
CLA-VAL

AUTOMATIC CONTROL VALVES

393-01/3693-01

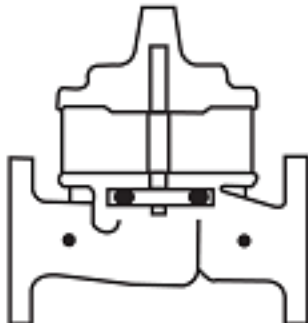
Place this manual with personnel responsible
for maintenance of this valve



Installation



Operation



Maintenance





NEWPORT BEACH, CALIFORNIA

CATALOG NO.
393-01/3693-01

DRAWING NO.
201674

REV
B

TYPE OF VALVE AND MAIN FEATURES

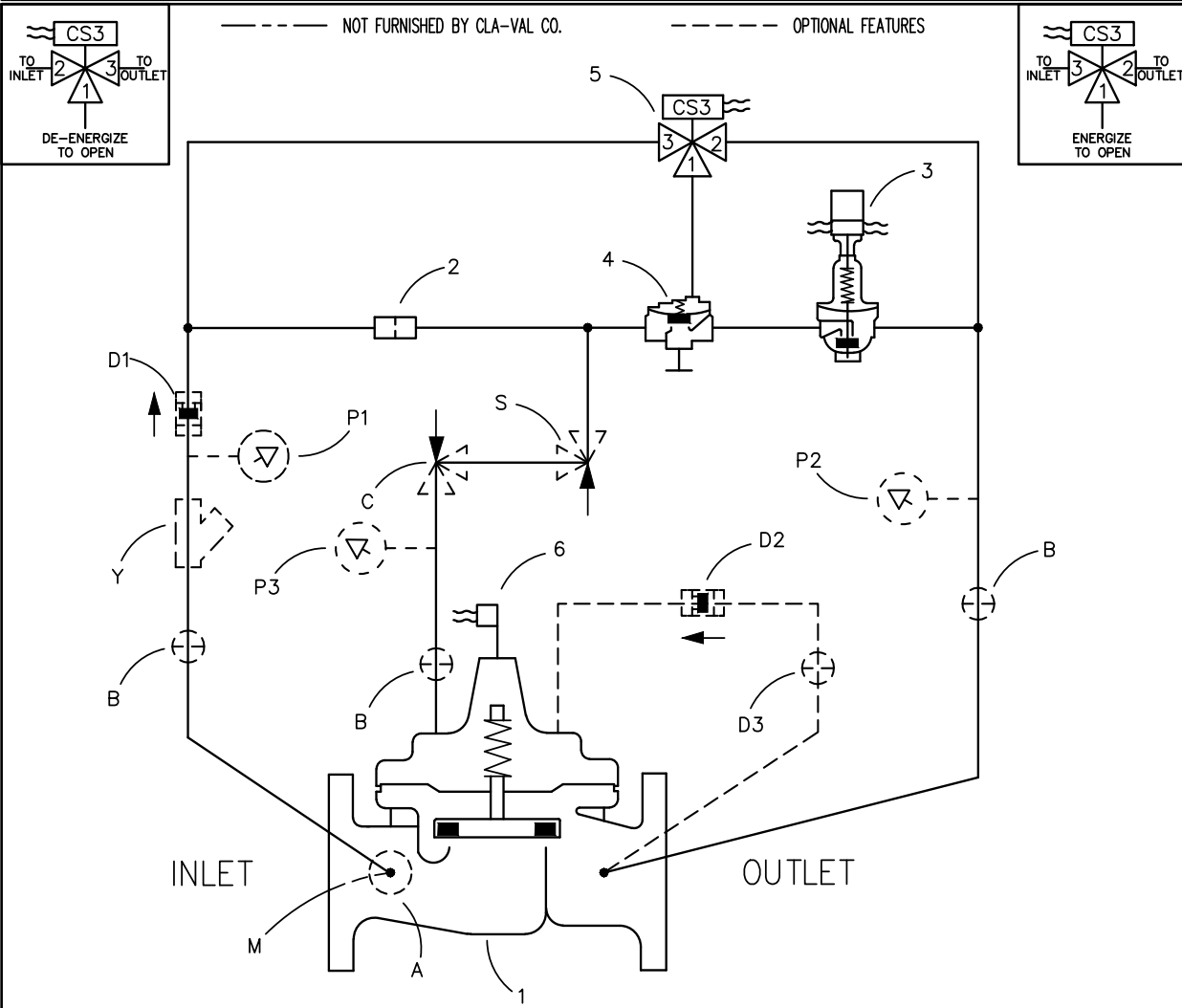
ELECTRONIC ACTUATED PRESSURE REDUCING
AND SOLENOID SHUTOFF VALVE

DESIGN

DRAWN	AK	6-15-00
CHK'D	VL	7-17-00
APVD	CH	7-18-00

CHANGED ITEMS 5 & 6 TO ITEMS 4 & 5; ADDED
 ITEM #6; DELETED OPTIONAL ITEM #E (ECO 18327)
 B CRD33 WAS CRD30; ADDED OPTIONAL M & P FEATURES (ECO 25062)

CAD REVISION RECORD - DO NOT REVISE MANUALLY
 DESCRIPTION
 DATE
 BY
 LTR
 I - RELEASED FOR PRODUCTION (NED 45290)
 A - DELETED ITEM #4 CRD PRESSURE REDUCING CONTROL;



ITEM NO.	BASIC COMPONENTS	QTY	OPTIONAL FEATURE SUFFIX ADDED TO CATALOG NUMBER	
1	100-01 HYTROL (393-01) MAIN VALVE	1	S	CV FLOW CONTROL (OPENING) 1
	100-20 HYTROL (3693-01) MAIN VALVE		Y	X43 "Y" STRAINER 1
2	X58C RESTRICTION ASSEMBLY	1		
3	CRD33 ELECTRONIC PRESSURE REDUCING CONTROL	1		
4	100-01 AUXILIARY HYTROL (REV. FLOW)	1		
5	CS3 SOLENOID CONTROL	1		
6	X105LCW LIMIT SWITCH ASSEMBLY	1		
A	X46A FLOW CLEAN STRAINER	1		
B	CK2 COCK (ISOLATION VALVE)	3		
C	CV FLOW CONTROL (CLOSING)	1		
D	CHECK VALVES WITH COCK	1		
M	X144 E-FLOW METER	1		
P	X141 PRESSURE GAUGE ASSEMBLY	3		

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CLA-VAL CO.

NEWPORT BEACH, CALIFORNIA

CATALOG NO.

393-01/3693-01

DRAWING NO.

201674

REV

B

TYPE OF VALVE AND MAIN FEATURES

 ELECTRONIC ACTUATED PRESSURE REDUCING
AND SOLENOID SHUTOFF VALVE

DESIGN

DRAWN

AK

6-15-00

CHK'D

VL

7-17-00

APVD

CH

7-18-00

OPERATING DATA

 I. SOLENOID CONTROL FEATURE:

SOLENOID CONTROL (5) IS A DIRECT ACTING, 3-WAY SOLENOID CONTROL THAT CHANGES POSITION WHEN THE COIL IS DE-ENERGIZED OR ENERGIZED. THIS APPLIES OR RELIEVES PRESSURE IN THE COVER CHAMBERS OF AUXILIARY HYTROL (4), PROVIDING THE OPERATION SHOWN IN THE FOLLOWING TABLE:

		393E-01/3693E-01 SERIES		393D-01/3693D-01 SERIES	
SOLENOID CONTROL (5)		AUXILIARY HYTROL (4) POSITION	MAIN VALVE (1) POSITION	AUXILIARY HYTROL (4) POSITION	MAIN VALVE (1) POSITION
POSITION	PORTS CONNECTED				
ENERGIZED	1 & 2	OPEN	OPEN UNDER COMMAND OF CONTROL (3)	CLOSED	CLOSED
DE-ENERGIZED	1 & 3	CLOSED	CLOSED	OPEN	OPEN UNDER COMMAND OF CONTROL (3)

 II. PRESSURE REDUCING FEATURE:

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

 III. SWITCH ASSEMBLY FEATURE:

SWITCH ASSEMBLY (6) IS ACTUATED BY A STEM EXTENSION ATTACHED TO THE MAIN VALVE STEM. THE SWITCH ASSEMBLY IS FACTORY ADJUSTED TO ACTUATE A SINGLE-POLE DOUBLE-THROW SWITCH WHEN THE MAIN VALVE IS ALMOST CLOSED. WHEN THE MAIN VALVE STARTS TO OPEN, THE SPRING LOADED SWITCH ACTUATING LEVER IS RELEASED AND RETURNS THE SWITCH TO ITS NORMAL POSITION.

CAD REVISION RECORD - DO NOT REVISE MANUALLY

DATE

BY

DESCRIPTION

LTR

SEE SHEET 1



NEWPORT BEACH, CALIFORNIA

CATALOG NO.

393-01/3693-01

DRAWING NO.

201674

REV

B

TYPE OF VALVE AND MAIN FEATURES

ELECTRONIC ACTUATED PRESSURE REDUCING
AND SOLENOID SHUTOFF VALVE

DESIGN

DRAWN	AK	6-15-00
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CHK'D	VL	7-17-00
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APVD	CH	7-18-00
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OPERATING DATA-CONTINUED

IV. OPTIONAL FEATURE OPERATING DATA:

SUFFIX A (FLOW CLEAN STRAINER):

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

SUFFIX B (ISOLATION VALVES):

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

SUFFIX C (CLOSING SPEED CONTROL):

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

SUFFIX D (CHECK VALVES WITH COCK):

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

SUFFIX M (E-FLOW METER):

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

SUFFIX P (PRESSURE GAUGE):

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


SUFFIX S (OPENING SPEED CONTROL):

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

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.

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

 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO. 393-01/3693-01	DRAWING NO. 201674	REV B
	TYPE OF VALVE AND MAIN FEATURES ELECTRONIC ACTUATED PRESSURE REDUCING AND SOLENOID SHUTOFF VALVE		DESIGN

DRAWN	AK	6-15-00
CHK'D	VL	7-17-00
APVD	CH	7-18-00

OPERATING DATA-CONTINUED

V. CHECK LIST FOR PROPER OPERATION:

- () SYSTEM VALVES OPEN UPSTREAM AND DOWNSTREAM.
- () AIR REMOVED FROM THE MAIN VALVE COVER AND PILOT SYSTEM AT ALL HIGH POINTS.
- () PERIODIC CLEANING OF STRAINER (Y) IS RECOMMENDED (OPTIONAL FEATURE).
- () CV FLOW CONTROLS (C) AND (S) OPEN AT LEAST 4 TURNS (OPTIONAL FEATURE).
- () CORRECT VOLTAGE TO SOLENOID CONTROL (5).
- () ELECTRONIC PRESSURE REDUCING CONTROL (3) PROPERLY WIRED.
- () CK2 COCKS (B) AND (D3) OPEN (OPTIONAL FEATURE).

LTR	DESCRIPTION	BY	DATE
	SEE SHEET 1		

CAD REVISION RECORD - DO NOT REVISE MANUALLY

Electronic Actuated Pressure Reducing and Solenoid Shut Off

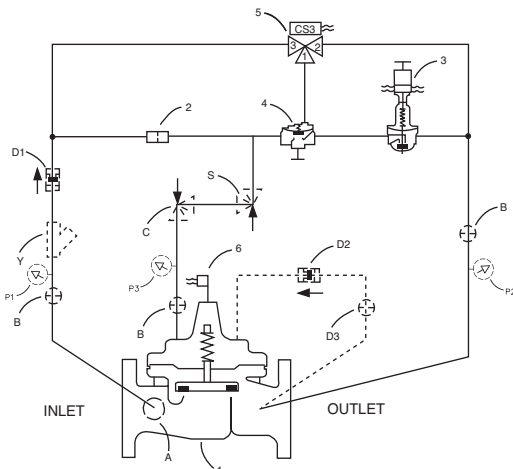


Schematic Diagram

Item	Description
1	Hytrol (Main Valve)
2	X58C Restriction Assembly
3	CRD-30 Electronic Pressure Reducing Control
4	100-01 Hytrol (Reverse Flow)
5	CS3 Solenoid Control
6	X105LC Limit Switch Assembly

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
Y	X43 "Y" Strainer



- Simplified Interfacing with SCADA Systems
- Accepts Local or Remote Setpoint
- Integral Loop Power Supply
- Accurate Pressure Control
- Reliable Hydraulic Operation
- Rugged Durable Design

The Cla-Val Model 393-01/3693-01 Electronic Actuated Pressure Reducing and Solenoid Shut Off Control Valve combines the precise control of field proven Cla-Val hydraulic pilots and the convenience and versatility of remote setpoint control. The 393-01/3693-01 is an accurate, pilot-operated regulator capable of holding downstream pressure to a pre-determined delivery pressure. When downstream pressure exceeds the pressure setting of the control pilot, the pilot valve and main valve close drip-tight. A solenoid control is provided to intercept the operation of the pressure reducing control and close the main valve. This valve is furnished either normally open (de-energized to open), or normally closed (energized to open). The pilot control, consisting of a hydraulic pilot and integral controller, accepts a setpoint and compares it with a pressure or internal potentiometer position signal and makes incremental adjustments to modulate the valve to a setpoint. The X105 limit switch prevents actuator travel when the solenoid closes the valve.

Adjustable solid state limit switches eliminate over ranging. In the event of a power or transmitter failure, the CRD-30 hydraulic pilot remains in valve control virtually assuring system stability under changing conditions. If the optional check feature ("D") is added, and a pressure reversal occurs, the valve closes to prevent return flow.

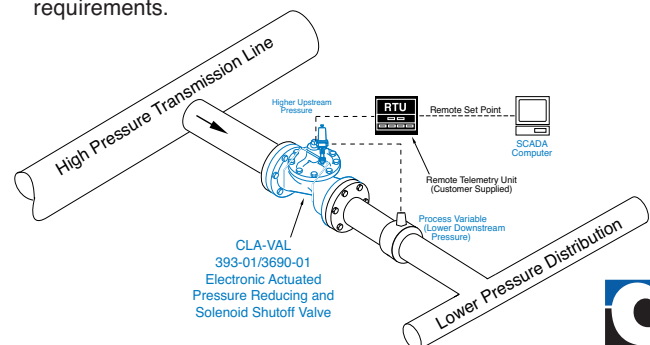
Typical Applications

The valve is designed to be used with supervisory control systems having a isolated remote analog setpoint output and a process variable (downstream pressure) input and on-off signal from solenoid.

An application for this valve is reducing high transmission line pressure to lower distribution system levels, while opening and closing on command. The solenoid control feature can be activated by an electrical signal from a timer or programmer.

It is also an effective solution for lowering direct costs associated with "confined space" requirements by eliminating need for entry into valve structure for setpoint adjustment and system information.

Additional Pilot Controls, hydraulic and/or electronic, can be easily added to perform multiple control functions to fit exact system requirements.



Model 393-01 (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

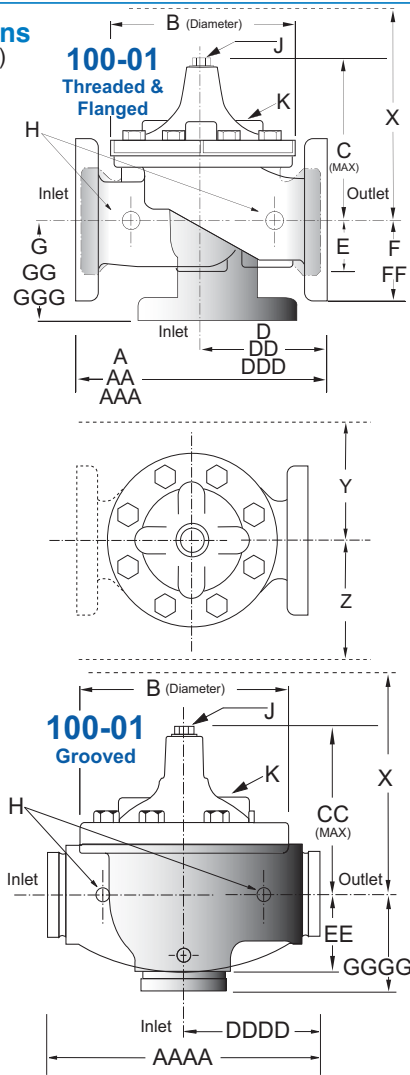
Note: * ANSI standards are for flange dimensions only.
 Flanged valves are available faced but not drilled.
 † End Details machined to ANSI B2.1 specifications.
Valves for higher pressure are available; consult factory for details

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 393-01 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

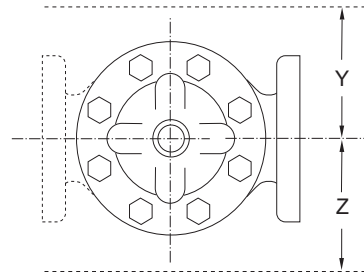
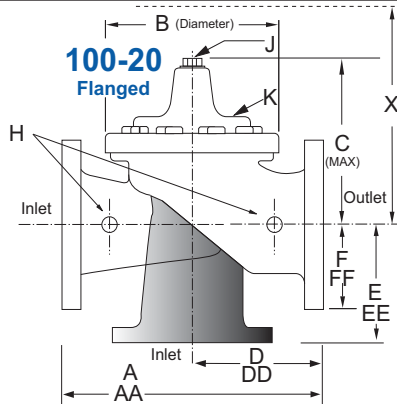
Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
Valves for higher pressure are available; consult factory for details

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 3693-01 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.

393-01/3693-01 Purchase Specifications

The 393-01/3693-01 Electronic Actuated Pressure Reducing and Solenoid Shutoff Control Valve shall have an integral hydraulic and electronic controller contained in a NEMA 4 enclosure to provide the interface between remote telemetry and valve control. It will compare a selectable remote analog or local setpoint with a process variable signal or an internal position sensor signal and automatically adjust the hydraulic pilot control until the main control valve reaches desired setpoint.

The electronic actuator will supply loop power for the process variable signal. Retransmission of the process variable shall be with an isolated non-powered analog signal. The actuator speed will be infinitely adjustable between 1/3 and 5 RPM and will have an adjustable dead band. In the event of an erroneous communications signal, actuator output will be capable of being limited to a predetermined process variable value. If these signals (SP and /or PV) are lost, the valve shall remain under control of the pressure reducing hydraulic control. The actuator can also be programmed to drive the main valve to the open or closed position if these signals are lost.

All setup and adjustments will be capable of being made prior to placing the valve into service using actuator test points for signal measurement and subsequent calibration. Actuator diagnostics will be displayed using LEDs. Manual operation of the hydraulic pilot will be fully adjustable using a non-rotating handwheel.

The Electronic Actuated Pressure Reducing and Solenoid Shut-Off Control Valve shall be the Cla-Val Model 393-01/3693-01 as manufactured by Cla-Val, Newport Beach, CA.

393-01 Valve Selection	100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes																		
	Inches	1	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	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	
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

3693-01 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

Many factors should be considered in sizing pressure reducing valves including inlet pressure, outlet pressure and flow rates. For sizing questions or cavitation analysis, consult Cla-Val with system details.

We recommend providing adequate space around valve for maintenance work

Pilot System Specifications

Adjustment Ranges

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

Temperature Range

Water: to 180°F

Materials

Standard Pilot System Materials

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

Optional Pilot System Materials

Pilot Systems are available with optional Aluminum, Stainless Steel or Monel materials.

Note: Available with remote sensing control. Consult Factory

When Ordering, Please Specify

1. Catalog No. 393-01 or 3693-01
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
10. Energized or de-energized to open Main Valve
11. Solenoid Voltage

Electronic Actuator - CRD-30 Pilot Control

- Input Voltage:** 120/240 Vac +/- 10%, 50/60 Hz
- Operating Current:** 2 Amperes at 120 Vac
- Process Variable:** Field Selectable between 4-20mA transmitter (supplied by others) or internal potentiometer
- Loop Power Supply:** 0-24 VDC
- Retransmission:** Isolated non-powered 4-20mA
- Input Signal Monitor:** If process variable is lost actuator holds in present position, opens or closes, field selectable
- Setpoint:** Field selectable between local and remote 4-20 mA, 0-5 Volt, 0-10 Volt
- Manual Adjustment:** Non-rotating handwheel
- Limit Switches:** Electronic-Full range adjustable
- Terminations:** Terminal blocks accepting up to #16 Awg solid or stranded wire
- Operating Temperature:** 0°F to 150 °F (-18 C to 65 C)
- Environmental Rating:** Enclosure rated NEMA type 4 indoor/outdoor, corrosion resistant aluminum

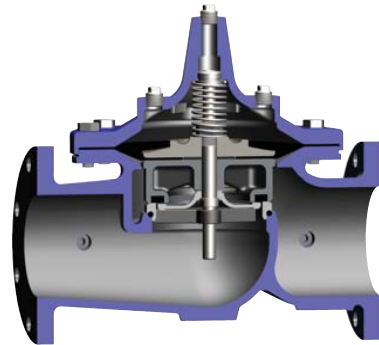


—MODEL— **100-01**
Hytrol Valve

Description

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

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

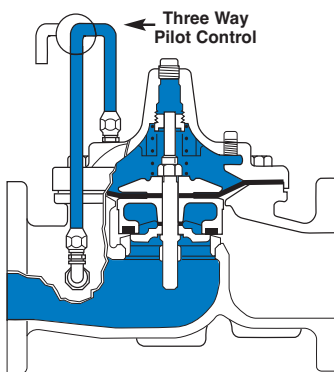


Installation

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

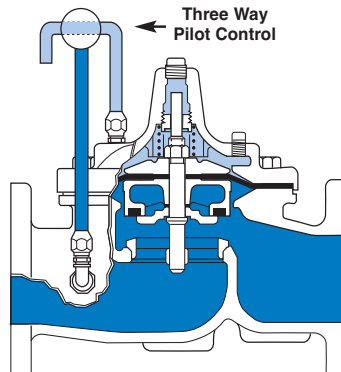
6. Caution must be taken in the installation of this valve to insure that galvanic and/or electrolytic action does not take place. The proper use of dielectric fittings and gaskets are required in all systems using dissimilar metals.
7. If a pilot control system is installed on the 100-01 Hytrol Valve,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

Principles of Operation



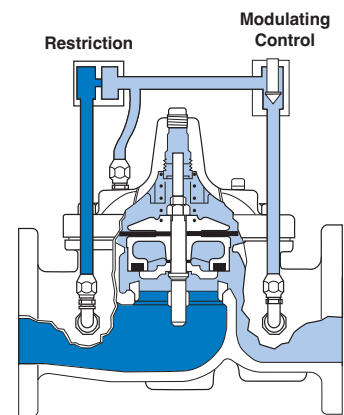
Tight Closing Operation

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



Full Open Operation

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



Modulating Action

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

Flow Direction

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



Recommended Tools

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

Troubleshooting

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

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

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

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

Three Checks

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

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

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

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

CAUTION:

*Care should be taken when doing the troubleshooting checks on the 100-01 Hytrol Valve. These checks do require the valve to open fully. This will either allow a high flow rate through the valve, or the downstream pressure will quickly increase to the inlet pressure. In some cases, this can be very harmful. Where this is the case, and there are no block valves in the system to protect the downstream piping, it should be realized that **the valve cannot be serviced under pressure**. Steps should be taken to remedy this situation before proceeding any further.*

Diaphragm Check (#1)

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

COVER CHAMBER CAPACITY

(Liquid Volume displaced when valve opens)

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

Freedom of Movement Check (#2)

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

STEM TRAVEL

(Fully Open to Fully Closed)

Valve Size (inches)		Travel (inches)	
Inches	MM	Inches	MM
1 1/4	32	0.4	10
1 1/2	40	0.4	10
2	50	0.6	15
2 1/2	65	0.7	18
3	80	0.8	20
4	100	1.1	28
6	150	1.7	43
8	200	2.3	58
10	250	2.8	71
12	300	3.4	86
14	350	4.0	100
16	400	4.5	114
20	500	5.6	143
24	600	6.7	165
30	800	7.5	190
36	900	8.5	216

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

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

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

Tight Sealing Check (#3)

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

Maintenance

Preventative Maintenance

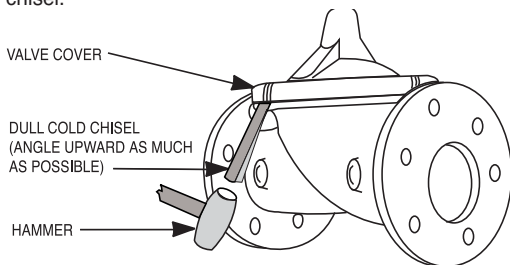
The Cla-Val Co. Model 100-01 Hytrol Valve requires no lubrication or packing and a minimum of maintenance. However, a periodic inspection schedule should be established to determine how the operating conditions of the system are affecting the valve. The effect of these actions must be determined by inspection.

Disassembly

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

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

1. Close upstream and downstream isolation valves **and independent operating pressure when used** to shut off all pressure to the valve.
2. Loosen tube fittings in the pilot system to remove pressure from valve body and cover chamber. After pressure has been released from the valve, use care to remove the controls and tubing. Note and sketch position of tubing and controls for re-assembly. The schematic in front of the Technical Manual can be used as a guide when reassembling pilot system.
3. Remove cover nuts and remove cover. If the valve has been in service for any length of time, chances are the cover will have to be loosened by driving upward along the edge of the cover with a **dull cold chisel**.



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

COVER CENTER PLUG SIZE

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

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

VALVE STEM THREAD SIZE

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

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

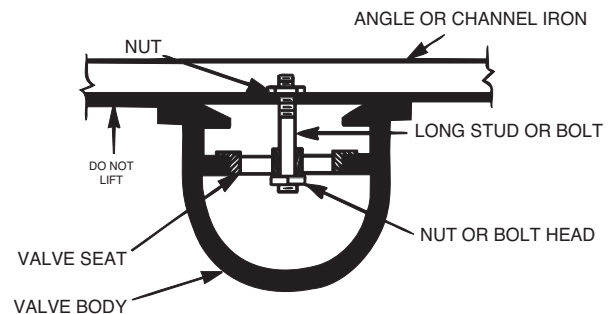
The use of a pipe wrench or a vise without soft brass jaws scars the fine finish on the stem. No amount of careful dressing can restore the stem to its original condition. Damage to the finish of the stem can cause the stem to bind in the bearings and the valve will not open or close.

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

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

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

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



Lime Deposits

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

Reassembly

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

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

Inspection of Parts

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

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

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

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

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

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

Test Procedure After Valve Assembly

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

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

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

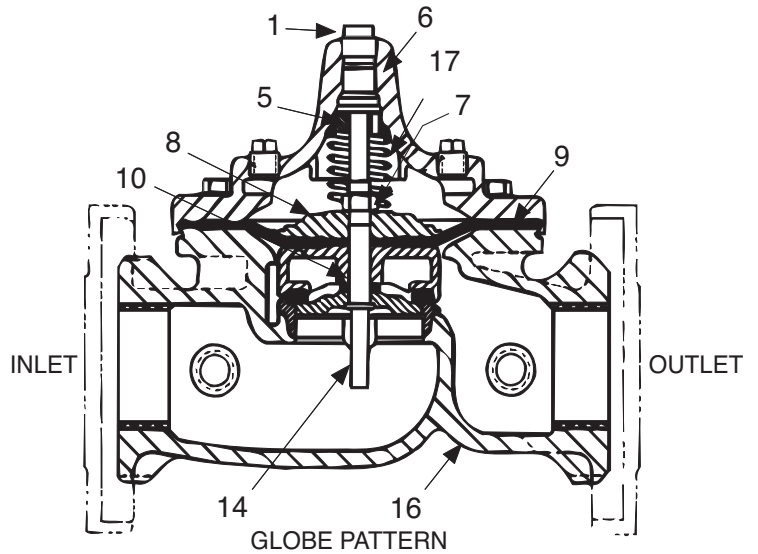
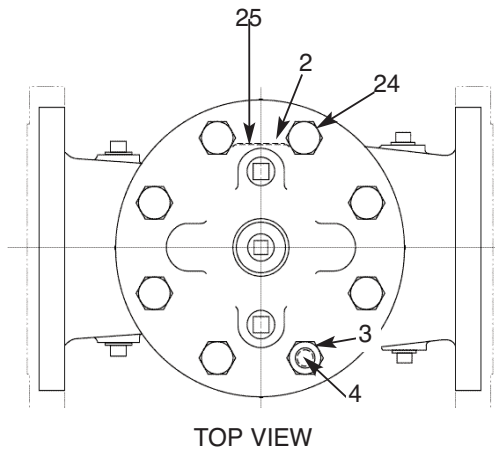
Due to the weight of the diaphragm assembly this procedure is not possible on valves 8” and larger. on these valves, the same determination can be made by carefully introducing a low pressure-less than five psi) into the valve body with the cover vented. **SEE CAUTION.** Looking in cover center hole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

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

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

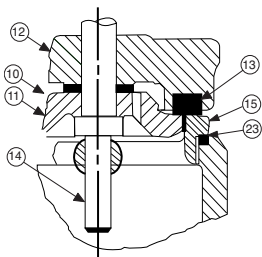
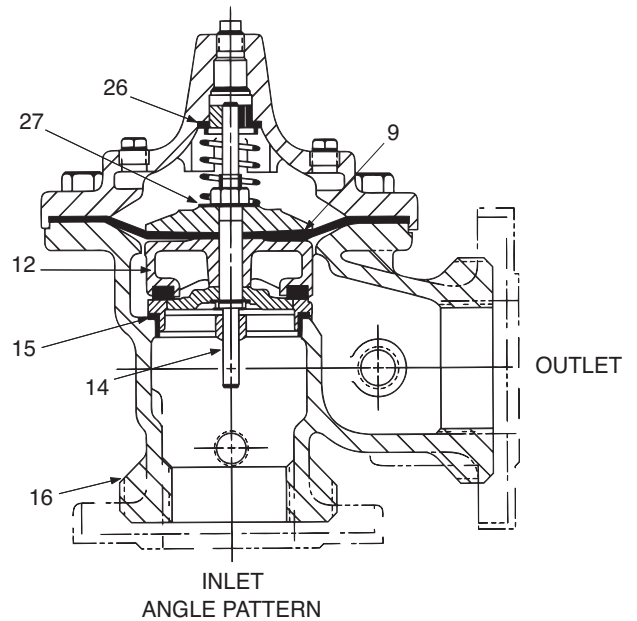
4. Remove pressure, then re-install the pilot system and tubing exactly as it was prior to removal. **Bleed air from all high points.**

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

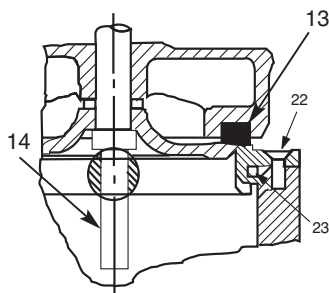


PARTS LIST

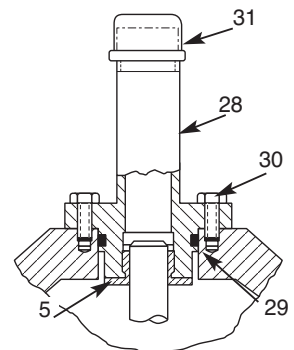
Item	Description
1.	Pipe Plug
2.	Drive Screws (for nameplate)
3.	Hex Nut (8" and larger)
4.	Stud (8" and larger)
5.	Cover Bearing
6.	Cover
7.	Stem Nut
8.	Diaphragm Washer
9.	Diaphragm
10.	Spacer Washers
11.	Disc Guide
12.	Disc Retainer
13.	Disc
14.	Stem
15.	Seat
16.	Body
17.	Spring
22.	Flat Head Screws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



1 1/4" - 6" SEAT DETAIL



8" - 24" SEAT DETAIL



16" COVER DETAIL

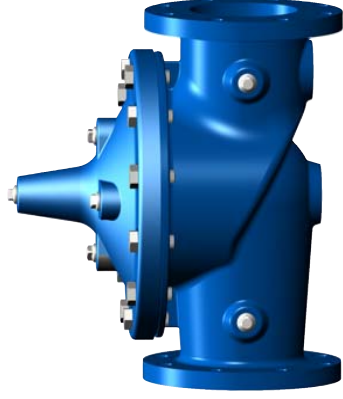


—MODEL—100-01 Hytrol Valve Service Data

Description 100-01 Hytrol Valve

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

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



Description 100-20 600 Series Hytrol Valve

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

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

HYTROL Service Data

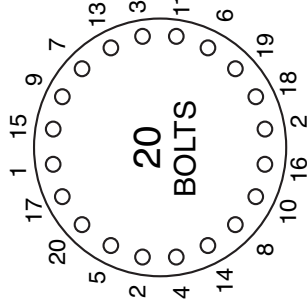
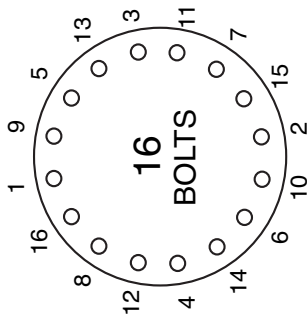
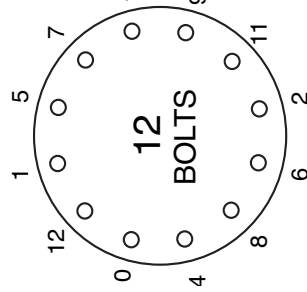
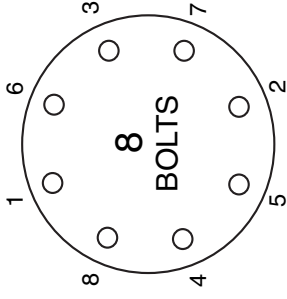
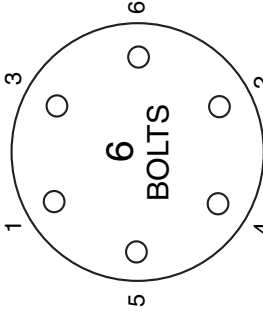
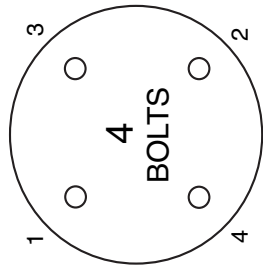
HYTROL SIZE		Stem Travel		Cover Capacity Displacement		Valve Stem Thread	Center Plug	Cover Nut or Bolt			Cover Lifting Holes UNC	Cover Plug		Cover Torque		Stem Nut**		Stem Nut Torque	
100-01	100-20	inches	mm	Gallons	Liters	UNF-Internal	NPT	Thread (Bolt)	Socket	Qty		Thread	Socket	ft. Lbs.	in. Lbs.	Thread	Socket (Long)	Lubed	DRY
1"	25							1/4" - 20 (B)	7/16"	8				4	48	3/8" - 24		4	6
1 1/4"	32			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			0.020	0.07	10 - 32	1/4"	5/16" - 18 (B)	1/2"	8				8	96	7/16" - 20		6	10
2"	50			0.032	0.12	10 - 32	1/2"	3/8" - 16 (B)	9/16"	8		3/8"	7/16"	12	12	1/2" - 20	3/4"	10	15
2 1/2"	65			0.043	0.16	10 - 32	1/2"	7/16" - 14 (B)	5/8"	8		1/2"	9/16"	20	20	5/8" - 18	15/16"	21	30
3"	80	4"	100	0.080	0.30	1/4 - 28	1/2"	1/2" - 13 (B)	3/4"	8		1/2"	9/16"	30	30	5/8" - 18	15/16"	21	30
4"	100	6"	150	0.169	0.64	1/4 - 28	3/4"	3/4" - 10 (B)	1 1/8"	8		3/4"	5/8"	110	110	3/4" - 16	1 1/16"	40	60
6"	150	8"	200	0.531	2.00	3/8 - 24	3/4"	3/4" - 10 (B)	1 1/8"	12		3/4"	5/8"	110	110	7/8" - 14	1 5/16"	85	125
8"	200	10"	250	1.26	4.80	3/8 - 24	1"	3/4" - 10	1 1/4"	16		1"	13/16"	110	110	1 1/8" - 12	1 13/16"	125	185
10"	250	12"	300	2.51	9.50	3/8 - 24	1"	7/8" - 9	1 7/16"	20		1"	13/16"	160	160	1 1/2" - 12	1 7/8"	252	375
12"	300	16"	400	4.0	15.10	3/8 - 24	1 1/4"	1 1/8" - 7	1 13/16"	20		1"	13/16"	390	390	1 1/2" - 12	2 1/2"	270	400
14"	350			6.5	24.60	3/8 - 24	1 1/2"	1 1/4" - 7	2"	20		1"	13/16"	545	545	1 1/2" - 12	2 1/2"	280	420
16"	400	20", 24"	600	9.6	36.20	1/2 - 20	2"	1 1/4" - 7	2"	20		1"	13/16"	545	545	2" - 16	3"	500	750
20"	500			12	45.40	3/4 - 16	1 1/2"	1 3/8" - 6	2 1/8"	24		1"	13/16"	670	670	2 1/4" - 16	3 1/2"	930	N/R
24"	600	30"	800	29.0	108.80	3/4 - 16*	3/4"	1 1/2" - 12	2 3/8"	24		1"	13/16"	800	800	3" - 12	Special	1350	N/R

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

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

** Must Use ONLY Cla-Val Supplied part

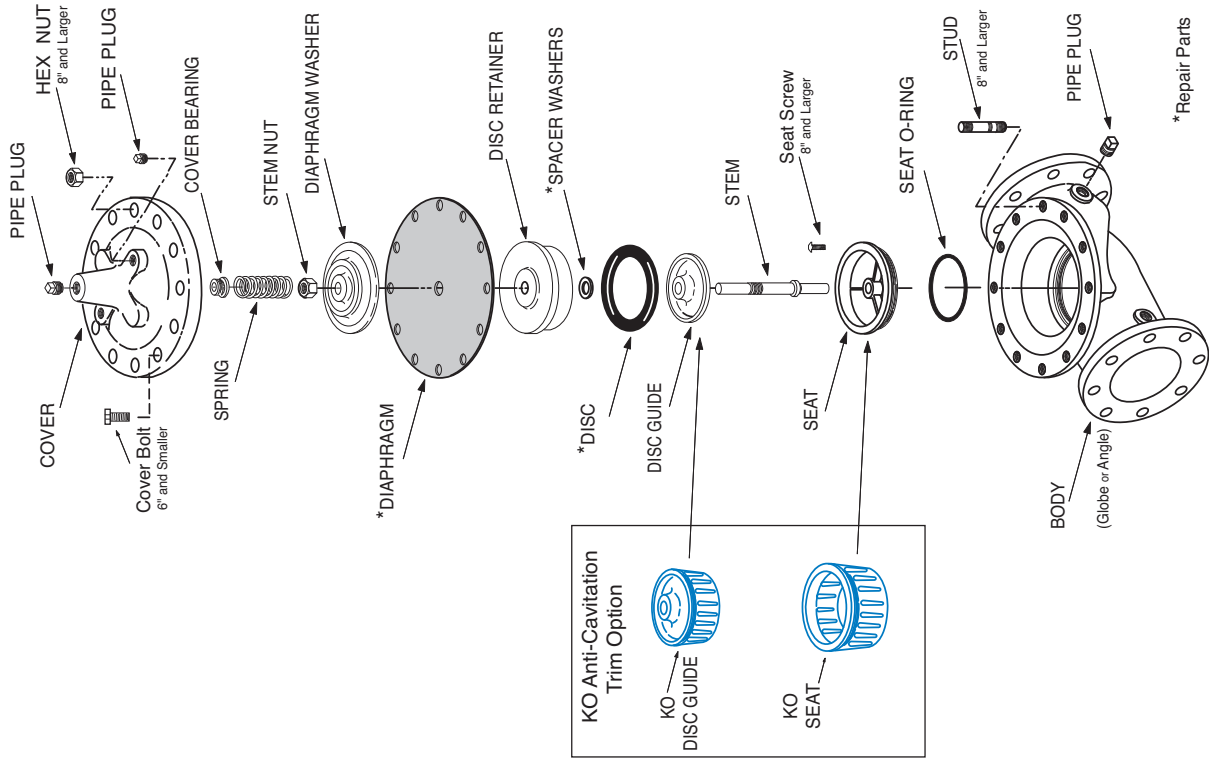
BOLT/NUT TORQUING PROCEDURES ON VALVE COVERS



Follow this procedure when reassembling MAIN Valve:

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

100-01 Hytrol Main Valve Assembly



*Repair Parts



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

600 Series Hytrol Valve

SERVICE AND MAINTENANCE OF 600 SERIES VALVES

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

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

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

UNDERSTANDING THE 600 SERIES VALVES

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

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

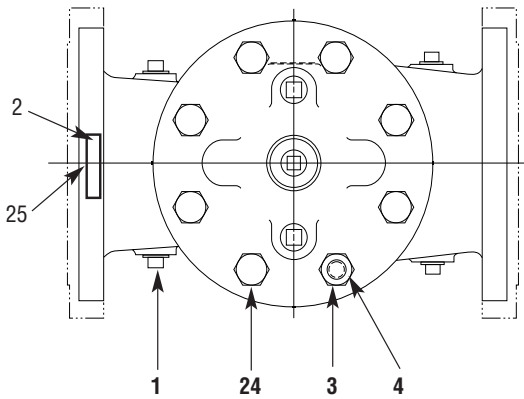
The 100-20 Hytrol valve has all of the basic features and advantages of the original 100-01 Hytrol. Only one part has been changed - the body. It is designed with different size inlet, seat and outlet openings. The 100-20 Hytrol has inlet and outlet flanges one valve size larger than the seat opening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

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

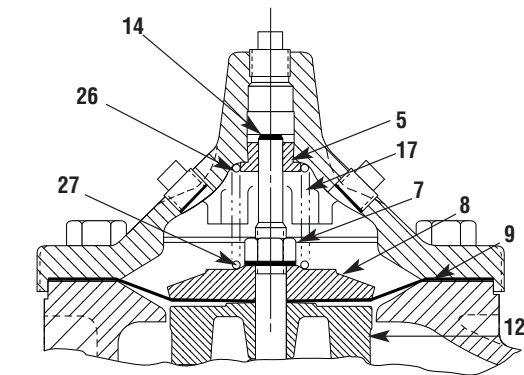
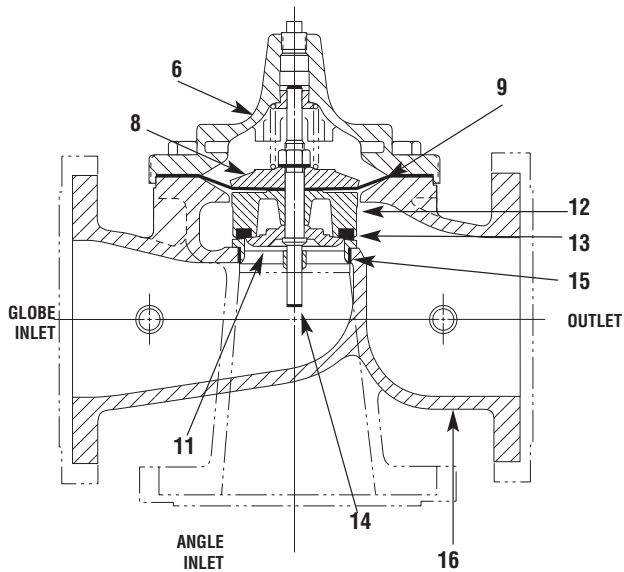
The 100-20 Hytrol is available only in ductile iron, 150 and 300 pressure class, and Bronze trim standard. Available extra cost main valve options include stainless steel trim, epoxy coating, Dura-Kleen stem, Delrin sleeved stem, and high temperature rubber parts. All four basic main valves have a 600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

Cla-Val Main Valves

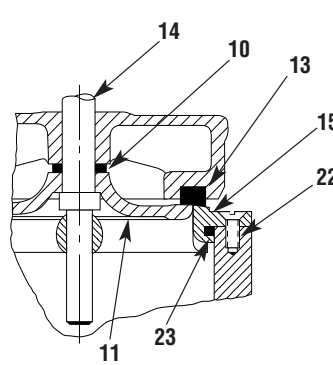
Catalog Name	Catalog Number		
	Circa 1936	100-Series	600 Series
Hytrol	100 (Angle =2100)	100-01	100-20
Powertrol	100P & 100PA	100-02	100-21
Powercheck	100PC & 100PCA	100-03	100-22
Hycheck	181	100-04	100-23



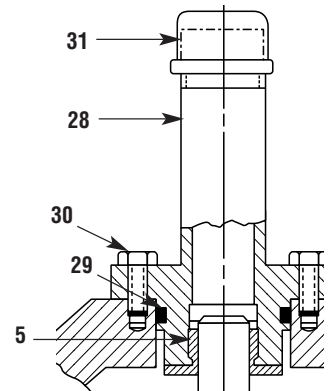
TOP VIEW



3" - 6" COVER DETAIL



10" - 24" SEAT DETAIL



20" - 24" COVER DETAIL

PARTS LIST

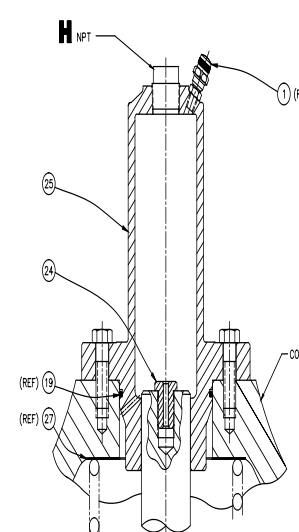
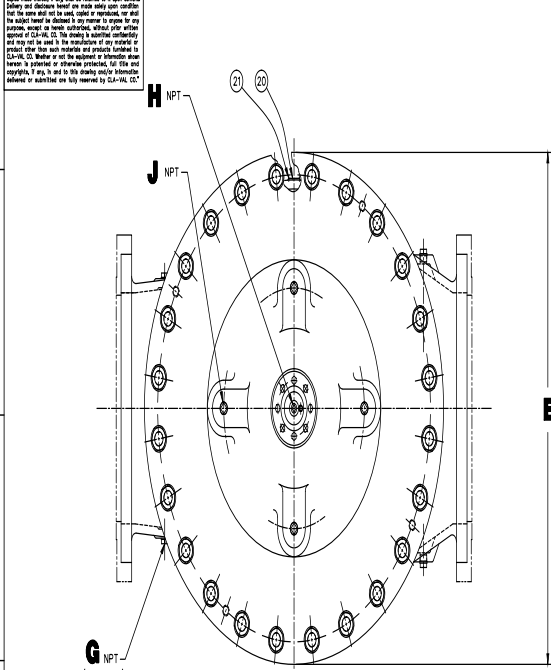
NO. DESCRIPTION

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

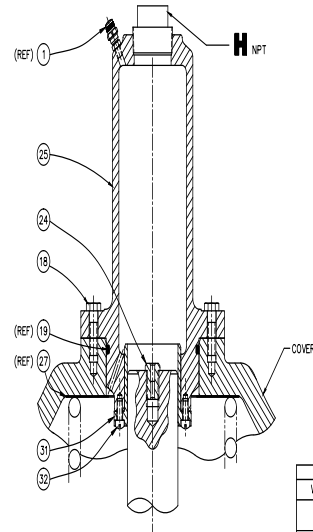
WHEN ORDERING PARTS, BE SURE TO GIVE COMPLETE NAMEPLATE DATA, ITEM NUMBER AND DESCRIPTION.

This drawing is the property of CIA-VAL CO. and same and copies may be loaned. If any part is returned to CIA-VAL CO. without the necessary return slip, the user assumes all responsibility for the use of the drawing. The user agrees to indemnify and hold CIA-VAL CO. harmless from all claims, damages, costs or expenses, including reasonable attorney's fees, which may be incurred by CIA-VAL CO. in connection with the use of this drawing. This drawing is a technical drawing and may not be used in the manufacture of any article or product other than that specifically intended and identified by this drawing. CIA-VAL CO. neither warrants nor represents that the information contained herein is complete or otherwise correct. The user agrees to hold CIA-VAL CO. harmless from all claims, damages, costs or expenses, including reasonable attorney's fees, which may be incurred by CIA-VAL CO. in connection with the use of this drawing.

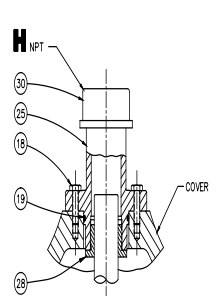
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
1	SEE SHEET 1		



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

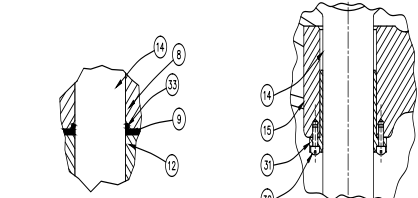


HOUSING ASSEMBLY DETAIL
30" AND 36" SIZES ONLY
36" SIZE SHOWN
SCALE: 1/2

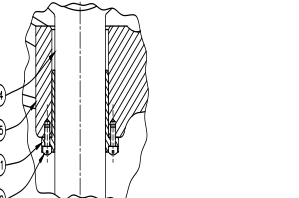


COVER BEARING/HOUSING DETAIL
16" SIZE ONLY
SCALE: NONE

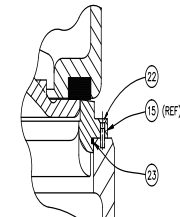
DIMENSION TABLE						
VALVE SIZES	16"	18"	20"	24"	30"	36"
A	41.38	46.00	52.00	61.50	63.00	72.75
AA	35.50	47.64	53.62	63.25	64.50	-
B DIA	35.50	41.50	45.00	53.16	56.00	66.00
C MAX	25.00	39.06	42.21	45.00	54.60	59.00
D	15.50	12.95	15.00	17.75	21.31	24.50
E	20.81	-	-	30.75	-	-
EE	21.62	-	-	31.62	-	-
F	15.69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



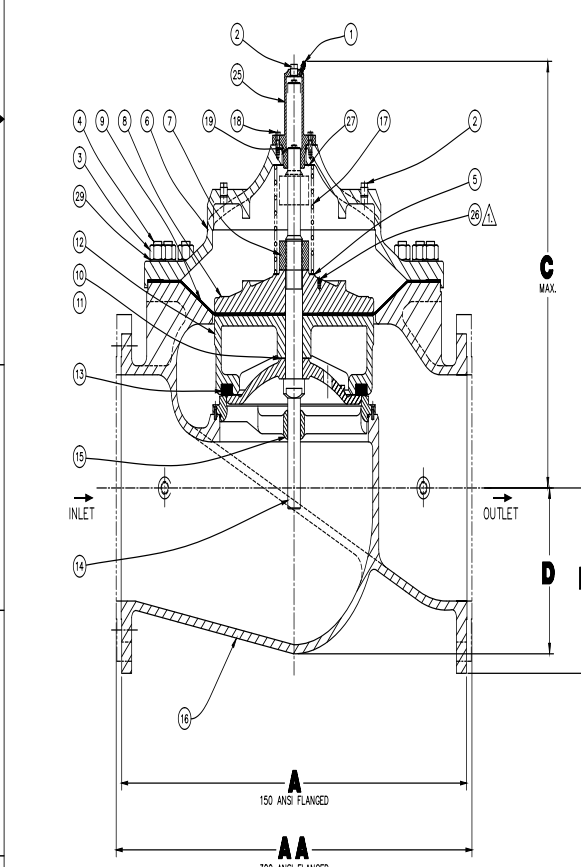
DIAPHRAGM WASHER SEAL DETAIL
30" SIZE ONLY
SCALE: 1/2



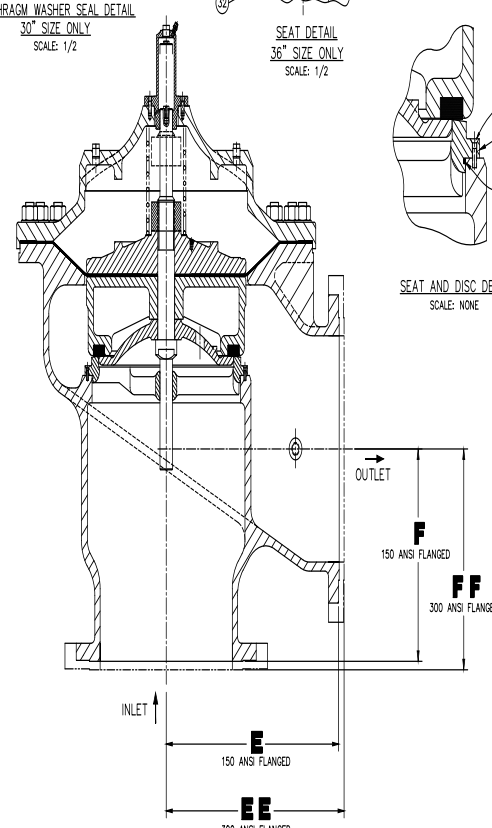
SEAT DETAIL
36" SIZE ONLY
SCALE: 1/2



SEAT AND DISC DETAIL
SCALE: NONE



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



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

NOTES: UNLESS OTHERWISE SPECIFIED.

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

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

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

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS DECIMALS ANGULAR
± 1/32 0.01 0.05 ± 0.5°
MAX. ± 0.02 -0.01
MIN. ± 0.01 -0.01
SURFACE FINISH: 125/
BREAK CORNERS: 1/16 MAX.
FILLET RADIUS: 1/16
--DO NOT SCALE DRAWING--

CONTRACT NO. _____
DATE _____
APPROVAL DATE _____
DRAWN BY: WEP 11-9-82
CHECKED BY: KD 11-22-82
DATE: 11-22-82
DWG NO: 86184
REV: 1/16 & NOTED (MTR) PC
SHEET 2 OF 2

CIA-VAL CO. REPORT ENCL. DRAWING
16" THRU 36"
100-01 & 2100 HYTROL
90842



— MODEL — **130VC**

Electronic Actuator



Table of Contents

Introduction	.2
Configuration procedures	.2
Main power supply selection	.2
Direction of rotation	.2
Actuator speed	.2
Loss of signal conditions	.3
Setpoint command signal	.3
Set up procedures	.3
Remote automatic mode	.2
Remote manual mode	.2
Diagnostics	.4
Wiring information	.5
Wiring diagrams	.6 - 12



130 Series Actuator Start Up Procedures

Introduction

It is recommended that this manual is read before applying power to the actuator and start up is attempted. It will take you step by step through:

- Modes of operation
- Factory configured default settings
- Configuration procedures
- Setup procedures
- Diagnostics
- Electrical components and wiring information

For specific information on the pilot(s) and control valve being actuated, consult the appropriate section of the Instruction Operation and Maintenance Manual (i.e. CRD-30, CRL-30, 90-01, etc.).

There are two separate methods of remote operation possible with the actuator. These are remote automatic and remote manual.

The remote automatic mode can use an external process variable or an internal potentiometer as the feedback signal.

Enable either one by changing the wiring on TB4 terminal strip (see pages 8,9 and 10).

Remote automatic mode. In this mode the actuator will typically position in the increasing direction when the setpoint (local or remote) is greater than the process variable (external PV or internal potentiometer). The actuator will continue to increase until the process variable is equal to the setpoint, the actuator maximum travel position (span) is reached or the process variable has reached a value equal to the maximum process variable limit.

The actuator will also decrease when the setpoint is lower than the process variable value. The actuator will continue to decrease until the process variable is equal to the setpoint, the actuator minimum position (zero) is reached or the process variable has reached a value equal to the minimum process variable range limit.

Remote manual mode. In this mode the actuator can be positioned between the minimum actuator position (zero) and the maximum actuator position (span) using dry contact closures supplied from an external source.

Factory default setting information.

The actuator, if new and factory installed on a hydraulic pilot, has been configured to specific default settings and preset at minimum actuator position. If these settings are appropriate for your application, then further configuration may not be required.

If new and not installed, these default settings will still be present, however some adjustment to the hydraulic control will be required. It will be necessary to turn the adjusting stem of the hydraulic control counter clockwise to the minimum spring setting before the actuator is installed. This will

insure that the minimum spring setting of the hydraulic pilot is equal to the minimum setting of the actuator.

If previously in service and settings are unknown, the unit should be completely reconfigured and the procedure for the hydraulic control adjusting stem, as described above, should be followed.

Default settings.

- Actuator power: 120 VAC
- Direction: Reverse acting (clockwise rotation when process variable is less than setpoint)
- Speed: 1/2 RPM
- Loss of remote setpoint or process variable: Actuator locks in place.
- setpoint type: 4-20 mA
- Zero (minimum) actuator position: Set at minimum CCW position
- Span (maximum) actuator position: Set at 8 turns CW from minimum CCW position
- Minimum process variable range limit: 4.0 mA
- Maximum process variable range limit: 20.0 mA
- Actuator set to minimum 4.0 mA position

1 Configuration procedures for remote automatic mode

This section contains the configuration and setup procedures for the **remote automatic mode** only. Use these steps to establish or change some or all of the default settings.

Remove cover using a 3/16 inch Allen wrench.

Main Power Supply Selection.

The AC input voltage must be selected prior to powering up the actuator. After cover removal, locate the main switch on the power supply board (see power supply terminal diagram). Slide the switch to the position corresponding to the correct input line voltage.

Right for 120 VAC.
Left for 240 VAC.

Direction of Rotation.

The direction is determined by the position of switch #1. When this switch is in the down position indicating reverse acting, the actuator will rotate clockwise when an increasing command is given. When the switch is in the up position indicating direct acting, the actuator will rotate counter clockwise when an increasing command is given. **Default setting is reverse acting.**

Actuator speed.

Turning the speed potentiometer to the desired value will set actuator speed. Increase is CW and decrease is CCW. **Default setting is 1/2 RPM.**

Loss of Signal Conditions.

The actuator will respond differently during loss of signal conditions. It will lock in place, rotate fully to the lowest limit of actuator travel (zero position) or rotate fully to the highest limit of actuator travel (span position). A loss of signal condition occurs when the setpoint signal or the process variable is not present. **Default setting is lock in place.**

SW - 2	SW- 3	LOS Function
UP	UP	The actuator will lock in place during LOS conditions.
DOWN	UP	The actuator will go to the minimum zero CCW position during LOS conditions
UP	DOWN	The actuator will go to the maximum span CW position during LOS condition

Setpoint Command Signal.

The setpoint command signal can accept a 4 – 20 mA current loop, 0 – 5 volt, 0 – 10 volt or a local setpoint.

Default setting is with 4 – 20 mA enabled.

Switch number	Enable	Function
SW1 – 5	DOWN	Used to enable the 0 - 5 V setpoint (this must be used in conjunction with SW1 – 7 which must be down)
SW1 – 6	DOWN	Used to enable the 4 to 20 ma setpoint
SW1 – 7	DOWN	Used to enable the 0 to 10 v setpoint (this must be used in conjunction with SW1 – 5 which must be up)
SW1 – 8	DOWN	Used to enable the local setpoint. In this mode the actuator will use a manually adjusted setpoint.

Setup Mode.

The setup of the actuator consists of the setting the lowest limit of actuator travel (zero position), the highest limit of actuator travel (span position), the minimum process variable range limit and the maximum process variable range limit.

Placing switch #4 (setup mode) in the down position enables the setup mode. Actuator travel can then be increased using the blue push button and decreased using the yellow push button to any position.

While in this mode, all remote commands given to the actuator will be temporarily disabled.

Setting the minimum actuator position. External Process variable

Position the actuator using the increase or decrease push button to the desired minimum position. Press the red enable and the blue zero push buttons at the same time. The LED light directly underneath the blue zero push button will illuminate confirming the setting. **Default setting is minimum CCW position.**

Setting the maximum actuator position. External Process variable mode

Position the actuator using the increase or decrease push button to the desired maximum position. Press the red enable and yellow span push buttons at the same time. The LED adjacent to the yellow span push button will illuminate confirming the setting. **Default setting is 8 turns from minimum CCW position.**

Setting the 4 milliamp actuator position internal potentiometer mode (if used)

Position the actuator to the minimum system value using the increase or decrease push button. Press the red enable and the blue zero push buttons at the same time. This sets the value at 4 mA.

Setting the 20 milliamp actuator position Internal potentiometer mode (if used)

Position the actuator to the maximum system value using the increase or decrease push button. Press the red enable and the yellow span buttons at the same time. This sets the valve 20 mA.

It is highly recommended that a minimum of one pilot spring revolution be used between the 4 and 20 milliamps values.

Setting the minimum process variable limit. External process variable mode only

Method one: Using the system process variable. Set the minimum process variable limit by reducing the actual system dynamic (i.e. pressure, flow etc.) to the desired value. This can be done by pressing the actuator increase or decrease push button to attain the desired minimum process variable. When achieved, press the red enable and black LS1 push buttons at the same time. The LED adjacent to the black LS1 push button will illuminate confirming the setting. **Default setting is 4 mA.**

Method two: Applies only to external PV using a milliamp calibrator (if process variable cannot be changed or is not in service).

Disconnect the actual process variable wires located on the logic board (including jumper on terminals 11 and 12 if used) and connect a milliamp calibrator to the process variable input terminals 10 (+) and 11 (-). Use a milliamp value corresponding to the desired minimum process variable limit (i.e. 25 psi = 8 mA, if transducer range is 0 -100 psi). This must be at least 4 mA. Press the red enable and black LS1 push buttons at the same time. The LED adjacent to the black LS1 push button will illuminate to confirm the setting. **Default setting is 4 mA.**

Setting the maximum process variable limit.

Method one: Using the system process variable. Set the maximum process variable limit by increasing the actual system dynamic (i.e. pressure, flow etc.) to the desired value. This can be done by pressing the actuator increase or decrease push button to attain the desired maximum process variable. When achieved, press the red enable and the white LS2 push buttons at the same time. The LED directly underneath will illuminate to confirm the setting. **Default setting is 20 mA.**

Method two: Applies only to external PV using a milliamp calibrator (if process variable cannot be changed or is not in service).

Disconnect the actual process variable wires located on the logic board (including jumper on terminals 11 and 12 if used) and connect a milliamp calibrator to the process variable input terminals 10 (+) and 11 (-). Use a milliamp value corresponding to the desired maximum process variable limit (i.e. 75 psi = 16mA, if transducer range is 0-100 psi). This must be 20mA or less. Press the red enable and the white LS2 push buttons at the same time. The LED directly underneath will illuminate to confirm the setting. **Default setting is 20 mA.**

Setup Complete.

Once the setup of the actuator has been completed, the setup mode selector must be turned off. This can be accomplished by placing switch #4 into the up position. The actuator is now in remote automatic operation and actuator movement will begin immediately.

2 Configuration procedures for remote manual mode.

Remove cover using a 3/16 inch Allen wrench.

In this mode, movement of the actuator is by dry contact closures (supplied by others). Only the direction of rotation, speed of rotation and actuator minimum and maximum positions require setting. Use the following steps to establish or change some or all of the default settings.

Main Power Supply Selection.

The AC input voltage must be selected prior to powering up the actuator. After cover removal, locate the main switch located on the power supply board (see power supply terminal diagram). Slide the switch to the position corresponding to the correct input line voltage. **Default is 120VAC**

Right for 120 VAC.
Left for 240 VAC.

Direction of Rotation.

The direction is determined by the position of switch #1. When this switch is in the down position indicating reverse acting, the actuator will rotate clockwise when an increasing command is given. When the switch is in the up position indicating direct acting, the actuator will rotate counter-clockwise when an increasing command is given.

Default setting is reverse acting.

Setting the actuator speed.

Turning the speed potentiometer to the desired value can set actuator speed. Increase is CW and decrease is CCW.

Default setting is 1/2 RPM.

Setup Mode.

The setup consists of setting the lowest limit of actuator travel (zero position) and the highest limit of actuator travel (span position). Placing switch #4 (setup mode) in the down position enables the setup mode. Actuator travel can then be increased using the blue push button and decreased using the yellow push button to any position. While in this mode, all remote commands given to the actuator will be temporarily disabled.

Setting the minimum actuator position.

Position the actuator using the increase or decrease push button to the desired minimum position. Press the red enable and the blue zero push buttons at the same time. The LED light directly underneath the blue zero push button will illuminate confirming the setting. **Default setting is minimum CCW position.**

Setting the maximum actuator position.

Position the actuator using the increase or decrease push button to the desired maximum position. Press the red enable and yellow span push buttons at the same time. The LED adjacent to the yellow span push button will illuminate confirming the setting. **Default setting is 8 turns from minimum CCW position.**

Setup Complete.

Once the setup of the actuator has been completed, the setup mode selector must be turned off. This can be accomplished by placing switch #4 into the up position. The actuator is now in remote manual mode and actuator movement will begin upon contact closure.

3 Diagnostics

The actuator contains two types of diagnostics. LED indication and voltage meter test ports.

LED indication.

LEDs are provided to display the status of the actuator. They are located on the logic board. Their functions are shown in the following table.

LED	Function
Microprocessor running	This LED is on when power is applied to the microprocessor, and the microprocessor is running. If LED is not on, then verify power to the board, as well as the SW1 setting on the top board
Actuator Increasing	This LED is on when the actuator is moving in the increasing direction
Actuator Decreasing	This LED is on when the actuator is moving in the decreasing direction.
Fault	This LED will flash when a fault is present. The LED will flash at a given rate. If the LED is flashing at 0.5 second intervals, then a LOS for the remote setpoint is present. If the LED is flashing at 1 second intervals, then a LOS for the process variable is present. If the LED is flashing a 2 second intervals, then the remote operation is disabled because the zero and span positions have not been set.
Red Enable Button	This LED will be on when the enable button and one of the other four setup push buttons have been pressed at the same time
Minimum Position	This LED will be on when the actuator is at or below its set minimum position.
LS1 Position	This LED will be on when the process variable is at or below its minimum value.
LS2 Position	This LED will be on when the process variable is at or above its maximum value.
Maximum Position	This LED will be on when the actuator is at or above its maximum position.

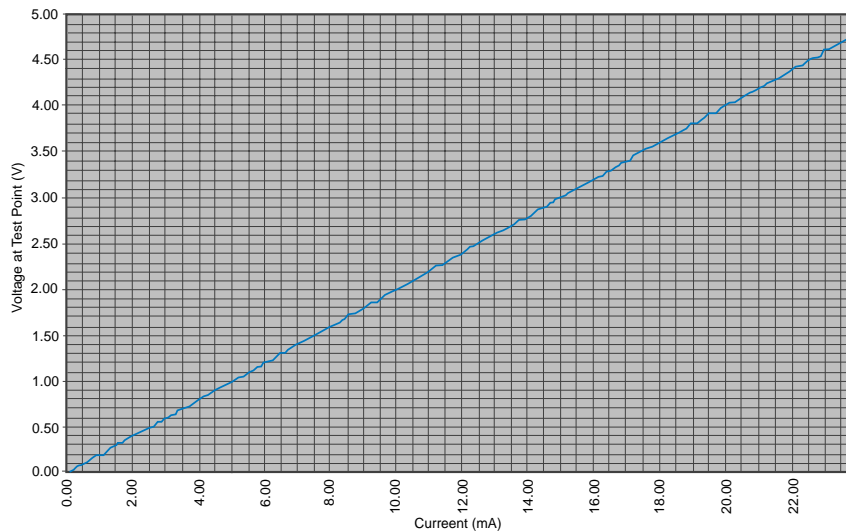
Tests using voltage meter.

There are four test points located on the logic board. The black test point labeled COM is used for the common connection. Connect a voltage meter to the COM and the appropriate test point. The values of the four red test points are shown in the following table:

Test Point	Function	Range
SPD See Figure #4	Speed of the actuator.	A value of 0 to 5 volts will be displayed.
PSN	The position of the actuator.	A value of 4.49 to 1.57 volts will be displayed 4.49V is minimum and 1.57V is maximum position
CMD	The setpoint command.	If 4 to 20ma current is selected, 0.8 volts to 4 will be displayed. If 0 to 5 volts, 0 to 10 or local setpoint volts is selected, then 0 to 5 volts will be displayed.
PV	The process variable.	Input is 4 to 20ma only and a value 0.8 volts to 4 volts will be displayed.

Voltage at Test Point vs. Current (mA)

Voltage at Test Point (V) vs Current (mA)



4 Wiring information

Wiring of remote automatic and remote manual operation.

There are two modes of remote operation possible with the actuator. They are remote automatic mode and remote manual mode. The wiring diagrams for each are shown separately.

Remote Automatic Actuator Wiring (when using an external process variable)

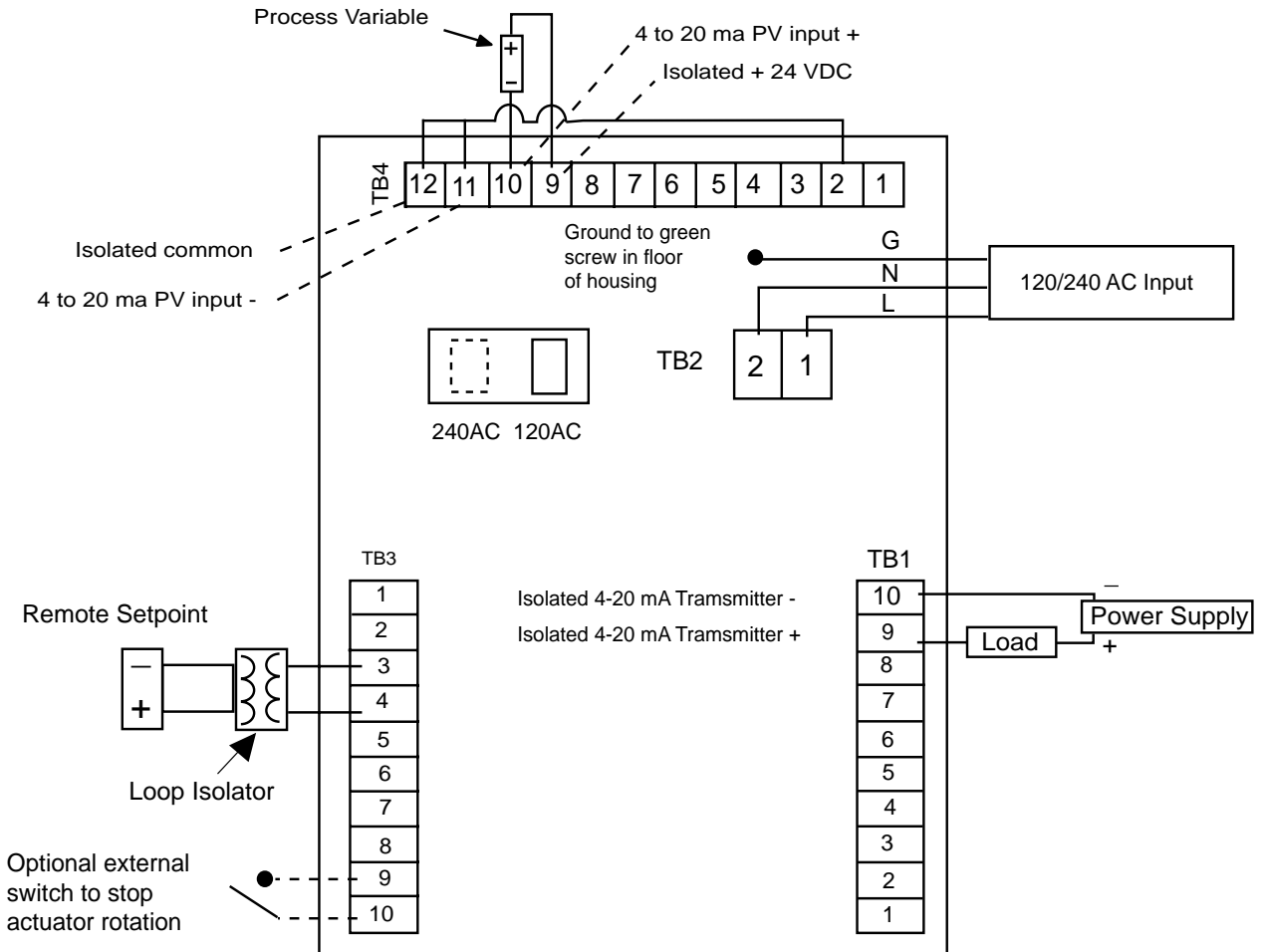
Use the following procedures when interfacing this actuator with ancillary instrumentation components. This arrangement has been thoroughly tested and insures that problems associated with ground loops are avoided.

- A. Wire the process variable transmitter directly to the actuator, using the actuator's internal power supply.
- B. Retransmit the process variable signal using the terminals 9&10 on TB2 These outputs are isolated and must be externally powered.
- C. Use isolator when remote setpoint is used.
- D. Use isolator when externally powering process variable.

Avoid whenever possible the "sharing" or "breaking-into" the process-variable loop wiring unless an optical isolator is used.

Remote Automatic Mode

Using external PV and internal power supply to power 4-20 mA loop

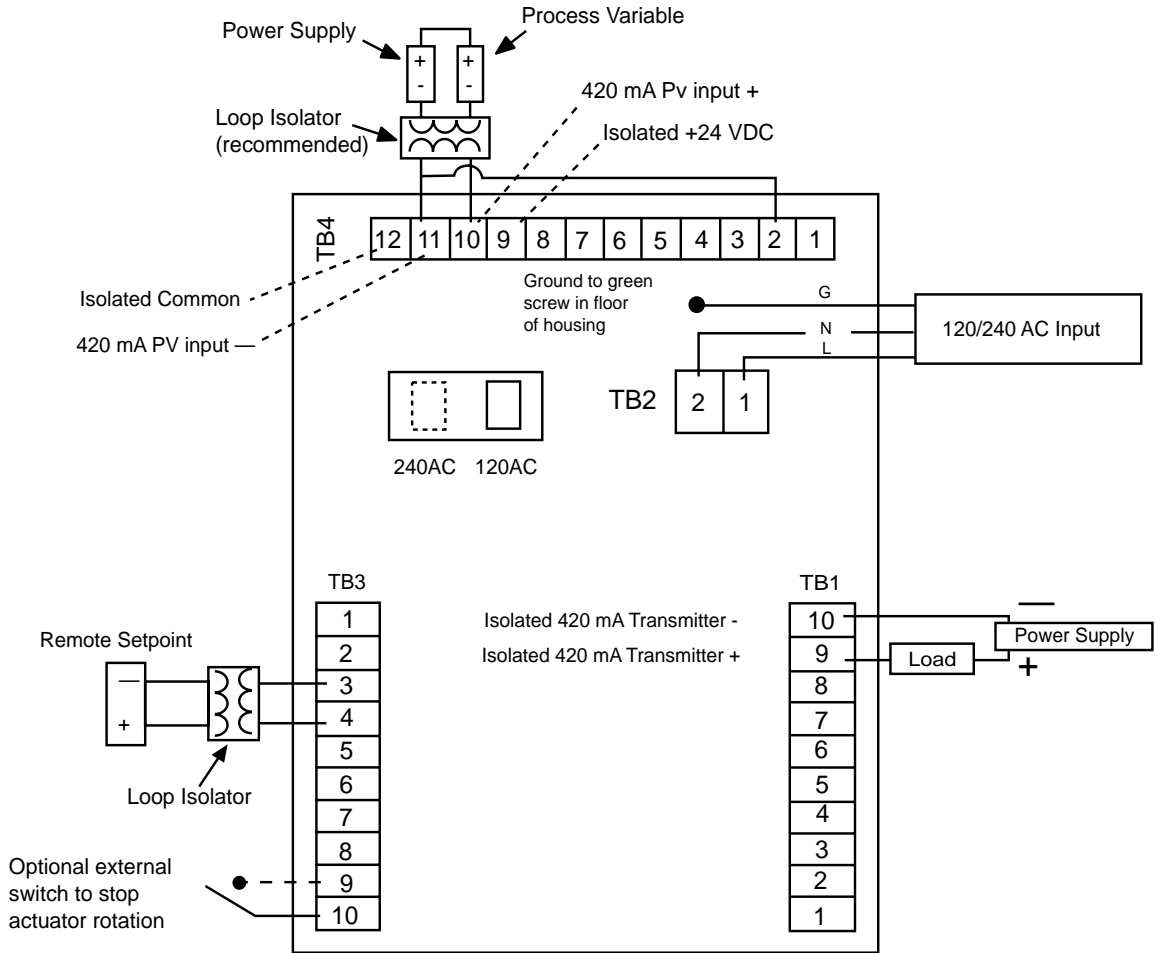


1. Remote setpoint must be isolated and powered from external source
2. PV retransmission requires an external power supply within 12 to 36 VDC .
Maximum load = (Power supply VDC 8 VDC) / .020 A.
3. A switch may be placed between terminals 9 and 10 on **TB3** to interrupt actuator travel. Contact between 9 and 10 will stop actuator movement.
DO NOT POWER.



Remote Automatic Mode

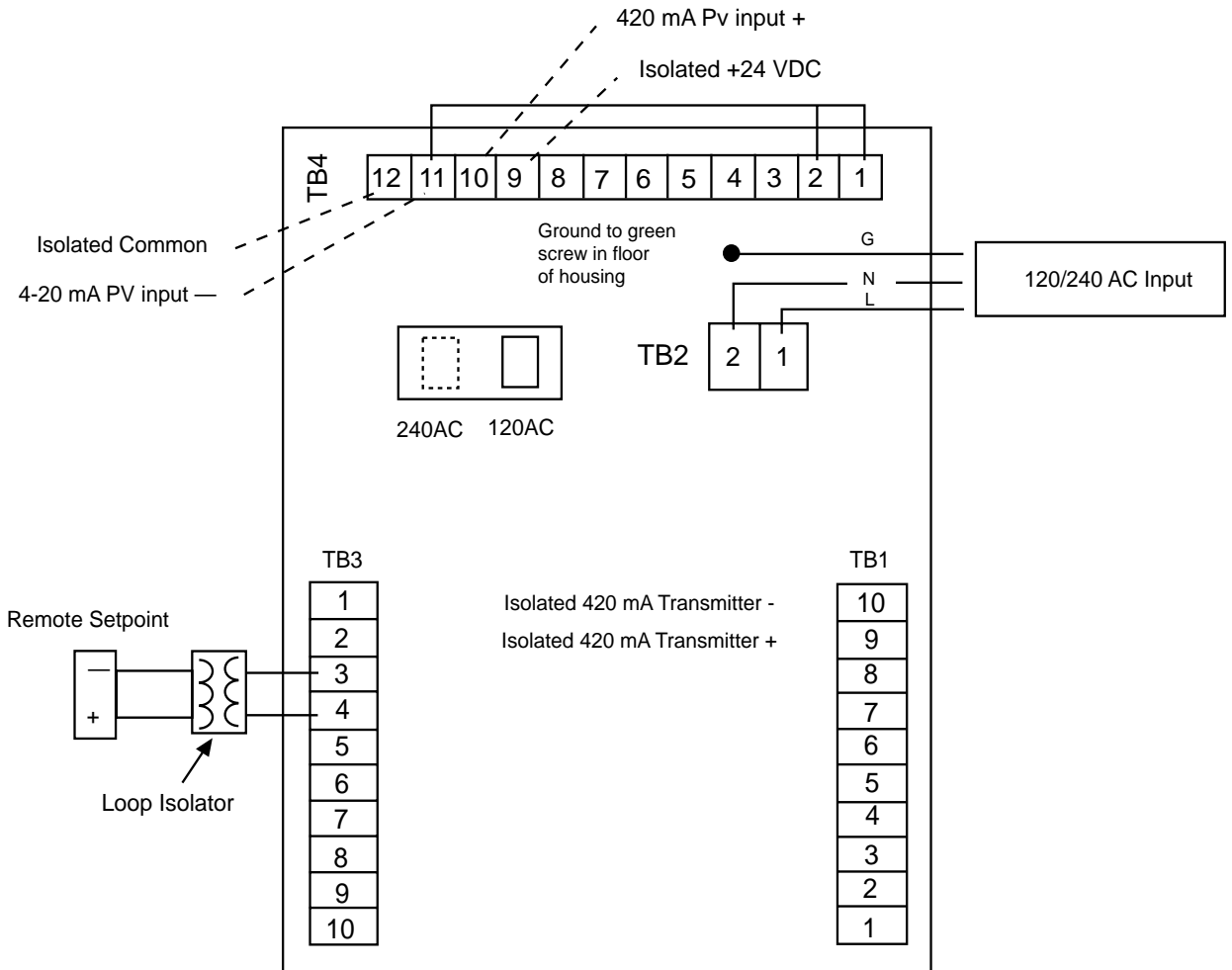
Using external PV and external power supply to power 4-20 mA loop



1. Remote setpoint must be isolated and powered from external source.
2. PV retransmission requires an external power supply within 12 to 36 VDC.
Maximum load = $(\text{Power supply VDC} - 8 \text{ VDC}) / .020\text{A}$.
3. A switch may be placed between terminals 9 and 10 on **TB3** to interrupt actuator travel. Contact between 9 and 10 will stop actuator movement.
DO NOT POWER.

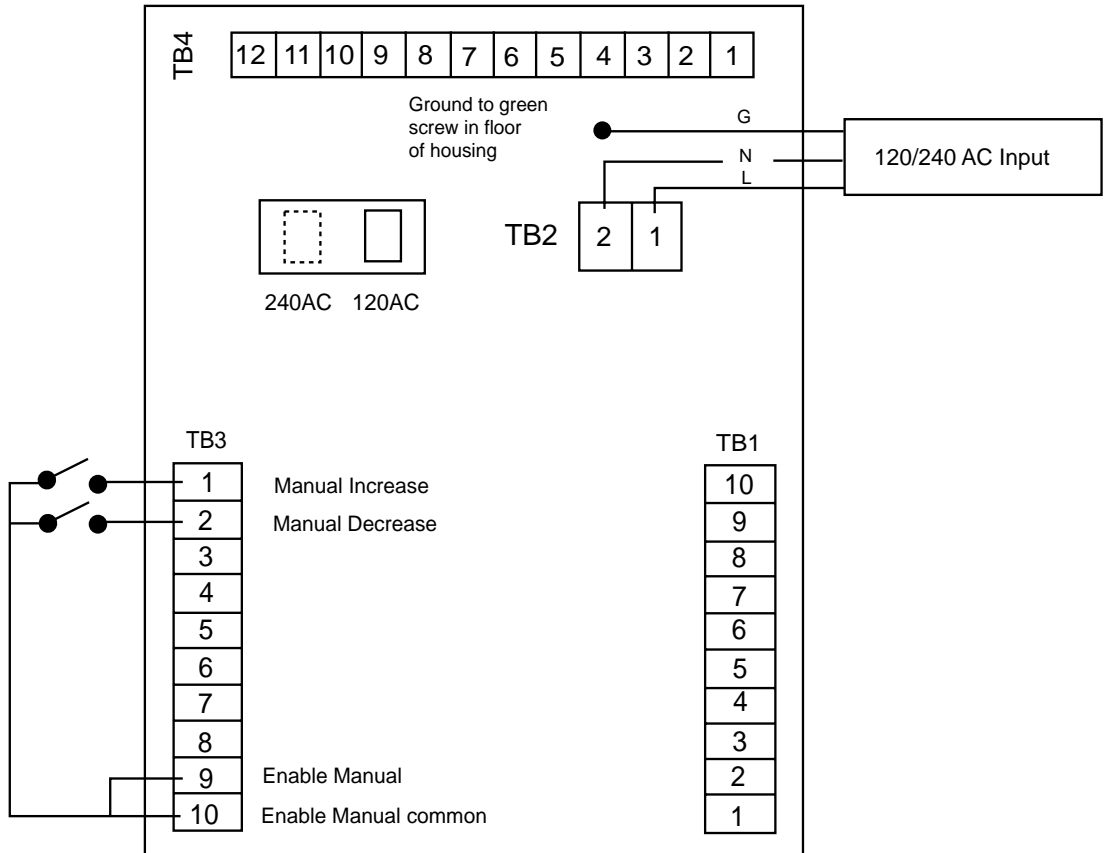
Remote Automatic Mode

Using internal potentiometer as Process Variable



1. Remote setpoint must be isolated and powered from external source.
2. PV retransmission requires an external power supply within 12 to 36 VDC.
Maximum load = (Power supply VDC-8 VDC) / 0,20 A.

Remote Manual Operation - Wiring Diagram Position actuator using contact closure



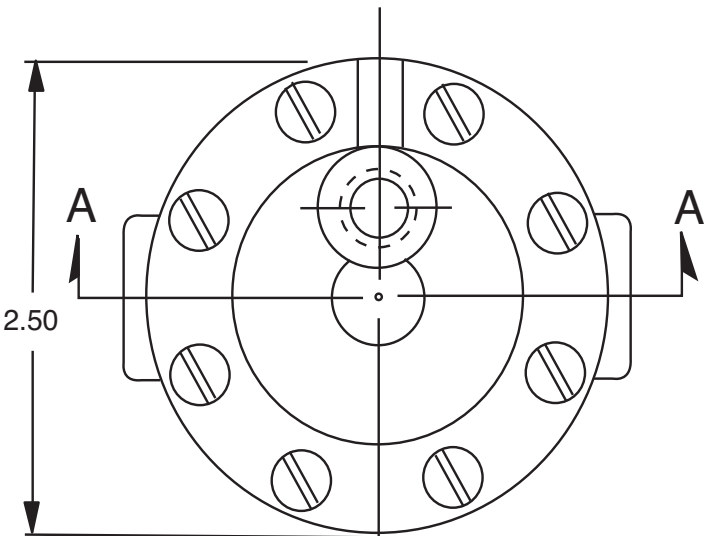
1. DO NOT POWER MANUAL INPUTS!
2. Use unpowered mechanical or solid state relays.
3. Use external jumper across terminal 9 and 10.



—MODEL —

100-01

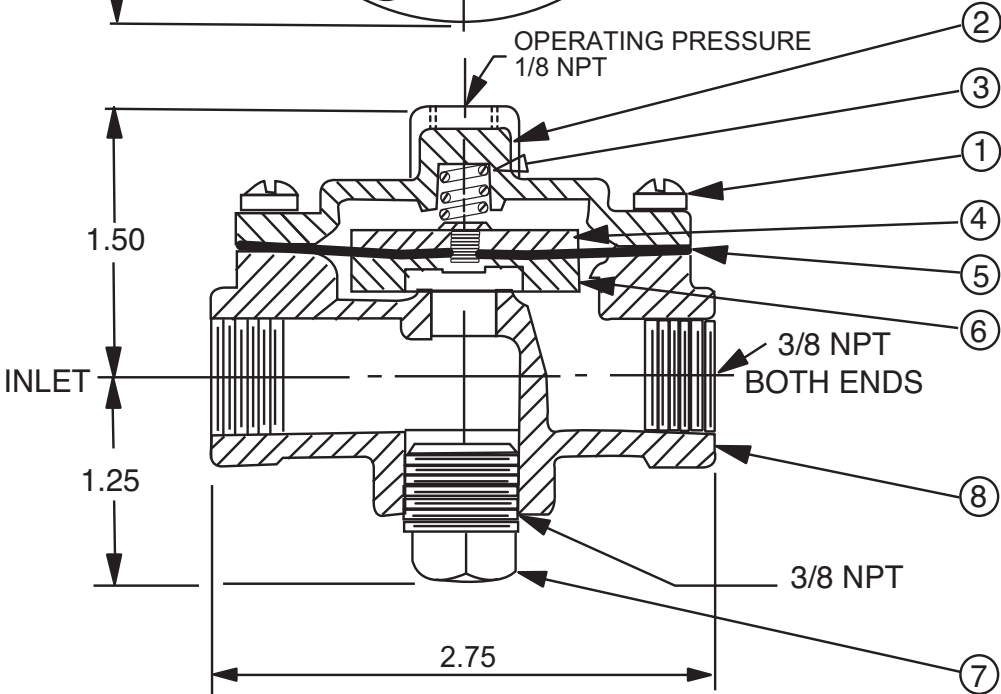
3/8"-1 Hytrol Valve



PARTS LIST

ITEM	DESCRIPTION
1.	Cover Screw (8 Required)
2.	Cover
3.	Spring
4.	Diaphragm Washer
* 5.	Diaphragm
* 6.	Disc Retainer Assembly
7.	Body Plug (3/8 NPT)
8.	Body

* Recommended Spare Parts



SECTION AA

100-01 3/8" HYTROL VALVE

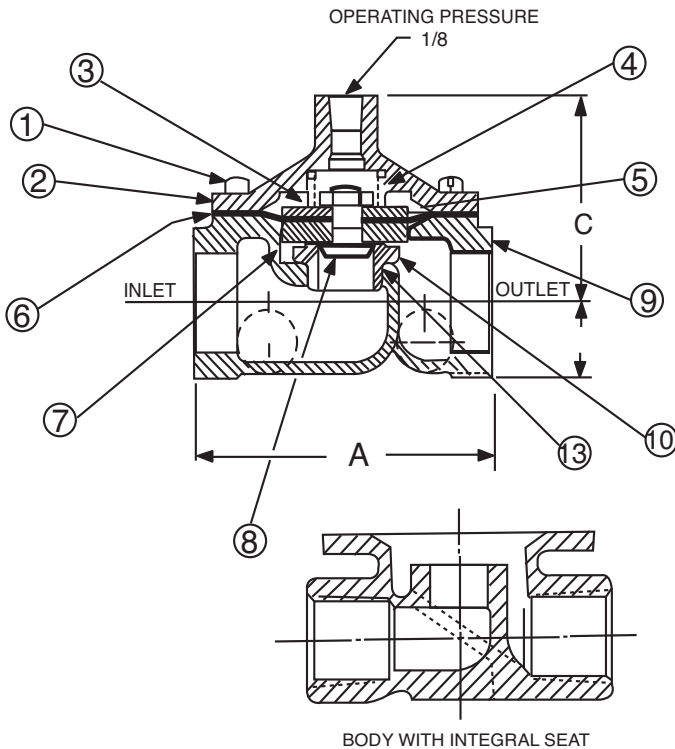
When Ordering parts, please specify

- All nameplate data
- Description
- Item Number
- Material

—MODEL— **100-01**

1/2"-3/4"-1" Hytrol Valve

100-01 3/4" & 1/2" Hytrol Valve



PARTS LIST

ITEM	DESCRIPTION
1	COVER SCREW
2	COVER
3	SPRING
4	STEM NUT
5	DIAPHRAGM WASHER
*6	DIAPHRAGM
*7	DISC RETAINER ASSEMBLY
8	DISC GUIDE & STEM
9	BODY
10	SEAT
11	NAMEPLATE
12	BODY PLUG HEX HD.
13	O-RING SEAT (FOR OLD STYLE BODY ONLY)

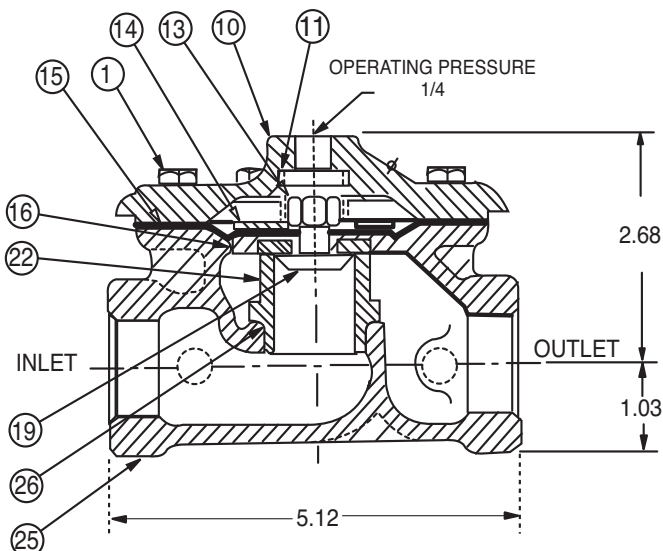
* Recommended Spare Parts

	1/2	3/4
A	1-7/16	3-1/2
C (MAXIMUM)	2-3/8	2-3/8
D	25/32	29/32

When Ordering parts, please specify

- All nameplate data
- Description
- Item Number
- Material

100-01 1" Hytrol Valve



PARTS LIST

ITEM	DESCRIPTION
1	COVER SCREW
2	NAMEPLATE
3	NAMEPLATE SCREW
10	COVER
11	SPRING
13	STEM NUT
14	DIAPHRAGM WASHER
15	DIAPHRAGM
16	DISC RETAINER ASSEMBLY
19	DISC GUIDE
22	SEAT
24	BODY PLUG
25	BODY
26	O-RING, SEAT

* Recommended Spare Parts

INSTALLATION AND MAINTENANCE INSTRUCTIONS

3-WAY SOLENOID VALVES, NORMALLY OPEN NORMALLY CLOSED AND UNIVERSAL CONSTRUCTION

**BULLETIN
8320**

ASCO
FORM NO. V5291R2

DESCRIPTION

Bulletin 8320 is a small 3-way solenoid operated valve with all three pipe connections located in the body. The bodies are of brass or stainless steel construction. Standard valves have General Purpose, Nema Type 1 Solenoid Enclosures. Valves that are equipped with a solenoid enclosure which is designed to meet Nema Type 4-Water tight, Nema Type 7 (C or D) Hazardous Locations - Class I, Group C or D, and Nema Type 9 (E, F or G) Hazardous Locations - Class II, Group E, F or G are shown on separate sheets of Installation and Maintenance Instructions, Form Numbers V-5391 and V-5381.

MANUAL OPERATORS (OPTIONAL)

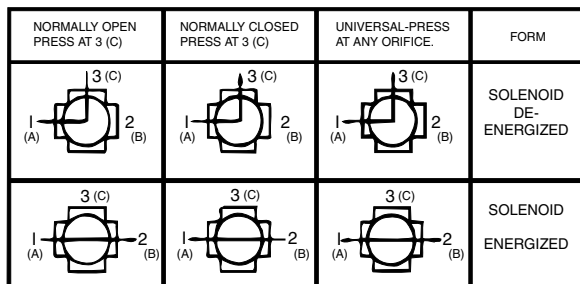
Valves with suffix "MO" or "MS" in catalog number are provided with a Manual Operator which allows manual operation when desired or during an interruption of electrical power.

OPERATION

Normally Closed: Applies pressure when solenoid is energized; exhausts pressure when solenoid is de-energized

Normally Open: Applies pressure when solenoid is de-energized; exhausts pressure when solenoid is energized.

Universal: For normally closed or normally open operation, selection or diversion of pressure can be applied at port 1 (A), 2 (B), or 3 (C).



NOTE: Port Markings 1, 2, and 3 correspond directly to A, B and C.

INSTALLATION

Check Nameplate for correct Catalog Number, pressure, voltage and service.

POSITIONING

Valve may be mounted in any position

PIPING

Connect piping to valve according to markings on valve body. Refer to Flow Diagram provided. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening pipe, do not use valve as lever.

IMPORTANT: For protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on the service conditions.

WIRING

Wiring must comply with local and National Electrical Codes. For valves equipped with an explosion-proof, watertight solenoid enclosure, the electrical fittings must be approved for use in the approved hazardous locations. Housings for all solenoids are made with connections for 1/2 inch conduit. The general purpose enclosure may be rotated to facilitate wiring by removing the retaining cap.

NOTE

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

SOLENOID TEMPERATURE

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

MAINTENANCE

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

CLEANING

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

IMPROPER OPERATION

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

COIL REPLACEMENT (REF. FIG. 2)

Turn off electrical power, disconnect coil lead wires and proceed as follows:

1. Remove retaining cap, nameplate and cover.
2. Slip yoke containing coil, sleeves and insulating washers off the solenoid base sub-assembly. Insulating washers are omitted when molded coil is used. In some D.C. Constructions, a single flux plate over the coil replaces yoke, sleeves and insulating washers.
3. Reassemble in reverse order of disassembly.

VALVE DISASSEMBLY AND REASSEMBLY (REF. FIG. 2)

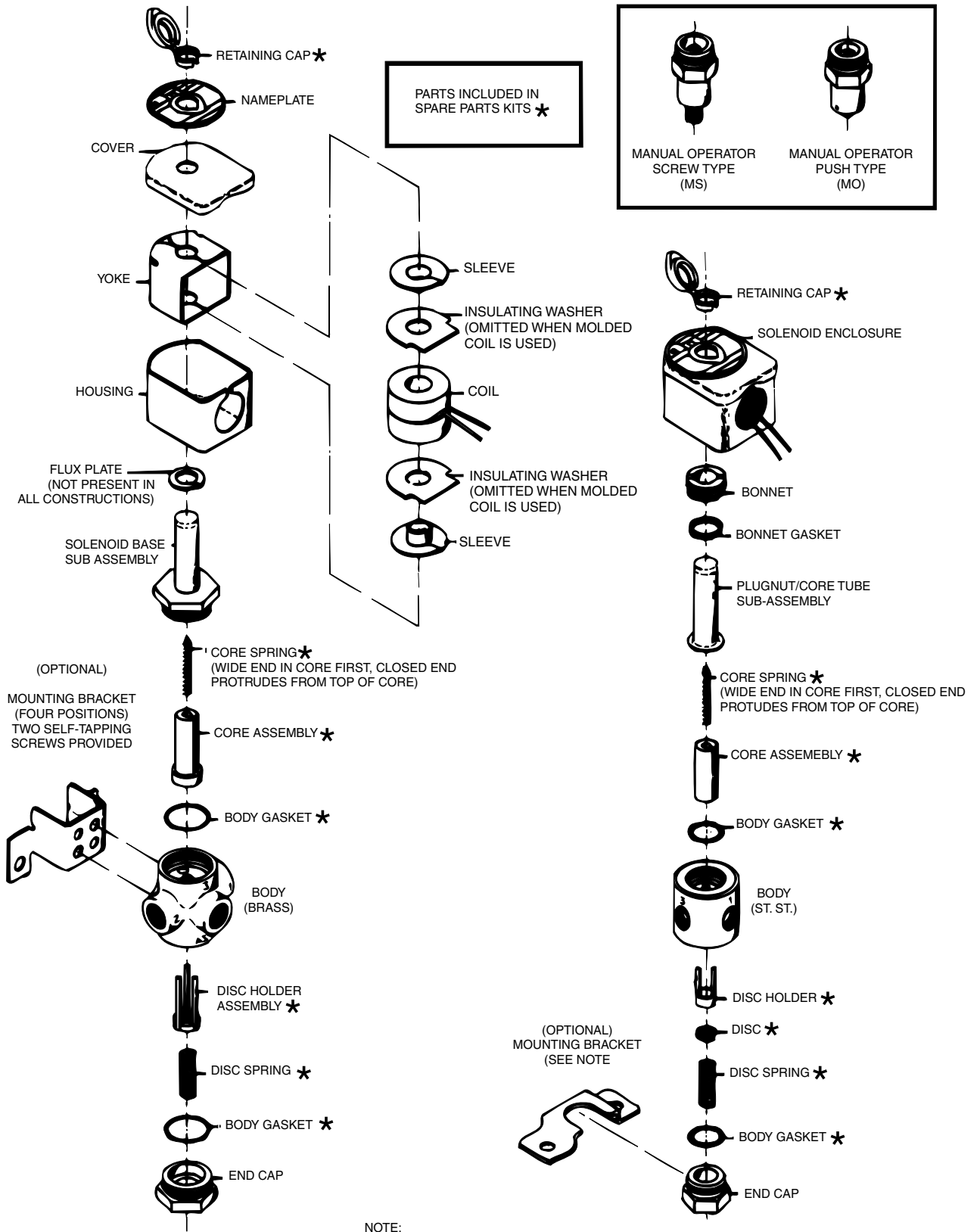
Turn off electrical power supply and de-pressurize valve.

1. Remove retaining cap and slip entire solenoid off solenoid base subassembly or plugnut/core tube sub-assembly.
2. Unscrew bonnet or solenoid base sub-assembly. Remove core assembly, core spring and body gasket.
3. Remove end cap, body gasket, disc spring, disc holder, disc or disc holder assembly.
4. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.
5. Reassemble in reverse order of disassembly paying careful attention to exploded view provided.

ORDERING INFORMATION FOR SPARE PARTS KITS

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

Spare Parts Kits and Coils are available for ASCO valves. Parts marked with



NOTE:
 1. FOR MOUNTING, A FLAT SURFACE MUST BE PROVIDED ACROSS THE ENTIRE LENGTH OF THE BRACKET. THE VALVE BODY BECOMES SECURE TO BRACKET, WHEN BRACKET IS TIGHTENED IN TO POSITION. IF THE VALVE HAS A MANUAL OPERATOR, A HOLE MUST BE MADE THROUGH THE MOUNTING SURFACE FOR THE OPERATOR STEM.

INSTALLATION AND MAINTENANCE INSTRUCTIONS

OPEN-FLAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

**BULLETIN
8016G**

ASCO
FORM NO. V6583R5

-SERVICE NOTICE-

ASCO® solenoid valves with design change letter "G" in the catalog number (example: 8210G 1) have an epoxy encapsulated ASCO® Red Hat II. solenoid. This solenoid replaces some of the solenoids with metal enclosures and open-frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

DESCRIPTION

Catalog numbers 8016G1 and 8016G2 are epoxy encapsulated pull-type solenoids. The green solenoid with lead wires and 1/2" conduit connection is designed to meet Enclosure Type 1 -General Purpose, Type 2-Dripproof, Types 3 and 3S-Raintight, and Types 4 and 4X-Watertight. The black solenoid on catalog numbers prefixed "EF" is designed to meet Enclosure Types 3 and 3S-Raintight, Types 4 and 4X-Watertight, Types 6 and 6P-Submersible, type 7 (A, B, C, & D) Explosionproof Class 1, Division 1, Groups A, B, C, & D and Type 9 (E, F, & G)-Dust-Ignitionproof Class 11, Division 1, Groups E, F, & G. The Class 11, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See Temperature Limitations section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a .250-28 UNF-2B tapped hole, 0.38 minimum full thread.

Series 8016G solenoids are available in:

- **Open-Frame Construction**
The green solenoid may be supplied with 1/4" spade, screw, or DIN terminals (Refer to Figure 4).
- **Panel Mounted Construction**
These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. (Refer to Figure 3 and section on Installation of Panel Mounted Solenoid).

Optional Features For Type 1—General Purpose Construction Only

- **Junction Box**
This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4" spade or screw terminals may have a junction box. The junction box provides a 1/2" conduit connection, grounding and spade or screw terminal Connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No. K236 - 034**
Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub-assembly. **IMPORTANT:** When the solenoid is de-energized, the initial return force for the core, Whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 4 ounces for DC construction.

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

WARNING: To prevent the possibility of electrical shock from the accessibility of live parts, install the open-frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature is less than 165° C. On valves used for steam service or when a class "H" solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180° C. See nameplate/retainer for service. **NOTE:** These solenoids have an internal non-resettable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust-ignitionproof enclosures (types 7&9).

IMPORTANT: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service condition & See ASCO Series 8600, 8601, and 8602 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature. **NOTE:** For steam service, refer to Wiring section, Junction Box for temperature rating of supply wires.

Temperature Limitations For Series 8016G Solenoids for use Valves Rated at 6.1, 8.1,9.1,10.6 or 11.1 Watts			
Watts Rating	Catalog Number Coil prefix	Class of Insulation	Maximum ambient Temp. °F
6.1, 8.1, 9.1, & 11.1	None, FB, KF, KP, SF, SP, SC, & SD	F	125
6.1, 8.1, 9.1, & 11.1	HB, HT, KB, KH, SS, ST, SU, & ST	H	140
10.6	None, KF, SF, & SC	F	104
10.6	HT, KH, SU, & ST	H	104

Minimum ambient temperature -40° F (-40° C); Positioning

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2" conduit connection. To facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

Additional Wiring Instructions For Optional Features:

- **Open-Frame solenoid with 1/4" spade terminals**
For solenoids supplied with screw terminal connections use #12-18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to 10 ± 2 in-lbs (1.0 + 1.2 Nm). A tapped hole is provided in the solenoid for grounding, use a #Y10-32 machine screw. Torque grounding screw to 15 -20

in-lbs (1,7 - 2,3 Nm). On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 - 20 in-lbs (1,7 - 2,3 Nm). with a 5/32" hex key wrench.

• Junction Box

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2" conduit connection. Connect #12-18AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

• DIN Plug Connector Kit No. KC236-034

1. The open—frame solenoid is provided with DIN terminals to accommodate the DIN plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12-18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4" for installation in socket terminals. The use of wire-end sleeves is also recommended for these socket terminals. Maximum length of wire-end sleeves to be approximately 1/4". Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer, and connector cover.

NOTE: Connector cover may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in-lbs ($0,6 \pm 1,1$ Nm).

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub-assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid. The 3/4" bonnet construction (Figure 1) must be disassembled for installation and installed with a special wrench adapter.

Installation of Panel Mounted Solenoid (See Figure 3)

Disassemble solenoid following instruction under Solenoid Replacement then proceed

3/4" Valve Bonnet Construction

1. Install retainer(convex side to solenoid) in 1.312 diameter mounting hole in customer panel.
2. Then position spring washer over plugnut/core tube sub-assembly.
3. Install plugnut/core tube sub-assembly through retainer in customer panel. Then replace solenoid, nameplate/retainer and red cap.

15/16" Valve Bonnet Construction

1. Install solenoid base sub-assembly through 0.69 diameter mounting hole in customer panel.
2. Position spring washer on opposite side of panel over solenoid base sub-assembly then replace.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve,

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic click signifies that the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown fuses, open-circuited or grounded solenoid, broken lead wires or splice connections.

- **Burned-Out Solenoid:** Check for open-circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.

- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

Solenoid Replacement

1. On solenoids with lead wires disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid.

2. Disassemble solenoids with optional features as follows:

• Spade or Screw Terminals

Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

• Junction Box

Remove conduit and socket head screw (use 5/32" hex key wrench) from center of junction box. Disconnect junction box from solenoid.

• DIN Plug Connector

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32" hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub-assembly.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade in slot provided between solenoid and nameplate/retainer. Pry up slightly and push to remove. Then remove solenoid from solenoid base sub-assembly.
5. Reassemble using exploded views for parts identification and placement

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see Solenoid Replacement.
2. Remove finger washer or spring washer from solenoid base sub-assembly.
3. Unscrew solenoid base sub-assembly.

NOTE: Some solenoid constructions have a plugnut/core tube sub-assembly, bonnet gasket and bonnet in place of the solenoid base sub-assembly. To remove bonnet use special wrench adapter supplied in ASCO Rebuild Kit. For wrench adapter only, order ASCO Wrench Kit No.K218 - 948.

4. The core is now accessible for cleaning or replacement.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Reassemble using exploded views for identification and placement of parts.

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

Torque Chart

Part Name	Torque Value in inch-Pounds	Torque Value in Newton-Meters
solenoid base sub-assembly	175 ± 25	19.8 ± 2.8
valve bonnet (3/4" bonnet constructions)	90 ± 10	10.2 ± 1.1
bonnet screw (3/8" or 1/2" NPT pipe size)	25	2.8
bonnet screw (3/4" NPT pipe size)	40	4.5

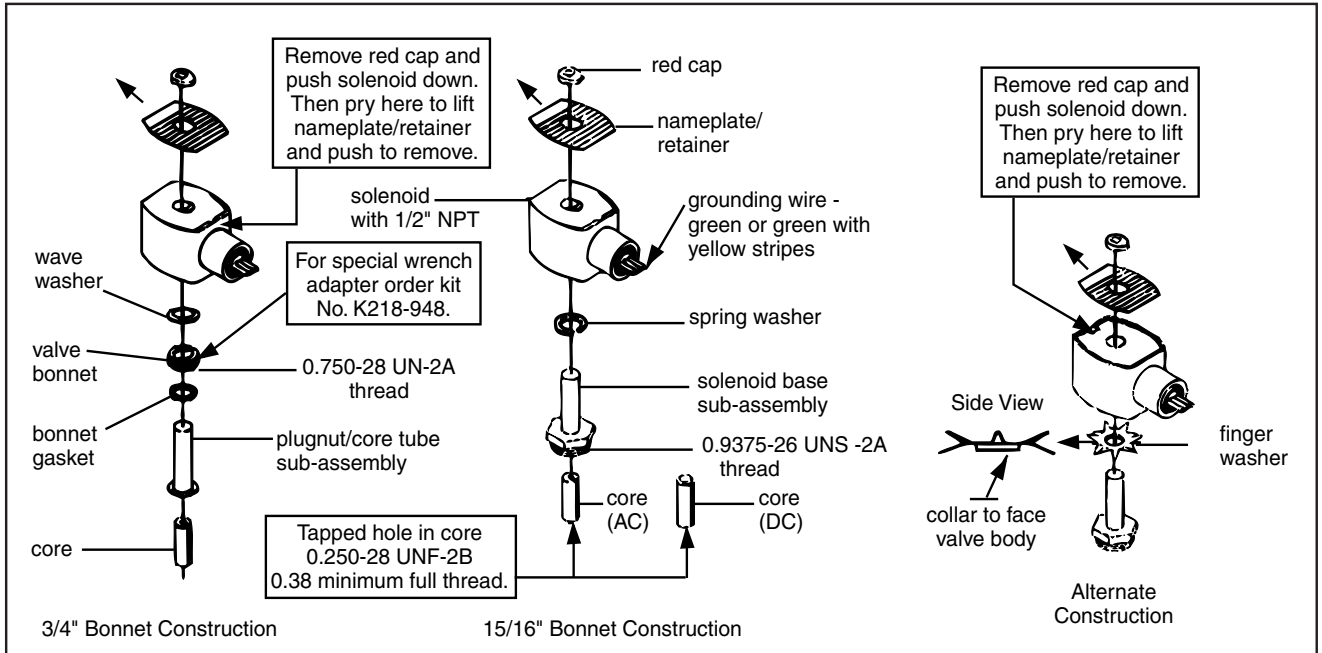


Figure 1. Series 8016G solenoids

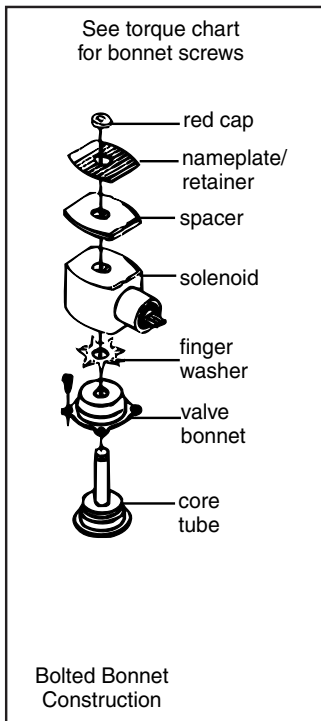


Figure 2. Series 8016G solenoid

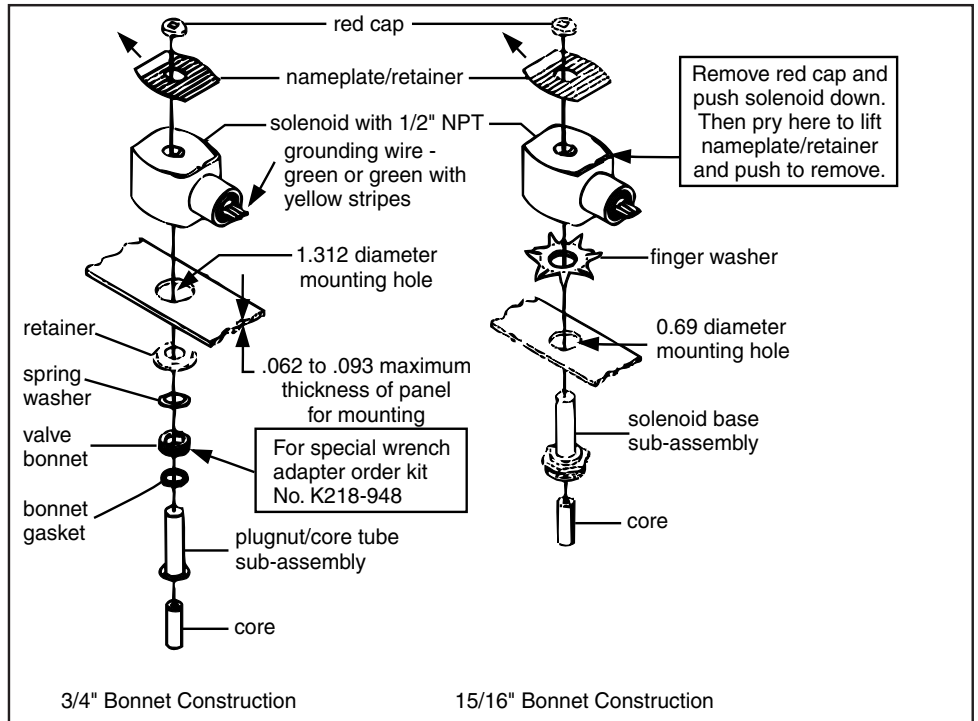


Figure 3. Series 8016G panel mounted solenoids

Torque Chart

Part Name	Torque Value in inch-Pounds	Torque Value in Newton-Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 - 20	1,7 - 2,3
center screw	5 ± 1	0,6 ± 0,1

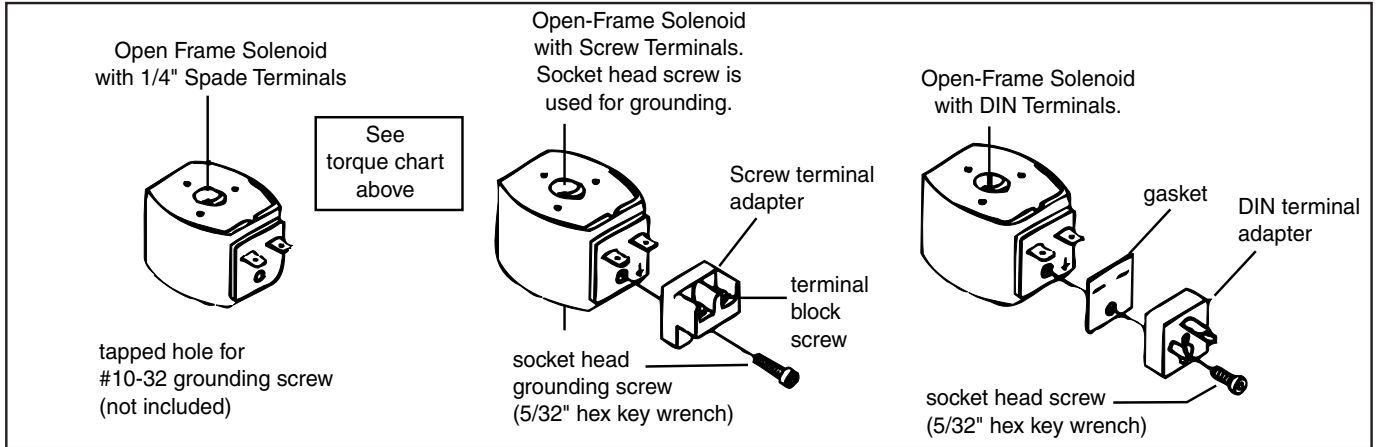


Figure 4. Open - frame solenoids

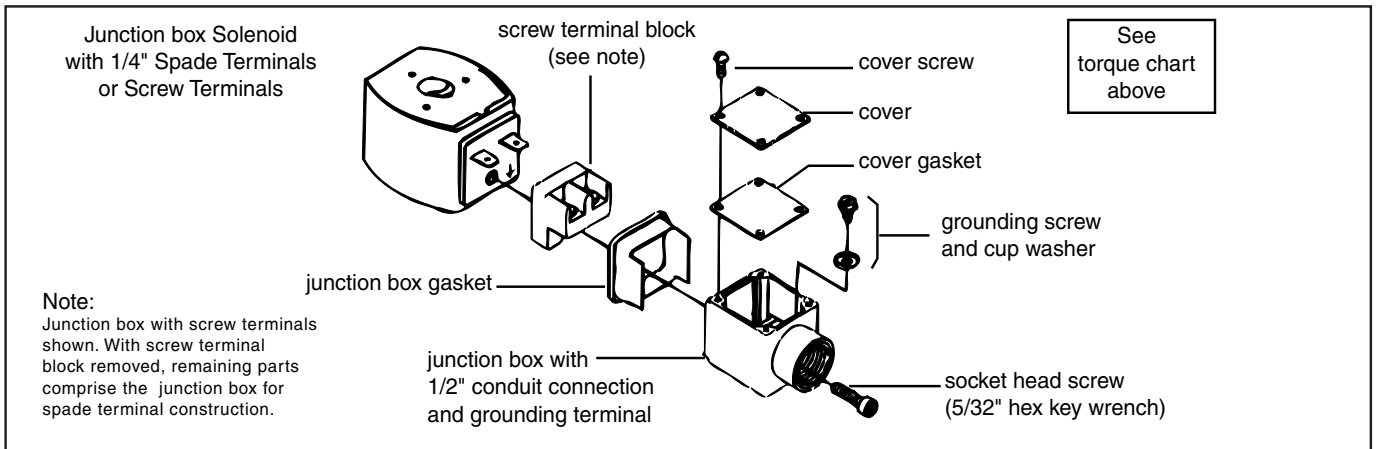
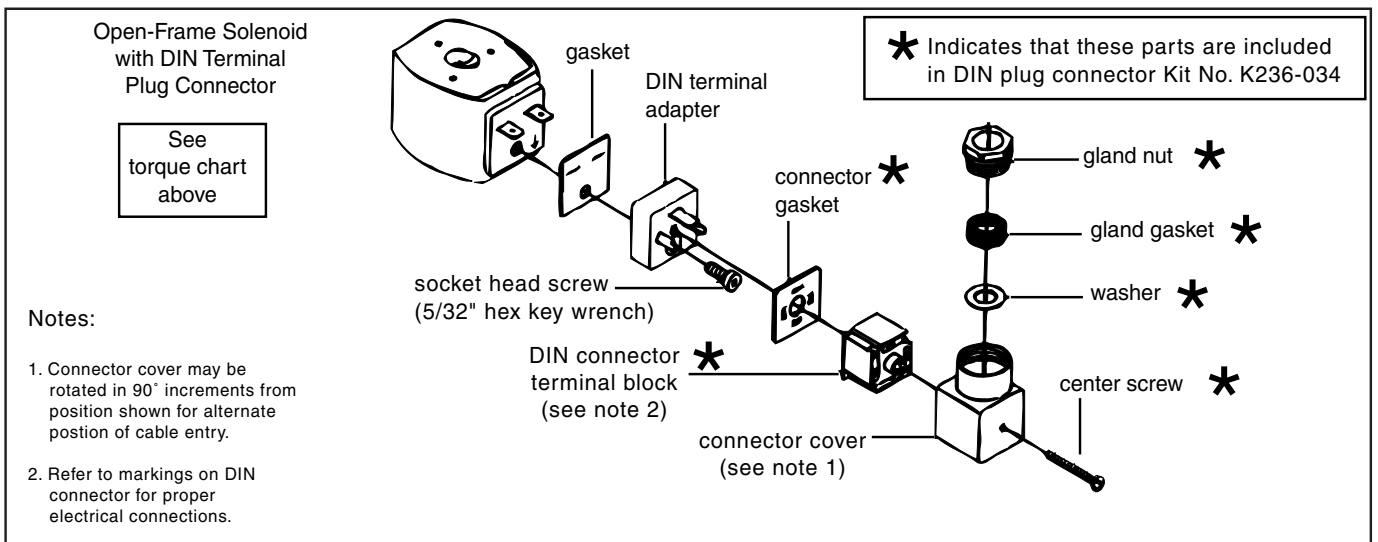


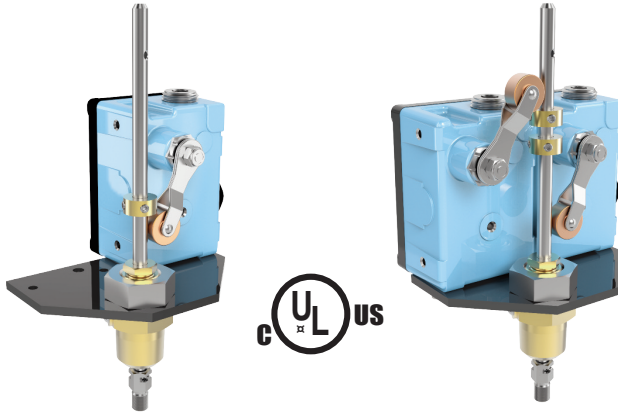
Figure 5. Open - frame solenoids





— MODELS — **X105L**
X105L2

Limit Switch Assemblies

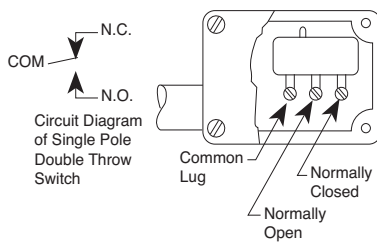


- **UL/ULC Listed**
- **Positive Action**
- **Rugged and Dependable**
- **Weather Proof or Explosion Proof**
- **Easy To Adjust**

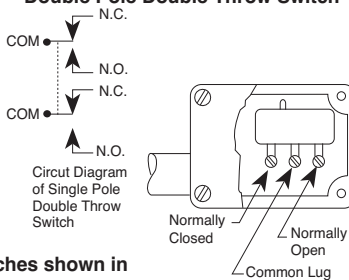
The Cla-Val Model X105L/X105L2 Limit Switch Assembly is a rugged, dependable and positive acting switch assembly actuated by the opening or closing of a Cla-Val control valve on which it is mounted. The single pole, double throw micro switch can be connected either to open or to close an electrical circuit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

Installation

Single Pole Double Throw Switch

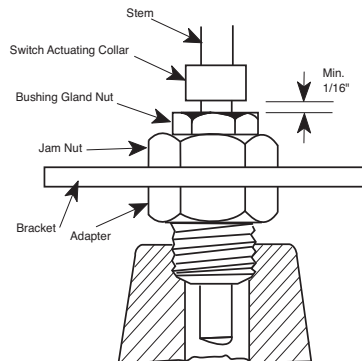


Double Pole Double Throw Switch



Switches shown in unactivated position.

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



Actuating Collar Adjustment Minimum Setting

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

Purchase Specifications

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

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

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

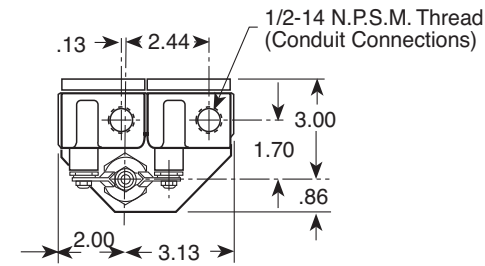


Fig. 1
Valve Size
1 1/4" Thru 8"
X105L2W
X105L2X

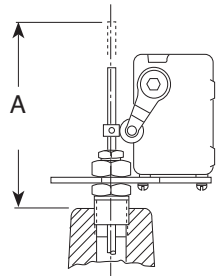


Fig. 2
Valve Size
1 1/4" Thru 14"
X105LCW
X105LCX

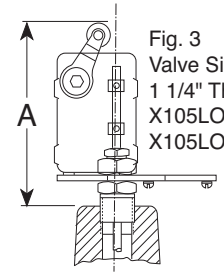


Fig. 3
Valve Size
1 1/4" Thru 8"
X105LOW
X105LOX

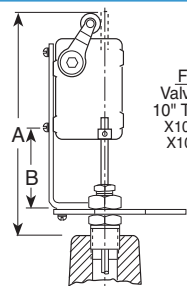


Fig. 4
Valve Size
10" Thru 14"
X105LOW
X105LOX

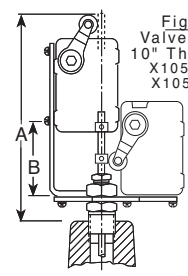
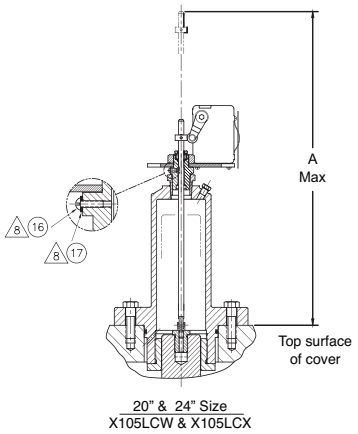
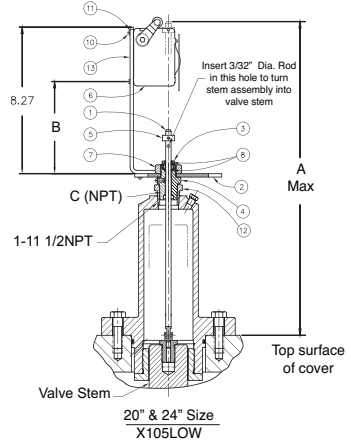


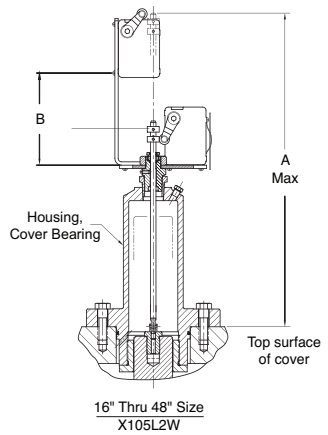
Fig. 5
Valve Size
10" Thru 14"
X105L2W
X105L2X



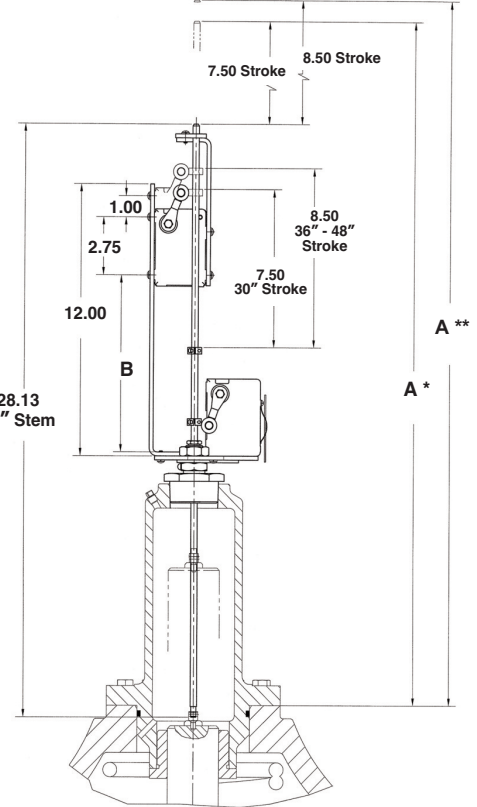
20" & 24" Size
X105LCW & X105LCX



20" & 24" Size
X105LOW



16" Thru 48" Size
X105L2W



A* - 30" • A** - 36", 42" & 48" Size

X105 Series Dimensions (In Inches)

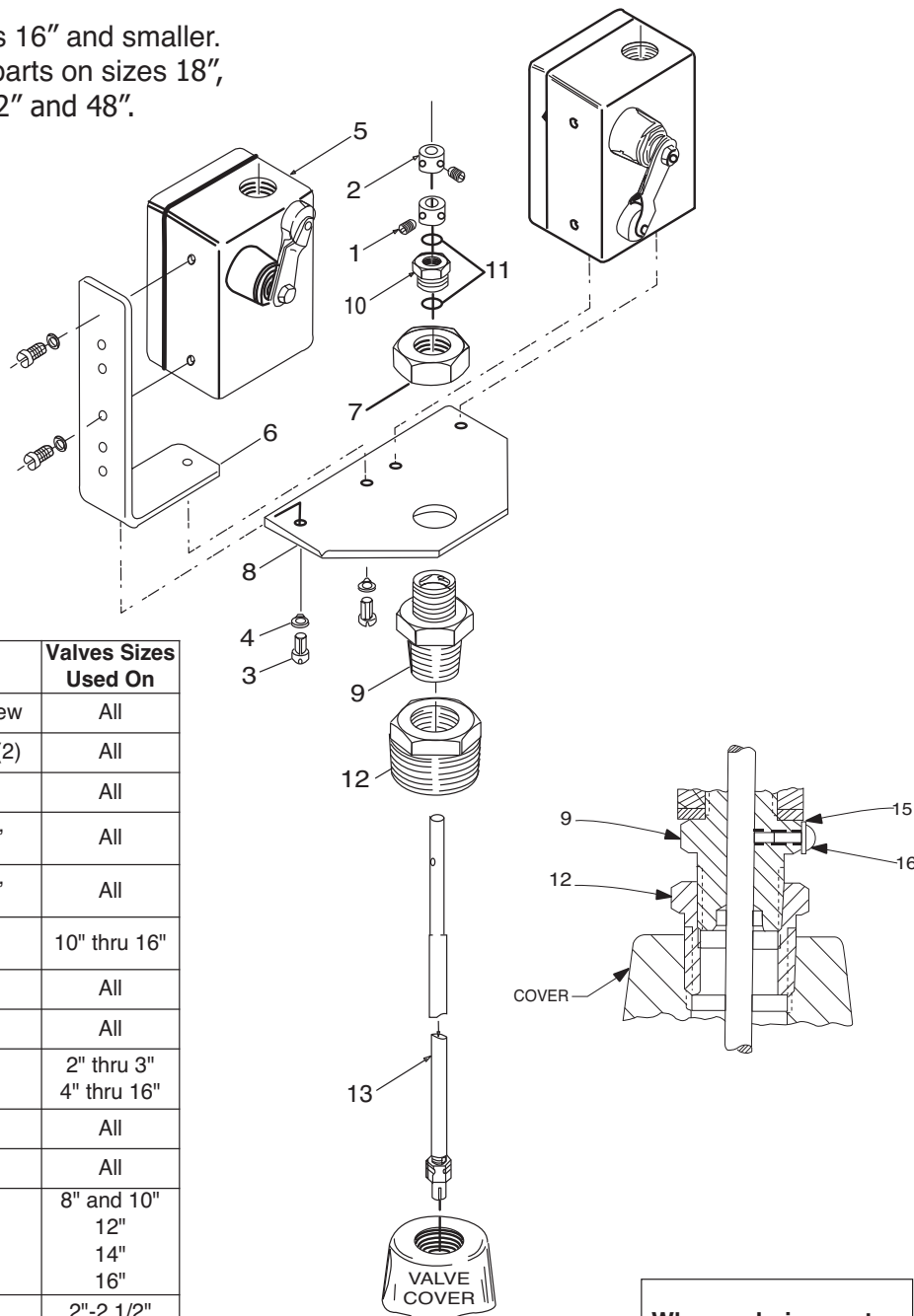
BasicValve 100-01	1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	18	20	24	30	36*	42*	48*
Dimension "A"	10.19	10.19	7.16	7.16	7.34	7.00	6.69	6.91	9.88	9.59	9.16	10.78	10.78	18.23	19.10	35.07	36.07	36.07	36.07
Dimension "B"							1.69	1.69	2.44	2.94	2.94	2.94	2.94	4.32	5.19	8.40	8.40	8.40	8.40
C (NPT)	1/4	1/4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



X105L

Limit Switch Assembly

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

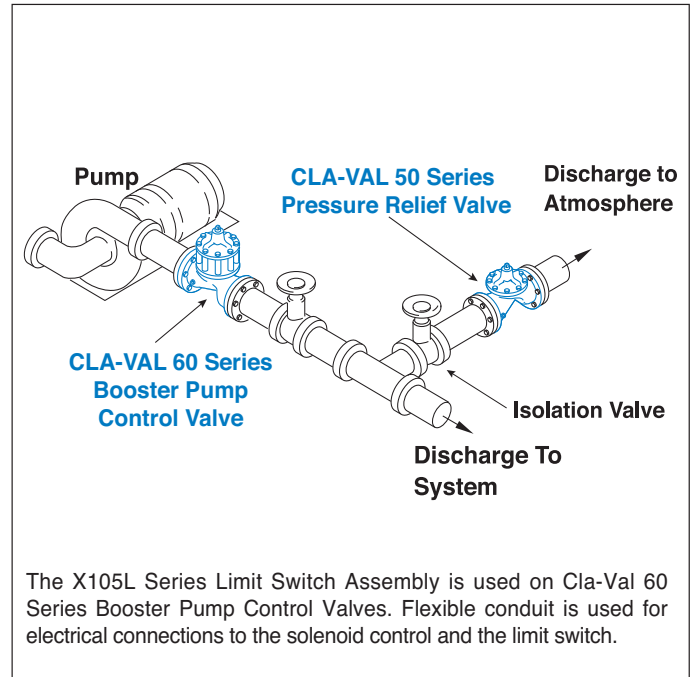
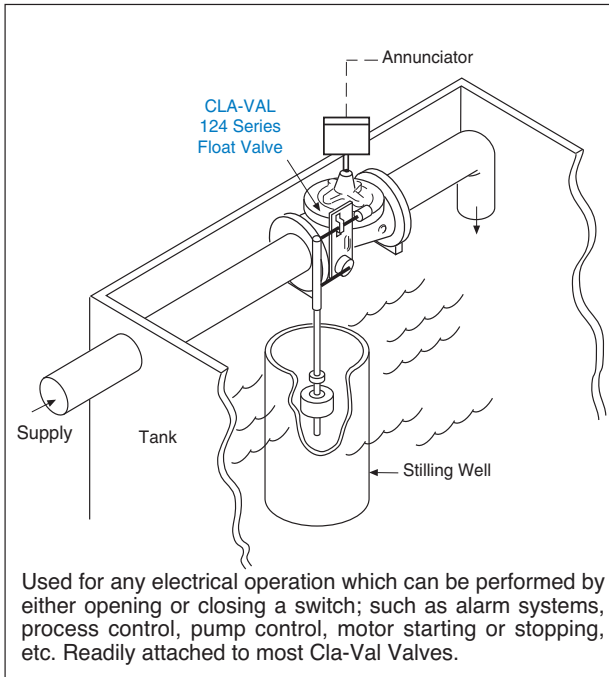


Item	Part Number	Description	Valves Sizes Used On
1-2	20441701E	Collar W/Set Screw	All
3	67578-21B	Screw, Machine (2)	All
4	67584-23F	Washer, Lock (2)	All
5	34637K	Switch Assembly, Weather Proof	All
	34633J	Switch Assembly, Explosion Proof	All
6	64310G	Bracket Switch Mounting	10" thru 16"
7	67815-06J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

When ordering parts, please specify:

- Item Number
- Description
- Part Number

Typical Applications



Specifications

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

Electrical: 1/2" Conduit connection

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

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

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

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

When Ordering, Please Specify

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

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



CLA-VAL

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

CLA-VAL CANADA

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

CLA-VAL EUROPE

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

CLA-VAL UK

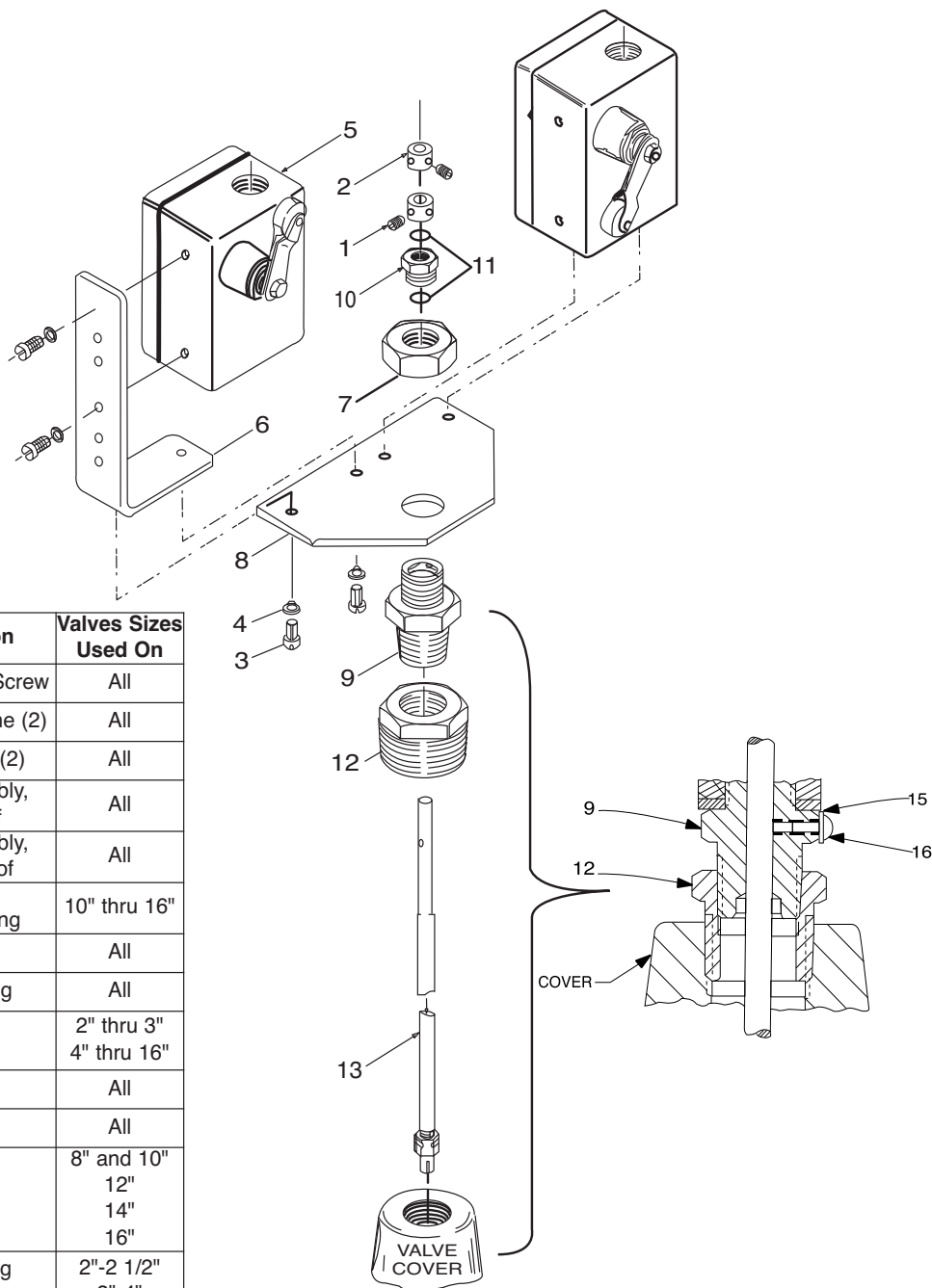
Dainton House, Goods Station Road
Tunbridge Wells
Kent TN1 2 DH England
Phone: 44-1892-514-400
E-mail: info@cla-val.co.uk

CLA-VAL FRANCE

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

CLA-VAL PACIFIC

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

X105L**Limit Switch Assembly**

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

When ordering parts, please specify:

- Item Number
- Description
- Part Number



— MODEL — **X46**

Flow Clean Strainer

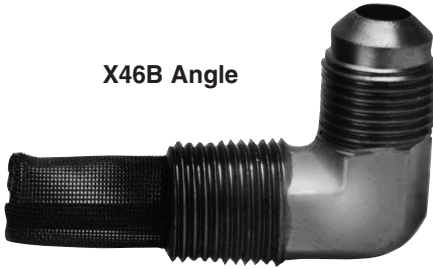


X46A Straight

- Self Scrubbing Cleaning Action
- Straight Type or Angle Type

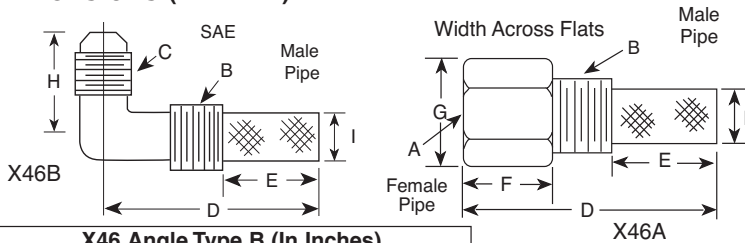
The Cla-Val Model X46 Strainer is designed to prevent passage of foreign particles larger than .015". It is especially effective against such contaminant as algae, mud, scale, wood pulp, moss, and root fibers. There is a model for every Cla-Val. valve.

X46B Angle



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

Dimensions (In Inches)



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

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

When Ordering, Please Specify:

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

INSTALLATION

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

INSPECTION

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

DISASSEMBLY

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

CLEANING


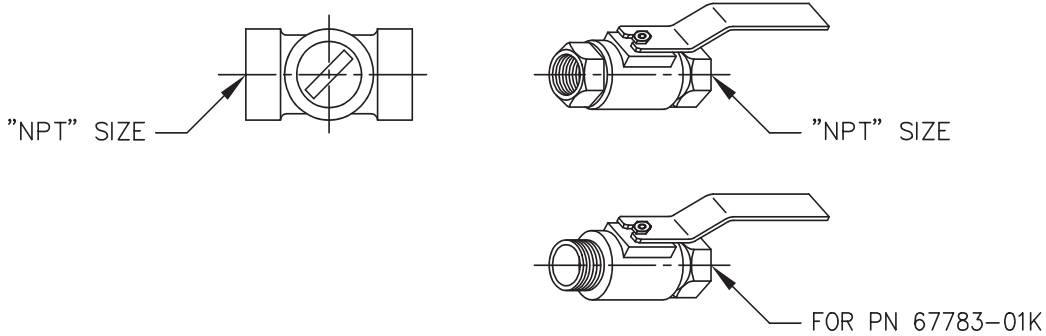
After inspection, cleaning of the X46 can begin. Water service usually will produce mineral or lime deposits on metal parts in contact with water. These deposits can be cleaned by dipping X46 in a 5-percent muriatic acid solution just long enough for deposit to dissolve. This will remove most of the common types of deposits.

Caution: use extreme care when handling acid. If the deposit is not removed by acid, then a fine grit (400) wet or dry sandpaper can be used with water. Rinse parts in water before handling. An appropriate solvent can clean parts used in fueling service. Dry with compressed air or a clean, lint-free cloth. Protect from damage and dust until reassembled.

REPLACEMENT

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

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

AK	07-10-08	AK	08-14-08	PC	10-1-2008			
	 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA		CATALOG NO.		DRAWING NO. 67783	REV BD		
	TYPE OF VALVE AND MAIN FEATURES CK2 COCK/BALL VALVE					DESIGN DRAWN MGR 4-02-80 CHK'D KD 4-03-80 APV'D CH 4-07-80		
SCALE: NONE								
								
CLA-VAL PART NO. AND MATERIAL								
BRONZE WITH HANDLE	STEEL WITH HANDLE	IRON WITH HANDLE	316 SST WITH HANDLE	316 SST W/ LOCKING HANDLE	BRONZE WITH HANDLE	MONEL WITH HANDLE	MONEL W/ LOCKING HANDLE	SIZE "NPT"
67783-01K*	-09C	-17F	-25J SUPSD BY-26G		-41F SUPSD BY-01K			1/8"
-02H	-10A	-18D	-26G	-51E SUPSD BY-26G -52C	-42D SUPSD BY-02H	-55F		1/4"
-03F * -59H***	-11J	-19B	-27E	-46E SUPSD BY-27E -53A	-45G -57B**	-48A SUPSD BY-49J	-63K	3/8"
-04D -60F***	-12G	-20K	-28C	-54J	-43B SUPSD BY-04D	-49J	-62B	1/2"
-05A -61D***	-13E	-21H	-29A	-64H	-44K SUPSD BY-05A	-56D		3/4"
-06J	-14C	-22F	-30J			-58K		1"
-07G	-15K	-23D	-31G					1 1/4"
-08E	-16H	-24B	-32E					1 1/2"
-50G			-47C					2"
* SEE ENGINEERING APPROVED VENDORS TABLE (SHEET 2 OF 2). ** HAMMOND VALVE 8501 ONLY. *** WILKINS CK2 (SEE SHEET 2 OF 2)								

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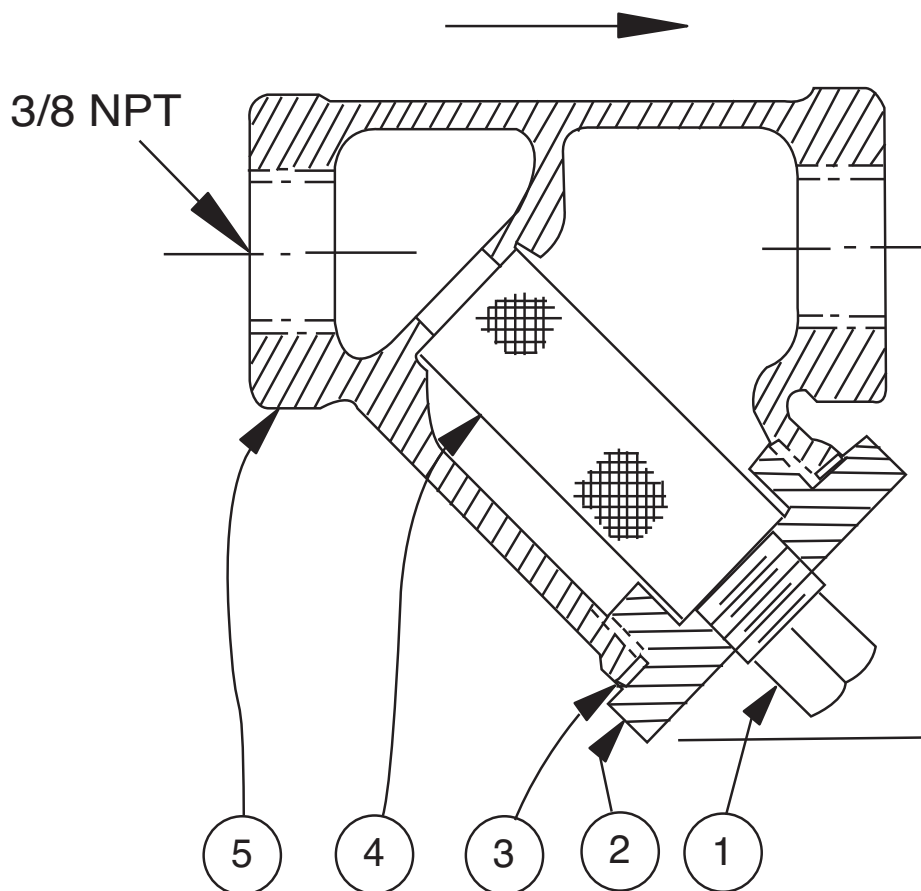
Strainer

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.

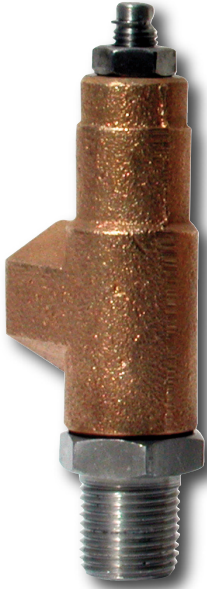
Standard 60 mesh pilot system strainer for fluid service.

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





—MODEL— **CV**
Flow Control



DESCRIPTION

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

OPERATION

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

INSTALLATION

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

DISASSEMBLY

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

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

INSPECTION

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

CLEANING

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

REPAIR AND REPLACEMENT

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

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

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

REASSEMBLY

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

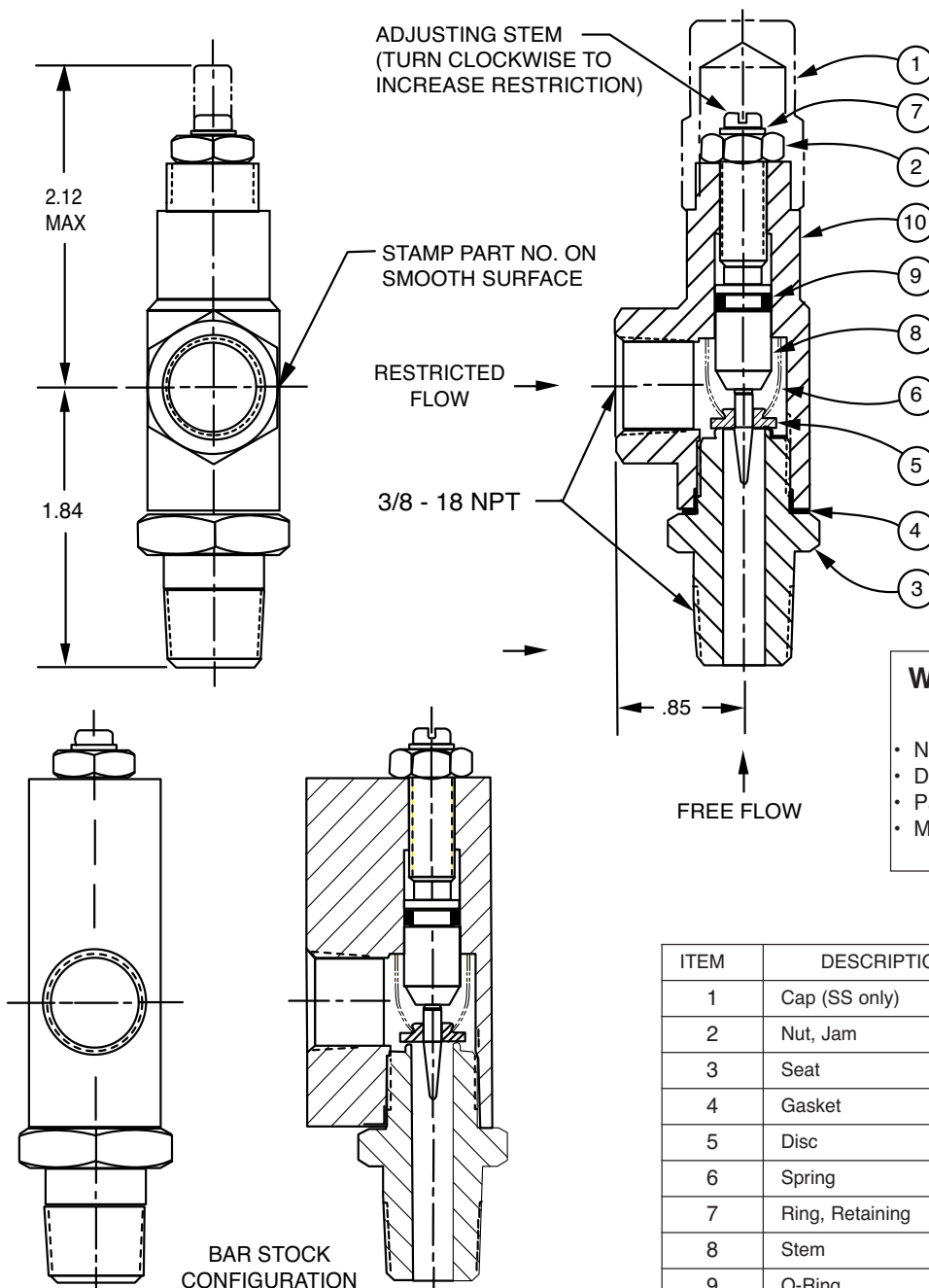
TEST PROCEDURE

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



CV

3/8" Flow Control



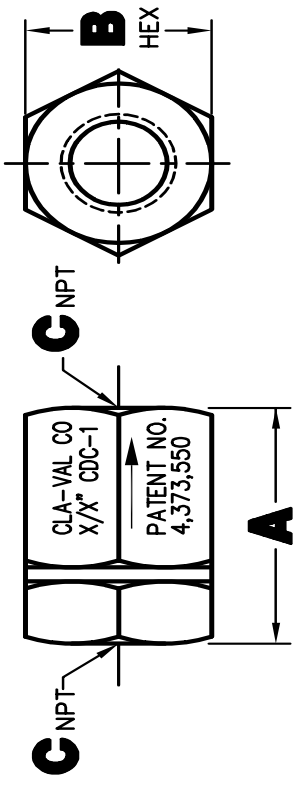
When ordering parts, please specify:

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

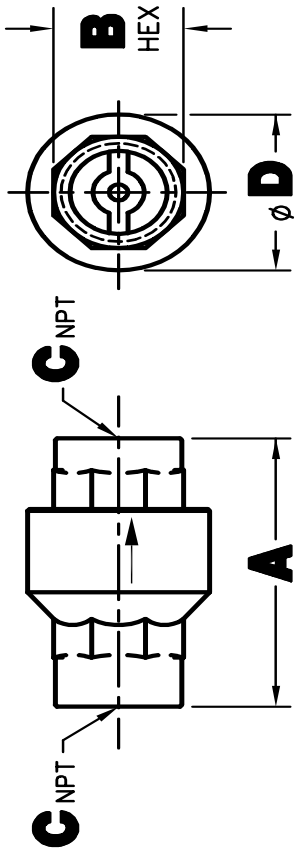
ITEM	DESCRIPTION	QTY
1	Cap (SS only)	1
2	Nut, Jam	1
3	Seat	1
4	Gasket	1
5	Disc	1
6	Spring	1
7	Ring, Retaining	1
8	Stem	1
9	O-Ring	1
10	Housing	1

BAR STOCK CONFIGURATION

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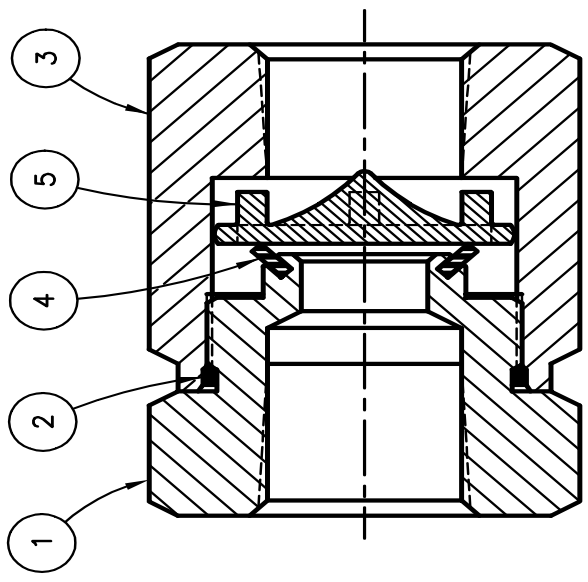
CLA-VAL CHECK VALVE (1/2" SIZE SHOWN)



BONOMI CHECK VALVE, MODLE 100002 (1/2" SIZE SHOWN)

REVISION		DATE	APPROVED
REV	DESCRIPTION		
A-E	SEE REVISION FILE		
F	ADDED BONOMI (MFG) CHECK VALVE CONFIG WITH RELATED DIMENSIONS (ECO 21854)	3-23-2010	PC

DESCRIPTION	A	B	C	D
3/8" CHECK VALVE	2.06	1.06	.38 (3/8)-18 NPT	∅
3/8" CHECK VALVE (BONOMI)	1.73	.79	.38 (3/8)-18 NPT	1.06
1/2" CHECK VALVE	2.12	1.38	.50 (1/2)-14 NPT	-
1/2" CHECK VALVE (BONOMI)	2.32	.98	.50 (1/2)-14 NPT	1.35



CLA-VAL CHECK VALVE CONFIG. (1/2" SIZE SHOWN)
(SCALE: 2/1)

ITEM NO.	QTY	DESC	MANUFACTURE OR DESCRIPTION
5	1	PLATE, VALVE	
4	1	SEAL, VALVE RING	
3	1	RETAINER, VALVE	
2	1	O-RING	
1	1	RETAINER, SEAL	

PARTS LIST (FOR CLA-VAL CHECK VALVE ONLY)

CONTRACT NO.		TITLE	
APPROVALS	DATE	3/8" & 1/2" CDC-1 CHECK VALVE	
DRAWN JC	11-30-84	SIZE	B 86184
CHECKED LFH	12-4-84	CAGE CODE	98345
APPROVED CH	12-6-84	DWG NO.	98345
ENGR		SCALE	1/1
		SHEET	1 OF 1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE FRACTIONS DECIMALS ANGULAR ± 1/32 .005 .010 ± .5° MAX = +.00 -0.00 MIN = +.00 -0.00 SURFACE FINISH 125/ BREAK CORNERS .010 MAX --DO NOT SCALE DRAWING--





X43

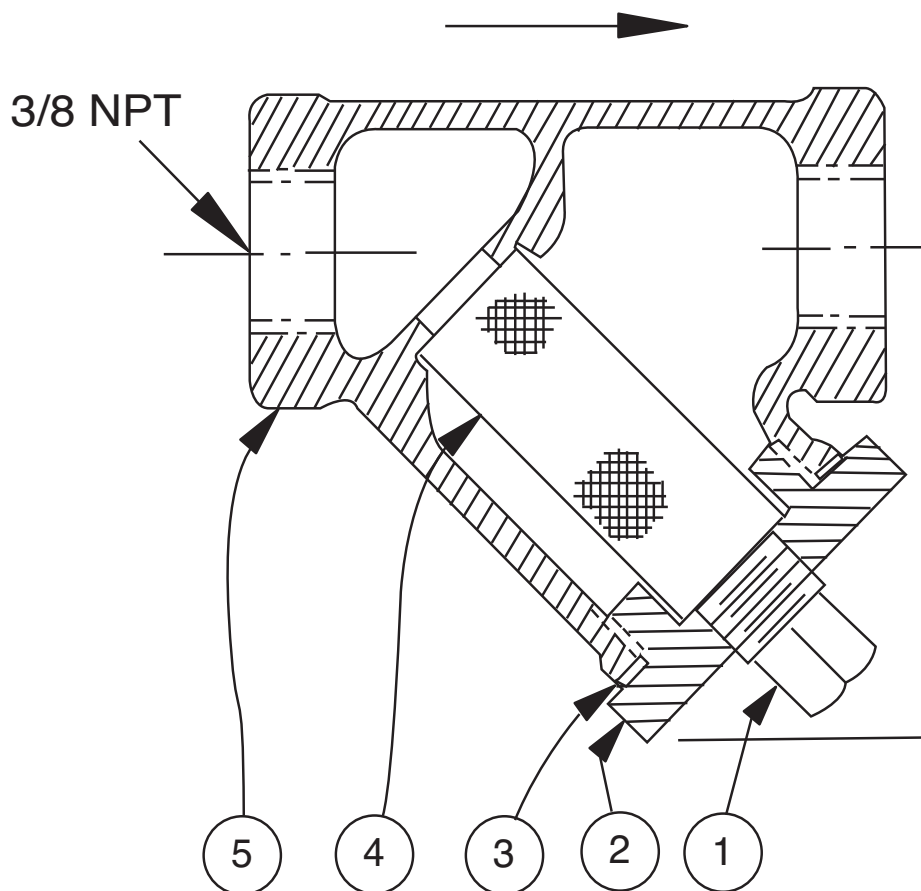
Strainer

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

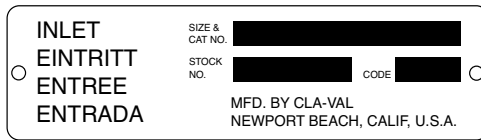


Proper Identification

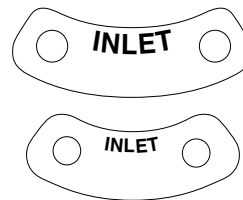
For ordering repair kits, replacement parts, or for inquiries concerning valve operation, it is important to properly identify Cla-Val products already in service by including all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details,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



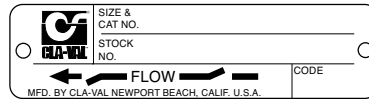
This brass plate appears on valves sized 2 1/2" and larger and is located on the top of the inlet flange.



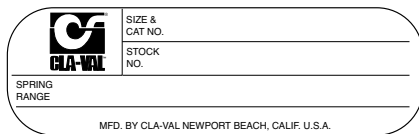
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



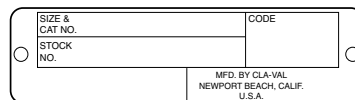
This brass plate appears on altitude valves only and is found on top of the outlet flange.



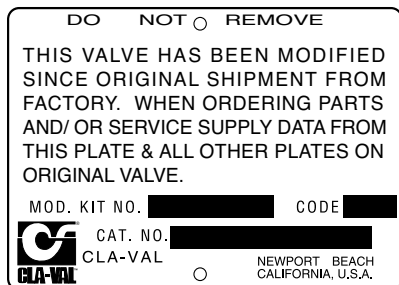
These two brass plates appear on threaded valves 1" through 3" size or flanged valves 1" through 2". It is located on only one side of the valve body.



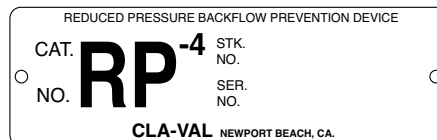
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



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



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



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

HOW TO ORDER

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

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

SPECIFY WHEN ORDERING

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

UNLESS OTHERWISE SPECIFIED

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

LIMITED WARRANTY

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

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

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

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

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

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

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

TERMS OF SALE

ACCEPTANCE OF ORDERS

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

CREDIT TERMS

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

PURCHASE ORDER FORMS

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

PRODUCT CHANGES

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

PRICES

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

RESPONSIBILITY

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

RISK

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

EXPORT SHIPMENTS

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

RETURNED GOODS

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



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

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Phone: 949-722-4800 • Fax: 949-548-5441

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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**

Model 100-01 Hytrol Main Valve

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

Model 100-20 Hytrol Main Valve

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

Consult factory for larger sizes

Rubber Kit Includes: Diaphragm, Disc, Spacer Washers

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

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

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

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

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

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

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

Larger Sizes: Consult Factory.

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

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

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

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

Larger Sizes: Consult Factory.

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

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

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

Repair Assemblies (In Standard Materials Only)

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

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

CLA-VAL

1701 Placentia Ave • Costa Mesa CA 92627 Phone: 949-722-4800 • Fax: 949-548-5441 • E-mail: info@cla-val.com • www.cla-val.com

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N-RK (R-08/2018)