G	G
	End Detail	T	T	T, F, Gr*	T, F, Gr	T, F, Gr*	T, F, Gr	F, Gr	F, Gr*	F, Gr*	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	55	93	125	210	300	460	800	1800	3100	4900	7000	8400	11000	14000	17000	25000	42000	50000
	Maximum Intermittent	68	120	160	260	370	580	990	2250	3900	6150	8720	10540	13700	17500	21700	31300	48000	62500
	Minimum	1	1	1	1	2	2	4	10	15	35	50	70	95	120	150	275	450	650
Suggested Flow (Liters/Sec)	Maximum	3.5	6	8	13	19	29	50	113	195	309	442	530	694	883	1073	1577	2650	3150
	Maximum Intermittent	4.3	7.6	10	16	23	37	62	142	246	387	549	664	863	1104	1369	1972	3028	3940
	Minimum	.03	.03	.03	.06	.09	0.13	0.25	0.63	0.95	2.2	3.2	4.4	6.0	7.6	9.5	17.4	28.4	41.0

100-01 Series is the full internal port Hytrol.

For Lower Flows Consult Factory

*Globe Grooved Only

We recommend providing adequate space around valve for maintenance work



CRD-34 Overview

The Cla-Val Model CRD-34 and CRA-34 Electronic Actuated Pressure Reducing Pilot Controls provide remote set-point adjustment and accurate downstream pressure control on Cla-Val 390 Series Control Valves. Remote set-point command signals can be from any SCADA-type control system using an analog 4-20 mA signal, by contact closure for cc/ccw rotation or through Modbus RTU.

The CRD-34 senses valve outlet pressure directly and the CRA-34 senses downstream pressure with remote hydraulic connection. Operating on 12 to 24 VDC and consuming very little power, they are an ideal control system for remote valve sites that may even be solar powered. Existing manually-set Cla-Val 90 Series Pressure Reducing control valves can be retrofitted with CRD-34 or CRA-34 to add remote set-point control of delivery pressure. Verification of downstream pressure may be sent to SCADA system from customer supplied pressure sensor attached to valve outlet.

CRD-34 Subassembly Specifications

Adjustment Ranges

- 2 to 30 psi
- 15 to 75 psi
- 20 to 105 psi
- 40 to 140 psi

End Connection

3/8" NPT

Temperature Range

Water: to 180°F

Materials

- Pilot Control: Low Lead Bronze
- Trim: Stainless Steel Type 303
- Rubber: Buna-N® Synthetic Rubber

Available with optional Stainless Steel or Monel materials. Consult factory for details.

Note: Available with remote sensing control (specify CRA-34)

When Ordering, Specify:

- | | |
|-----------------------------|------------------------------|
| 1. Catalog No. 390-02 | 6. Trim Material |
| 2. Valve Size | 7. Adjustment Range |
| 3. Pattern - Globe or Angle | 8. Desired Options |
| 4. Pressure Class | 9. When Vertically Installed |
| 5. Threaded or Flanged | |

CRD-34 Actuator Specifications

Supply Power Input:

- 12 to 24 VDC
- No Load draw: 50 mA
- Max. Load draw: 250 mA

Remote Command Inputs:

- 4-20mA, analog signal (isolated and reverse-polarity protected)
- Dry contact closure (CW/CCW)

Position Feedback Signal:

4-20 mA

Alarm Output:

Dry-contact closure (High/Low)

Speed of Rotation:

Adjustable On/Off time, max 6 rpm

Diagnostic:

LED Indicator

Loss of Power:

Actuator will remain in last commanded position.

Loss of Signal Position:

Programmable - 4 mA, Last, or 20 mA

Electrical Connections:

Single, 30 feet of permanently attached cable with color-coded power supply and signal wires

Mechanical Specifications:

Environmental

Protection Class: IP-68 (Temporary submersible)

Ambient Temperature: 15° to 150° F (-10° to 65° C)

Materials

Electronics Enclosure: Anodized Aluminum

Mechanical Housing: Bronze

Coupling Assembly: Stainless Steel

Gear Train: Stainless Steel, permanently lubricated

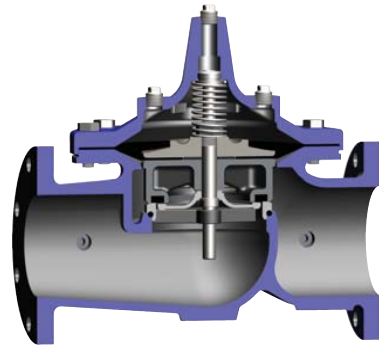


—MODEL— **100-01**
Hytrol Valve

Description

The Cla-Val Model 100-01 Hytrol Valve is a main valve for Cla-Val Automatic Control Valves. It is a hydraulically operated, diaphragm-actuated, globe or angle pattern valve.

This valve consists of three major components; body, diaphragm assembly, and cover. The diaphragm assembly is the only moving part. The diaphragm assembly uses a diaphragm of nylon fabric bonded with synthetic rubber. A synthetic rubber disc, contained on three and one half sides by a disc retainer and disc guide, forms a seal with the valve seat when pressure is applied above the diaphragm. The diaphragm assembly forms a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.

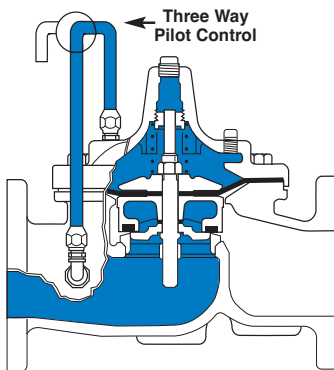


Installation

1. Before valve is installed, pipe lines should be flushed of all chips, scale and foreign matter.
2. It is recommended that either gate or block valves be installed on both ends of the 100-01 Hytrol Valve to facilitate isolating the valve for preventive maintenance and repairs.
3. Place the valve in the line with flow through the valve in the direction indicated on the inlet nameplate. (See "Flow Direction" Section)
Note: Valve can be installed in the vertical or horizontal position.
4. Allow sufficient room around valve to make adjustments and for disassembly.
5. Cla-Val 100-01 Hytrol Valves operate with maximum efficiency when mounted in horizontal piping with the cover UP, however, other positions are acceptable. Due to size and weight of the cover and internal components of 8 inch and larger valves, installation with the cover UP is advisable. This makes internal parts readily accessible for periodic inspection.

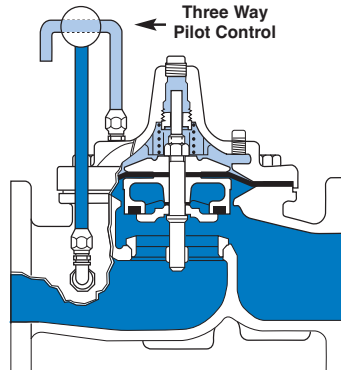
6. Caution must be taken in the installation of this valve to insure that galvanic and/or electrolytic action does not take place. The proper use of dielectric fittings and gaskets are required in all systems using dissimilar metals.
7. If a pilot control system is installed on the 100-01 Hytrol Valve, use care to prevent damage. If it is necessary to remove fittings or components, be sure they are kept clean and replaced exactly as they were.
8. After the valve is installed and the system is first pressurized, vent air from the cover chamber and pilot system tubing by loosening fittings at all high points.

Principles of Operation



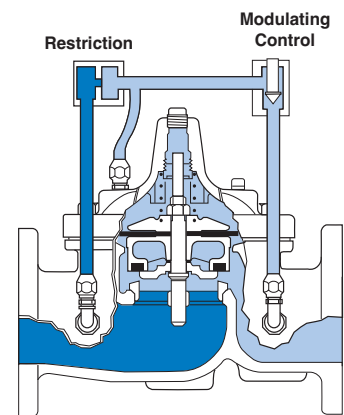
Tight Closing Operation

When pressure from the valve inlet (or an equivalent independent operating pressure) is applied to the diaphragm chamber the valve closes drip-tight.



Full Open Operation

When pressure in diaphragm chamber is relieved to a zone of lower pressure (usually atmosphere) the line pressure (5 psi Min.) at the valve inlet opens the valve.



Modulating Action

Valve modulates when diaphragm pressure is held at an intermediate point between inlet and discharge pressure. With the use of a Cla-Val. "modulating control," which reacts to line pressure changes, the pressure above the diaphragm is varied, allowing the valve to throttle and compensate for the change.

Flow Direction

The flow through the 100-01 Hytrol Valve can be in one of two directions. When flow is “up-and-over the seat,” it is in “normal” flow and the valve will fail in the open position. When flow is “over-the seat-and down,” it is in “reverse” flow and the valve will fail in the closed position. There are no permanent flow arrow markings.



Recommended Tools

1. Three pressure gauges with ranges suitable to the installation to be put at Hytrol inlet, outlet and cover connections.
2. Cla-Val Model X101 Valve Position Indicator. This provides visual indication of valve position without disassembly of valve.
3. Other items are: suitable hand tools such as screwdrivers, wrenches, etc. soft jawed (brass or aluminum) vise, 400 grit wet or dry sandpaper and water for cleaning.

Troubleshooting

The following troubleshooting information deals strictly with the Model 100-01 Hytrol Valve. This assumes that all other components of the pilot control system have been checked out and are in proper working condition. (See appropriate sections in Technical Manual for complete valve).

All trouble shooting is possible without removing the valve from the line or removing the cover. It is highly recommended to permanently install a Model X101 Valve Position Indicator and three gauges in unused Hytrol inlet, outlet and cover connections.

SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to Close	Closed isolation valves in control system, or in main line.	Open Isolation valves.
	Lack of cover chamber pressure.	Check upstream pressure, pilot system, strainer, tubing, valves, or needle valves for obstruction.
	Diaphragm damaged. (See Diaphragm Check.)	Replace diaphragm.
	Diaphragm assembly inoperative. Corrosion or excessive scale build up on valve stem. (See Freedom of Movement Check)	Clean and polish stem. Inspect and replace any damaged or badly eroded part.
	Mechanical obstruction. Object lodged in valve. (See Freedom of Movement Check)	Remove obstruction.
	Worn disc. (See Tight Sealing Check)	Replace disc.
	Badly scored seat. (See Tight Sealing Check)	Replace seat.
Fails to Open	Closed upstream and/or downstream isolation valves in main line.	Open isolation valves.
	Insufficient line pressure.	Check upstream pressure. (Minimum 5 psi flowing line pressure differential.)
	Diaphragm assembly inoperative. Corrosion or excessive buildup on valve stem. (See Freedom of Movement Check)	Clean and polish stem. Inspect and replace any damaged or badly eroded part.
	Diaphragm damaged. (For valves in "reverse flow" only)	Replace diaphragm.

After checking out probable causes and remedies, the following three checks can be used to diagnose the nature of the problem before maintenance is started. They must be done in the order shown.

Three Checks

The 100-01 Hytrol Valve has only one moving part (the diaphragm and disc assembly). So, there are only three major types of problems to be considered.

First: Valve is stuck - that is, the diaphragm assembly is not free to move through a full stroke either from open to close or vice versa.

Second: Valve is free to move and can't close because of a worn out diaphragm.

Third: Valve leaks even though it is free to move and the diaphragm isn't leaking.

CAUTION:

*Care should be taken when doing the troubleshooting checks on the 100-01 Hytrol Valve. These checks do require the valve to open fully. 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 **the valve cannot be serviced under pressure**. Steps should be taken to remedy this situation before proceeding any further.*

Diaphragm Check (#1)

1. Shut off pressure to the Hytrol Valve by slowly closing upstream and downstream isolation valves. **SEE CAUTION.**
2. Disconnect or close all pilot control lines to the valve cover and leave only one fitting in highest point of cover open to atmosphere.
3. With the cover vented to atmosphere, slowly open upstream isolation valve to allow some pressure into the Hytrol Valve body. Observe the open cover tapping for signs of continuous flow. It is not necessary to fully open isolating valve. Volume in cover chamber capacity chart will be displaced as valve moves to open position. Allow sufficient time for diaphragm assembly to shift positions. If there is no continuous flow, you can be quite certain the diaphragm is sound and the diaphragm assembly is tight. If the fluid appears to flow continuously this is a good reason to believe the diaphragm is either damaged or it is loose on the stem. In either case, this is sufficient cause to remove the valve cover and investigate the leakage. (See "Maintenance" Section for procedure.)

COVER CHAMBER CAPACITY

(Liquid Volume displaced when valve opens)

Valve size (inches)	Displacement	
	Gallons	Liters
1 1/4	.020	.07
1 1/2	.020	.07
2	.032	.12
2 1/2	.043	.16
3	.080	.30
4	.169	.64
6	.531	2.0
8	1.26	4.8
10	2.51	9.5
12	4.00	15.1
14	6.50	24.6
16	9.57	36.2
20	12.00	45.4
24	29.00	109.8
30	42.00	197.0
36	90.00	340.0

Freedom of Movement Check (#2)

4. Determining the Hytrol Valve's freedom of movement can be done by one of two methods.
5. For most valves it can be done after completing Diaphragm Check (Steps 1, 2, and 3). **SEE CAUTION.** At the end of step 3 the valve should be fully open.
6. If the valve has a Cla-Val X101 Position Indicator, observe the indicator to see that the valve opens wide. Mark the point of maximum opening.
7. Re-connect enough of the control system to permit the application of inlet pressure to the cover. Open pilot system cock so pressure flows from the inlet into the cover.
8. While pressure is building up in the cover, the valve should close smoothly. There is a hesitation in every Hytrol Valve closure, which can be mistaken for a mechanical bind. The stem will appear to stop moving very briefly before going to the closed position. This slight pause is caused by the diaphragm flexing at a particular point in the valve's travel and is not caused by a mechanical bind.
9. When closed, a mark should be made on the X101 Valve position indicator corresponding to the "closed" position. The distance between the two marks should be approximately the stem travel shown in chart.

STEM TRAVEL

(Fully Open to Fully Closed)

Valve Size (inches)		Travel (inches)	
Inches	MM	Inches	MM
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	28
6	150	1.7	43
8	200	2.3	58
10	250	2.8	71
12	300	3.4	86
14	350	4.0	100
16	400	4.5	114
20	500	5.6	143
24	600	6.7	165
30	800	7.5	190
36	900	8.5	216

10. If the stroke is different than that shown in stem travel chart this is a good reason to believe something is mechanically restricting the stroke of the valve at one end of its travel. If the flow does not stop through the valve when in the indicated "closed" position, the obstruction probably is between the disc and the seat. If the flow does stop, then the obstruction is more likely in the cover. In either case, the cover must be removed, and the obstruction located and removed. The stem should also be checked for scale build-up. (See "Maintenance, section for procedure.)

11. For valves 6" and smaller, the Hytrol Valve's freedom of movement check can also be done after all pressure is removed from the valve. **SEE CAUTION.** After closing inlet and outlet isolation valves and bleeding pressure from the valve, check that the cover chamber and the body are temporarily vented to atmosphere. Insert fabricated tool into threaded hole in top of valve stem, and lift the diaphragm assembly manually. Note any roughness. The diaphragm assembly should move smoothly throughout entire valve stroke. The tool is fabricated from rod that is threaded on one end to fit valve stem and has a "T" bar handle of some kind on the other end for easy gripping. (See chart in Step 4 of "Disassembly" Section.)

12. Place marks on this diaphragm assembly lifting tool when the valve is closed and when manually positioned open. The distance between the two marks should be approximately the stem travel shown in stem travel chart. If the stroke is different than that shown, there is a good reason to believe something is mechanically restricting the stroke of the valve. The cover must be removed, and the obstruction located and removed. The stem should also be checked for scale build-up. (See "Maintenance" Section for procedure.)

Tight Sealing Check (#3)

13. Test for seat leakage after completing checks #1 & #2 (Steps 1 to 12). **SEE CAUTION.** Close the isolation valve downstream of the Hytrol Valve. Apply inlet pressure to the cover of the valve, wait until it closes. Install a pressure gauge between the two closed valves using one of the two ports in the outlet side of the Hytrol. Watch the pressure gauge. If the pressure begins to climb, then either the downstream isolation valve is permitting pressure to creep back, or the Hytrol is allowing pressure to go through it. Usually the pressure at the Hytrol inlet will be higher than on the isolation valve discharge, so if the pressure goes up to the inlet pressure, you can be sure the Hytrol is leaking. Install another gauge downstream of isolating valve. If the pressure between the valves only goes up to the pressure on the isolation valve discharge, the Hytrol Valve is holding tight, and it was just the isolation valve leaking.

Maintenance

Preventative Maintenance

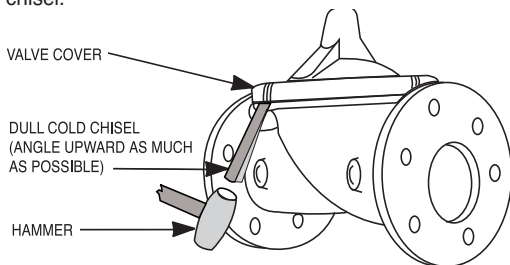
The Cla-Val Co. Model 100-01 Hytrol Valve requires no lubrication or packing and a minimum of maintenance. However, a periodic inspection schedule should be established to determine how the operating conditions of the system are affecting the valve. The effect of these actions must be determined by inspection.

Disassembly

Inspection or maintenance can be accomplished without removing the valve from the line. Repair kits with new diaphragm and disc are recommended to be on hand before work begins.

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

1. Close upstream and downstream isolation valves **and independent operating pressure when used** to shut off all pressure to the valve.
2. Loosen tube fittings in the pilot system to remove pressure from valve body and cover chamber. After pressure has been released from the valve, use care to remove the controls and tubing. Note and sketch position of tubing and controls for re-assembly. The schematic in front of the Technical Manual can be used as a guide when reassembling pilot system.
3. Remove cover nuts and remove 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**.



On 6" and smaller valves block and tackle or a power hoist can be used to lift valve cover by inserting proper size eye bolt in place of the center cover plug. on 8" and larger valves there are 4 holes (5/8" – 11 size) where jacking screws and/or eye bolts may be inserted for lifting purposes. **Pull cover straight up** to keep from damaging the integral seat bearing and stem.

COVER CENTER PLUG SIZE

Valve Size	Thread Size (NPT)
1 1/4" – 1 1/2"	1/4"
2" – 3"	1/2"
4" – 6"	3/4"
8" – 10"	1"
12"	1 1/4"
14"	1 1/2"
16"	2"
20" & 24"	2"
30" & 36"	2"

4. Remove the diaphragm and disc assembly from the valve body. With smaller valves this can be accomplished by hand by **pulling straight up on the stem so as not to damage the seat bearing**. On large valves, an eye bolt of proper size can be installed in the stem and the diaphragm assembly can be then lifted with a block and tackle or power hoist. Take care not to damage the stem or bearings. The valve won't work if these are damaged.

VALVE STEM THREAD SIZE

Valve Size	Thread Size (UNF Internal)
1 1/4" – 2 1/2"	10–32
3" – 4"	1/4–28
6" – 14"	3/8–24
16"	1/2–20
20"	3/4–16
24"	3/4–16
30"	3/4–16
36"	3/4–16

5. The next item to remove is the stem nut. Examine the stem threads above the nut for signs of mineral deposits or corrosion. If the threads are not clean, use a wire brush to remove as much of the residue as possible. Attach a good fitting wrench to the nut and give it a sharp "rap" rather than a steady pull. Usually several blows are sufficient to loosen the nut for further removal. On the smaller valves, the entire diaphragm assembly can be held by the stem in a vise **equipped with soft brass jaws** before removing the stem nut.

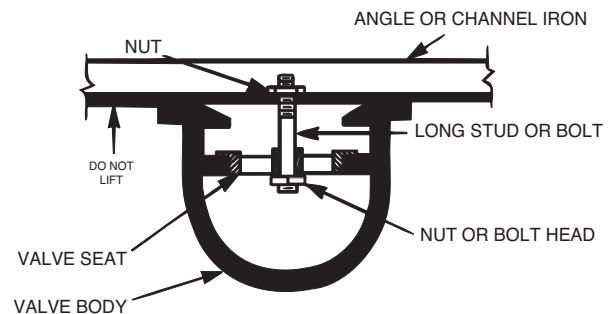
The use of a pipe wrench or a vise without soft brass jaws scars the fine finish on the stem. No amount of careful dressing can restore the stem to its original condition. Damage to the finish of the stem can cause the stem to bind in the bearings and the valve will not open or close.

6. After the stem nut has been removed, the diaphragm assembly breaks down into its component parts. Removal of the disc from the disc retainer can be a problem if the valve has been in service for a long time. Using two screwdrivers inserted along the outside edge of the disc usually will accomplish its removal. Care should be taken to preserve the spacer washers in water, particularly if no new ones are available for re-assembly.

7. The only part left in the valve body is the seat which ordinarily does not require removal. Careful cleaning and polishing of inside and outside surfaces with 400 wet/dry sandpaper will usually restore the seat's sharp edge. If, however, it is badly worn and replacement is necessary, it can be easily removed.

Seats in valve sizes 1 1/4" through 6" are threaded into the valve body. They can be removed with accessory X109 Seat Removing Tool available from the factory. On 8" and larger valves, the seat is held in place by flat head machine screws. Use a tight-fitting, long shank screwdriver to prevent damage to seat screws. If upon removal of the screws the seat cannot be lifted out, it will be necessary to use a piece of angle or channel iron with a hole drilled in the center. Place it across the body so a long stud can be inserted through the center hole in the seat and the hole in the angle iron. By tightening the nut a uniform upward force is exerted on the seat for removal.

NOTE: Do not lift up on the end of the angle iron as this may force the integral bearing out of alignment, causing the stem to bind.



Lime Deposits

One of the easiest ways to remove lime deposits from the valve stem or other metal parts is to dip them in a 5-percent muriatic acid solution just long enough for the deposit to dissolve. This will remove most of the common types of deposits. **CAUTION: USE EXTREME CARE WHEN HANDLING ACID.** Rinse parts in water before handling. If the deposit is not removed by acid, then a fine grit (400) wet or dry sandpaper can be used with water.

Reassembly

1. Reassembly is the reverse of the disassembly procedure. If a new disc has been installed, it may require a different number of spacer washers to obtain the right amount of “grip” on the disc. When the diaphragm assembly has been tightened to a point where the diaphragm cannot be twisted, the disc should be compressed very slightly by the disc guide. Excessive compression should be avoided. Use just enough spacer washers to hold the disc firmly without noticeable compression.

2. MAKE SURE THE STEM NUT IS VERY TIGHT. Attach a good fitting wrench to the nut and give it a sharp “rap” rather than a steady pull. Usually several blows are sufficient to tighten the stem nut for final tightening. Failure to do so could allow the diaphragm to pull loose and tear when subjected to pressure.

Inspection of Parts

After the valve has been disassembled, each part should be examined carefully for signs of wear, corrosion, or any other abnormal condition. Usually, it is a good idea to replace the rubber parts (diaphragm and disc) unless they are free of signs of wear. These are available in a repair kit. Any other parts which appear doubtful should be replaced. **WHEN ORDERING PARTS, BE SURE TO GIVE COMPLETE NAMEPLATE DATA, ITEM NUMBER AND DESCRIPTION.**

NOTE: If a new disc isn't available, the existing disc can be turned over, exposing the unused surface for contact with the seat. The disc should be replaced as soon as practical.

3. Carefully install the diaphragm assembly by lowering the stem through the seat bearing. Take care not to damage the stem or bearing. Line up the diaphragm holes with the stud or bolt holes on the body. on larger valves with studs, it may be necessary to hold the diaphragm assembly up part way while putting the diaphragm over the studs.

4. Put spring in place and replace cover. Make sure diaphragm is lying smooth under the cover.

5. Tighten cover nuts firmly using a cross-over pattern until all nuts are tight.

6. Test Hytrol Valve before re-installing pilot valve system.

Test Procedure After Valve Assembly

There are a few simple tests which can be made in the field to make sure the Hytrol Valve has been assembled properly. Do these before installing pilot system and returning valve to service. These are similar to the three troubleshooting tests.

1. Check the diaphragm assembly for freedom of movement after all pressure is removed from the valve. **SEE CAUTION.** Insert fabricated tool into threaded hole in top of valve stem, and lift the diaphragm assembly manually. Note any roughness, sticking or grabbing. The diaphragm assembly should move smoothly throughout entire valve stroke. The tool is fabricated from rod that is threaded on one end to fit valve stem (See chart in Step 4 of “Disassembly” section.) and has a “T” Bar handle of some kind on the other end for easy gripping.

Place marks on this diaphragm assembly lifting tool when the valve is closed and when manually positioned open. The distance between the two marks should be approximately the stem travel shown in stem travel chart. (See “Freedom of Movement Check” section.) If the stroke is different than that shown, there is a good reason to believe something is mechanically restricting the stroke of the valve. The cover must be removed, the obstruction located and removed. (See “Maintenance” Section for procedure.)

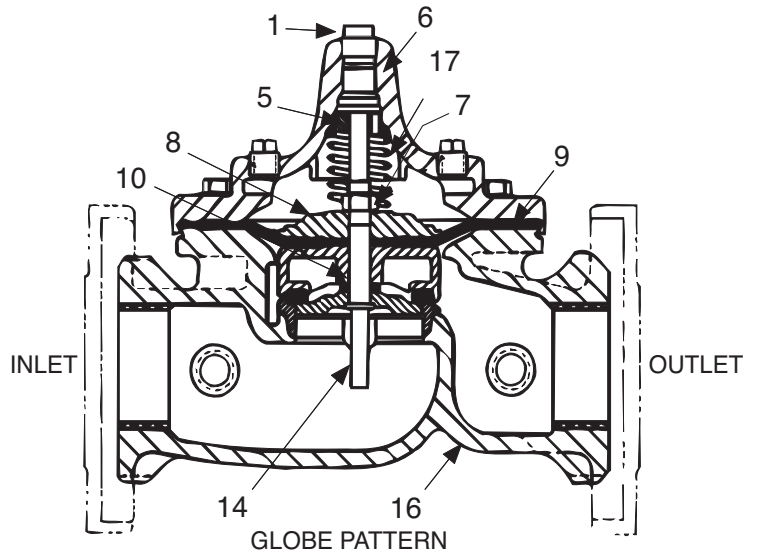
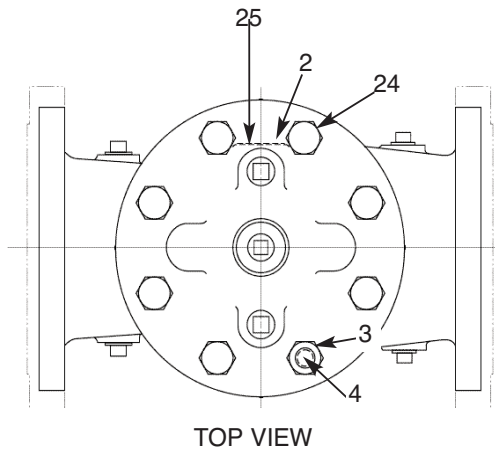
Due to the weight of the diaphragm assembly this procedure is not possible on valves 8” and larger. on these valves, the same determination can be made by carefully introducing a low pressure-less than five psi) into the valve body with the cover vented. **SEE CAUTION.** Looking in cover center hole see the diaphragm assembly lift easily without hesitation, and then settle back easily when the pressure is removed.

2. To check the valve for drip-tight closure, a line should be connected from the inlet to the cover, and pressure applied at the inlet of the valve. If properly assembled, the valve should hold tight with as low as ten PSI at the inlet. See “Tight Sealing Check” section.)

3. With the line connected from the inlet to the cover, apply full working pressure to the inlet. Check all around the cover for any leaks. Re-tighten cover nuts if necessary to stop leaks past the diaphragm.

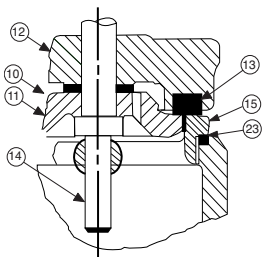
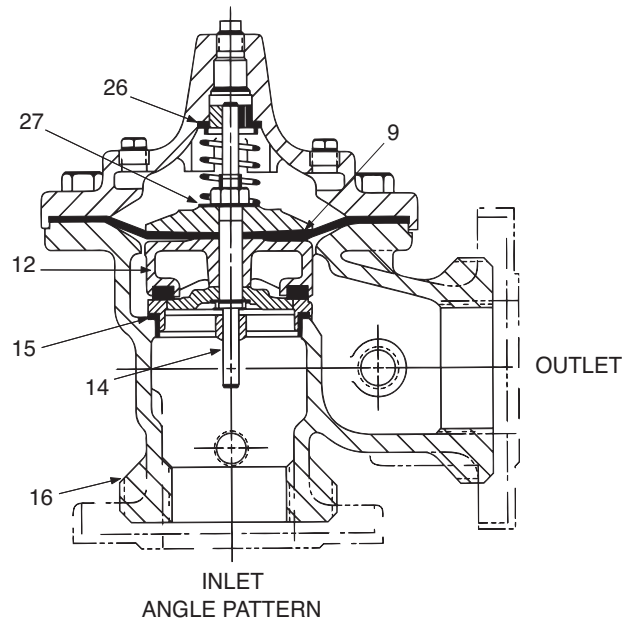
4. Remove pressure, then re-install the pilot system and tubing exactly as it was prior to removal. **Bleed air from all high points.**

5. Follow steps under “Start-Up and Adjustment” Section in Technical Manual for returning complete valve back to service.

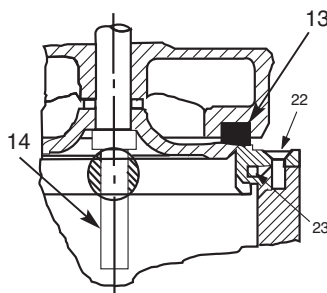


PARTS LIST

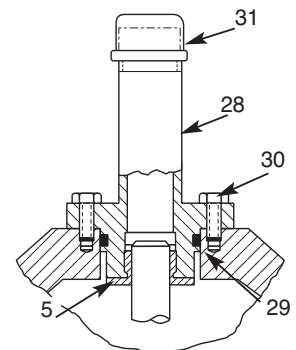
Item	Description
1.	Pipe Plug
2.	Drive Screws (for nameplate)
3.	Hex Nut (8" and larger)
4.	Stud (8" and larger)
5.	Cover Bearing
6.	Cover
7.	Stem Nut
8.	Diaphragm Washer
9.	Diaphragm
10.	Spacer Washers
11.	Disc Guide
12.	Disc Retainer
13.	Disc
14.	Stem
15.	Seat
16.	Body
17.	Spring
22.	Flat Head Screws (8" and larger)
23.	Seat O-Ring
24.	Hex head Bolt (1 1/4" thru 4")
25.	Nameplate
26.	Upper Spring Washer (Epoxy coated valves only)
27.	Lower Spring Washer (Epoxy coated valves only)
28.	Cover Bearing Housing (16" only)
29.	Cover O-Ring (16" only)
30.	Hex Bolt (16" only)
31.	Pipe Cap (16" only)



1 1/4" - 6" SEAT DETAIL



8" - 24" SEAT DETAIL



16" COVER DETAIL

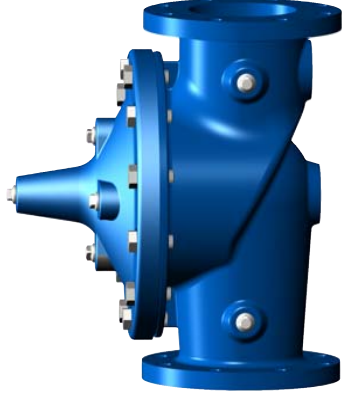


—MODEL—100-01 Hytrol Valve Service Data

Description 100-01 Hytrol Valve

The Cla-Val Model 100-01 Hytrol Valve is a main valve for Cla-Val Automatic Control Valves. It is a hydraulically operated, diaphragm-actuated, globe or angle pattern valve.

This valve consists of three major components; body, diaphragm assembly, and cover. The diaphragm assembly is the only moving part. The diaphragm assembly uses a diaphragm of nylon fabric bonded with synthetic rubber. A synthetic rubber disc, contained on three and one half sides by a disc retainer and disc guide, forms a seal with the valve seat when pressure is applied above the diaphragm. The diaphragm assembly forms a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure.



Description 100-20 600 Series Hytrol Valve

The Cla-Val Model 100-20 Hytrol Valve (600 Series main valve) have only one part -the body- that is different from standard 100 Series Cla-Val main valve parts. The remaining parts of the 600 series main valve are standard Cla-Val main valve parts. All service and maintenance information for the standard 100 Series main valves also apply to the 600 series main valves.

The most important thing to remember when ordering main valve repair kits and replacement parts, except for the body, all other parts are going to be for a smaller size main valve. Cla-Val identifies main valve parts with the flange size of the standard 100 Series main valve. Refer to the "Main Valve Sizes" chart below.

HYTROL Service Data

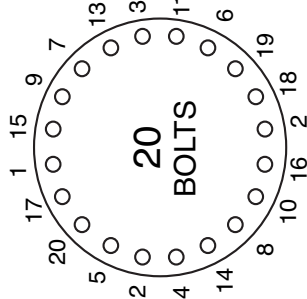
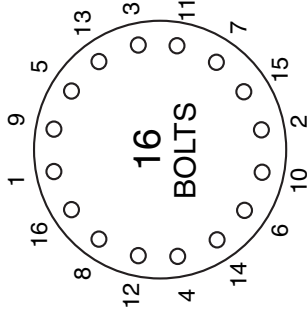
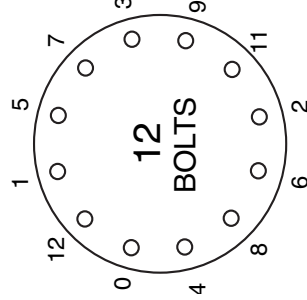
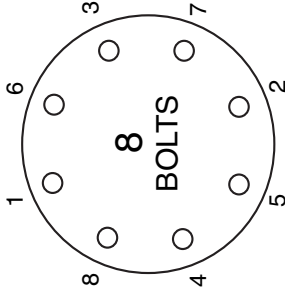
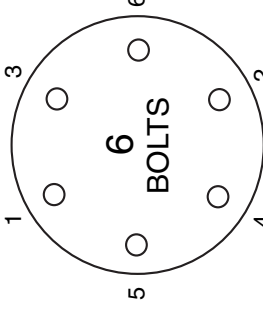
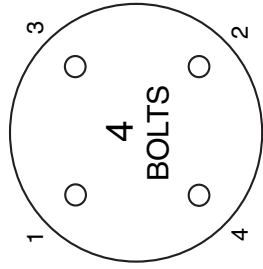
HYTROL SIZE		Stem Travel		Cover Capacity Displacement		Valve Stem Thread	Center Plug	Cover Nut or Bolt			Cover Lifting Holes UNC	Cover Plug		Cover Torque		Stem Nut**		Stem Nut Torque	
100-01	100-20	inches	mm	Gallons	Liters	UNF-Internal	NPT	Thread (Bolt)	Socket	Qty		Thread	Socket	ft. Lbs.	in. Lbs.	Thread	Socket (Long)	Lubed	DRY
1"	25							1/4" - 20 (B)	7/16"	8				4	48	3/8" - 24		4	6
1 1/4"	32					10 - 32	1/4"	5/16" - 18 (B)	1/2"	8				8	96	7/16" - 20		6	10
1 1/2"	40					10 - 32	1/4"	5/16" - 18 (B)	1/2"	8				8	96	7/16" - 20		6	10
2"	50					10 - 32	1/2"	3/8" - 16 (B)	9/16"	8		3/8"	7/16"	12	1/2" - 20	3/4"	10	15	
2 1/2"	65					10 - 32	1/2"	7/16" - 14 (B)	5/8"	8		1/2"	9/16"	20	5/8" - 18	15/16"	21	30	
3"	80	4"	100			0.080	0.30	1/2" - 13 (B)	3/4"	8		1/2"	9/16"	30	5/8" - 18	15/16"	21	30	
4"	100	6"	150			0.169	0.64	3/4" - 10 (B)	1 1/8"	8		3/4"	5/8"	110	3/4" - 16	1 1/16"	40	60	
6"	150	8"	200			0.531	2.00	3/4" - 10 (B)	1 1/8"	12		3/4"	5/8"	110	7/8" - 14	1 5/16"	85	125	
8"	200	10"	250			1.26	4.80	3/4" - 10	1 1/4"	16		5/8" - 11	1"	110	1 1/8" - 12	1 13/16"	125	185	
10"	250	12"	300			2.51	9.50	7/8" - 9	1 7/16"	20		3/4" - 10	1"	160	1 1/2" - 12	1 7/8"	252	375	
12"	300	16"	400			4.0	15.10	1 1/8" - 7	1 13/16"	20		3/4" - 10	1"	390	1 1/2" - 12	2 1/2"	270	400	
14"	350					6.5	24.60	1 1/4" - 7	2"	20		1"	13/16"	545	1 1/2" - 12	2 1/2"	280	420	
16"	400	20", 24"	600			9.6	36.20	1 1/4" - 7	2"	20		1"	13/16"	545	2" - 16	3"	500	750	
20"	500					12	45.40	1 3/8" - 6	2 1/8"	24		1"	13/16"	670	2 1/4" - 16	3 1/2"	930	N/R	
24"	600	30"	800			29.0	108.80	1 1/2" - 12	2 3/8"	24		1"	13/16"	800	3" - 12	Special	1350	N/R	

* Adapter p/n 2594101E inside 1/4" - 28"

Grade 5 Bolts
"Heavy" Grade Nuts
Tighten cover nuts in a "star" cross-over pattern

** Must Use ONLY Cla-Val Supplied part

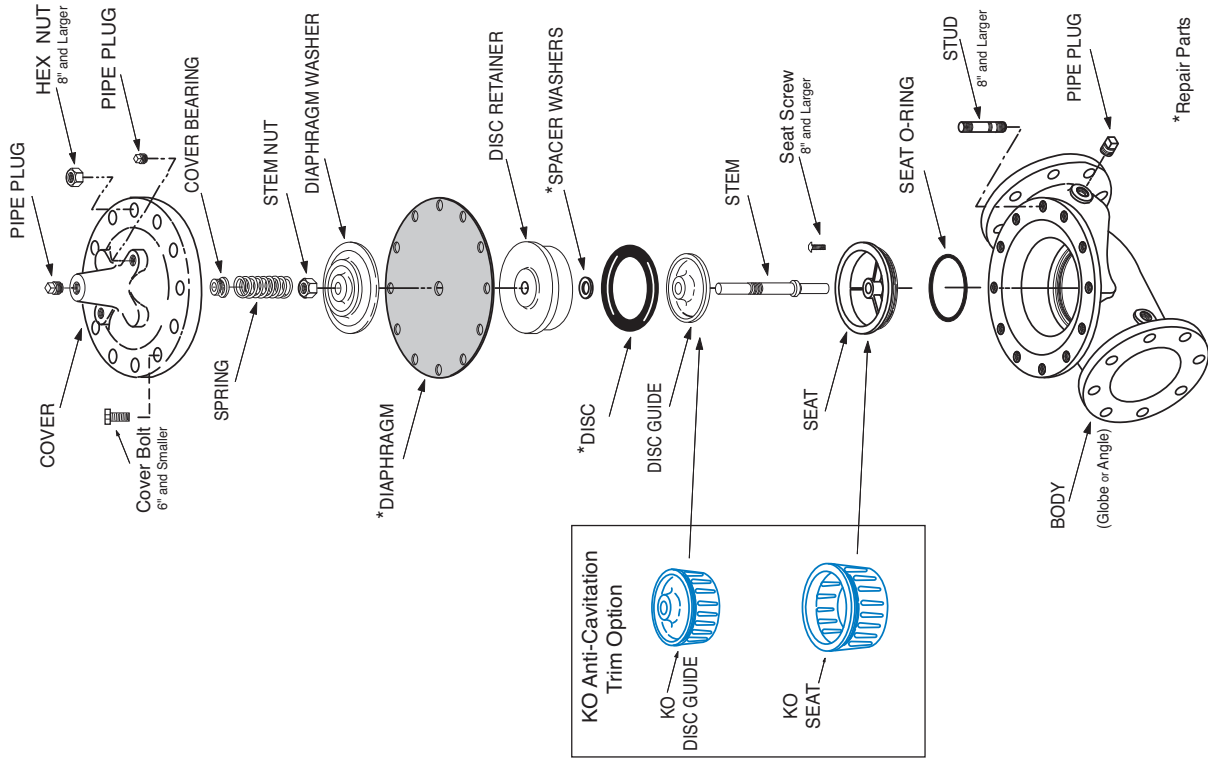
BOLT/NUT TORQUING PROCEDURES ON VALVE COVERS



Follow this procedure when reassembling MAIN Valve:

1. Tightens bolts/nuts in a "Star" or "Cross-Over" pattern following the numbers shown above to insure that cover seats evenly on the diaphragm material and body.
2. Torque the bolt/nuts in three stages with a "Star" or "Cross-Over" pattern for each stage:
 - A. To approximately 10% of final torque.
 - B. To approximately 75% of final torque.
 - C. To final required torque.
3. Valves that are to be tested to 375 PSI or higher should be retorqued after 24 hours.

100-01 Hytrol Main Valve Assembly



*Repair Parts



— MODEL — **100-20**
(Reduced Internal Port)

600 Series Hytrol Valve

SERVICE AND MAINTENANCE OF 600 SERIES VALVES

The 600 series main valves have only one part -the body- that is different from standard 100 Series Cla-Val main valve parts. The remaining parts of the 600 series main valve are standard Cla-Val main valve parts. All service and maintenance information for the standard 100 Series main valves in this manual also apply to the 600 series main valves.

The most important thing to remember when ordering main valve repair kits and replacement parts, except for the body, all other parts are going to be for a smaller size main valve. Cla-Val identifies main valve parts with the flange size of the standard 100 Series main valve. Refer to the "Main Valve Sizes Comparison" chart. For example, if you are servicing a 6" 100-20 Hytrol and needed a repair kit, you would order a repair kit for a 4" 100-01 Hytrol. This kit is also suitable for a 6" 100-20 Hytrol. Complete Technical Manuals include a repair kit data sheet N-RK that shows this relationship.

When you order repair parts, it is a good idea to include valve nameplate data (size, catalog number, and part number) and description of the parts desired. Do this to be sure parts will fit the valve you are working on and not be too big for it. Pilot controls and repair kits maintenance information remain the same for 100 or 600 Series valves.

UNDERSTANDING THE 600 SERIES VALVES

In 1987, Cla-Val introduced the Model 100-20 Hytrol as the basic main valve for the 600 Series of automatic control valves. To identify all new valves using the 100-20 Hytrol, an existing catalog number is modified. Making a 600 Series catalog number is simply done by using a "6" in front of the two digit catalog numbers or replacing the "2" with a "6" in three digit catalog numbers. Current schematics reflect both catalog numbers together separated by a slash (i.e. - 90-01/690-01, 58-02/658-02, 210-01/610-01, etc). Since these two valves 'share' the same catalog number and schematic, they provide the same function in a system. The only difference between the two valves is the relative capacity of the two main valve series.

The 100-01 Hytrol is the basic main valve for Cla-Val automatic control valves. This valve is the current version of the Clayton Hytrol valve design originated in 1936. The 100-01 Hytrol is designed as a full flow area valve. This means that the inlet, seat and outlet openings are the same size. Thus, the pressure drop is kept to a minimum for this globe style design.

The 100-20 Hytrol valve has all of the basic features and advantages of the original 100-01 Hytrol. Only one part has been changed - the body. It is designed with different size inlet, seat and outlet openings. The 100-20 Hytrol has inlet and outlet flanges one valve size larger than the seat opening size. This results in what is sometimes called a 'reduced port' main valve. For example, a 4" 100-20 valve has a 3" seat. Note: valve size is always determined by the flange size. The following chart compares the 100-01 and the 100-20 main valves.

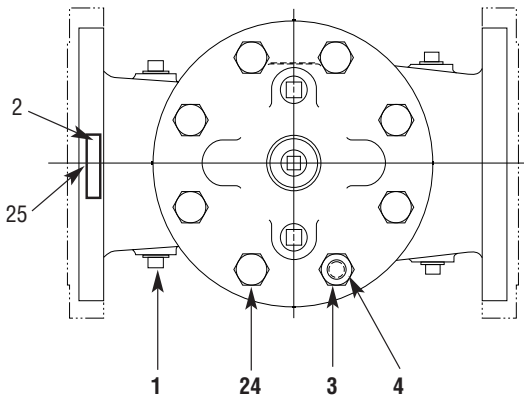
Basic Main Valve Size Comparison		
Globe Pattern Valves		
Flange Size (inch)	Seat Size	
	100-01 (100 Series)	100-20 (600 Series)
3	3	2
4	4	3
6	6	4
8	8	6
10	10	8
12	12	10
14	14	----
16	16	12
18	----	16
20	20	16
24	24	16
30	30	24
36	36	30
42	----	36
48	----	36
Angle Pattern Valves		
Flange Size (inch)	Seat Size	
	100-01 (100 Series)	100-20 (600 Series)
4	4	3
6	6	4
8	8	6

The 100-20 Hytrol is available only in ductile iron, 150 and 300 pressure class, and Bronze trim standard. Available extra cost main valve options include stainless steel trim, epoxy coating, Dura-Kleen stem, Delrin sleeved stem, and high temperature rubber parts. All four basic main valves have a 600 Series version available with all of the same benefits and size relationships. The following chart shows the relationship of Cla-Val main valve catalog numbers.

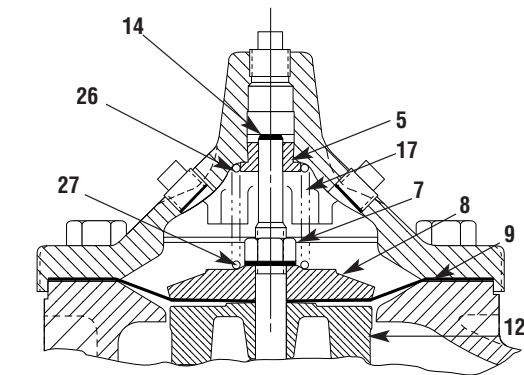
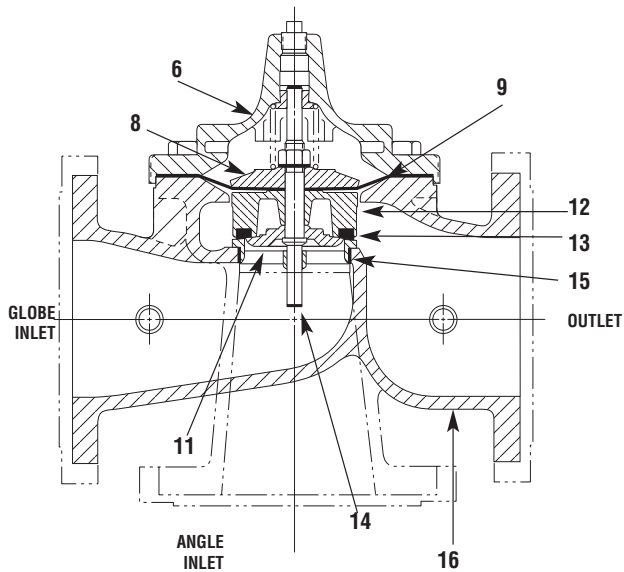
Cla-Val Main Valves

Catalog Name	Catalog Number		
	Circa 1936	100-Series	600 Series
Hytrol	100 (Angle =2100)	100-01	100-20
Powertrol	100P & 100PA	100-02	100-21
Powercheck	100PC & 100PCA	100-03	100-22
Hycheck	181	100-04	100-23

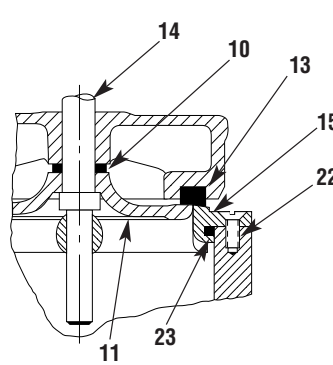
100-20



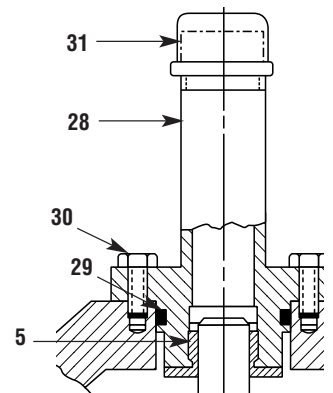
TOP VIEW



3" - 6" COVER DETAIL



10" - 24" SEAT DETAIL



20" - 24" COVER DETAIL

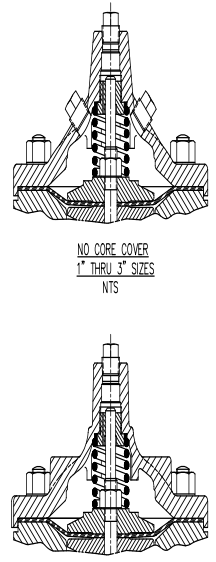
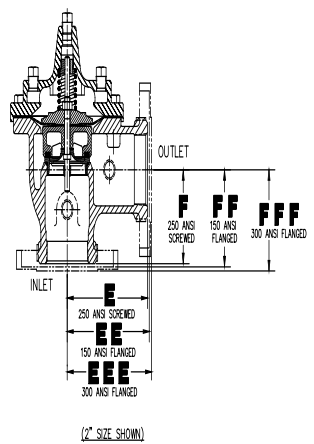
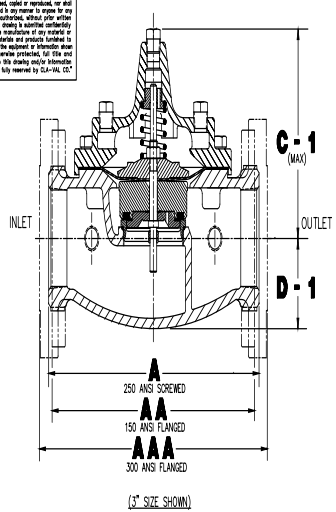
PARTS LIST

NO. DESCRIPTION

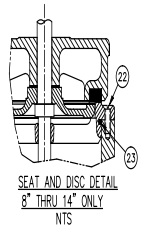
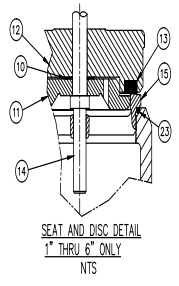
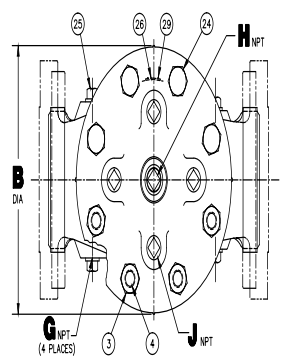
- 1 Pipe Plug
- 2 Drive Screws (for nameplate)
- 3 Hex Nut (8" and larger)
- 4 Stud (8" and larger)
- 5 Cover Bearing
- 6 Cover
- 7 Stem Nut
- 8 Diaphragm Washer
- 9 Diaphragm
- 10 Spacer Washers
- 11 Disc Guide
- 12 Disc Retainer
- 13 Disc
- 14 Stem
- 15 Seat
- 16 Body
- 17 Spring
- 22 Flat Head Screws (10" and larger)
- 23 Seat O-Ring
- 24 Hex Bolt (3" Thru 6")
- 25 Nameplate (Mounted on inlet flange)
- 26 Upper Spring Washer (Epoxy coated valves only)
- 27 Lower Spring Washer (Epoxy coated valves only)
- 28 Cover Bearing Housing (20" & 24" & 30")
- 29 Cover Bearing Housing O-Ring (20" & 24" & 30")
- 30 Hex Bolt (20" & 24")
- 31 Pipe Cap (20" & 24" & 30")

WHEN ORDERING PARTS, BE SURE TO GIVE COMPLETE NAMEPLATE DATA, ITEM NUMBER AND DESCRIPTION.

This drawing is the property of CDA-VAL CO. and same and copies may be loaned. If they shall be returned to you upon demand. Safety and attention should be made only upon condition that the user will not use, copy or reproduce, or sell the design thereof in violation of the contract or any other agreement, except on written authorization, without the written approval of CDA-VAL CO. This drawing is neither a contract and may not be used in the manufacture of any material or product after they have been made and products conforming to CDA-VAL CO. Number or not the material or dimension shown herein is optional or otherwise indicated, for the end user's benefit. If any, to and to this drawing and/or alterations herein or substituted are fully covered by CDA-VAL CO.

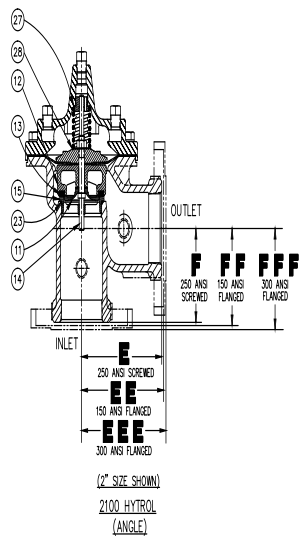
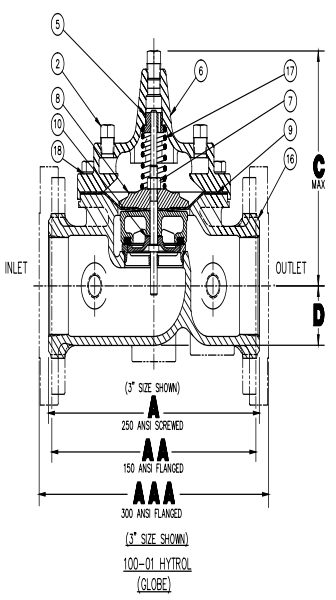


OLD STYLE BODY CONFIGURATIONS



		DIMENSION TABLE												
VALVE SIZES		1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	F
A		7.25	7.25	7.25	9.38	11.00	12.50	-	-	-	-	-	-	-
AA		-	-	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	-
AAA		-	-	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	-
B	DIA	5.62	5.62	5.62	6.62	8.00	9.12	11.50	15.75	20.00	23.62	28.00	32.75	-
C	MAX	5.50	5.50	5.50	6.50	7.56	8.19	10.62	13.38	16.00	-	-	-	-
C-1	MAX	-	4.75	4.75	5.75	6.88	7.25	9.31	12.12	14.62	17.12	20.88	24.19	-
D		1.12	1.12	1.12	1.50	1.69	2.06	3.19	4.31	5.31	-	-	-	-
D-1		-	2.00	2.00	2.50	2.88	3.12	4.25	6.00	7.56	9.25	10.75	12.62	-
E		3.25	3.25	3.25	4.75	5.50	6.25	-	-	-	-	-	-	-
EE		-	-	4.00	4.75	5.50	6.00	7.50	10.00	12.89	14.88	17.00	19.50	-
EEE		-	-	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56	17.75	20.25	-
F		1.88	1.88	1.88	3.25	4.00	4.50	-	-	-	-	-	-	-
FF		-	-	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88	-
FFF		-	-	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62	-
G	NPT	3/8"	3/8"	3/8"	3/8"	1/2"	1/2"	3/4"	3/4"	1"	1"	1"	1"	-
H	NPT	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	3/4"	3/4"	1"	1"	1-1/4"	1-1/2"	-
J	NPT	1/4"	1/4"	1/4"	3/8"	1/2"	1/2"	3/4"	3/4"	1"	1"	1"	1"	-

* 3/8" NPT FOR NO CORE COVER



** USE ON PAINTED OR EPOXY-COATED VALVES ONLY
** RECOMMENDED SPARE PARTS

ITEM NO.	DESCRIPTION	QTY
29	SCREEN DRIVE	2
28	WASHER, SPRING, LOWER **	1
27	WASHER, SPRING, UPPER **	1
26	NAMEPLATE	1
25	PLUG, PIPE, BODY	A/R
24	BOLT, HEX HD. (1" THRU 6" ONLY)	A/R
23	O-RING, SEAT	1
22	SCREW, FLAT HD. (8" THRU 14" ONLY)	A/R
21		
20		
19		
18	WASHER, FLAT	A/R
17	SPRING	1
16	BODY	1
15	SEAT	1
14	STEM	1
13	DISC	1
12	RETAINER, DISC	1
11	GUIDE, DISC	1
10	WASHER, SPACER	2
9	DIAPHRAGM	1
8	WASHER, DIAPHRAGM	1
7	NUT, STEM	1
6	COVER	1
5	BEARING, COVER	1
4	STUD (8" THRU 14" ONLY)	A/R
3	NUT, HEX (8" THRU 14" ONLY)	A/R
2	PLUG, PIPE, COVER	A/R
1	PLUG, PIPE, CENTER COVER	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGULAR
± 1/32 0.01 0.05 ± 0.5°
MAX +.02 -.02
MIN +.02 -.02

CONTRACT NO. _____
DATE _____
DRAWN BY _____
CHECKED BY _____
APPROVED BY _____

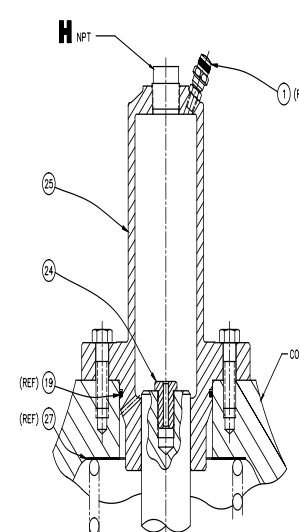
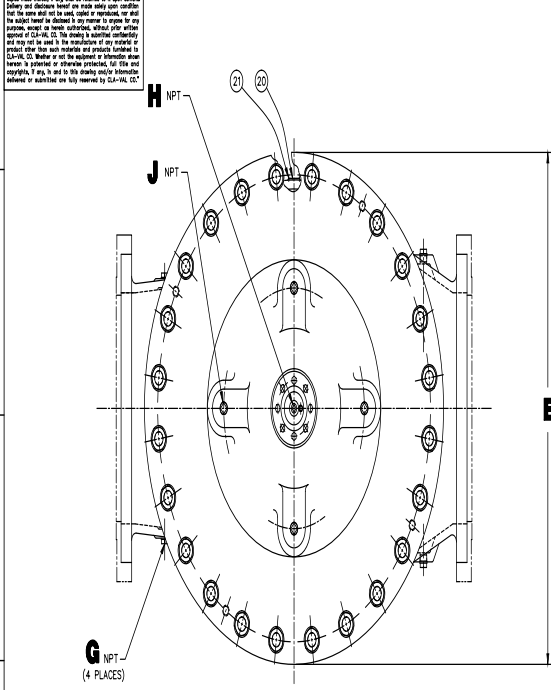
DATE: 11-22-83
REV: 11-9-82
REV: 10-21-83

ITEM NO. 86184
DESCRIPTION: 1" THRU 14" 100-01 & 2100 HYTROL

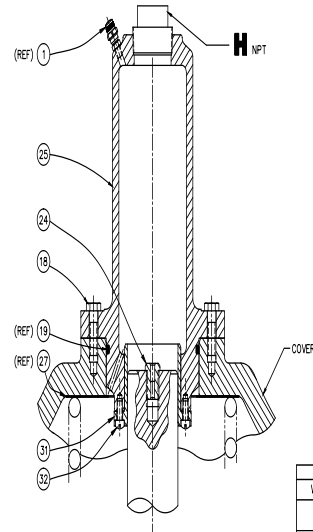
REV: M
SHEET 1 OF 2

This drawing is the property of CIA-VAL CO. and same and copies must be returned. If any part is returned to CIA-VAL CO. without a return slip, the return slip must be filled out and returned to CIA-VAL CO. with the part. Safety and explosion hazard are made only upon condition that the user must read and understand the instructions and must be familiar with the operation of the valve. The user must be familiar with the operation of the valve and must not be used in the manufacture of any material or product unless the user is familiar with the operation of the valve and must not be used in the manufacture of any material or product unless the user is familiar with the operation of the valve. If any, to and to this drawing only for information. Release or modification are fully covered by CIA-VAL CO.

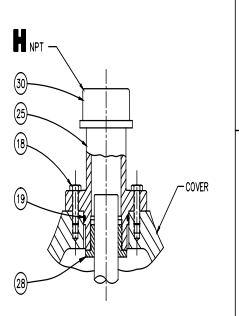
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
1	SEE SHEET 1		



HOUSING ASSEMBLY DETAIL
18", 20", & 24" SIZES ONLY
24" SIZE SHOWN
SCALE: NONE

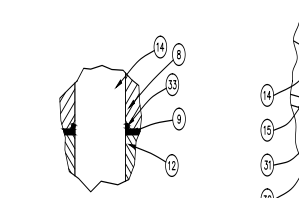


HOUSING ASSEMBLY DETAIL
30" AND 36" SIZES ONLY
36" SIZE SHOWN
SCALE: 1/2

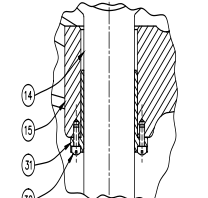


COVER BEARING/HOUSING DETAIL
16" SIZE ONLY
SCALE: NONE

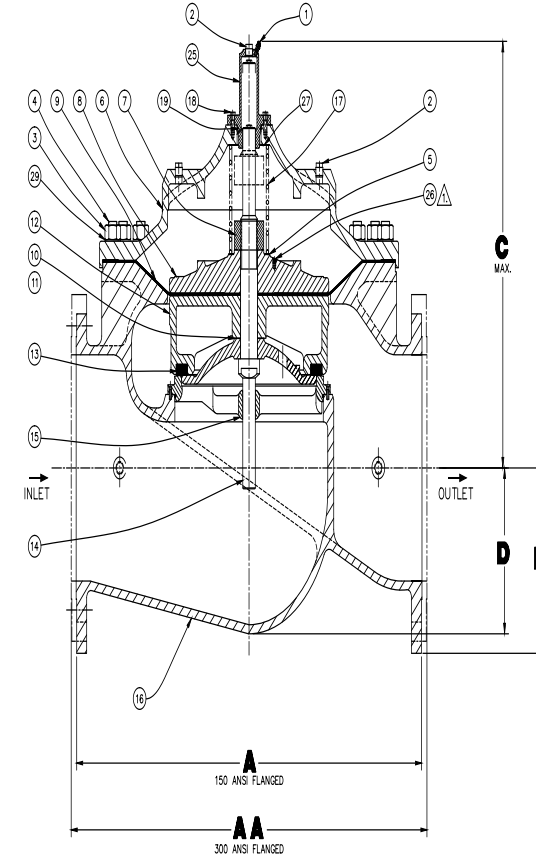
VALVE SIZES	DIMENSION TABLE					
	16"	18"	20"	24"	30"	36"
A	41.38	46.00	52.00	61.50	63.00	72.75
AA	35.50	47.64	53.62	63.25	64.50	-
B DIA	35.50	41.50	45.00	53.16	56.00	66.00
C MAX	25.00	39.06	42.21	45.00	54.60	59.00
D	15.50	12.95	15.00	17.75	21.31	24.50
E	20.81	-	-	30.75	-	-
EE	21.62	-	-	31.62	-	-
F	15.69	-	-	22.06	-	-
FF	16.50	-	-	22.90	-	-
G NPT	1"	1"	1"	1"	2"	2"
H NPT	2"	1"	1"	1"	2"	2"
J NPT	1"	1"	1"	1"	2"	2"
K	-	15.00	16.50	19.25	22.50	28.50



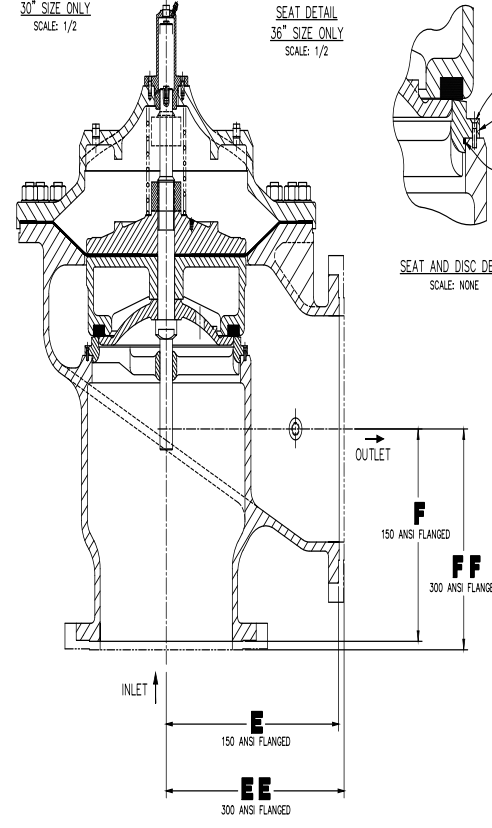
DIAPHRAGM WASHER SEAL DETAIL
30" SIZE ONLY
SCALE: 1/2



SEAT DETAIL
36" SIZE ONLY
SCALE: 1/2



(24" SIZE SHOWN)
100-01 HYTROL
(GLOBE)



(24" SIZE SHOWN)
2100-01 HYTROL
(ANGLE)

NOTES: UNLESS OTHERWISE SPECIFIED.

▲ PULL ITEM NO. 26 SCREW INTO ITEM NO. 8 DIAPHRAGM WASHER TO PRESERVE THREADS FOR FIELD SERVICE HANDLING.

** USE ON PAINTED OR EPOXY-COATED VALVES ONLY
** RECOMMENDED SPARE PARTS

ITEM NO.	DESCRIPTION	QTY
1	VALVE, PURGE (18" - 36" ONLY)	1
2	PULL, PIPE	A/R
3	NUT, HEX	A/R
4	STUD	A/R
5	WASHER, SPRING, LOWER **	1
6	COVER	1
7	NUT, STEM	1
8	WASHER, DIAPHRAGM	1
9	DIAPHRAGM	1
10	WASHER, SPACER	2
11	GUIDE, DISC	1
12	RETAINER, DISC	1
13	DISC	1
14	STEM	1
15	SEAT	1
16	BODY	1
17	SPRING	8
18	BOLT, HEX HD.	1
19	O-RING	1
20	MANEPLATE	2
21	SCREW, DRIVE	2
22	SCREW, FLAT HD.	A/R
23	O-RING, SEAT	1
24	BUSHING, ADAPTER	1
25	HOUSING	1
26	SCREW, SOCKET CUP POINT	3
27	WASHER, SPRING, UPPER **	1
28	BEARING, COVER (16" ONLY)	1
29	WASHER, FLAT	A/R
30	CAP, PIPE (16" ONLY)	1
31	INSERT, COVER BEARING (30" AND 36" ONLY)	A/R
32	SCREW, FL. HD. (30" AND 36" ONLY)	A/R
33	O-RING (30" ONLY)	1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGULAR
± 1/32 0.015 ± 0.5°
MAX +0.0025 -0.0010
MIN +0.00 -0.00
SURFACE FINISH: 125/
BREAK CORNERS: 1/16 MAX
FILLET RADIUS: 3/16
--DO NOT SCALE DRAWING--

CONTRACT NO. _____
DATE _____
APPROVAL DATE _____
DRAWN BY: WEP 11-9-82
CHECKED BY: KD 11-22-82
DATE: 11-22-82
REV: CH 10-21-83
REV: CH 10-21-83

DESCRIPTION: 16" THRU 36" 100-01 & 2100 HYTROL

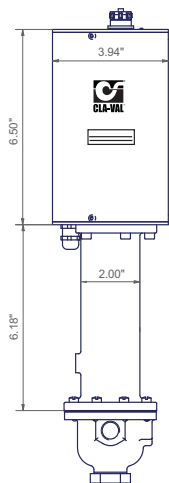
ITEM NO. 86184 QTY 90842

DATE: 1/16 & NOTED INTR/PC SHEET 2 OF 2



— MODELS — CRD-33 and CRA-33

Electronic Actuated Pressure Reducing Pilot Control

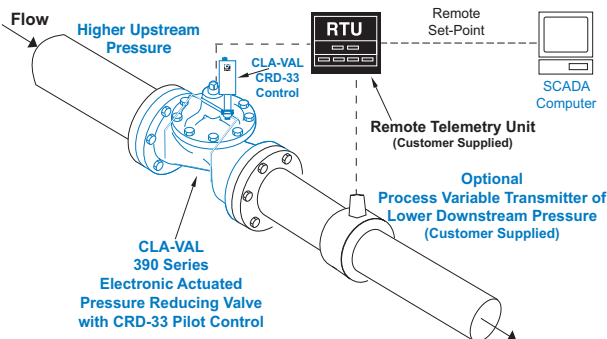


- Ideal for Pressure Management
- Simplified Remote Valve Set-Point Control
- Isolated Input
- 12-24VDC Input Power
- Reverse Polarity Protection
- IP-68 Submersible

The Cla-Val Model CRD-33 and CRA-33 Electronic Actuated Pressure Reducing Pilot Controls provide remote set-point adjustment and accurate downstream pressure control on Cla-Val 390 Series Control Valves. Remote set-point command signals can be from any SCADA-type control system using an analog 4-20 mA signal or by contact closure for cc/ccw rotation.

The CRD-33 senses valve outlet pressure directly and the CRA-33 senses downstream pressure with remote hydraulic connection. Operating on 12 to 24 VDC and consuming very little power, they are an ideal control system for remote valve sites that may even be solar powered. Existing manually-set Cla-Val 90 Series Pressure Reducing control valves can be retrofitted with CRD-33 or CRA-33 to add remote set-point control of delivery pressure. Verification of downstream pressure may be sent to SCADA system from customer supplied pressure sensor attached to valve outlet.

The CRD-33 and CRA-33 consists of a hydraulic pilot and integral controller that accepts a 4-20 mA remote set-point and positions the pilot to maintain a pressure at valve outlet within preset limits. Pressure settings are linear between these settings. Pressure settings are calibrated to the specific spring range of the control. Special USB connector cable and free downloadable software can be used to change this range if needed. Continuous internal monitoring of actuator position results in smooth transitions between pilot set-points with no backlash or dithering. Should power or control input fail, the CRD-33 or CRA-33 pilot remains in automatic hydraulic control assuring system stability under all conditions.



Typical Applications

The CRD-33 and CRA-33 are installed on Cla-Val 390 Series valves that maintain downstream pressure and require this pressure to be changed from a remote location. It can be an effective solution for lowering costs associated with "confined space" requirements by eliminating the need for entry in valve structure for set-point adjustment. It is also ideal for pressure management, and can be programmed to minimum night time and optimum daytime pressures. Optional profiler can be used to create custom correlation between pressure and flow information. Flow information can also be provided from the main valve, see E-133VF. Additional pilot controls, hydraulic and/or electronic, are also available to perform multiple functions to fit exact system requirements.



CRD-33 and CRA-33 Purchase Specifications

The Electronic Actuated Pressure Reducing Pilot Control shall have an integral hydraulic pilot and electronic controller contained in a IP-68 rated submersible enclosure to provide interface between remote telemetry and valve set-point control. It will compare a remote analog command signal with an internal position sensor signal and adjust the hydraulic pilot control spring mechanism to a new set-point position. Remote analog signal input shall be isolated and reverse polarity protected. 4-20 mA actuator position feedback output shall be supplied standard. A second command control input shall be from dry-contact switch closure for clockwise or counter clockwise actuator rotation. Assembly shall be factory calibrated to the spring range listed below.

If power fails, the control pilot valve shall continue to control main valve to last set-point command. If the Remote Set-Point signal is lost the actuator shall be programmable to go to either the 4mA, Last, or 20mA command set-point. No mechanical adjustments shall be necessary to the actuator. The low and high position range adjustment shall be accomplished only with valve manufacturer's components and instructions to be supplied in a separate kit. The assembly shall be supplied with 30 feet of cable.

The Electronic Actuated Pressure Reducing Pilot Control shall be Cla-Val Model CRD-33 or CRA-33 as manufactured by Cla-Val, Newport Beach, CA.

Pilot Control Subassembly Specifications

Adjustment Ranges

- 2 to 30 psi
- 15 to 75 psi
- 20 to 105 psi
- 30 to 300 psi

End Connection

3/8" NPT

Temperature Range

Water: to 180°F

Materials

Pilot Control: Bronze ASTM B62
Trim: Stainless Steel Type 303
Rubber: Buna-N® Synthetic Rubber

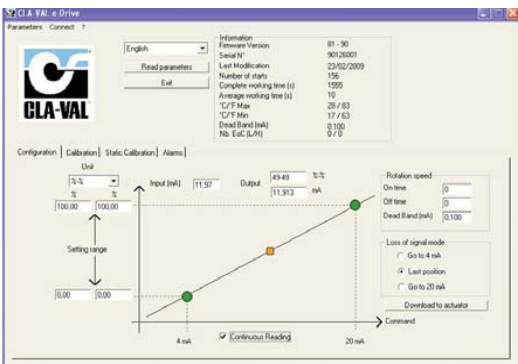
Available with optional Stainless Steel or Monel materials at additional cost. Consult factory for details.

Note: Available with remote sensing control (specify CRA-33)

Note: Total Shipping Weight: 8 Lbs.

Options:

- Re-ranging software - free download from www.cla-val.com. Ranging software makes it easy to set low (4mA) and high (20mA) set-point limits.



- USB connection cable required when changing range parameters or restoring range parameters after servicing pilot control subassembly.

CRD-33 and CRA-33 Electronic Actuator Specifications

Supply Power Input: 12V to 24V DC/24V DC

No Load draw: 50 mA

Max. Load draw: 250 mA

Remote Command Inputs:

- 4-20mA, analog signal (isolated and reverse-polarity protected)
- Dry contact closure (CW/CCW)

Position Feedback Signal: 4-20 mA

Alarm Output: Dry-contact closure (High/Low)

Speed of Rotation: Adjustable On/Off time, max 6 rpm

Diagnostic: LED Indicator

Loss of Power: Actuator will remain in last commanded position.

Loss of Signal Position: Programmable - 4 mA, Last, or 20 mA

Electrical Connections: Single, 30 feet of permanently attached cable with color-coded power supply and signal wires

Mechanical Specifications:

Environmental

Protection Class: IP-68 (Temporary submersible)

Ambient Temperature: 15° to 150° F (-10° to 65° C)

Materials

Enclosure and Bracket: Anodized Aluminum

Coupling Assembly: Stainless Steel

Gear Train: Stainless Steel, permanently lubricated

When Ordering, Please Specify

- Catalog No. CRD-33 (Direct Sensing) or CRA-33 (Remote Sensing)
- Materials - Pilot Control - Wetted Parts



E-CRD-33 and CRA-33 (R-9/2011)

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Represented By:



—MODEL— 130VC-3

Electronic Actuator for 33 Series Pilot Controls

130VC-3 Electronic Actuator for 33 Series Pilot Controls

Thank you for purchasing a 33 Series Electronic Control with 130VC-3 “e-Drive” Actuator. With proper maintenance, the actuator will perform indefinitely and provide very accurate and reliable valve control. It is built with the latest technology utilizing the highest quality components.

33 Series Controls

The 33 Series Actuated Pilot Controls for 300 Series Valves consist of a hydraulic pilot subassembly and 130VC-3 Actuator. The Cla-Val Model CDHS-33, CRA-33, CRD-33, and CRL-33 pilot controls are factory set to full adjustment range of the pilot sub-assembly. The 130VC-3 Actuator accepts a 4 - 20 mA remote command set point or dry contact closure and positions spring-loaded hydraulic pilot subassembly as it maintains set point of pressure or flow rate. The pilot subassembly is automatically linear between the limit settings.

32 Series Control Operation

A.) The 130VC-3 actuator allows 33 Series Controls to be used in valve remote control applications where a simple change of pilot set-point is needed. SCADA instrumentation provides set-point control and verification communication based on this scale. The actuator can also be controlled by simple contact closure.

B.) Other suitable valve remote control applications are where 4 - 20 mA command input signal is calibrated to specific high and low range values. SCADA instrumentation provides set-point control and verification communication based on system dynamic conditions and valve’s re-ranged scale. Using a laptop computer, the 130VC-3 actuator is calibrated in the field to specific minimum and maximum pressure or flow control settings that are in direct proportion to 4 - 20 mA command signal. Once values are established, the valve will be linear between limits and set-point will not exceed limits throughout the 4 - 20 mA signal range. For example, when actuator is calibrated to 4 mA = 50 psi to 20 mA = 100 psi, a 12 mA command signal will result in a 75 psi set point.

33 Series Actuator Hardware Set-up

BEFORE running actuator or software program, complete the following hookup steps:

Use good field wiring practices for low voltage DC analog instrumentation wiring (use 20-gauge twisted pair shielded wire minimum). Avoid potential ground loops. Avoid over tightening wiring connector fasteners.

The enclosure is rated IP-68 (similar to NEMA 6P) submersible for short periods of time. It is not intended for continuous underwater use. Consult Cla-Val factory technical support if you have questions. The ten-wire ten meter cable is permanently attached to 130VC-3 actuator and should be terminated in suitable junction box or directly into an above grade RTU or similar device. Care should be used when attaching to wires to avoid damage. Installation of suitable protection from lightning is highly recommended.

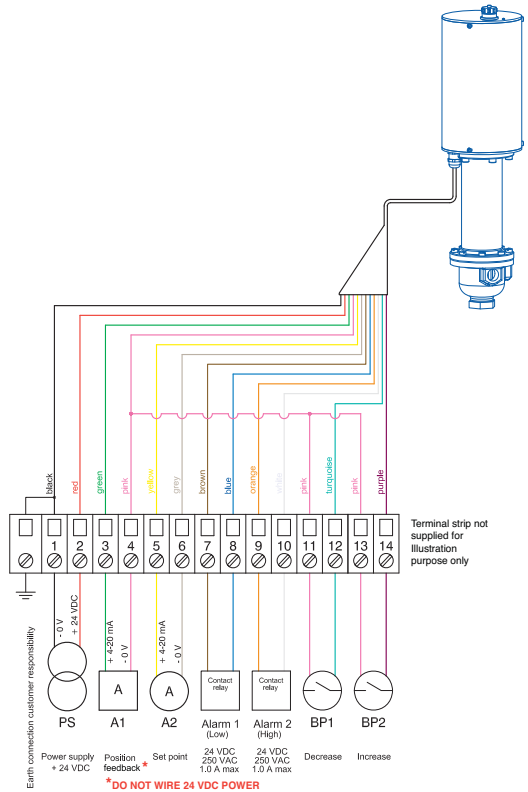
There are no user serviceable parts inside the actuator and tampering or opening it will void the warranty. The ten-wire actuator cable is permanently attached. Internal damage not covered by warranty will occur if cable is removed.

FIELD WIRING STEPS:

Terminate wires only applicable to your application. For example, minimal wiring requirements for power and remote set point are:

1.) Attach 12 to 24 VDC power to 130VC-3 Actuator cable. Black wire is for (-) negative; Red wire is for (+) positive. Provide minimum 500 mA supply.

2.) Attach 4 to 20 mA analog Remote Command Input (from SCADA system or loop calibrator) to 130VC-3 Actuator cable. Yellow is positive and Grey is negative.



Download Wiring Diagram from website (www.cla-val.com)

3.) After wiring is complete and actuator is powered, it can be used with 4 - 20 mA remote command input signal scaled to factory default pilot control adjustment range (Operation A, above).

Troubleshooting Actuator Set-up

1.) The actuator LED will remain red for approximately 30 seconds after power on, and then will switch to green indicating actuator is OK and that internal start-up test is complete.

2.) The actuator LED blinks red if there is a problem. After resolving the problem, reset the actuator by turning power off for ten seconds then on again.

3.) The actuator blinks red and green if still in the calibration mode. It will be necessary to finish calibration.

32 Series Software Kit

For Operation A (above) applications, no changes to the 33 Series control preset values are needed. For Operation B (above) applications, the 33 Series Software kit is used to ONLY change factory-set values of: 1) range limits (high and low), 2) rotational speed of actuator, and 3) loss of signal mode. It is used only for set-up of 33 Series pilot controls during initial valve start-up or during valve repair.

The Cla-Val 130VC-3 Software Kit is required to communicate between your Windows XP laptop computer and 130VC-3 Actuator. It consists of a free software program, a special multi-USB connector cable, and these instructions. The software is obtained by downloading from our website. Only one cable is needed to work with all 130VC-3 Actuators. Replacement cables (p/n 20519203A) can be ordered at extra cost. ADAPTOR. Do not use this software for remote control of 130VC-3 Actuator.

Software Download Instructions

Supported Operating Systems are Windows XP and XP Service Pack 2

- 1) Go to Cla-Val website (www.cla-val.com) and navigate to 33 Series actuator software download page. Click the Download 130VC-3 Range Software button to start the download.
- 2) Do one of the following:
 - _ To start the installation immediately, click RUN to run this program from its current location.
 - _ To copy the download to your computer for installation at a later time, click SAVE to save this program.
- 3) This program will automatically be installed in new e-Drive folder in C: Program Files/Cla-Val folder on your computer. A new Cla-Val folder is created in Program Files folder and an "e-Drive" icon link is created on Desktop to start program.

33 Series Actuator and Software Set-up

Change 130VC-3 Actuator configuration from factory default settings, by using free download software from website (www.cla-val.com). To set up a communication link with 130VC-3 Actuator, first install software and cable driver and then special USB communications cable in laptop computer. After installing driver and communication cable, the actuator must be powered for link to work. Follow hardware set-up and wiring diagram instructions. Your computer must be on before powering the actuator.

Hardware set-up steps must be completed before program will communicate and change 130VC-3 factory default settings. Until wiring and power connections are made to the actuator, the software program can be opened, but new parameters can not be created or stored or sent to actuator. Changes to parameters must be done "live" and while control valve is operating.

Cla-Val multi-USB Driver Setup

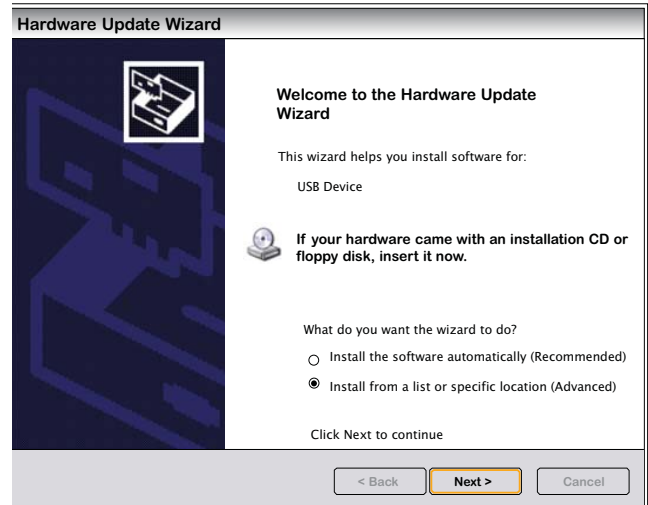
When 130VC-3 communications cable is installed in your laptop computer USB port for the first time, Windows will search your computer for the cable multi-USB driver. If Windows Plug-and-Play does not automatically find the driver and connect to actuator, then the cable driver must be set-up manually. Use the following instructions to manually activate the cable driver.

Download multi-USB software from the Cla-Val web site:

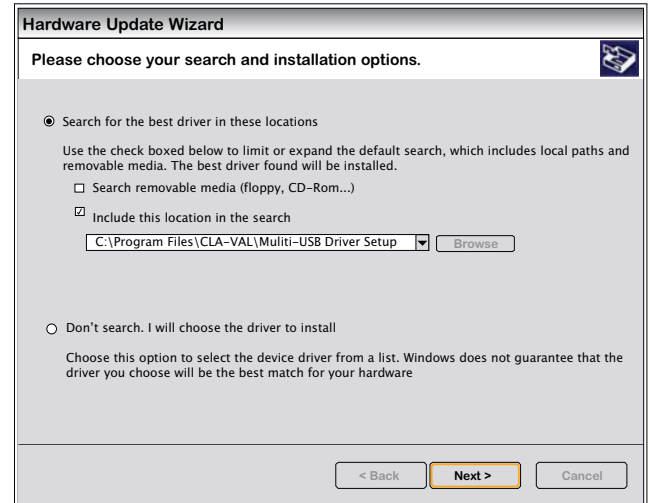
www.cla-val.com

Connect the USB cable to the laptop.

Select: "Install from a list or specific location".



Browse to file: C:\Program Files\CLA-VAL\Multi-USB Driver Setup.



Microsoft validation press "Continue Anyway"

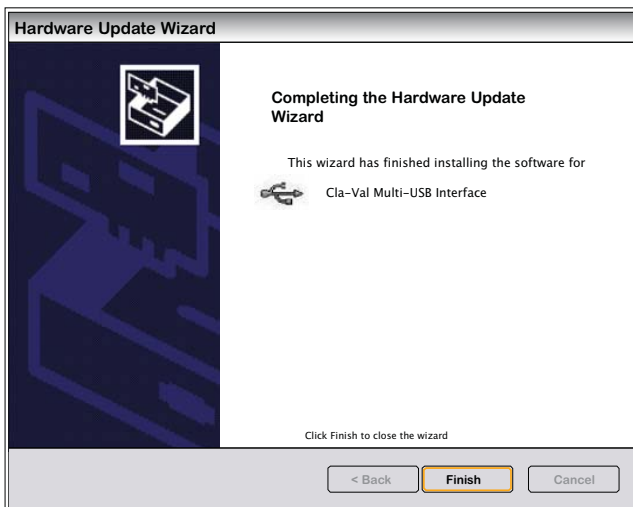
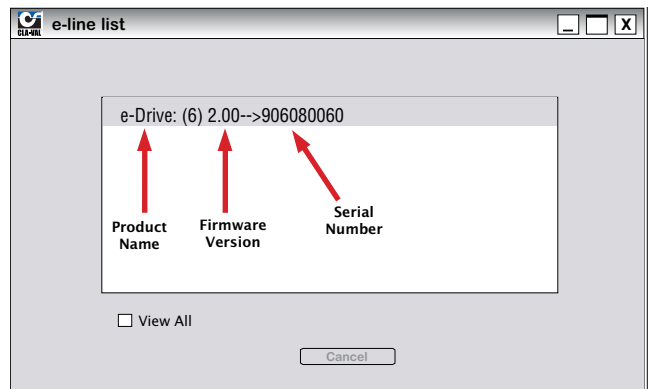


Setting the restore point during installation



If connected to one or more actuators, click on "View All" and select the actuator you would like to communicate with from the list then click once on left mouse button.

Product name, Firmware version and serial number are displayed.

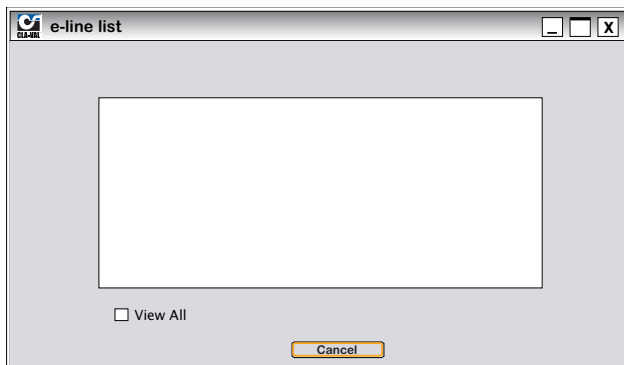


Installation complete.

Opening Software

When the "e-Drive" desktop icon is clicked, the Actuator List will be displayed, which can contain multiple listing of the actuators.

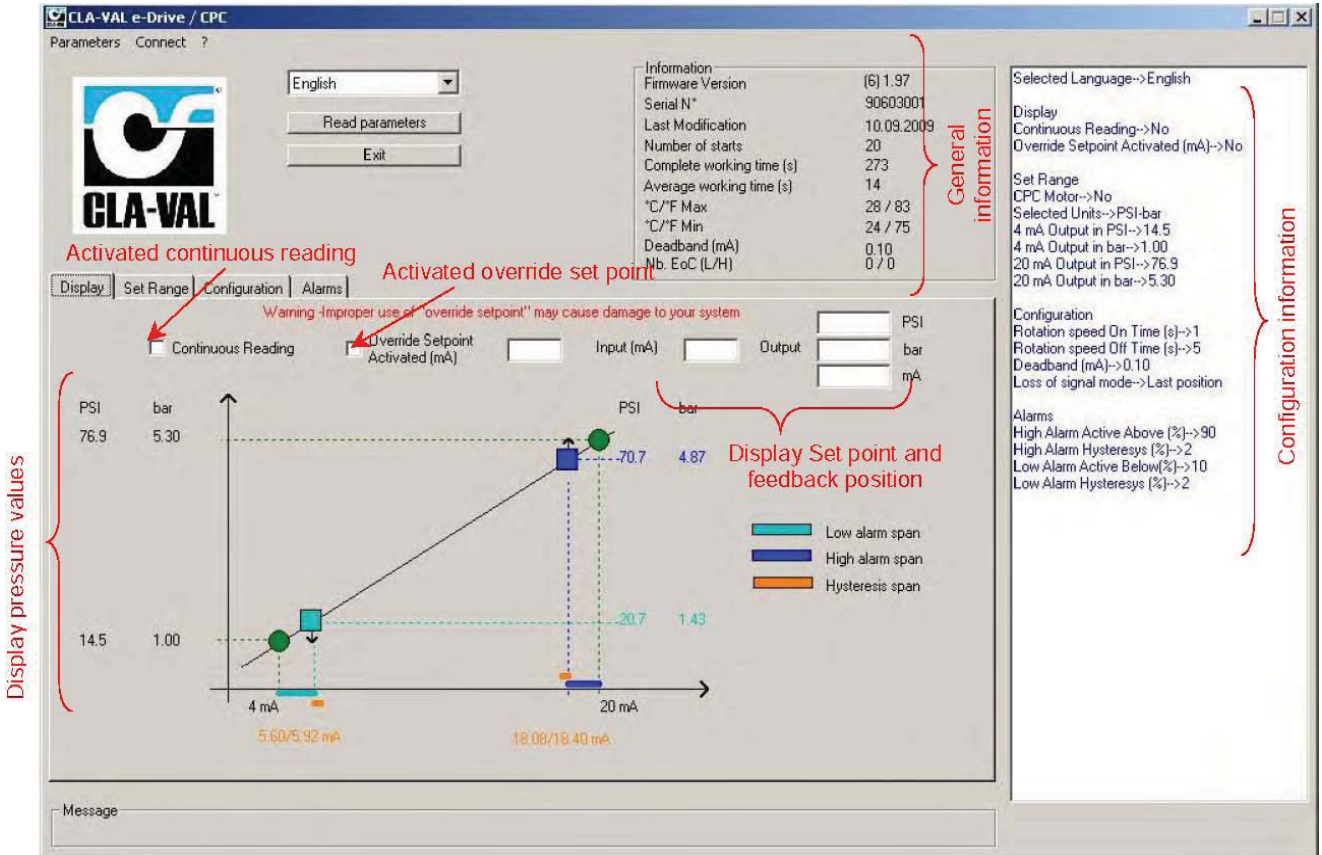
If the actuator is not connected to the laptop, the window will be empty but can be used to view the software to become familiarized with the different windows. Click the "cancel" button to launch the software



Starting Actuator Software

First, be sure hardware set-up and wiring to actuator is completed. Connect laptop computer to actuator using special multi-USB cable. Be sure computer is on and actuator is powered. Check that Actuator LED is steady green. The first window to appear will be display.

Display



LIN039UE-01

- 1 Start the e-Drive / CPC CLA-VAL software.
- 2 Select the e-Drive in the e-Line list.
- 3 Select language and click "Read parameters".
- 4 The right side will display specific configuration information. Also general information including the date of latest calibration, the average & total working time since the first power up, the number of starts, the serial number, the firmware version and the maximum and minimum recorded temperature is displayed.
- 5 Click on continuous reading to see the position of e-Drive, set point (mA) and, if used feedback position (mA and units).
- 6 To manually change the setting, write the setting and click on "Override Set point".

CAUTION: Improper use of "Override Set point" may cause damage to your system



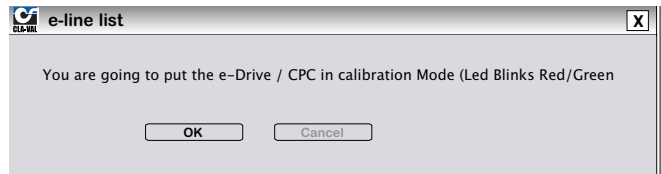
Calibration - Static and Dynamic

Before beginning the calibration process, determine if it is actually necessary! The actuator, if new, has been factory calibrated to the spring range shown on the pilot and may not require further calibration (30-300 spring range is calibrated from 40 to 140 psi).

Static calibration

Static calibration is a fast and convenient method of calibrating the actuator by calculating the 4 and 20 mA values rather than raise or lower the actual system pressure. Dynamic Calibration requires that the system pressure is actually raised and lowered to the system values desired.

The "Set Range" window will launch either Static or Dynamic calibration. When the "Set Range" is activated, the following message will be displayed. To continue with calibration, click "OK", if not click "Cancel".



- 1 Select "Static Calibration" Mode. The "CPC Motor" check box should unchecked (Disabled).
- 2 Use increase and decrease buttons to put valve in control of system. This will establish the reference set point.
- 3 Determine the pilot spring range. (Check nameplate label on pilot). Get the pressure change per turn per pilot revolution from the spring chart. Calculate the number of turns between the reference set point and desired low and high pressures.
- 4 These numbers are the "Value at 4 mA" and the Value at 20 mA". Numbers must be positive and can have up to 2 decimal places.
- 5 Enter the low value in set-point window (1).
- 6 Enter the high value in set-point window (2).
- 7 Click "Write Set Range" tab to complete actuator to complete calibration.

Model	Spring Range (psi)	PSI change / turn
CRD-33	15-75	9.1
CRD-33	20-105	11.2
CRD-33	40-140	26.8
CDB-33	5-25	3.8
CDB-33	10-60	11.5
CDB-33	20-80	13.9
CDB-33	50-150	28.3
CDB-33	65-180	42.4
CRL-33	7-75	9.1
CRL-33	20-105	14.8
CRL-33	20-200	28.6

GUIDANCE NOTES
 Low Point setting
 Adjust the number of turn to reach 4mA value setting corresponding to your spring.
 High Point setting
 Adjust the number of turn to reach 20mA value setting corresponding to your spring.

Example:

Valve is in control operating at 45 psi (3 bar).

The desired pressure at 4 mA is 30 psi (2 bar).

The desired pressure at 20 mA is 70 psi (4.8 bar).

From the spring chart, using a 15-75 spring, the pressure per turn is 10.2 psi (0.7 bar). The number of turns to Low set point is equal to 45 psi (3 bar) minus 30 psi (2 bar) divided by 10.2 psi (0.7 bar) = 1.47 turns. The number of turns to High set point is equal to 70 psi (4.82 bar) minus 45 psi (3 bar) divided by 10.2 psi (0.6 bar) = 2.45 turns.



Dynamic Calibration

When using this method, the system pressures must be changed from the actual minimum to maximum set-point values. If this is not possible, use "Static Calibration" mode.

- 1 Press the Set Range tab and select the Dynamic Calibration mode. Uncheck the "CPC Motor".
- 2 Select Units.
- 3 Enter the pressure/flow value at 4 mA and at 20 mA.
- 4 "Low point setting" - Look at the pressure/flow gauge/display and use the "Decrease actuator" button until the low pressure/flow setting is attained.
- 5 Click on "Low point setting" button to store the value.
- 6 "High point setting". Look at the pressure/flow on the gauge/display and use the "Increase actuator" button until the high pressure/flow setting is attained.
- 7 Click on the "High point setting" tab to store value.
- 8 When all values have been entered, click on "Write Set Range". Dynamic calibration is done.

Configuration

Use the configuration mode to set the rotation speed, dead band and loss of signal values.

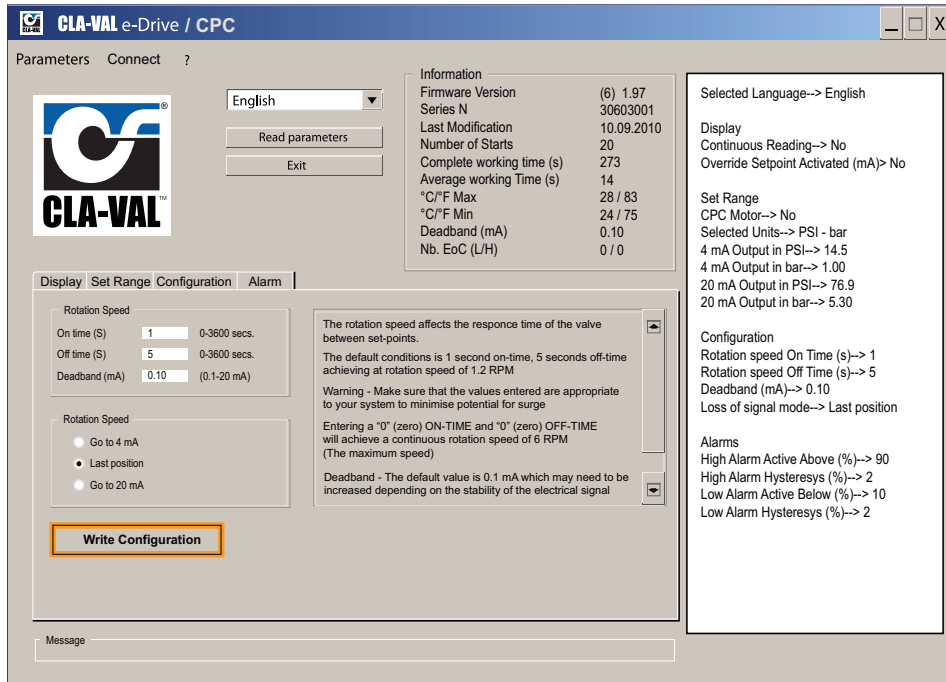
- 1 Rotation speed affects the response time of the valve between set-points. The default condition is 1 second on-time, 5 seconds off-time achieving at rotation speed of 1.2 rpm. Entering a '0' (zero) on time and '0' (zero) off time will achieve a continuous rotation speed of 6 rpm (maximum speed).



Make sure that the values entered are appropriate to your system to minimize the potential for surge.

- 2 Dead band - The default value is 0.1 mA. This value can be increased depending on the stability of the of the set point signal. The actuator is internally isolated however, If the set point is inherently unstable, the actuator can dither. If this happens, improve the signal or increase the dead band.
- 3 Choose the loss of set point signal mode:
 - a. Go to 4 mA: Actuator will default to the 4 mA position (low set point).
 - b. Last position: Actuator will maintain the last position.
 - c. Go to 20 mA: Actuator will default to the 20 mA position (high set point).
- 4 Click on "Write Configuration" button to complete configuration.



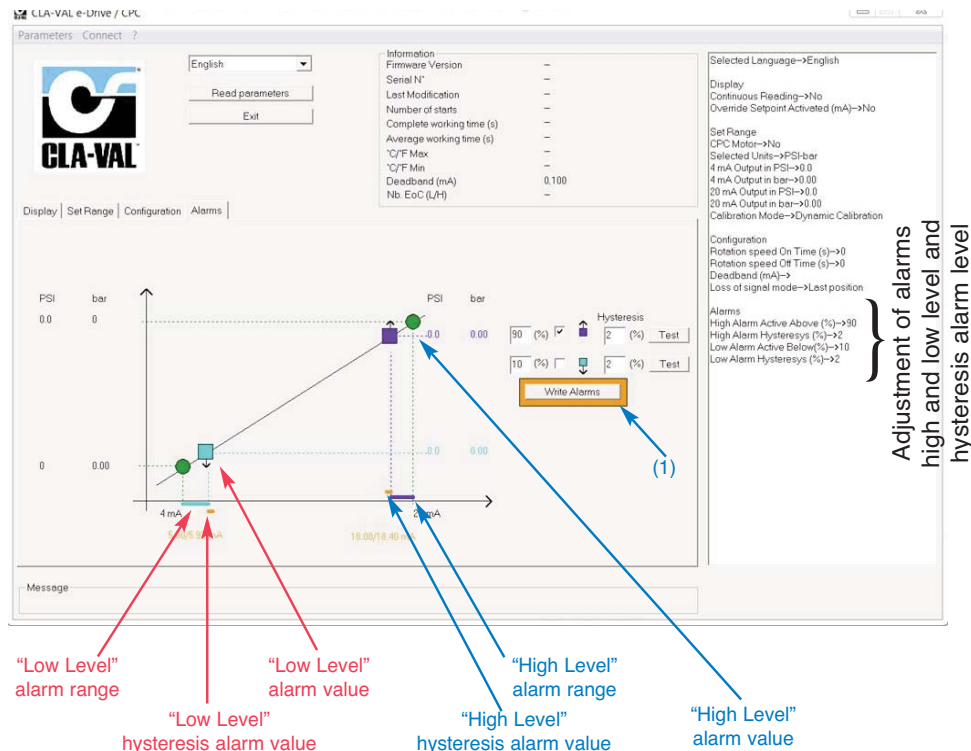


Alarms

The actuator has a Low and High Alarm with an adjustable hysteresis and is activated as shown in the lower window:
 Example: 10% Low alarm = 4 mA + (10% x 16 mA) = 5.6 mA. 90% High alarm = 4mA + (90% x 16 mA) = 18.4 mA.

Hysteresis

- 1 Hysteresis prevents chattering of the alarms when the set point is very close to the alarm status. It is calculated as follows:
 $4 \text{ mA} + (2\% \times 16 \text{ mA}) = 0.32 \text{ mA}$. Low alarm hysteresis therefore equals $5.6 \text{ mA} + 0.32 \text{ mA} = 5.92 \text{ mA}$. High alarm hysteresis equals $18.4 \text{ mA} - 0.32 \text{ mA} = 18.08 \text{ mA}$.
- 2 Enter the requested percentage, for the alarms and hysteresis.
- 3 Click on "Test" to close or open your contact relay.
- 4 Click on "Write Alarms" button to complete.



Troubleshooting FAQ

LED Diagnostics

When power is applied to the actuator, the LED will be red for approximately 5-30 seconds, and then will change to solid green.

Green

OK.

No light

Check power supply.

Red

High torque limit has been exceeded - Power down and power up again

Excessive Voltage has been applied (Above 32 Volts).

Blinking red/green

Calibration was not completed - recalibrate

Changing set-point without a 4-20 mA command signal with the USB cable connected to

Go to 'Display' tab and select Milliamp value and check the box to activate.

Changing set-point without a command signal without an e-Drive - USB cable.

Refer to wiring diagram.

To Increase Actuator connect the Purple Wire with the Pink.

To Decrease Actuator connect the turquoise Wire with the Pink.

To Increase or Decrease the actuator without 4-20 mA signal.

Refer to wiring diagram in the this manual. To increase actuator connect the purple wire to the pink. To decrease actuator, connect the turquoise wire to the pink.

What are the default settings for the 130VC-3 actuator?

Factory default setting for 130VC-3 Actuator range parameter is the full pilot spring range scaled to match the 4 to 20 mA Remote Command Input analog signal. Factory default setting for 130VC-3 Actuator rotation speed is one rpm with 24 VDC power.

How do I get the software to work with the actuator?

To set up a link with 130VC-3 Actuator, first install cable driver and then the special multi-USB communications cable. After installing driver and communication cable, the Actuator must be powered for link to work. Follow wiring diagram and hardware hookup instructions. Download Wiring Diagram from website (www.cla-val.com).

How do I install Special USB Communication Cable?

When 130VC-3 communications cable is installed in your laptop computer USB port for the first time, Windows will search your computer for the cable USB driver. If Windows Plug and Play does

not automatically find the driver and connect to actuator, then the cable driver must be set up manually. Windows will take you step-by-step through the manual set up process. The cable USB driver is installed during software download. You will have to browse to the Cla-Val folder created during download where the driver file is located. Details are in this manual.

My computer does not have a USB port

Older laptop computers with only Serial port may have a problem using USB to Serial adapter with special USB connector cable and communicating with 130VC-3 actuator. Make sure the USB to Serial adapter cable is less than 18 inches long. Also, USB extension cables should not be used because they will degrade signals and cause problems. If problem persists, consult Cla-Val factory technical support.

Why is actuator LED still blinking red/green after I downloaded the settings?

Once the calibration mode button is activated, all steps must be done before downloading is begun. Actuator LED will show green when downloading is successful and complete.

Can I make a file ahead of time and download it to 130VC-3 later?

All hardware hookup steps must be completed before program will communicate and change 130VC-3 parameters. Until wiring and power connections are made to the actuator, this program can be opened, but new parameters can not be created or stored or sent to the actuator. Changes to parameters must be done "live" and while control valve is operating. Actuator LED will show green when downloading is successful and complete.

GENERAL DISCLAIMER

In accordance with our policy of continuous development and improvement, CLA-VAL reserves the right to modify or improve its products at any time without prior notice. CLA-VAL assumes no liability or responsibility for any errors or omissions in the content of this document.

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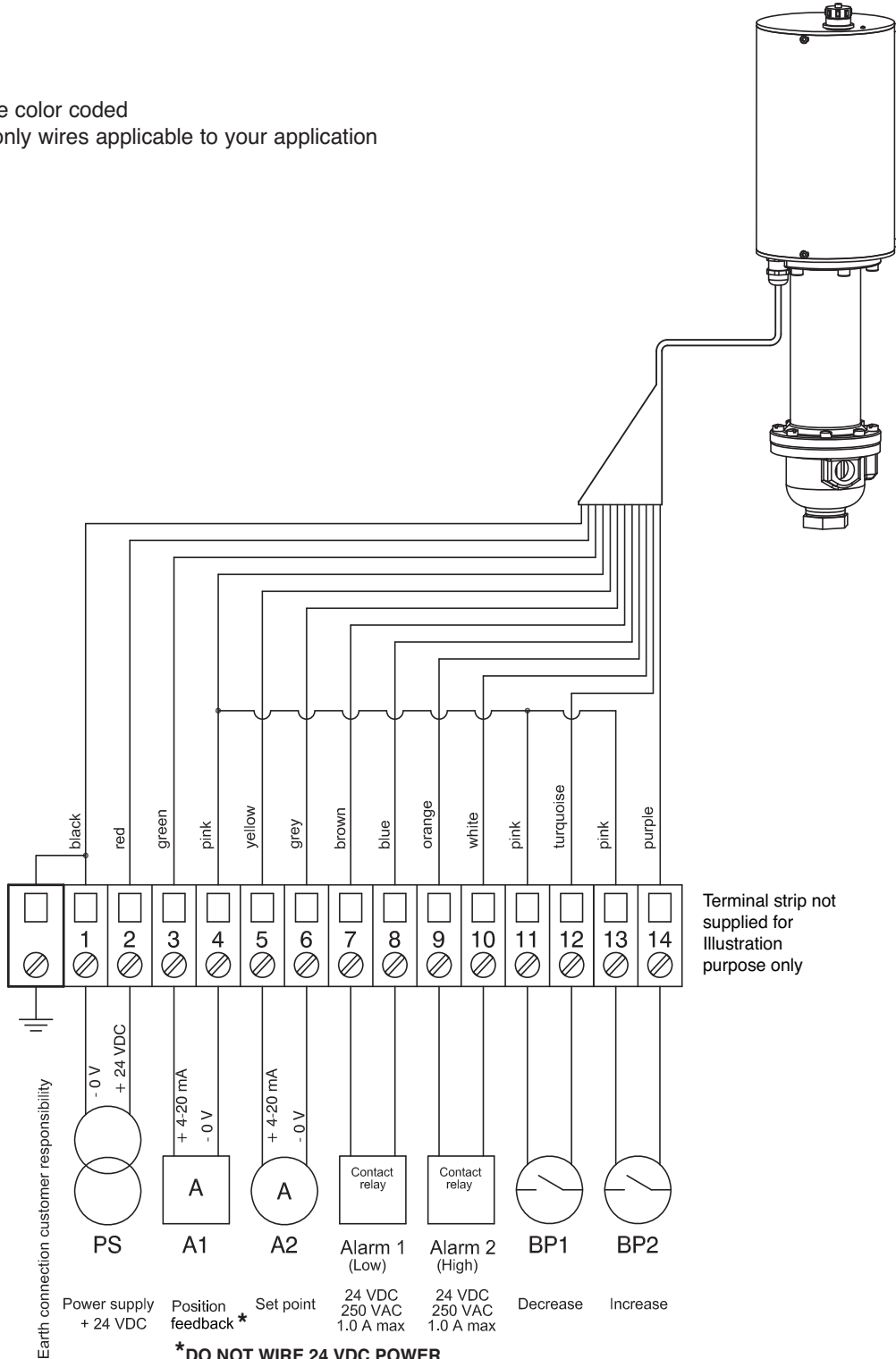
Porte du Grand Lyon 1
ZAC du Champ du Périer
France - 01700 Neyron
Phone: 33-4-72-25-92-93
Fax: 33-4-72-25-04-17
E-mail: cla-val@cla-val.fr



130VC-3 33 Series Actuator Wiring Diagram

Note:

1. All wires are color coded
2. Terminate only wires applicable to your application





NEWPORT BEACH, CALIFORNIA

CATALOG NO.
X58C

DRAWING NO.
48834

REV
AP

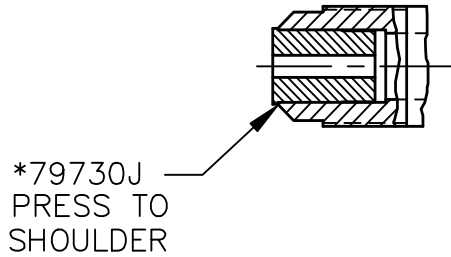
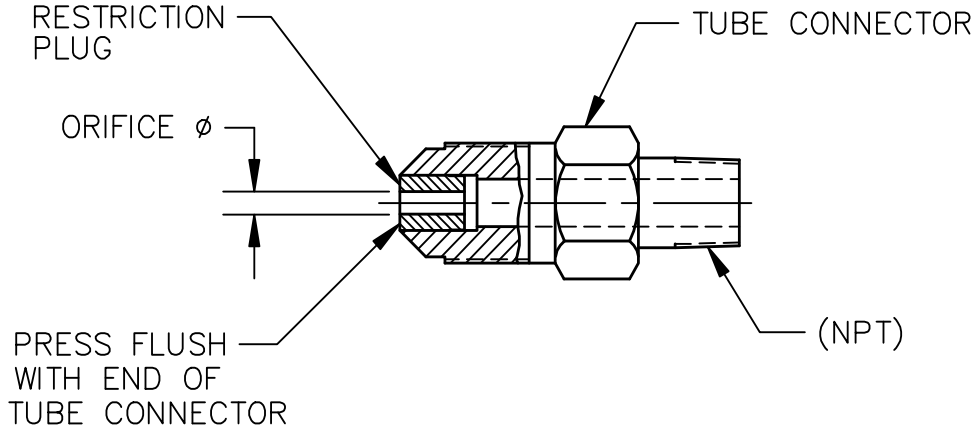
TYPE OF VALVE AND MAIN FEATURES

X58C RESTRICTION ASSEMBLIES

DESIGN		
DRAWN	JC	12-3-85
CHK'D	JC	12-4-85
APV'D	CH	12-11-85

TLC	10-18-94
AK	09-15-98
EK	9-29-11
AM	REINSTATED PN 68565B & 64673H (ECO 15043)
AN	ADDED PN 48834-05F (NED 43663)
AP	ADDED PN 48834-06D (NED 75779)

CAD REVISION RECORD - DO NOT REVISE MANUALLY	
DESCRIPTION	DATE
BY	
EK	11-18-93
AL REDRAWN ON CAD (ECO 14229)	
LTR	
A-AK	SEE REVISION FILE



NOTES:

1. *FOR IDENTIFICATION, THESE STOCK NO'S ARE TO BE STAINED BLUE WITH 74234-03.
2. **FOR IDENTIFICATION, THESE STOCK NO'S ARE TO BE STAINED RED WITH 74234-05.
3. SEE DWG 76740 FOR STAINLESS STEEL X58C.
4. SEE SHEETS 3 & 4 FOR UL APPROVED DRAWING.



NEWPORT BEACH, CALIFORNIA

CATALOG NO.
X58C

DRAWING NO.
48834

REV
AP

TYPE OF VALVE AND MAIN FEATURES

X58C RESTRICTION ASSEMBLIES

DESIGN		
DRAWN	JC	12-3-85
CHK'D	JC	12-4-85
APV'D	CH	12-11-85

X58C STOCK NO.	TUBE CONNECTOR		RESTRICTION PLUG	
	SIZE TUBE X NPT	MATERIAL	ORIFICE DIA	MATERIAL
**44734C	3/8 X 3/8-18 NPT	ALUMINUM	.125 (1/8)	S. STEEL
	<u>37° FLARE</u>			
*37814B	1/4 X 1/8-27 NPT	BRASS	.031 (1/32)	S. STEEL
*80500C	1/4 X 1/8-27 NPT	BRASS	.062 (1/16)	S. STEEL
*67739D	3/8 X 1/8-27 NPT	BRASS	.040	S. STEEL
*64672K	3/8 X 3/8-18 NPT	BRASS	.062 (1/16)	S. STEEL
*99329-01D	3/8 X 3/8-18 NPT	BRASS	.094 (3/32)	S. STEEL
**79730J	1/2 X 1/2-14 NPT	BRASS	.125 (1/8)	S. STEEL
**48834-05F	3/8 X 3/8-18 NPT	BRASS	.125 (1/8)	S. STEEL
*85484E	1/4 X 1/8-27 NPT	BRASS	.031 (1/32)	DELTRIN
*85486K	1/4 X 1/8-27 NPT	BRASS	.040	DELTRIN
**48834-03A	1/4 X 1/8-27 NPT	BRASS	.125 (1/8)	DELTRIN
*48834-04J	1/4 X 1/8-27 NPT	BRASS	.093	DELTRIN
*88409-01G	3/8 X 1/8-27 NPT	BRASS	.031 (1/32)	DELTRIN
*88409J	3/8 X 1/8-27 NPT	BRASS	.052	DELTRIN
*42346H	3/8 X 1/8-27 NPT	BRASS	.062 (1/16)	DELTRIN
**48834-01E	3/8 X 1/8-27 NPT	BRASS	.125 (1/8)	DELTRIN
*42775H	3/8 X 1/4-18 NPT	BRASS	.062 (1/16)	DELTRIN
**63604D	3/8 X 1/4-18 NPT	BRASS	.156 (5/32)	DELTRIN
*10253D	3/8 X 3/8-18 NPT	BRASS	.031 (1/32)	DELTRIN
*46946A	3/8 X 3/8-18 NPT	BRASS	.062 (1/16)	DELTRIN
**64673H	3/8 X 3/8-18 NPT	BRASS	.125 (1/8)	DELTRIN
*68565B	3/8 X 3/8-18 NPT	BRASS	.094 (3/32)	DELTRIN
**43302K	3/8 X 3/8-18 NPT	BRASS	.188 (3/16)	DELTRIN
**12900H	1/2 X 1/2-14 NPT	BRASS	.125 (1/8)	DELTRIN
**48834-02C	1/2 X 1/2-14 NPT	BRASS	.188 (3/16)	DELTRIN
**48834-06D	1/2 X 1/2-14 NPT	BRASS	.250 (1/4)	DELTRIN

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

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— MODEL — **CRD**

Pressure Reducing Control



DESCRIPTION

The Cla-Val Model CRD Pressure Reducing Control automatically reduces a higher inlet pressure to a lower outlet pressure. It is a direct acting, spring loaded, diaphragm type control that operates hydraulically or pneumatically. It may be used as a self-contained valve or as a pilot control for a Cla-Val main valve. It will hold a constant downstream pressure within very close pressure limits.

OPERATION

The CRD Pressure Reducing Control is normally held open by the force of the compression spring above the diaphragm; and delivery pressure acts on the underside of the diaphragm. Flow through the valve responds to changes in downstream demand to maintain a pressure.

INSTALLATION

The CRD Pressure Reducing Control may be installed in any position. There is one inlet port and two outlets, for either straight or angle installation. The second outlet port can be used for a gage connection. A flow arrow is marked on the body casting.

ADJUSTMENT PROCEDURE

The CRD Pressure Reducing Control can be adjusted to provide a delivery pressure range as specified on the nameplate. Pressure adjustment is made by turning the adjustment screw to vary the spring pressure on the diaphragm. The greater the compression on the spring the higher the pressure setting.

1. Turn the adjustment screw in (clockwise) to increase delivery pressure.
2. Turn the adjustment screw out (counter-clockwise) to decrease the delivery pressure.
3. When pressure adjustment is completed tighten jam nut on adjusting screw and replace protective cap.
4. When this control is used, as a pilot control on a Cla-Val main valve, the adjustment should be made under flowing conditions. The flow rate is not critical, but generally should be somewhat lower than normal in order to provide an inlet pressure several psi higher than the desired setting

The approximate minimum flow rates given in the table are for the main valve on which the CRD is installed.

Valve Size	1 1/4" -3"	4"-8"	10"-16"
Minimum Flow GPM	15-30	50-200	300-650

SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to open when delivery pressure lowers	No spring compression	Tighten adjusting screw
	Damaged spring	Disassemble and replace
	Spring guide (8) is not in place	Assemble properly
	Yoke dragging on inlet nozzle	Disassemble and reassemble properly (refer to Reassembly)
Fails to close when delivery pressure rises	Spring compressed solid	Back off adjusting screw
	Mechanical obstruction	Disassemble and reassemble properly (refer to Reassembly)
	Worn disc	Disassemble remove and replace disc retainer assembly
	Yoke dragging on inlet nozzle	Disassemble and reassemble properly (refer to Reassembly)
Leakage from cover vent hole	Damaged diaphragm	Disassemble and replace
	Loose diaphragm nut	Remove cover and tighten nut

MAINTENANCE

Disassembly

To disassemble follow the sequence of the item numbers assigned to parts in the sectional illustration.

Reassembly

Reassembly is the reverse of disassembly. Caution must be taken to avoid having the yoke (17) drag on the inlet nozzle of the body (18). Follow this procedure:

1. Place yoke (17) in body and screw the disc retainer assembly (16) until it bottoms.
2. Install gasket (14) and spring (19) for 2-30 and 2-6.5 psi range onto plug (13) and fasten into body. Disc retainer must enter guide hole in plug as it is assembled. Screw the plug in by hand. Use wrench to tighten only.
3. Place diaphragm (12) diaphragm washer (11) and Belleville washer (20) on yoke. Screw on hex nut (10).
4. Hold the diaphragm so that the screw holes in the diaphragm and body align. Tighten diaphragm nut with a wrench. At the final tightening release the diaphragm and permit it to rotate 5° to 10°. The diaphragm holes should now be properly aligned with the body holes.

To check for proper alignment proceed as follows:

Rotate diaphragm clockwise and counterclockwise as far as possible. Diaphragm screw holes should rotate equal distance on either side of body screw holes ±1/8".

Repeat assembly procedure until diaphragm and yoke are properly aligned. There must be no contact between yoke and body nozzle during its normal movement. To simulate this movement hold body and diaphragm holes aligned. Move yoke to open and closed positions. There must be no evidence of contact or dragging.

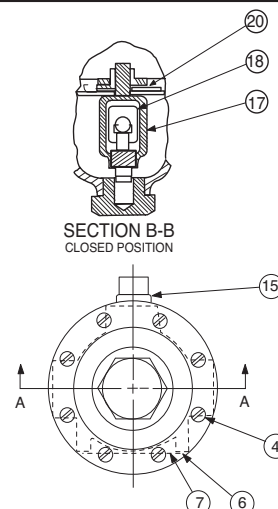
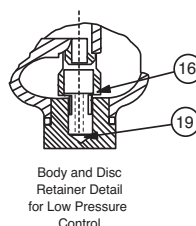
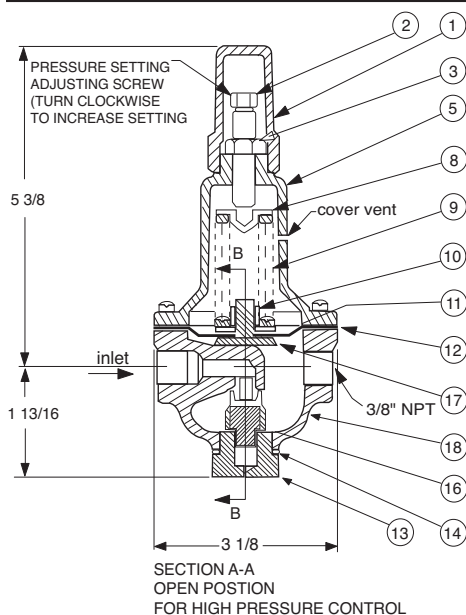
5. Install spring (9) with spring guide (8).
6. Install cover (5), adjusting screw (2) and nut (3), then cap (1).



CRD

Pressure Reducing Control

(Bronze Body with 303SS Trim)



Size (inch)	Stock Number	Adjustment Range	
		psi	Ft of Water
3/8	7194307A	2 - 6.5	4.5 - 15
3/8	7194308J	2 - 30	4.5 - 69
3/8	7194303K	15 - 75	35 - 173
3/8	7194311C	20 - 105	46 - 242
3/8	7194304H	30 - 300	69 - 692
Factory Set Pressure		PSI per Turn*	
2 - 6.5 set @ 3.5 psi		.61	
2 - 30 set @ 10 psi		3.0	
15 - 75 set @ 20 psi		9.0	
20 - 105 set @ 60 psi		12.0	
30 - 300 set @ 60 psi		27.0	

*Approximate-Final Adjustment should be with a pressure gauge and with flow.

When ordering parts specify:

- All nameplate data
- Item Description
- Item number

Item	Description	Material	Part Number	List Price
1	Cap	PL	67628J	
2	Adjusting Screw	BRS	7188201D	
3	Jam Nut (3/8-16)	SS	6780106J	
4*	Machine Screw (Fil.Hd.) 8 Req'd	303	6757821B	
5	Cover	BRS	C2544K	
6	Nameplate Screw	SS	67999D	
7	Nameplate	BRS	C0022001G	
8	Spring Guide	302	71881H	
	Spring Guide (20 - 105 psi)	303	205620F	
9	Spring (15-75 psi)	CHR/VAN	71884B	
	Spring (2 - 6.5 psi)	SS	82575C	
	Spring (2 - 30 psi)	SS	81594E	
	Spring (20 - 105 psi)	316	20632101E	
	Spring (30 - 300 psi)	CHR/VAN	71885J	
10	Hex Nut	303	71883D	
11	Diaphragm Washer	302	71891G	
12*	Diaphragm	NBR	C6936D	
13	Plug, Body	BRS	V5653A	
14*	Gasket	Fiber	40174F	
15	Plug	BRS	6766003F	
16*	Disc Retainer Assy. (2 - 30 psi)	SS/Rub	C8348K	
	Disc Retainer Assy. (15 - 75 psi)	SS/Rub	37133G	
	Disc Retainer Assy. (20 - 105 psi)	SS/Rub	37133G	
	Disc Retainer Assy. (30 - 300 psi)	SS/Rub	37133G	
17	Yoke	VBZ	V6951H	
18	Body & 1/4" Seat Assy	BR/SS	8339702G	
19*	Bucking Spring (2 - 6.5 psi)(2 - 30psi)	302	V0558G	
20	Belleville Washer	STL	7055007E	
*	Repair Kit (No Bucking Spring)	Buna®-N	9170003K	
*	Repair Kit (with Bucking Spring)	Buna®-N	9170002B	

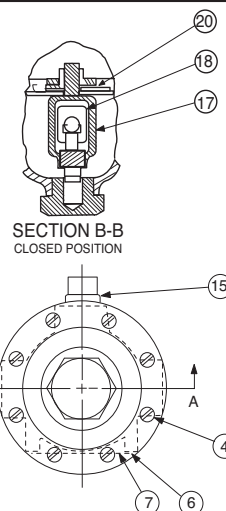
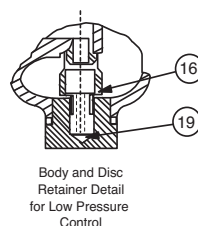
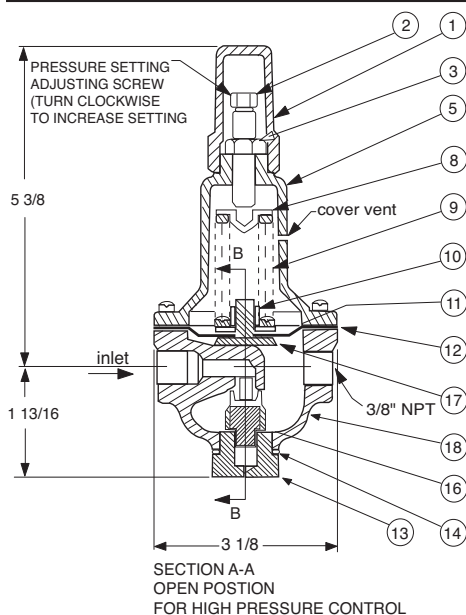
*SUGGESTED REPAIR PARTS



CRD

Pressure Reducing Control

(Bronze Body with 303SS Trim)



Size (inch)	Stock Number	Adjustment Range	
		psi	Ft of Water
3/8	7194307A	2 - 6.5	4.5 - 15
3/8	7194308J	2 - 30	4.5 - 69
3/8	7194303K	15 - 75	35 - 173
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3/8	7194304H	30 - 300	69 - 692
Factory Set Pressure		PSI per Turn*	
2 - 6.5 set @ 3.5 psi		.61	
2 - 30 set @ 10 psi		3.0	
15 - 75 set @ 20 psi		9.0	
20 - 105 set @ 40 psi		12.0	
30 - 300 set @ 60 psi		27.0	

*Approximate-Final Adjustment should be with a pressure gauge and with flow.

When ordering parts specify:

- All nameplate data
- Item Description
- Item number

Item	Description	Material	Part Number
1	Cap	PL	67628J
2	Adjusting Screw	BRS	7188201D
3	Jam Nut (3/8-16)	SS	6780106J
4*	Machine Screw (Fil.Hd.) 8 Req'd	303	6757821B
5	Cover	BRS	C2544K
6	Nameplate	SS	67999D
7	Nameplate	BRS	C0022001G
8	Spring Guide	302	71881H
	Spring Guide (20 - 105 psi)	303	205620F
9	Spring (15-75 psi)	CHR/VAN	71884B
	Spring (2 - 6.5 psi)	SS	82575C
	Spring (2 - 30 psi)	SS	81594E
	Spring (20 - 105 psi)	316	20632101E
	Spring (30 - 300 psi)	CHR/VAN	71885J
10	Hex Nut	303	71883D
11	Diaphragm Washer	302	71891G
12*	Diaphragm	NBR	C6936D
13	Plug, Body	BRS	V5653A
14*	Gasket	Fiber	40174F
15	Plug	BRS	6766003F
16*	Disc Retainer Assy. (2 - 30 psi)	SS/Rub	C8348K
	Disc Retainer Assy. (15 - 75 psi)	SS/Rub	37133G
	Disc Retainer Assy. (20 - 105 psi)	SS/Rub	37133G
	Disc Retainer Assy. (30 - 300 psi)	SS/Rub	37133G
17	Yoke	VBZ	V6951H
18	Body & 1/4" Seat Assy	BR/SS	8339702G
19*	Bucking Spring (2 - 6.5 psi)(2 - 30psi)	302	V0558G
20	Belleville Washer	STL	7055007E
*	Repair Kit (No Bucking Spring)	Buna®-N	9170003K
*	Repair Kit (with Bucking Spring)	Buna®-N	9170002B

*SUGGESTED REPAIR PARTS



— MODEL — **X46**

Flow Clean Strainer



X46A Straight

- Self Scrubbing Cleaning Action
- Straight Type or Angle Type

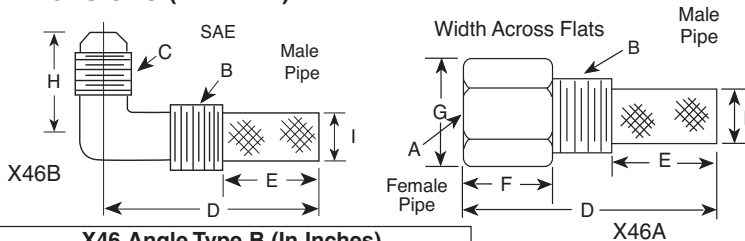
The Cla-Val Model X46 Strainer is designed to prevent passage of foreign particles larger than .015". It is especially effective against such contaminant as algae, mud, scale, wood pulp, moss, and root fibers. There is a model for every Cla-Val. valve.

X46B Angle



The X46 Flow Clean strainer operates on a velocity principle utilizing the circular "air foil" section to make it self cleaning. Impingement of particles is on the "leading edge" only. The low pressure area on the downstream side of the screen prevents foreign particles from clogging the screen. There is also a scouring action, due to eddy currents, which keeps most of the screen area clean.

Dimensions (In Inches)



B(NPT)	C(SAE)	D	E	H	I
1/8	1/4	1-3/8	5/8	7/8	1/4
1/4	1/4	1-3/4	3/4	1	3/8
3/8	1/4	2	7/8	1	1/2
3/8	3/8	1-7/8	7/8	1	1/2
1/2	3/8	2-3/8	1	1-1/4	5/8

A (NPT)	B (NPT)	D	E	F	G	I
1/8	1/8	1-3/4	3/4	1/2	1/2	1/4
1/4	1/4	2-1/4	1	3/4	3/4	3/8
3/8	3/8	2-1/2	1	7/8	7/8	1/2
3/8	1/2	2-1/2	1-1/4	1/2	7/8	3/4
1/2	1/2	3	1-1/4	1	1-1/8	3/4
3/8	3/4	3-3/8	2	1/2	1	7/8
3/4	3/4	4	2	1	1-1/2	7/8
3/8	1	4-1/4	2-3/4	1/2	1-3/8	7/8
1	1	4-1/2	2-3/4	1-1/4	1-3/4	7/8
1/2	1	4-1/4	2-3/4	1/2	1-3/8	7/8

When Ordering, Please Specify:

- Catalog Number X46
- Straight Type or Angle Type
- Size Inserted Into and Size Connection
- Materials

INSTALLATION

The strainer is designed for use in conjunction with a Cla-Val Main Valve, but can be installed in any piping system where there is a moving fluid stream to keep it clean. When it is used with the Cla-Val Valve, it is threaded into the upstream body port provided for it on the side of the valve. It projects through the side of the Main Valve into the flow stream. All liquid shunted to the pilot control system and to the cover chamber of the Main Valve passes through the X46 Flow Clean Strainer.

INSPECTION

Inspect internal and external threads for damage or evidence of cross-threading. Check inner and outer screens for clogging, embedded foreign particles, breaks, cracks, corrosion, fatigue, and other signs of damage.

DISASSEMBLY

Do not attempt to remove the screens from the strainer housing.

CLEANING

After inspection, cleaning of the X46 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 X46 in a 5-percent muriatic acid solution just long enough for deposit 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.

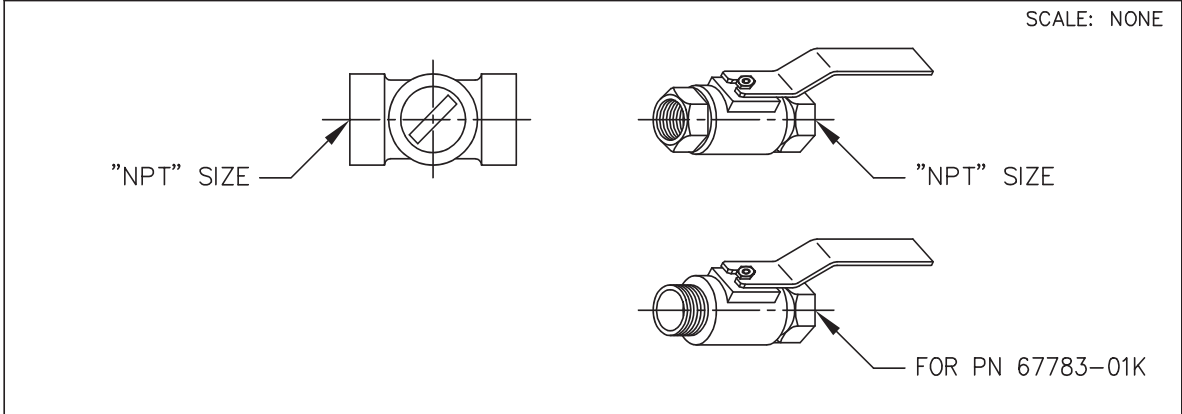
REPLACEMENT

If there is any sign of damage, or if there is the slightest doubt that the Model X46 Flow Clean Strainer may not afford completely satisfactory operation, replace it. Use Inspection steps as a guide. Neither inner screen, outer screen, nor housing is furnished as a replacement part. Replace Model X46 Flow Clean Strainer as a complete unit.

When ordering replacement Flow-Clean Strainers, it is important to determine pipe size of the tapped hole into which the strainer will be inserted (refer to column A or F), and the size of the external connection (refer to column B or G).

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

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



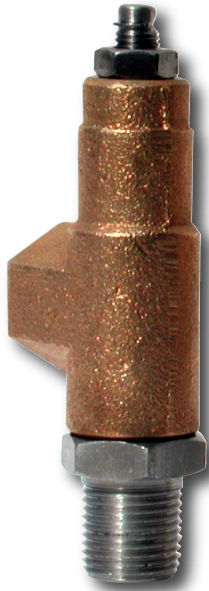
CLA-VAL PART NO. AND MATERIAL								
BRONZE WITH HANDLE	STEEL WITH HANDLE	IRON WITH HANDLE	316 SST WITH HANDLE	316 SST W/ LOCKING HANDLE	BRONZE WITH HANDLE	MONEL WITH HANDLE	MONEL W/ LOCKING HANDLE	SIZE "NPT"
67783-01K*	-09C	-17F	-25J SUPSD BY-26G		-41F SUPSD BY-01K			1/8"
-02H	-10A	-18D	-26G	-51E SUPSD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

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

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—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.

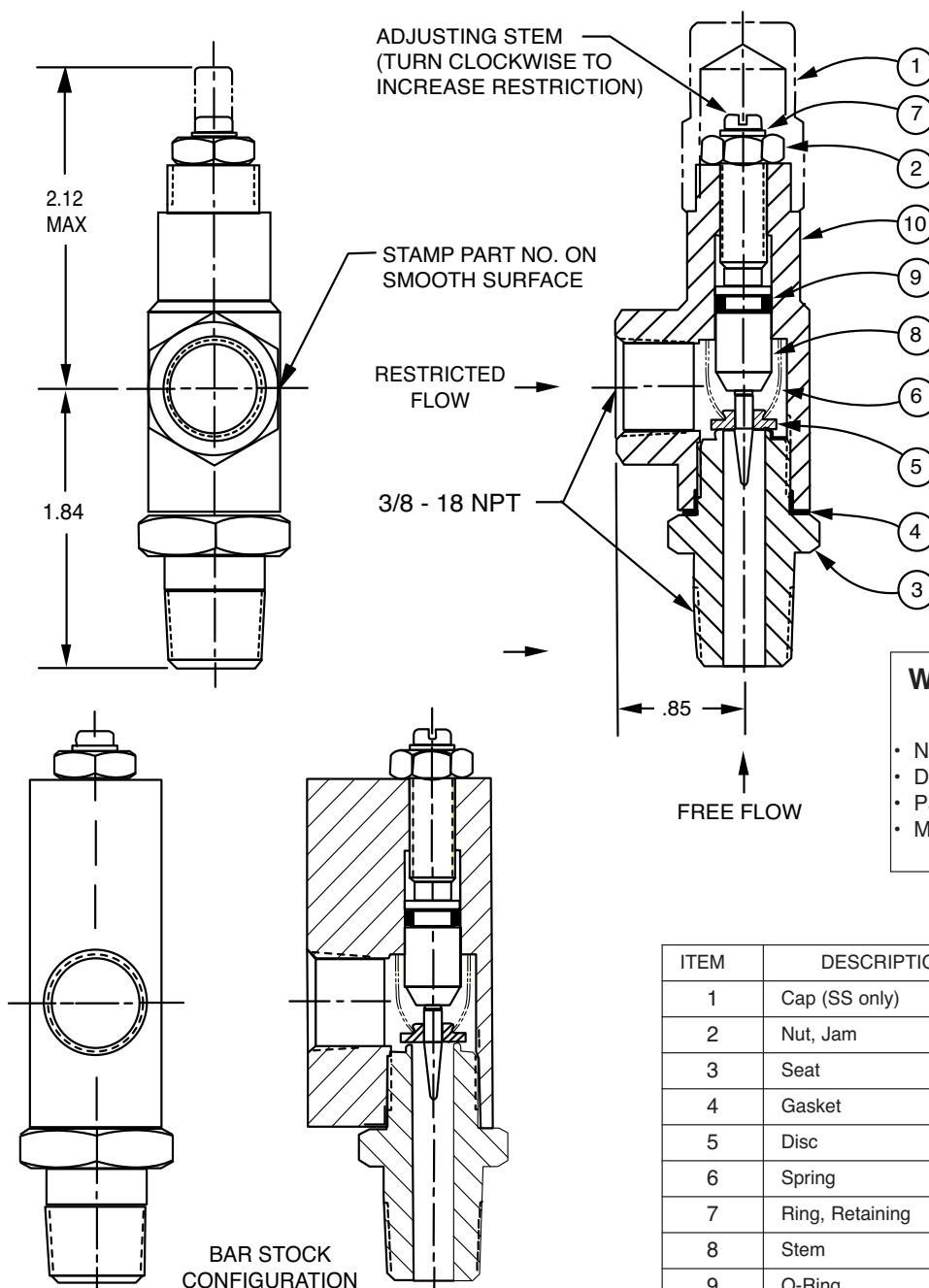
TEST PROCEDURE

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



CV

3/8" Flow Control


**When ordering parts,
please specify:**

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

ITEM	DESCRIPTION	QTY
1	Cap (SS only)	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	Housing	1



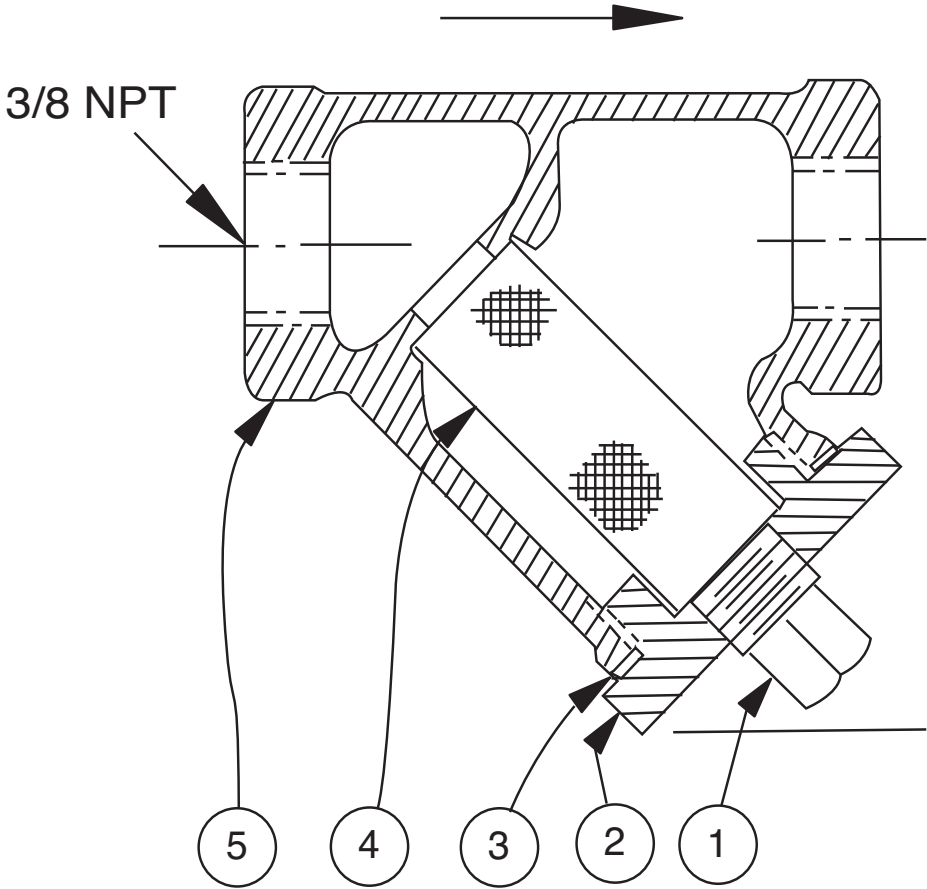
X43 Strainer

ITEM	DESCRIPTION	MATERIAL
1	Pipe Plug	Steel
2	Strainer Plug	Brass
3	Gasket	Copper
4	Screen	SST
5	Body	Brass

No parts available. Replacement assembly only.

Standard 60 mesh pilot system strainer for fluid service.

Size	Stock Number
3/8 x 3/8	33450J

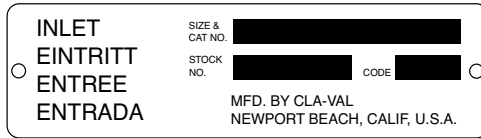


Proper Identification

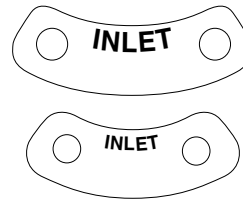
For ordering repair kits, replacement parts, or for inquiries concerning valve operation, it is important to properly identify Cla-Val products already in service by including all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details,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

Identification Plates

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



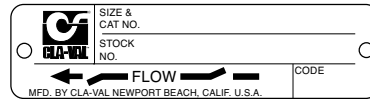
This brass plate appears on valves sized 2 1/2" and is located on the top of the inlet flange.



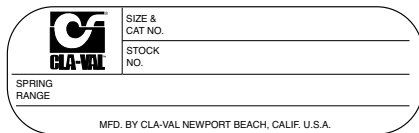
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



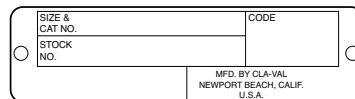
This brass plate appears on altitude valves only and is found on top of the outlet flange.



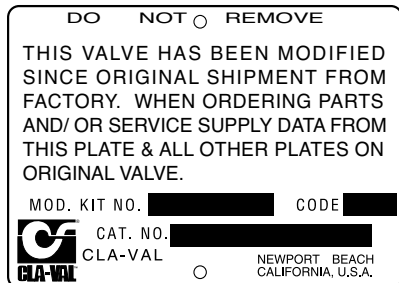
These two brass plates appear on threaded valves 1" through 3" size or flanged valves 1" through 2". It is located on only one side of the valve body.



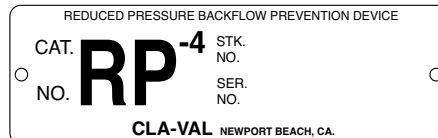
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



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



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



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

HOW TO ORDER

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

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

SPECIFY WHEN ORDERING

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

UNLESS OTHERWISE SPECIFIED

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

LIMITED WARRANTY

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

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

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

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

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

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

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

TERMS OF SALE

ACCEPTANCE OF ORDERS

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

CREDIT TERMS

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

PURCHASE ORDER FORMS

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

PRODUCT CHANGES

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

PRICES

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

RESPONSIBILITY

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

RISK

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

EXPORT SHIPMENTS

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

RETURNED GOODS

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



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

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www.cla-val.com

Represented By:



—MODEL— **REPAIR KITS**

Model 100-01 Hytrol Main Valve

BUNA-N MATERIAL				
	RUBBER KIT	REPAIR KIT	REBUILD KIT	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 KIT	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 Kit 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

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

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

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

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

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

Larger Sizes: Consult Factory.

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

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

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

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

Larger Sizes: Consult Factory.

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

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

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

Repair Assemblies (In Standard Materials Only)

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

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

CLA-VAL

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N-RK (R-08/2018)