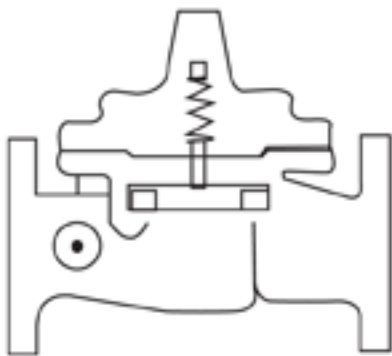


CLA-VAL

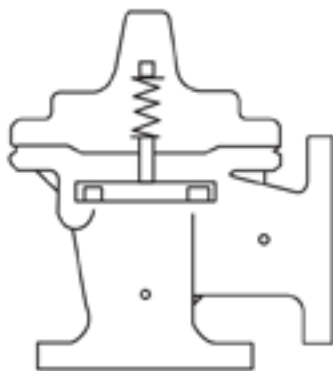
AUTOMATIC CONTROL VALVES

390-02/3690-02

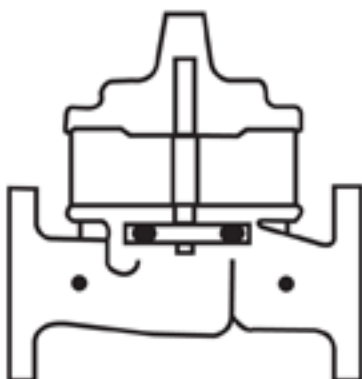
Place this manual with personnel responsible
for maintenance of this valve



INSTALLATION



OPERATION



MAINTENANCE



**CLA-VAL CO.**

NEWPORT BEACH, CALIFORNIA

CATALOG NO.

390-02/3690-02

DRAWING NO.

200699

REV

B

TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC INTERFACE PRESSURE REDUCING VALVE (INTEGRAL CONTROLLER TYPE)

DESIGN

DRAWN

AK

03-05-02

CHK'D

VL

3-06-02

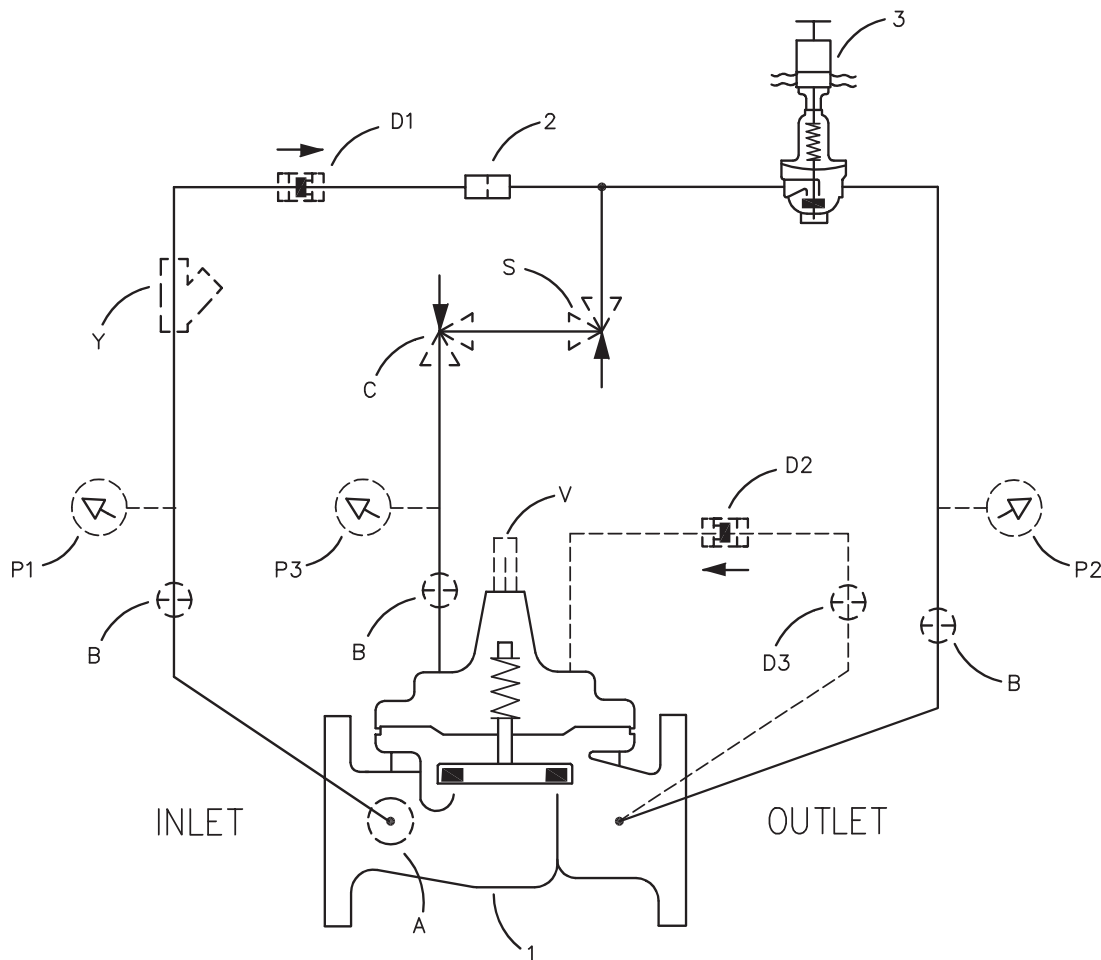
APVD

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
1	100-20 HYTROL (3690-02) MAIN VALVE	1
2	X58C RESTRICTION FITTING	1
3	CRD33 ELECTRONIC PRESSURE REDUCING CONTROL	1

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

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**CLA-VAL CO.**

NEWPORT BEACH, CALIFORNIA

CATALOG NO.

390-02/3690-02

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TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC INTERFACE PRESSURE REDUCING VALVE (INTEGRAL CONTROLLER TYPE)

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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) ADJUSTMENT: ACTUATE THE ELECTRONIC CONTROL TO CHANGE THE PRESSURE REDUCING CONTROL SETTING.

NOTE: REFER TO CLA-VAL PRINTED FORM N-CRD-32 FOR ADDITIONAL INFORMATION REGARDING INSTALLATION, OPERATION AND MAINTENANCE OF THE ELECTRONIC PRESSURE REDUCING CONTROL.

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 (D1) CLOSSES. THIS DIRECTS THE HIGHER OUTLET PRESSURE INTO THE MAIN VALVE COVER AND THE MAIN VALVE CLOSSES.

SUFFIX P (PRESSURE GAUGE):

PRESSURE GAUGES (P) 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

B

TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC INTERFACE PRESSURE
REDUCING VALVE (INTEGRAL CONTROLLER TYPE)

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.
- () CK2 COCKS (B) OPEN (OPTIONAL FEATURE).
- () PERIODIC CLEANING OF STRAINER (Y) IS RECOMMENDED (OPTIONAL FEATURE).
- () CV FLOW (C) AND (S) OPEN AT LEAST 4 TURNS (OPTIONAL FEATURE).
- () CORRECT VOLTAGE TO ELECTRONIC PRESSURE REDUCING CONTROL (3).

CAD REVISION RECORD - DO NOT REVISE MANUALLY

DESCRIPTION

DATE

BY

SEE SHEET 1

LTR

Electronic Actuated Pressure Reducing Valve

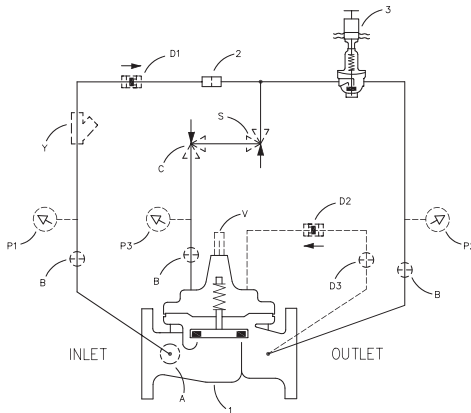


Schematic Diagram

Item	Description
1	Hytrol (Main Valve)
2	X58C Restriction Fitting
3	CRD-33 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
P	X141 Pressure Gauge
S	CV Flow Control (Opening)
V	X101 Valve Position Indicator



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

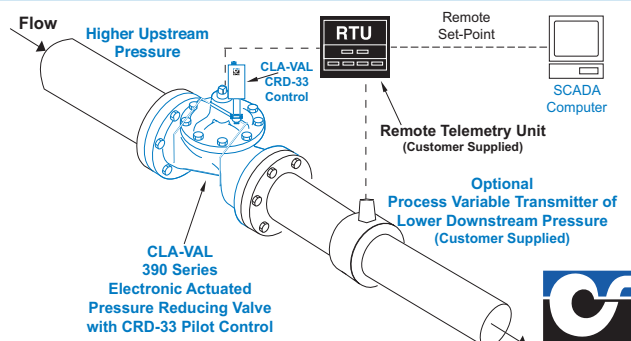
The Cla-Val Model 390-02/3690-02 Electronic Actuated Pressure Reducing Control Valve combines precise control of field proven Cla-Val hydraulic pilots and simple, remote valve control. The Cla-Val Model 390-02/3690-02 Pressure Reducing Valve automatically reduces a higher inlet pressure to a steady lower 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-33 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-33 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-33 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-33 can also accommodate control systems where the RTU compares pressure transmitter signal to the remote set point command signal. The RTU adjusts the CRD-33 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-33 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.

Typical Applications

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. 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 133VF. Additional pilot controls, hydraulic and/or electronic, are also available to perform multiple functions to fit exact system requirements.



Model 390-02 (Uses Basic Valve Model 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
ASTM B62	Bronze	B16.24	225	400	400	400

Note: * ANSI standards are for flange dimensions only.

Flanged valves are available faced but not drilled.

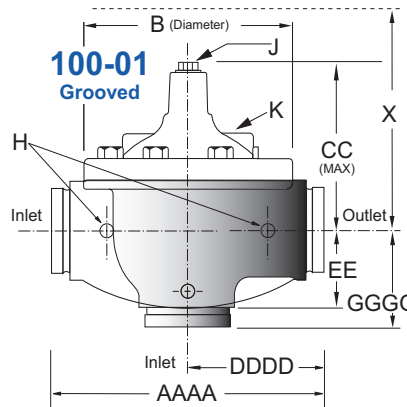
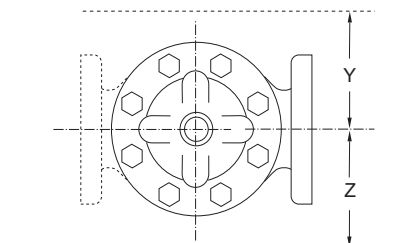
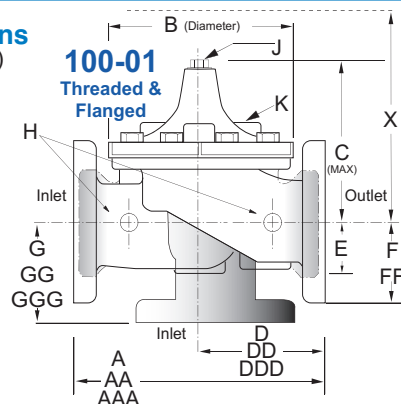
† End Details machined to ANSI B2.1 specifications.

Valves for higher pressure are available; consult factory for details

Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	1" - 36"	1" - 16"	1" - 16"
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.			

Dimensions (In inches)



Model 390-02 Dimensions (In 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	76.00
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	76.00
AAAA Grooved End	—	—	8.50	9.00	11.00	12.50	15.00	20.00	25.38	—	—	—	—	—	—	—	—	—
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	35.50	41.50	45.00	53.16	56.00	66.00
C Max.	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	61.50
CC Max. 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	25.60
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	25.60
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	.375	.375	.375	.375	.50	.50	.75	.75	1	1	1	1	1	1	1	1	2	2
J NPT Cover Center Plug	.25	.25	.25	.50	.50	.50	.75	.75	1	1	1.25	1.5	2	1.5	1.5	1.5	2	2
K NPT Cover Tapping	.375	.375	.375	.375	.50	.50	.75	.75	1	1	1	1	1	1	1	1	2	2
Stem Travel	0.4	0.4	0.4	0.6	0.7	0.8	1.1	1.7	2.3	2.8	3.4	4.0	4.5	5.1	5.63	6.75	7.5	8.5
Approx. Ship Wt. Lbs.	15	15	15	35	50	70	140	285	500	780	1165	1600	2265	2982	3900	6200	7703	11720
X Pilot System	11	11	11	13	14	15	17	29	31	33	36	40	40	43	47	68	79	85
Y Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	40	45
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.

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 Class	300 Class
ASTM A536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
ASTM B62	Bronze	B16.24	225	400

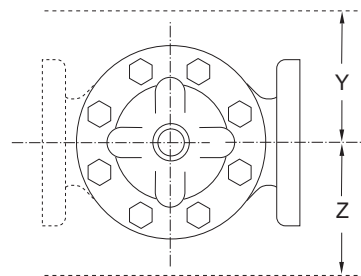
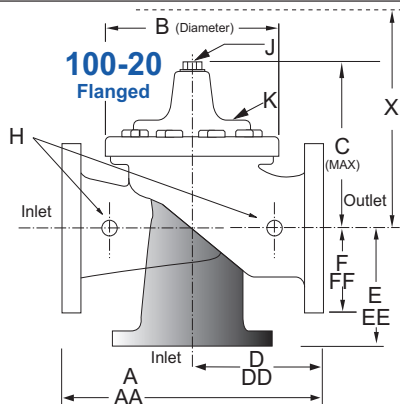
Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
Valves for higher pressure are available; consult factory for details

Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	3" - 48"	3" - 16"	3" - 16"
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.

Dimensions (In inches)



Model 3690-02 Dimensions (In Inches)

Valve Size (Inches)	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
A 150 ANSI	10.25	13.88	17.75	21.38	26.00	30.00	34.25	35.00	42.12	48.00	48.00	63.25	65.00	76.00	94.50
AA 300 ANSI	11.00	14.50	18.62	22.38	27.38	31.50	35.75	36.62	43.63	49.62	49.75	63.75	67.00	76.00	94.50
B Dia.	6.62	9.12	11.50	15.75	20.00	23.62	27.47	28.00	35.44	35.44	35.44	53.19	56.00	66.00	66.00
C Max.	7.00	8.62	11.62	15.00	17.88	21.00	20.88	25.75	25.00	31.00	31.00	43.94	54.60	61.50	61.50
D 150 ANSI	—	6.94	8.88	10.69	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
DD 300 ANSI	—	7.25	9.38	11.19	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
E 150 ANSI	—	5.50	6.75	7.25	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
EE 300 ANSI	—	5.81	7.25	7.75	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
F 150 ANSI	3.75	4.50	5.50	6.75	8.00	9.50	11.00	11.75	15.88	14.56	17.00	19.88	25.50	28.00	31.50
FF 300 ANSI	4.12	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.88	16.06	19.00	22.00	27.50	28.00	31.50
H NPT Body Tapping	.375	.50	.75	.75	1	1	1	1	1	1	1	1	2	2	2
J NPT Cover Center Plug	.50	.50	.75	.75	1	1	1.25	1.25	2	2	2	2	2	2	2
K NPT Cover Tapping	.375	.50	.75	.75	1	1	1	1	1	1	1	1	2	2	2
Stem Travel	0.6	0.8	1.1	1.7	2.3	2.8	3.4	3.4	3.4	4.5	4.5	6.5	7.5	8.5	8.5
Approx. Ship Wt. Lbs.	45	85	195	330	625	900	1250	1380	1500	2551	2733	6500	8545	12450	13100
X Pilot System	13	15	27	30	33	36	36	41	40	46	55	68	79	85	86
Y Pilot System	10	11	18	20	22	24	26	26	30	30	30	39	40	45	47
Z Pilot System	10	11	18	20	22	24	26	26	30	30	30	39	42	47	49

*Consult Factory

Note: The top two flange holes on valve sizes 36 thru 48 are threaded to 1 1/2"-6 UNC.

390-02/3690-02 Purchase Specifications (CRD-33 supplement)

The Electronic Actuated Pressure Reducing Valve shall maintain a constant downstream pressure and shall be capable of remotely changing this pressure as directed by the hydraulic pressure reducing pilot and integral electronic actuator. The actuator shall provide the interface between remote telemetry and valve set point control. It shall compare a remote analog signal with an internal position signal in the actuator and adjust the hydraulic pilot spring mechanism to the new setting. The remote analog signal input shall be isolated and reverse polarity protected. A 4-20 mA actuator feedback signal shall be supplied as standard. A second command control input shall be available from dry contact switch closure for clockwise and counter clockwise rotation. The actuator shall be IP-68 rated for submersible service.

If power fails, the pilot shall continue to control the main valve to last set point. If remote set point signal is lost, the actuator shall be programmable to stay at last position or go to 4 mA or to 20 mA value of set point range. Default is last position. The actuator shall be ranged at the factory to the specific spring range in the pilot control. If other than the default settings are required, these changes shall be accomplished by using only the manufacturer's software and USB cable.

The Electronic Actuated Pressure Reducing Valve shall be Cla-Val Model 390-02/3690-02 as manufactured by Cla-Val, Newport Beach, CA.

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	
Basic 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	

3690-02 Valve Selection	100-20 Pattern: Globe (G), Angle (A), End Connections: Flanged (F) Indicate Available Sizes															
	Inches	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
	mm	80	100	150	200	250	300	350	400	450	500	600	750	900	1000	1200
Basic Valve 100-20	Pattern	G	G, A	G, A	G, A	G	G	G	G	G	G	G	G	G	G	G
	End Detail	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	260	580	1025	2300	4100	6400	9230	9230	16500	16500	16500	28000	33500	33500	33500
	Minimum	1	2	4	10	15	35	50	50	95	95	95	275	450	450	450
Suggested Flow (Liters/Sec)	Maximum	16	37	65	145	258	403	581	581	1040	1040	1040	1764	2115	2115	2115
	Minimum	.06	.13	.25	.63	.95	2.2	3.2	3.2	6.0	6.0	6.0	17.4	28.4	41.0	41.0
100-20 Series is the reduced internal port size version of the 100-01 Series.																
For Lower Flows Consult Factory																

We recommend providing adequate space around valve for maintenance work

CRD-33 Subassembly Specifications

Adjustment Ranges

- 2 to 30 psi
- 15 to 75 psi
- 20 to 105 psi
- 30 to 300 psi (factory ranged 40 to 140 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.
Consult factory for details.

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

When Ordering, Please Specify

1. Catalog No. 390-02 or 3690-02
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Threaded or Flanged
6. Trim Material
7. Adjustment Range
8. Desired Options
9. When Vertically Installed

130VC-3 (CRD-33) Actuator Specifications

Supply Power Input:

- 12V to 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

- Electronics Enclosure: Anodized Aluminum
- Mechanical Housing: Bronze
- Coupling Assembly: Stainless Steel
- Gear Train: Stainless Steel, permanently lubricated

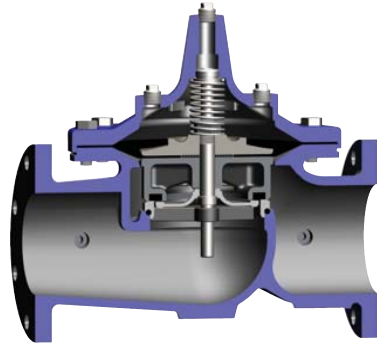


—MODEL— 100-01 Hytrol Valve

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.

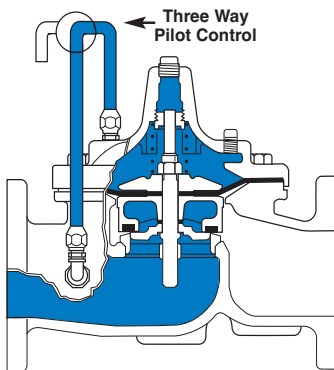


Installation

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.

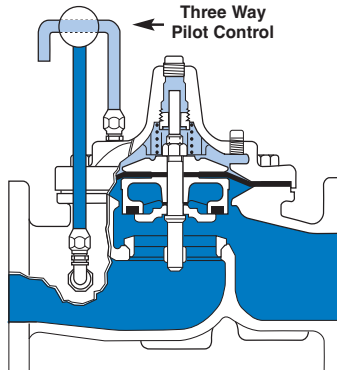
6. Caution must be taken in the installation of this valve to insure that galvanic and/or electrolytic action does not take place. The proper use of dielectric fittings and gaskets are required in all systems using dissimilar metals.
7. If a pilot control system is installed on the 100-01 Hytrol Valve, 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



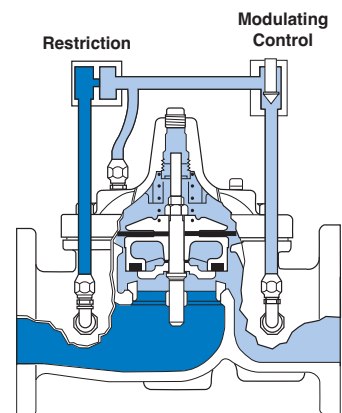
Tight Closing Operation

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.



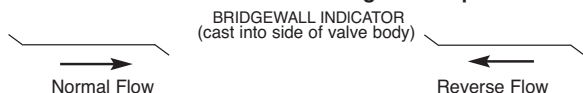
Modulating Action

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.

The valve must be installed according to nameplate data.



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

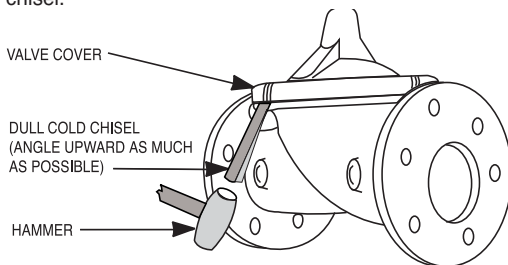
Inspection or maintenance can be accomplished without removing the valve from the line. Repair kits with new diaphragm and disc are recommended to be on hand before work begins.

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.

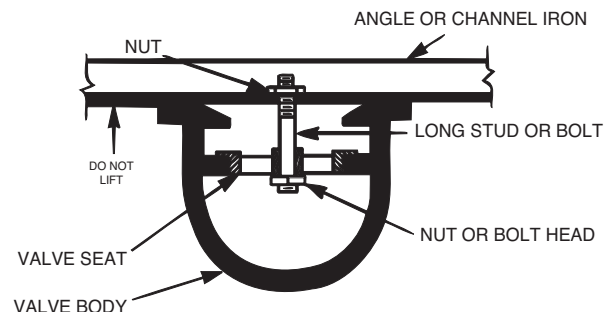
The use of a pipe wrench or a vise without soft brass jaws scars the fine finish on the stem. No amount of careful dressing can restore the stem to its original condition. Damage to the finish of the stem can cause the stem to bind in the bearings and the valve will not open or close.

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.)

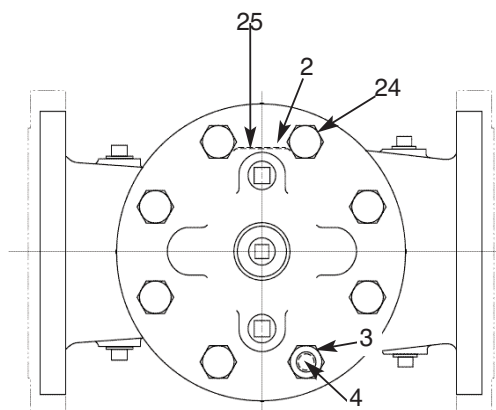
Due to the weight of the diaphragm assembly this procedure is not possible on valves 8” and larger. On these valves, the same determination can be made by carefully introducing a low pressure-less than five psi) into the valve body with the cover vented. **SEE CAUTION.** Looking in cover center hole 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.)

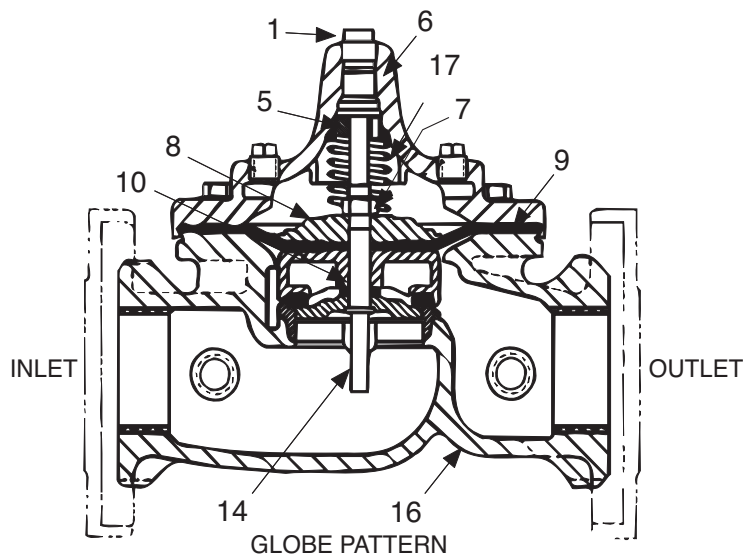
3. With the line connected from the inlet to the cover, apply full working pressure to the inlet. Check all around the cover for any leaks. Re-tighten cover nuts if necessary to stop leaks past the diaphragm.

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.



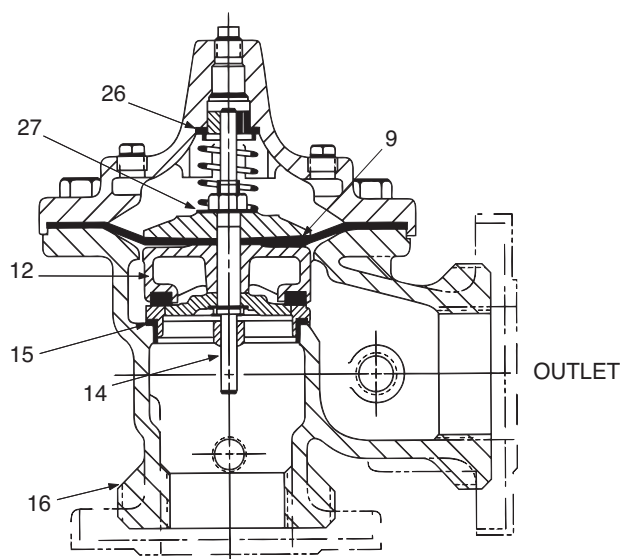
TOP VIEW



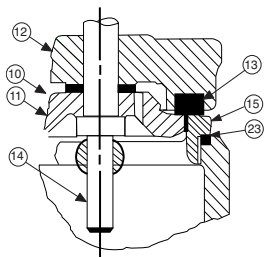
GLOBE PATTERN

PARTS LIST

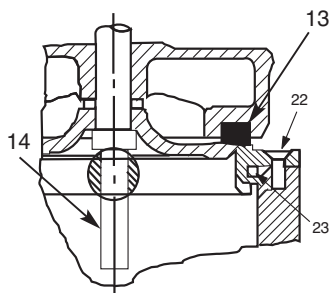
Item	Description
1.	Pipe Plug
2.	Drive Screws (for nameplate)
3.	Hex Nut (8" and larger)
4.	Stud (8" and larger)
5.	Cover Bearing
6.	Cover
7.	Stem Nut
8.	Diaphragm Washer
9.	Diaphragm
10.	Spacer Washers
11.	Disc Guide
12.	Disc Retainer
13.	Disc
14.	Stem
15.	Seat
16.	Body
17.	Spring
22.	Flat Head Screws (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)



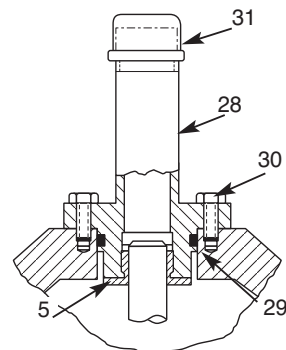
INLET
ANGLE PATTERN



1 1/4" - 6" SEAT DETAIL



8" - 24" SEAT DETAIL



16" COVER DETAIL



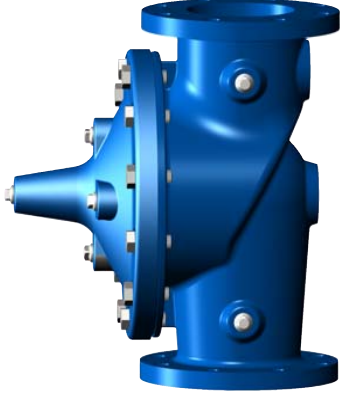
—MODEL—100-01

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

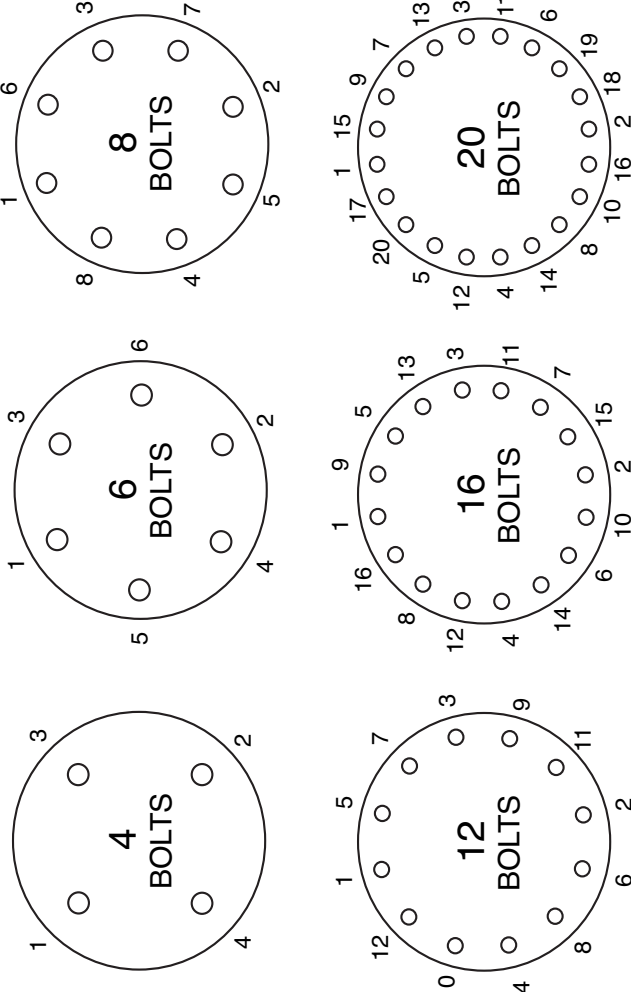
The Cla-Val Model 100-20 Hytrol Valve (600 Series main valve) have only one part -the body- that is different from standard 100 Series Cla-Val main valve parts. The remaining parts of the 600 series main valve are standard Cla-Val main valve parts. All service and maintenance information for the standard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

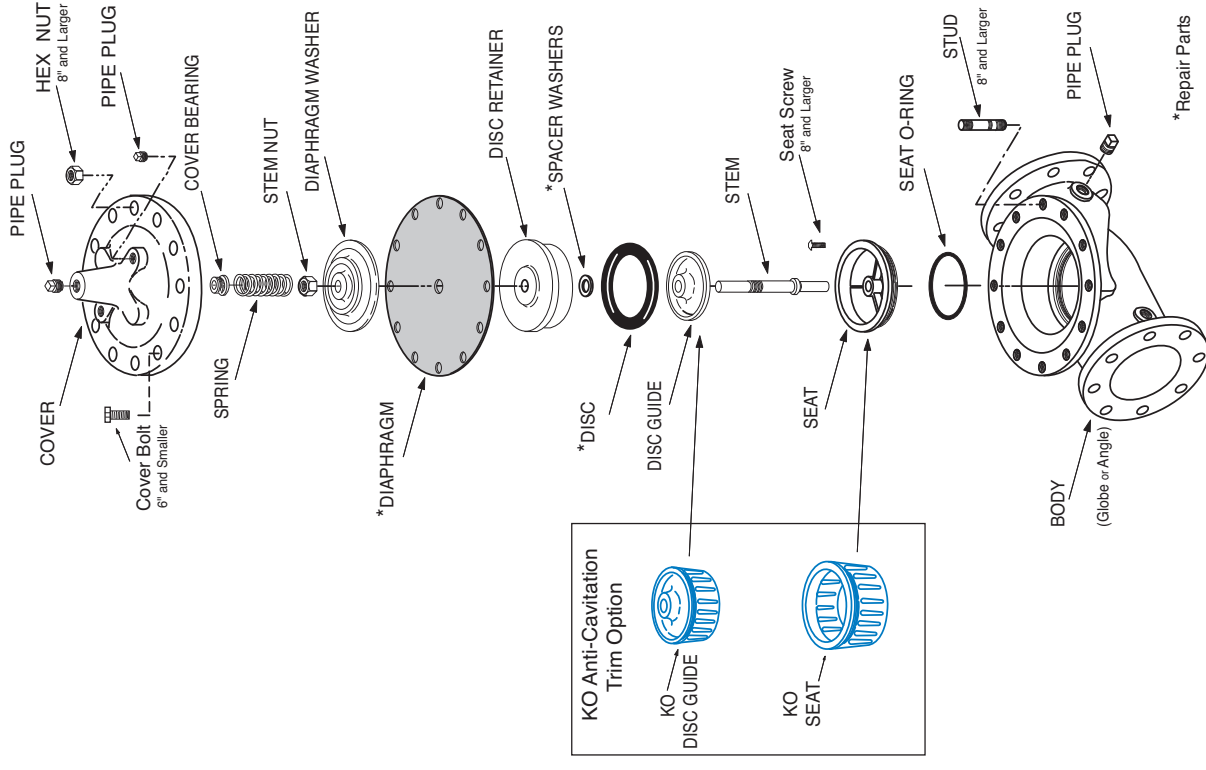
HYTROL SIZE				Stem Travel		Cover Capacity Displacement		Valve Stem Thread	Center Plug	Cover Nut or Bolt			Cover Lifting Holes	Cover Plug		Cover Torque		Stem Nut**		Stem Nut Torque	
100-01		100-20						UNF-Internal	NPT	Thread (Bolt)	Socket	Qty	UNC	Thread	Socket	ft. Lbs.	in. Lbs.	Thread	Socket (Long)	Lubed	DRY
inches	mm	inches	mm	inches	mm	Gallons	Liters														
1"	25			0.3	8				1/4"	1/4" - 20 (B)	7/16"	8				4	48	3/8" - 24		4	6
1 1/4"	32			0.4	10	0.020	0.07	10 - 32	1/4"	5/16" - 18 (B)	1/2"	8				8	96	7/16" - 20		6	10
1 1/2"	40			0.4	10	0.020	0.07	10 - 32	1/4"	5/16" - 18 (B)	1/2"	8				8	96	7/16" - 20		6	10
2"	50			0.6	15	0.032	0.12	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			0.7	18	0.043	0.16	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"		0.8	20	0.080	0.30	1/4 - 28	1/2"	1/2" - 13 (B)	3/4"	8		1/2"	9/16"	30		5/8" - 18	15/16"	21	30
4"	100	6"		1.1	23	0.169	0.64	1/4 - 28	3/4"	3/4" - 10 (B)	1 1/8"	8		3/4"	5/8"	110		3/4" - 16	1 1/16"	40	60
6"	150	8"		1.7	43	0.531	2.00	3/8 - 24	3/4"	3/4" - 10 (B)	1 1/8"	12		3/4"	5/8"	110		7/8" - 14	1 5/16"	85	125
8"	200	10"		2.3	58	1.26	4.80	3/8 - 24	1"	3/4" - 10	1 1/4"	16	5/8" - 11	1"	13/16"	110		1 1/8" - 12	1 13/16"	125	185
10"	250	12"		2.8	71	2.51	9.50	3/8 - 24	1"	7/8" - 9	1 7/16"	20	3/4" - 10	1"	13/16"	160		1 1/2" - 12	1 7/8"	252	375
12"	300	16"		3.4	86	4.0	15.10	3/8 - 24	1 1/4"	1 1/8" - 7	1 13/16"	20	3/4" - 10	1"	13/16"	390		1 1/2" - 12	2 1/2"	270	400
14"	350			3.9	99	6.5	24.60	3/8 - 24	1 1/2"	1 1/4" - 7	2"	20	1" - 8	1"	13/16"	545		1 1/2" - 12	2 1/2"	280	420
16"	400	20", 24"		4.5	114	9.6	36.20	1/2 - 20	2"	1 1/4" - 7	2"	20	1" - 8	1"	13/16"	545		2" - 16	3"	500	750
20"	500			5.63	143	12	45.40	3/4 - 16	1 1/2"	1 3/8" - 6	2 1/8"	24	1" - 8	1"	13/16"	670		2 1/4" - 16	3 1/2"	930	N/R
24"	600	30"		6.75	165	29.0	108.80	3/4 - 16*	3/4"	1 1/2" - 12	2 3/8"	24	1 1/8" - 7	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.



*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.

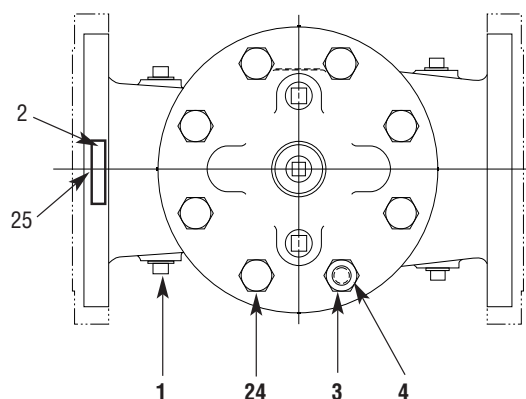
The 100-20 Hytrol valve has all of the basic features and advantages of the original 100-01 Hytrol. Only one part has been changed - the body. It is designed with different size inlet, seat and outlet openings. The 100-20 Hytrol has inlet and outlet flanges one valve size larger than the seat opening 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

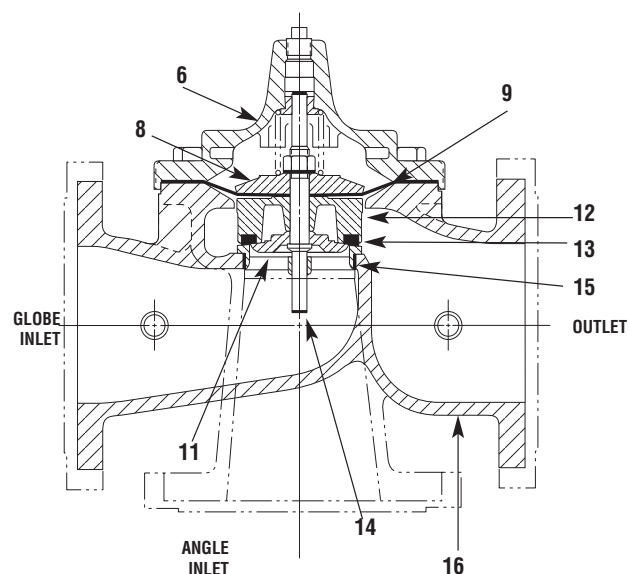
The 100-20 Hytrol is available only in ductile iron, 150 and 300 pressure class, and Bronze trim standard. Available extra cost main valve options include stainless steel trim, epoxy coating, Dura-Kleen stem, Delrin sleeved stem, and high temperature rubber parts. All four basic main valves have a 600 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



TOP VIEW

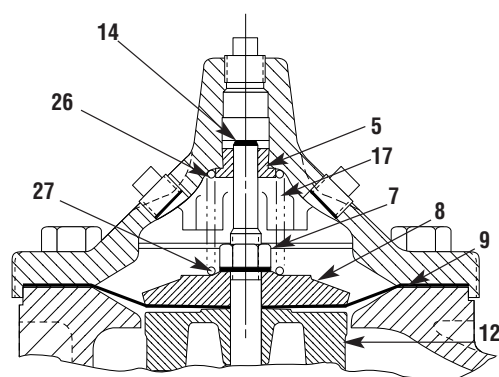


PARTS LIST

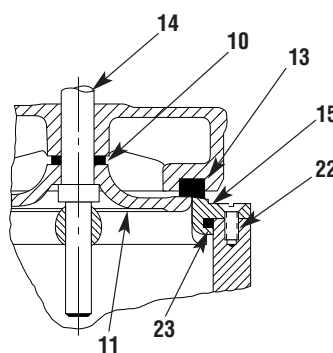
NO. DESCRIPTION

- | | |
|----|--|
| 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") |

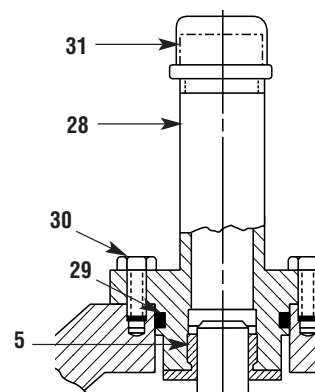
WHEN ORDERING PARTS, BE SURE TO GIVE COMPLETE NAMEPLATE DATA, ITEM NUMBER AND DESCRIPTION.



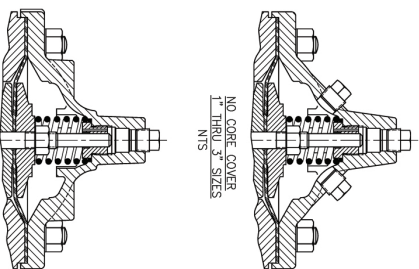
3" - 6" COVER DETAIL



10" - 24" SEAT DETAIL

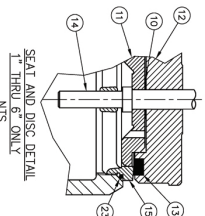


20" - 24" COVER DETAIL

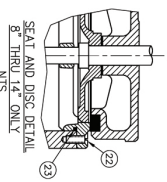


OLD STYLE BODY CONFIGURATIONS

4" SIZE NO CORE COVER
NTS



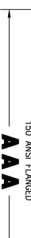
SEAT AND DISC DETAIL
1" THRU 6" ONLY
NTS



SEAT AND DISC DETAIL
8" THRU 14" ONLY
NTS

WAVE SIZES	DIMENSION TABLE											
	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"
A	7.25	7.25	7.25	9.38	11.00	12.50	—	—	—	—	—	—
AA	—	—	8.50	9.38	10.00	12.50	—	—	—	—	—	—
AAA	—	—	8.00	10.00	11.62	13.25	15.62	21.00	26.38	31.75	35.50	40.50
G DIA	5.62	5.62	5.62	6.62	8.00	9.12	11.50	13.75	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	4.23	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	12.69	14.88	17.00	19.50
EEE	—	—	4.25	5.00	5.68	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	3.50	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88
FFF	—	—	4.25	3.25	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62
G NET	3/8"	3/8"	3/8"	1/2"	1/2"	1/2"	3/4"	3/4"	1"	1"	1"	1"
H NET	1/4"	1/4"	1/4"	1/2"	1/2"	1/2"	3/4"	3/4"	1"	1"	1"	1"
J NET	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

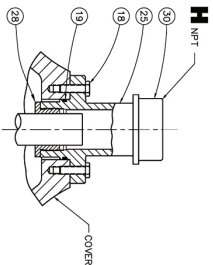


(3" SIZE SHOWN)
100-01 HYTROL
(GLOBE)

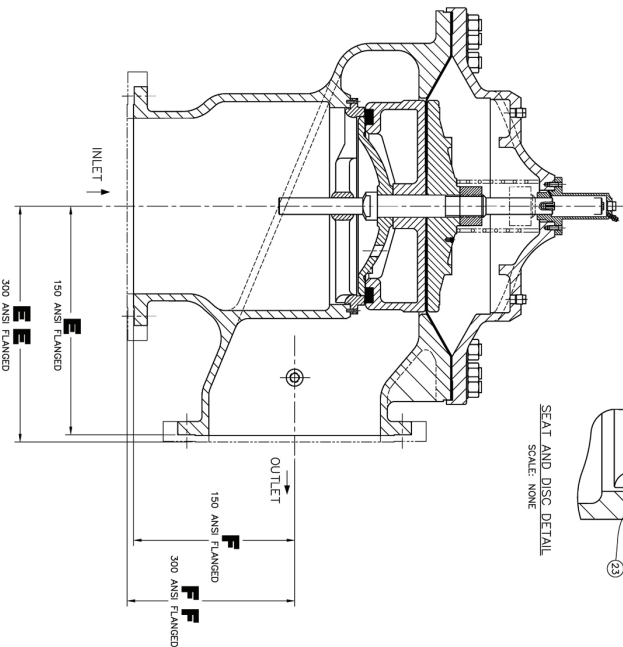
(2" SIZE SHOWN)
2100 HYTROL
(ANGLE)

REVISIONS		
REV	DESCRIPTION	DATE
A	REVISION: REVISION TITLE	APPROVED
E	RE-SEAL AND REPAIRMAN ON C/O; ADDED DIM. 4.00	03-19-98
A	4.25 ON WALK SIZE 1-1/2" (C/O 16999)	AK
F	ADDED 1" SIZE SCREENED CONFINEMENT TO THE	02-18-10
F	DIM. (C/O 21854)	AK
G	PARALLEL AND FLAT FROM DIMENSION TABLE	6-16-2010
G	DETAIL "NEW" (C/O 21974)	PC
H	ADDED SHEET 2 (C/O 22323)	05-28-11
H	ADDED WALKS AND REPAVED STUO LENGTH ON	07-18-12
J	100-01 WALKS (C/O 23155)	MS

[illegible]



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



SEAT AND DISC DETAIL

DIMENSION TABLE									
VALUE SIZES	16"	20"	24"	30"	36"				
A	41.38	46.00	52.02	61.00	76.00				
A	43.50	47.64	53.82	63.25	64.50				
B	35.50	45.00	53.18	56.00	66.00				
C	25.00	30.06	42.21	45.00	54.60	61.50			
D	15.50	12.56	15.00	17.75	21.31	24.56			
E	20.81	-	-	50.75	-	-			
E	21.62	-	-	31.62	-	-			
F	15.69	-	-	22.06	-	-			
F	16.50	-	-	22.90	-	-			
G	1"	1"	1"	2"	2"				
H	2"	1"	1"	1"	2"				
J	1"	1"	1"	2"	2"				
K	-	15.00	16.50	19.25	22.50	25.00			

- RECOMMENDED SPARE PARTS

50	30	PAE (1P ONLY)	
49	29	PAE (1P ONLY)	
48	28	REAR COVER (1P ONLY)	
47	27	SPRING WASHER UPPER	
46	26	SPRING WASHER LOWER	
45	25	HOUSING SOCKET (FOR POINT)	
44	24	HOUSING	
43	23	BUSHING ADAPTER	
42	22	SCREW, 1/4" X 1/2"	
41	21	SCREW, 1/4" X 1/2"	
40	20	SCREW, 1/4" X 1/2"	
39	19	O-RING 1/2"	
38	18	SPRING HEX HD.	
37	17	SPRING	
36	16	BODY	
35	15	STIM	
34	14	STIM	
33	13	DISC	
32	12	DISC, SPRING, DISC	
31	11	GUIDE, DISC	
30	10	WASHER, SPACER	
29	9	WASHER, SPACER	
28	8	WASHER, DIAPHRAGM	
27	7	WASHER, DIAPHRAGM	
26	6	COIL SPRING	
25	5	SPRING WASHER, LOWER	
24	4	SPRING WASHER, LOWER	
23	3	PAE, HEX	
22	2	PAE, HEX	
21	1	PAE, HEX (1P - 3P ONLY)	
20		DESCRIPTION	
19		ITEM	
18		ITEM	
17		ITEM	
16		ITEM	
15		ITEM	
14		ITEM	
13		ITEM	
12		ITEM	
11		ITEM	
10		ITEM	
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6		ITEM	
5		ITEM	
4		ITEM	
3		ITEM	
2		ITEM	
1		ITEM	

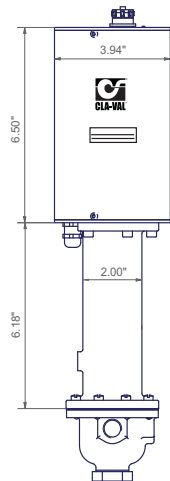
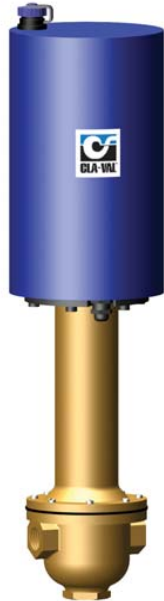
GLA-VAL GO. NEWPORT BEACH, CALIFORNIA

TRANSMISSION TYPE AND GEAR TYPE AND GEAR		CONTROL NO. _____	
DRIVE SHAFTS NO. 1/2" 300 360 420 480 540 600 660 720 780 840 900 960 1020 1080 1140 1200 1260 1320 1380 1440 1500 1560 1620 1680 1740 1800 1860 1920 1980 2040 2100 2160 2220 2280 2340 2400 2460 2520 2580 2640 2700 2760 2820 2880 2940 3000 3060 3120 3180 3240 3300 3360 3420 3480 3540 3600 3660 3720 3780 3840 3900 3960 4020 4080 4140 4200 4260 4320 4380 4440 4500 4560 4620 4680 4740 4800 4860 4920 4980 5040 5100 5160 5220 5280 5340 5400 5460 5520 5580 5640 5700 5760 5820 5880 5940 6000 6060 6120 6180 6240 6300 6360 6420 6480 6540 6600 6660 6720 6780 6840 6900 6960 7020 7080 7140 7200 7260 7320 7380 7440 7500 7560 7620 7680 7740 7800 7860 7920 7980 8040 8100 8160 8220 8280 8340 8400 8460 8520 8580 8640 8700 8760 8820 8880 8940 9000 9060 9120 9180 9240 9300 9360 9420 9480 9540 9600 9660 9720 9780 9840 9900 9960 10020 10080 10140 10200 10260 10320 10380 10440 10500 10560 10620 10680 10740 10800 10860 10920 10980 11040 11100 11160 11220 11280 11340 11400 11460 11520 11580 11640 11700 11760 11820 11880 11940 12000 12060 12120 12180 12240 12300 12360 12420 12480 12540 12600 12660 12720 12780 12840 12900 12960 13020 13080 13140 13200 13260 13320 13380 13440 13500 13560 13620 13680 13740 13800 13860 13920 13980 14040 14100 14160 14220 14280 14340 14400 14460 14520 14580 14640 14700 14760 14820 14880 14940 15000 15060 15120 15180 15240 15300 15360 15420 15480 15540 15600 15660 15720 15780 15840 15900 15960 16020 16080 16140 16200 16260 16320 16380 16440 16500 16560 16620 16680 16740 16800 16860 16920 16980 17040 17100 17160 17220 17280 17340 17400 17460 17520 17580 17640 17700 17760 17820 17880 17940 18000 18060 18120 18180 18240 18300 18360 18420 18480 18540 18600 18660 18720 18780 18840 18900 18960 19020 19080 19140 19200 19260 19320 19380 19440 19500 19560 19620 19680 19740 19800 19860 19920 19980 20040 20100 20160 20220 20280 20340 20400 20460 20520 20580 20640 20700 20760 20820 20880 20940 21000 21060 21120 21180 21240 21300 21360 21420 21480 21540 21600 21660 21720 21780 21840 21900 21960 22020 22080 22140 22200 22260 22320 22380 22440 22500 22560 22620 22680 22740 22800 22860 22920 22980 23040 23100 23160 23220 23280 23340 23400 23460 23520 23580 23640 23700 23760 23820 23880 23940 24000 24060 24120 24180 24240 24300 24360 24420 24480 24540 24600 24660 24720 24780 24840 24900 24960 25020 25080 25140 25200 25260 25320 25380 25440 25500 25560 25620 25680 25740 25800 25860 25920 25980 26040 26100 26160 26220 26280 26340 26400 26460 26520 26580 26640 26700 26760 26820 26880 26940 27000 27060 27120 27180 27240 27300 27360 27420 27480 27540 27600 27660 27720 27780 27840 27900 27960 28020 28080 28140 28200 28260 28320 28380 28440 28500 28560 28620 28680 28740 28800 28860 28920 28980 29040 29100 29160 29220 29280 29340 29400 29460 29520 29580 29640 29700 29760 29820 29880 29940 30000 30060 30120 30180 30240 30300 30360 30420 30480 30540 30600 30660 30720 30780 30840 30900 30960 31020 31080 31140 31200 31260 31320 31380 31440 31500 31560 31620 31680 31740 31800 31860 31920 31980 32040 32100 32160 32220 32280 32340 32400 32460 32520 32580 32640 32700 32760 32820 32880 32940 33000 33060 33120 33180 33240 33300 33360 33420 33480 33540 33600 33660 33720 33780 33840 33900 33960 34020 34080 34140 34200 34260 34320 34380 34440 34500 34560 34620 34680 34740 34800 34860 34920 34980 35040 35100 35160 35220 35280 35340 35400 35460 35520 35580 35640 35700 35760 35820 35880 35940 36000 36060 36120 36180 36240 36300 36360 36420 36480 36540 36600 36660 36720 36780 36840 36900 36960 37020 37080 37140 37200 37260 37320 37380 37440 37500 37560 37620 37680 37740 37800 37860 37920 37980 38040 38100 38160 38220 38280 38340 38400 38460 38520 38580 38640 38700 38760 38820 38880 38940 39000 39060 39120 39180 39240 39300 39360 39420 39480 39540 39600 39660 39720 39780 39840 39900 39960 40020 40080 40140 40200 40260 40320 40380 40440 40500 40560 40620 40680 40740 40800 40860 40920 40980 41040 41100 41160 41220 41280 41340 41400 41460 41520 41580 41640 41700 41760 41820 41880 41940 42000 42060 421			



— MODELS — CRD-33 and CRA-33

Electronic Actuated Pressure Reducing Pilot Control

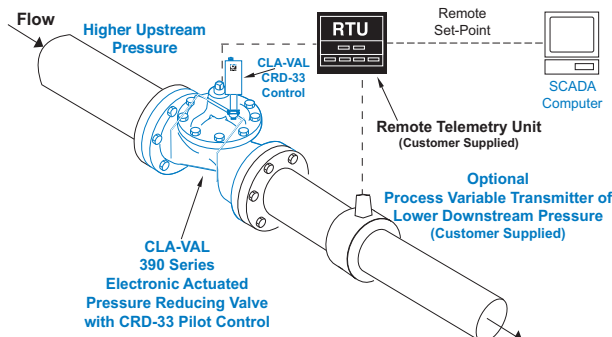


- Ideal for Pressure Management
- Simplified Remote Valve Set-Point Control
- Isolated Input
- 12-24VDC Input Power
- Reverse Polarity Protection
- IP-68 Submersible

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

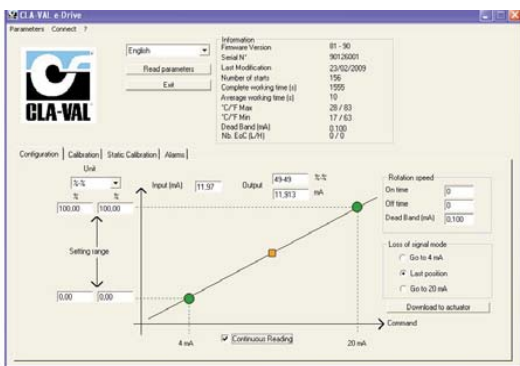
Available with optional Stainless Steel or Monel materials at additional cost. Consult factory for details.

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 DC24V 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)

CLA-VAL

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www.cla-val.com

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 subassembly. 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.

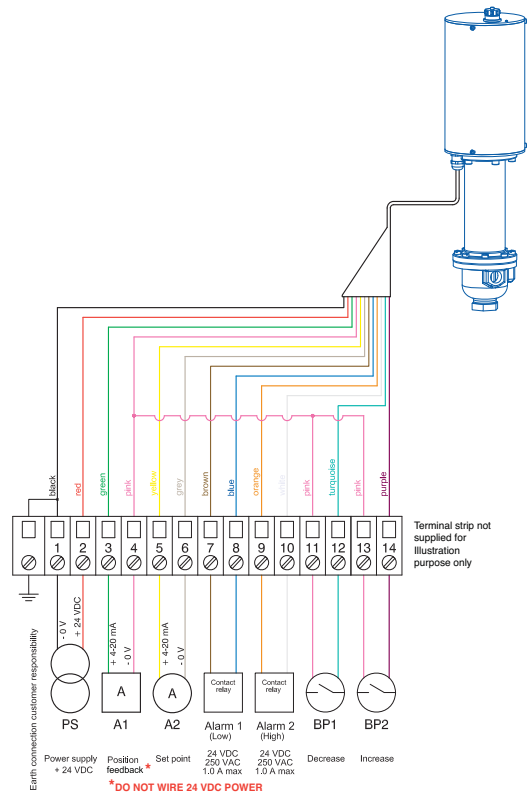
There are no user serviceable parts inside the actuator and tampering or opening it will void the warranty. The ten-wire actuator cable is permanently attached. Internal damage not covered by warranty will occur if cable is removed.

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

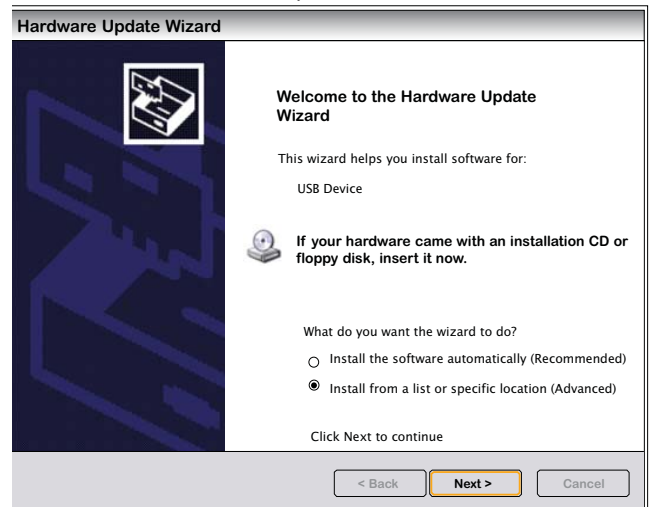
When 130VC-3 communications cable is installed in your laptop computer USB port for the first time, Windows will search your computer for the cable multi-USB driver. If Windows Plug-and-Play does not automatically find the driver and connect to actuator, then the cable driver must be set-up manually.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

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

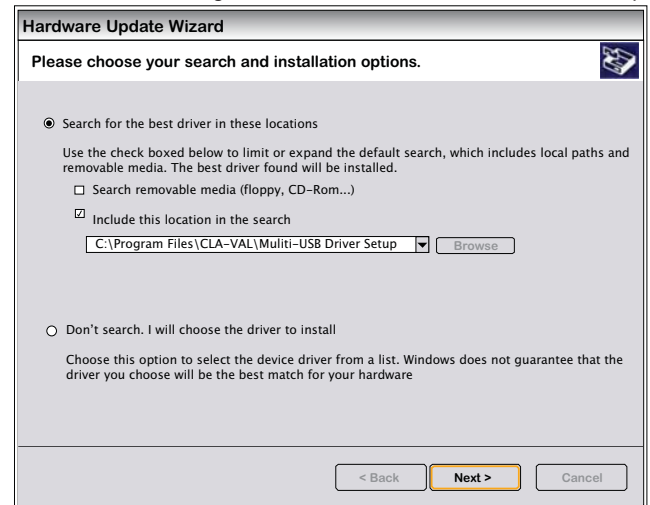
www.cla-val.com

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 presss "Continue Anyway"

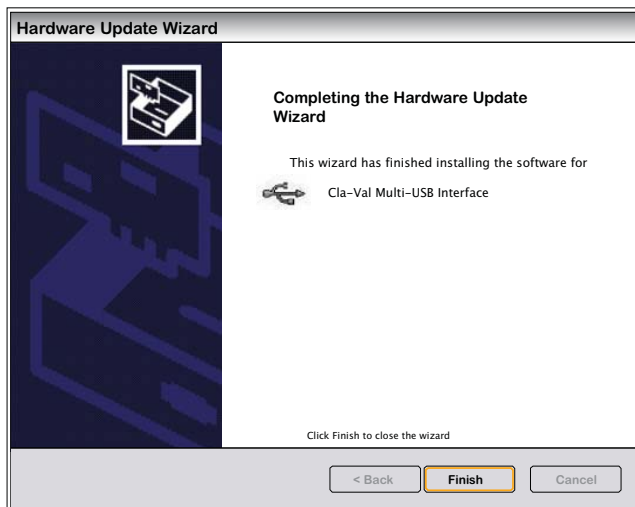
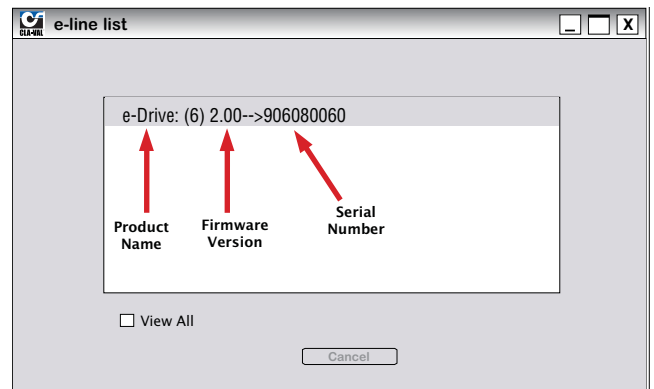


Setting the restore point during installation



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.

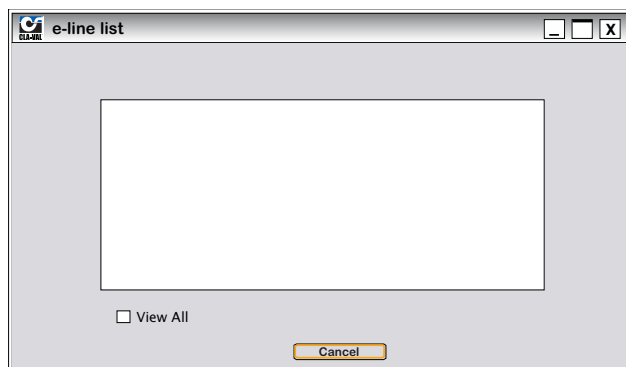


Installation complete.

Opening Software

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

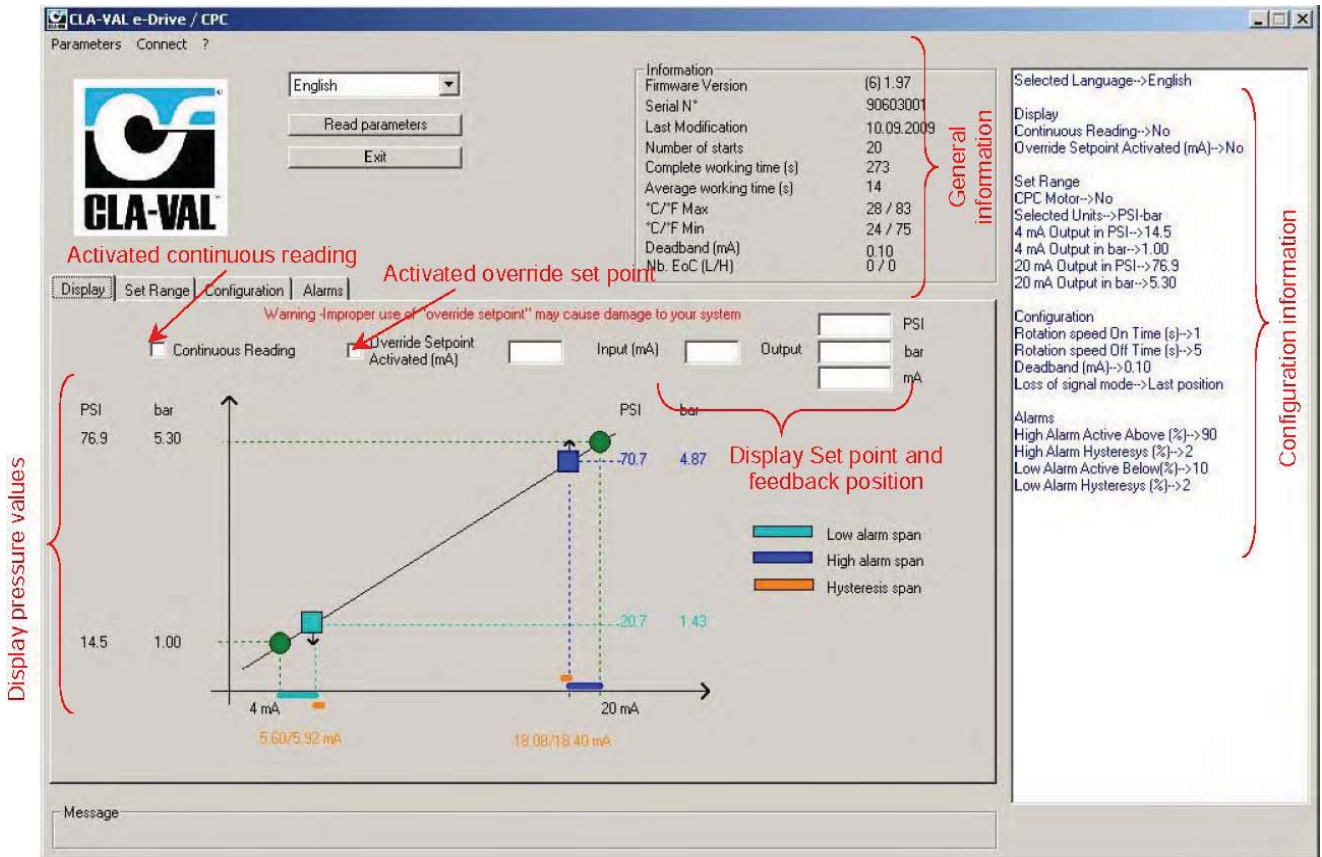
If the actuator is not connected to the laptop, the window will be empty but can be used to view the software to become familiarized with the different windows. Click the "cancel " button to launch the software



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



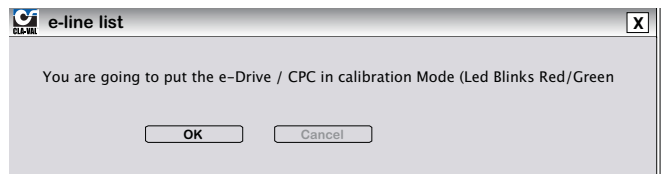
Calibration - Static and Dynamic

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 be 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.

Parameters Connect ?

English

Reed parameters

Exit

Information

Firmware Version	-
Serial N°	-
Last Modification	-
Number of starts	-
Complete working time (s)	-
Average working time (s)	-
°C/°F Max	-
°C/°F Min	-
Deadband (mA)	0.100
Nb. EoC (L/H)	-

Selected Language→English

Display

Continuous Reading→No

Override Setpoint Activated (mA)→No

Set Range

CPC Motor→No

Selected Units→PSI-bar

4 mA Output in PSI→0.0

4 mA Output in bar→0.00

20 mA Output in PSI→0.0

20 mA Output in bar→0.00

Calibration Mode→Static Calibration

Turns to Low Point→0

Turns to High Point→0

Configuration

Rotation speed On Time (s)→0

Rotation speed Off Time (s)→0

Deadband (mA)→

Loss of signal mode→Last position

Alarms

High Alarm Active Above (%)→90

High Alarm Hysteresys (%)→2

Low Alarm Active Below (%)→10

Low Alarm Hysteresys (%)→2

Cancel Calibration

1- Mode: Static Calibration ☐ CPC Motor

2- Units: PSI-bar

3- Value at 4 mA: 0.0 0.00 4 - Enter Turns to Low Point 0 Decrease actuator

3- Value at 20 mA: 0.0 0.00 5 - Enter Turns to High Point 0 Increase actuator

Spring Chart

US e-Drive-33
PSI change / turn
CRD-33 15-75 per turn : 9.1
CRD-33 20-105 per turn : 11.2
CRD-33 40-140 per turn : 26.8
CDB-33 5-25 per turn : 3.8
CDB-33 10-60 per turn : 11.5
CDB-33 20-80 per turn : 13.9
CDB-33 50-150 per turn : 28.3
CDB-33 65-180 per turn : 42.4
CRL-33 7-75 per turn : 9.1
CRL-33 20-105 per turn : 14.8
CRL-33 20-200 per turn : 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.

Parameters Connect ?

English

Read parameters

Exit

Information

Firmware Version -

Serial N -

Last Modification -

Number of starts -

Complete working time (s) -

Average working time (s) -

C/F Max -

C/F Min -

Deadband (mA) 0.100

Nb. EoC (L/H) -

Selected Language→English

Display

Continuous Reading→No

Override Setpoint Activated (mA)→No

Set Range

CPC Motor→No

Selected Units→PSI-bar

4 mA Output in PSI→0.0

4 mA Output in bar→0.00

20 mA Output in PSI→0.0

20 mA Output in bar→0.00

Calibration Mode→Dynamic Calibration

Configuration

Rotation speed On Time (s)→0

Rotation speed Off Time (s)→0

Deadband (mA)→

Loss of signal mode→Last position

Alarms

High Alarm Active Above (%)→90

High Alarm Hysteresis (%)→2

Low Alarm Active Below (%)→10

Low Alarm Hysteresis (%)→2

Cancel Calibration

1- Mode

Dynamic Calibration

CPC Motor

2- Units

PSI-bar

3- Value at 4 mA

0.0 0.00

4- Adjust valve to 4 mA value

Low point setting

Decrease actuator

3- Value at 20 mA

0.0 0.00

5- Adjust valve to 20 mA value

High point setting

Increase actuator

6- Attainable high point value

0.0 0.00

GUIDANCE NOTES

Low Point setting : Adjust the valve to 4mA value setting using Decrease/Increase Actuator buttons : then select 'Low point setting'

High Point setting : Adjust the valve to 20mA value setting using Decrease/Increase Actuator then select 'High point setting'

- 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.

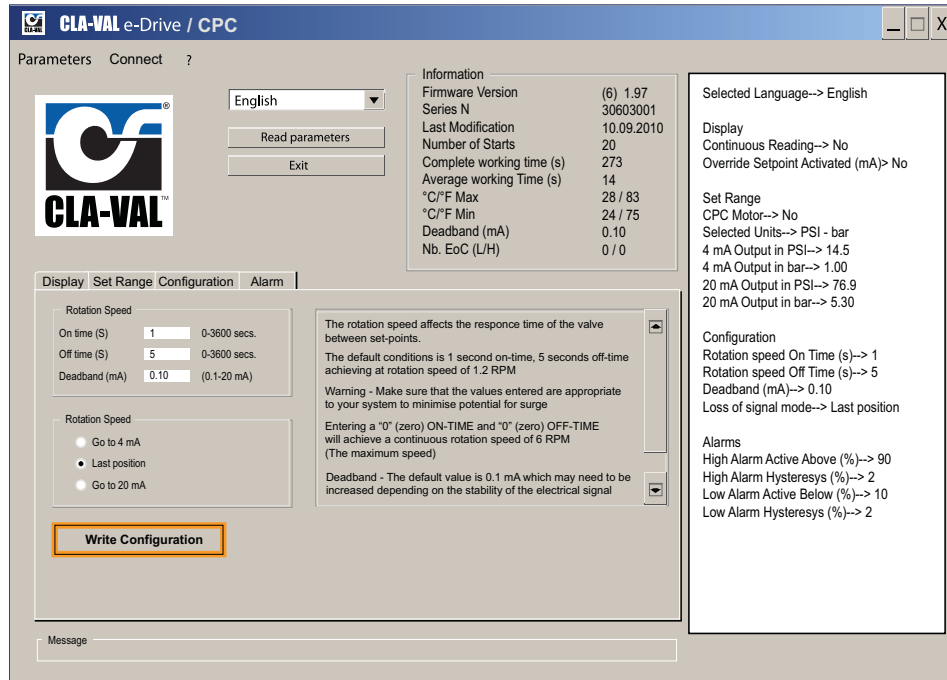
- 1 Rotation speed affects the response time of the valve between set-points. The default condition is 1 second on-time, 5 seconds off-time achieving at rotation speed of 1.2 rpm. Entering a '0' (zero) on time and '0' (zero) off time will achieve a continuous rotation speed of 6 rpm (maximum speed).



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.



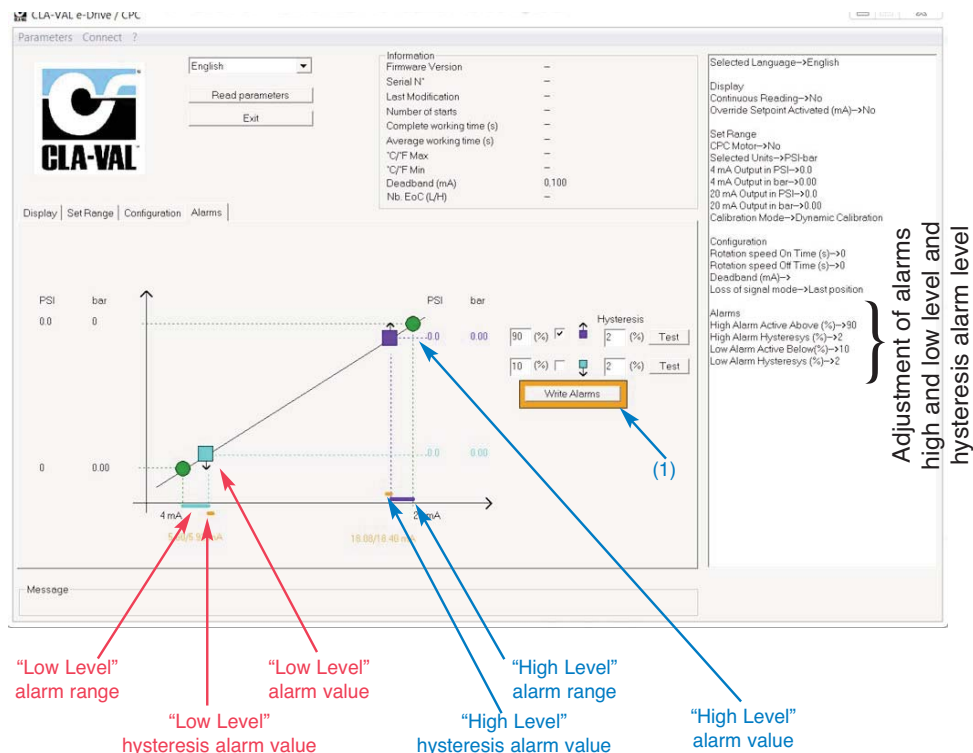


Alarms

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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E-mail: cla-val@cla-val.fr

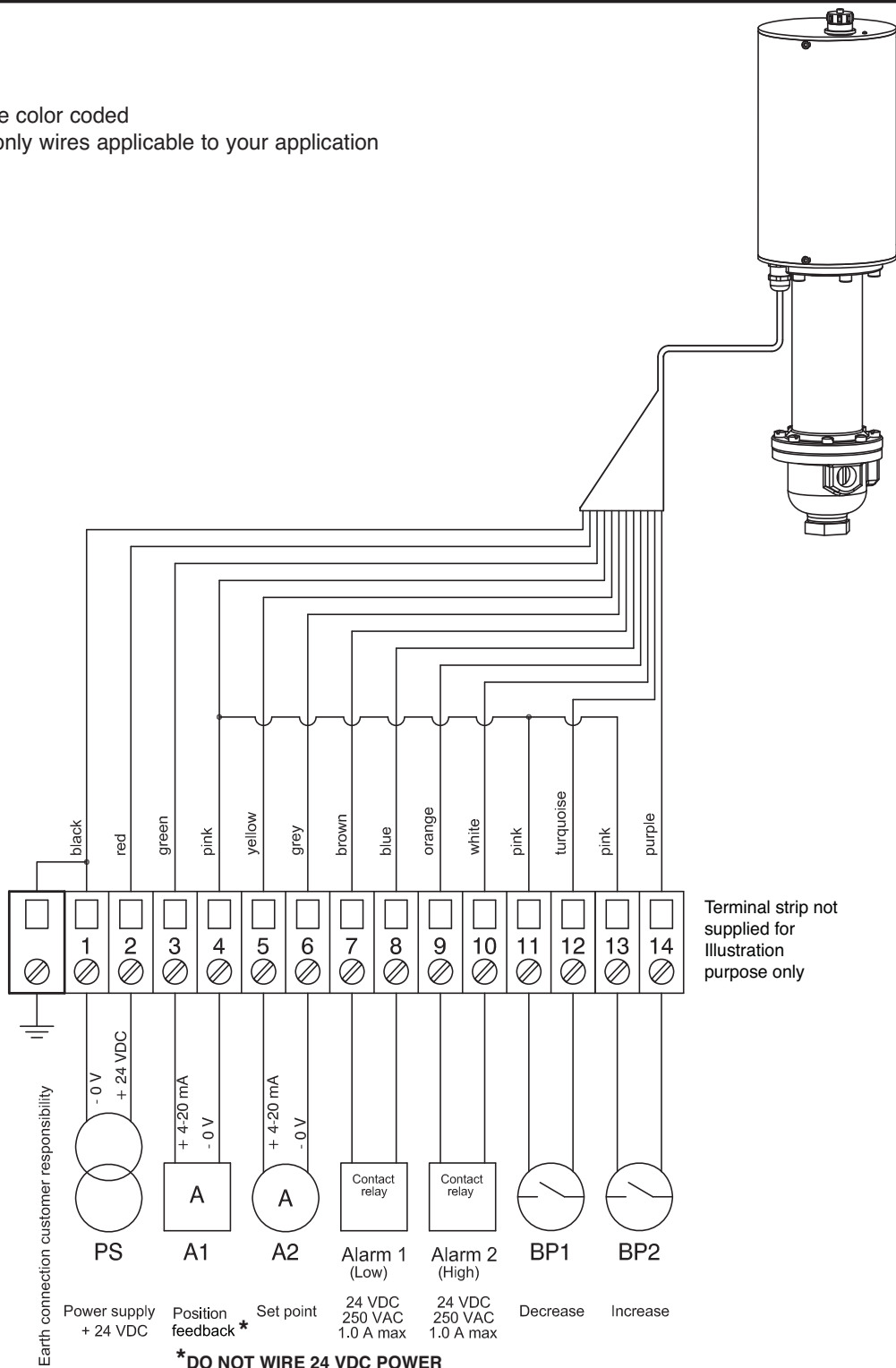


130VC-3

33 Series Actuator Wiring Diagram

Note:

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



CLA-VAL CO.

NEWPORT BEACH, CALIFORNIA

CATALOG NO.

X58C

DRAWING NO.

48834

REV

AP

TYPE OF VALVE AND MAIN FEATURES

X58C RESTRICTION ASSEMBLIES

DESIGN

DRAWN JC

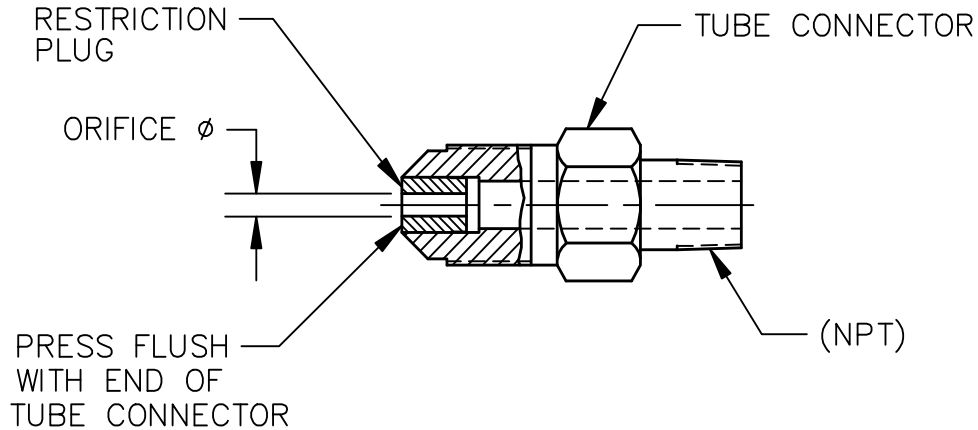
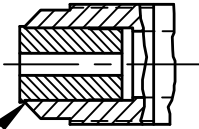
12-3-85

CHK'D JC

12-4-85

APV'D CH

12-11-85

*79730J
PRESS TO
SHOULDER

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.

CAD REVISION RECORD - DO NOT REVISE MANUALLY

DATE	BY	DESCRIPTION
11-18-93	EK	SEE REVISION FILE
		AL REDRAWN ON CAD (ECO 14229)



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

37° FLARE

**44734C

3/8 X 3/8-18 NPT

ALUMINUM

.125 (1/8)

S. STEEL

45° FLARE

*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)

DELRIN

*85486K

1/4 X 1/8-27 NPT

BRASS

.040

DELRIN

**48834-03A

1/4 X 1/8-27 NPT

BRASS

.125 (1/8)

DELRIN

*48834-04J

1/4 X 1/8-27 NPT

BRASS

.093

DELRIN

*88409-01G

3/8 X 1/8-27 NPT

BRASS

.031 (1/32)

DELRIN

*88409J

3/8 X 1/8-27 NPT

BRASS

.052

DELRIN

*42346H

3/8 X 1/8-27 NPT

BRASS

.062 (1/16)

DELRIN

**48834-01E

3/8 X 1/8-27 NPT

BRASS

.125 (1/8)

DELRIN

*42775H

3/8 X 1/4-18 NPT

BRASS

.062 (1/16)

DELRIN

**63604D

3/8 X 1/4-18 NPT

BRASS

.156 (5/32)

DELRIN

*10253D

3/8 X 3/8-18 NPT

BRASS

.031 (1/32)

DELRIN

*46946A

3/8 X 3/8-18 NPT

BRASS

.062 (1/16)

DELRIN

**64673H

3/8 X 3/8-18 NPT

BRASS

.125 (1/8)

DELRIN

*68565B

3/8 X 3/8-18 NPT

BRASS

.094 (3/32)

DELRIN

**43302K

3/8 X 3/8-18 NPT

BRASS

.188 (3/16)

DELRIN

**12900H

1/2 X 1/2-14 NPT

BRASS

.125 (1/8)

DELRIN

**48834-02C

1/2 X 1/2-14 NPT

BRASS

.188 (3/16)

DELRIN

**48834-06D

1/2 X 1/2-14 NPT

BRASS

.250 (1/4)

DELRIN

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 $\pm 1/8"$.

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.

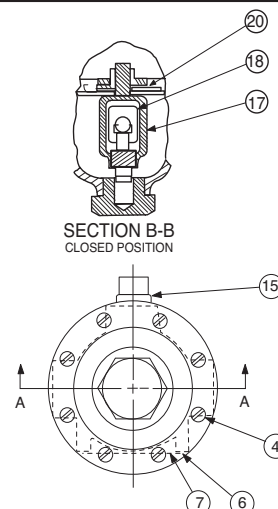
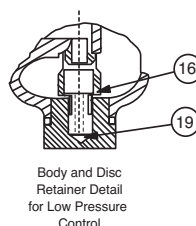
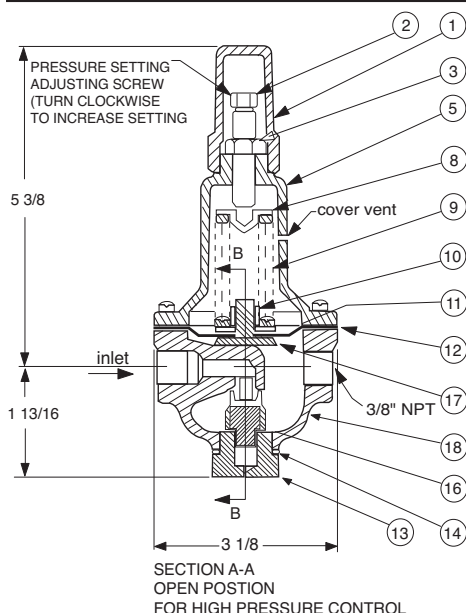
5. Install spring (9) with spring guide (8).
6. Install cover (5), adjusting screw (2) and nut (3), then cap (1).



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



— MODEL — **X46**

Flow Clean Strainer



X46A Straight



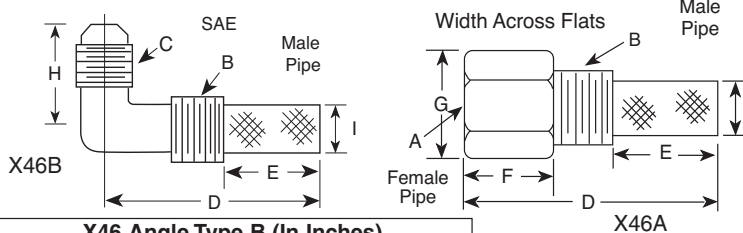
X46B Angle

- 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.

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)



X46 Angle Type B (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

**When Ordering,
Please Specify:**

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

X46A Straight Type A (In Inches)

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

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.

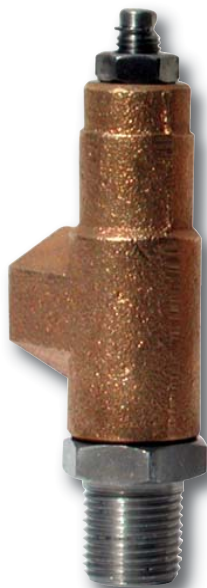
REPLACEMENT

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).



— MODEL — **CV**
Flow Control



DESCRIPTION

The Cla-Val Model CV Flow Control is a simply-designed, spring-loaded check valve. Rate of flow is full flow in one direction and restricted in other direction. Flow is adjustable in the restricted direction. It is intended for use in conjunction with a pilot control system on a Cla-Val Automatic Control Valve.

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.

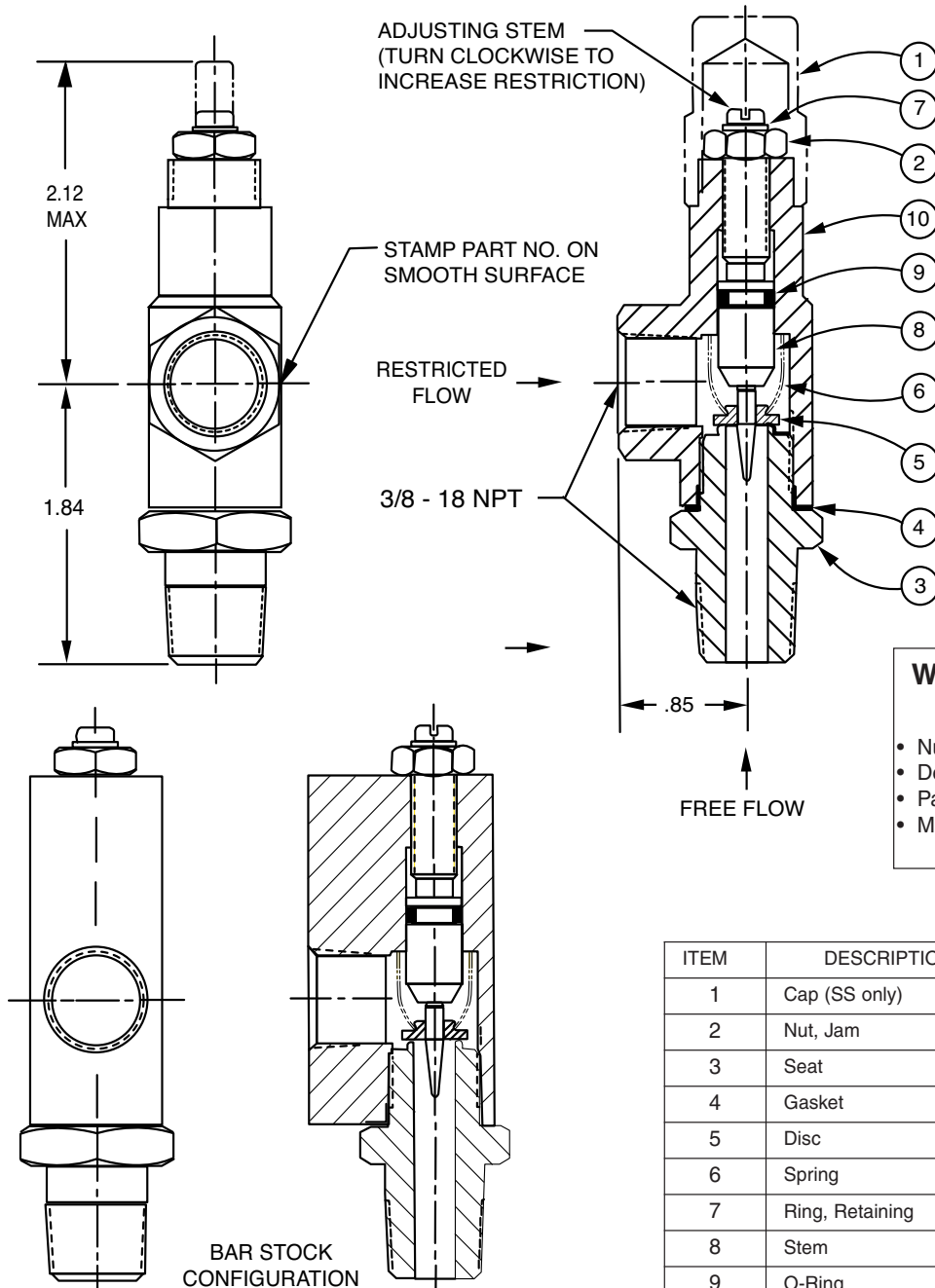
TEST PROCEDURE

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



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



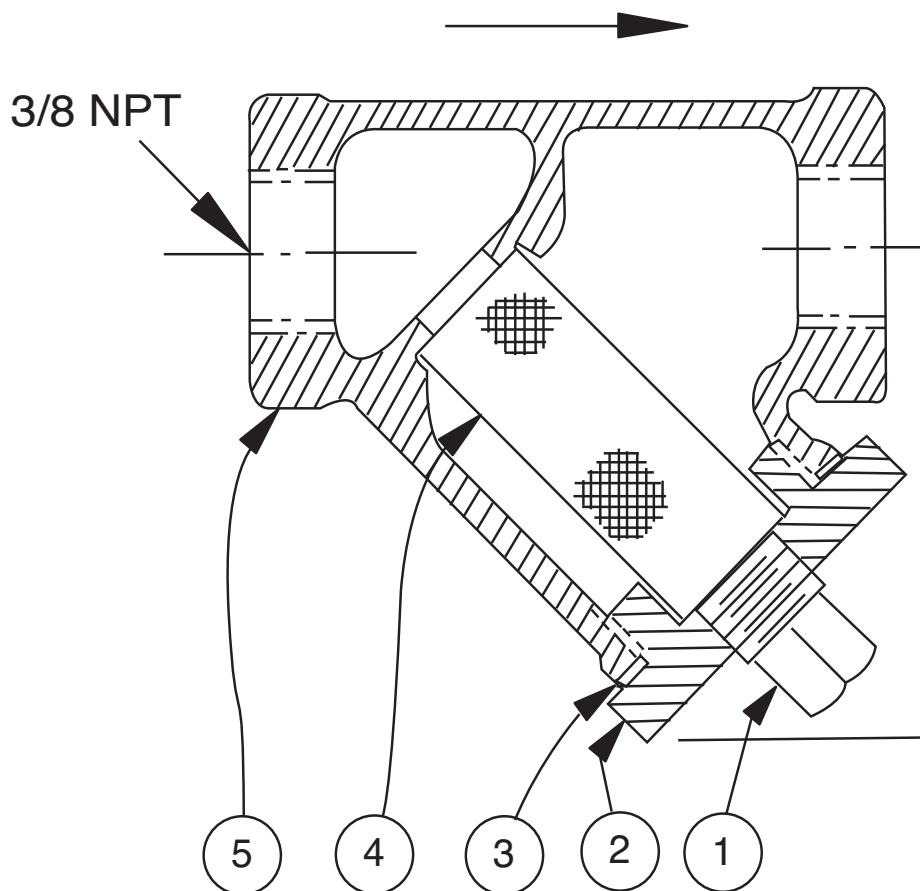
X43

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

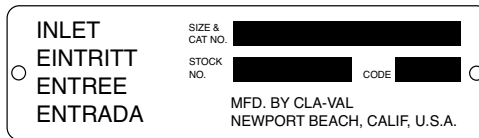


Proper Identification

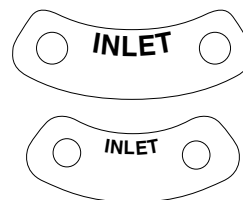
For ordering repair kits, replacement parts, or for inquiries concerning valve operation, it is important to properly identify Cla-Val products already in service by including all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details,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



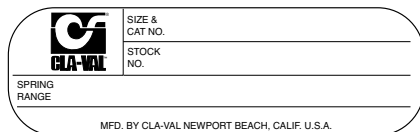
This brass plate appears on valves sized 2 1/2" and is located on the top of the inlet flange.



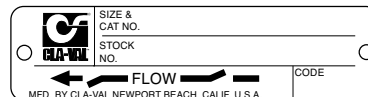
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



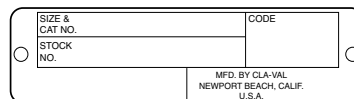
This brass plate appears on altitude valves only and is found on top of the outlet flange.



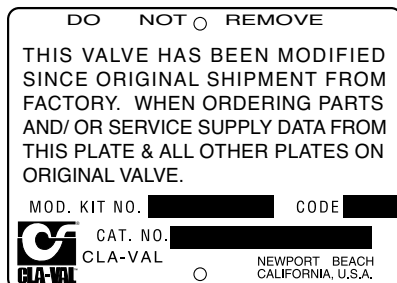
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



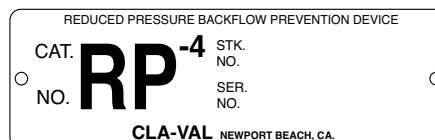
These two brass plates appear on threaded valves 1" through 3" size or flanged valves 1" through 2". It is located on only one side of the valve body.



This 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

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.

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)

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

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

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

TERMS OF SALE

ACCEPTANCE OF ORDERS

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

CREDIT TERMS

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

PURCHASE ORDER FORMS

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

PRODUCT CHANGES

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

PRICES

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

RESPONSIBILITY

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

RISK

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

EXPORT SHIPMENTS

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

RETURNED GOODS

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



CLA-VAL

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Fax: 905-563-4040

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

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www.cla-val.com

Represented By:



—MODEL—

REPAIR KITS

Complete Replacement Diaphragm Assemblies for 100-01 and 100-20 Hytrol Main Valves
For: Hytrol Main Valves with Ductile Iron, Bronze Trim Materials—**125/150 Pressure Class Only.**
FACTORY ASSEMBLED
 Includes: Stem, Disc Guide, Disc, Disc Retainer, Spacer Washers, Diaphragm, Diaphragm Washer and Stem Nut.

Valve Size	Diaphragm Assembly Stock Number		Valve Size	Diaphragm Assembly Stock Number	
	100-01	100-20		100-01	100-20
3/8" (Also 81-01)	49097K	N/A	6"	40456G	33273E
1/2" - 3/4" (Also 81-01)	C2518D	N/A	8"	45276D	40456G
1"	C2520K	N/A	10"	81752J	45276D
1 1/4"-1 1/2"	C2522 F	N/A	12"	85533J	81752J
2"	C2524B	N/A	14"	89067D	N/A
2 1/2"	C2523D	N/A	16"	89068B	85533J
3"	C2525J	C2524B	20"	N/A	89068B
4"	33273E	C2525J	24"	N/A	89068B

Repair Kits for 100-01/100-20 Hytrol Valves

For: Hytrol Main Valves—**125/150 Pressure Class Only.**
 Includes: Diaphragm, Disc (or Disc Assembly) and spare Spacer Washers.

Buna-N® Standard Material				Viton (For KB Valves)			
Valve Size	Repair Kit Stock Number		Valve Size	Repair Kit Stock Number		Valve Size	Repair Kit Stock Number
	100-01	100-20		100-01	100-20		
3/8" (Also 81-01)	9169801K	N/A	3/8" (Also 81-01)	9169806J	N/A	3/8" (Also 81-01)	9169806J
1/2" - 3/4" (Also 81-01)	9169802H	N/A	1/2" - 3/4" (Also 81-01)	9169807G	N/A	1/2" - 3/4" (Also 81-01)	9169807G
1"	9169803F	N/A	1"	9169808E	N/A	1"	9169808E
1 1/4" - 1 1/2"	9169804D	N/A	1 1/4" - 1 1/2"	9169809C	N/A	1 1/4" - 1 1/2"	9169809C
2"	9169805A	N/A	2"	9169810A	N/A	2"	9169810A
2 1/2"	9169811J	N/A	2 1/2"	9169817F	N/A	2 1/2"	9169817F
3"	9169812G	9169805A	3"	9169818D	9169810A	3"	9169818D
4"	9169813E	9169812G	4"	9169819B	9169818D	4"	9169819B
6"	9169815K	9169813E	6"	9169820K	9169819B	6"	9169820K
8"	9817901D	9169815K	8"	9169834A	9169820K	8"	9169834A
10"	9817902B	9817901D					
12"	9817903K	9817902B					
14"	9817904H	N/A					
16"	9817905E	9817903K					
20"	N/A	9817905E					
24"	9817906C	9817905E					

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

Repair Kits for 100-02/100-21 Powertrol and 100-03/100-22 Powercheck Main Valves**For:** Powertrol and Powercheck Main Valves—**125/150 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

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

Larger Sizes: Consult Factory.

For: Hy-Check Main Valves—**125/150 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

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

Larger Sizes: Consult Factory.

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

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