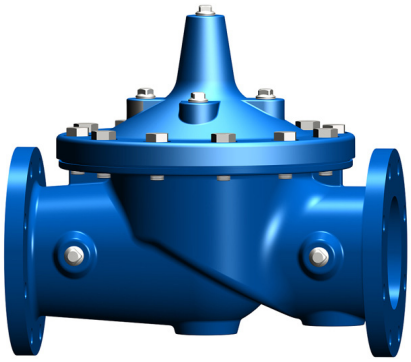
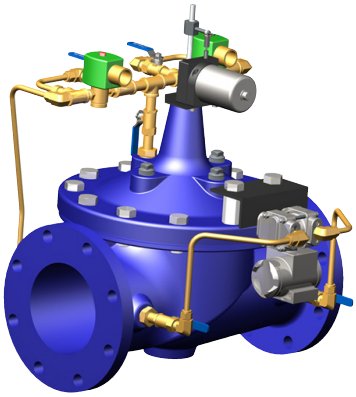
Cla-Val

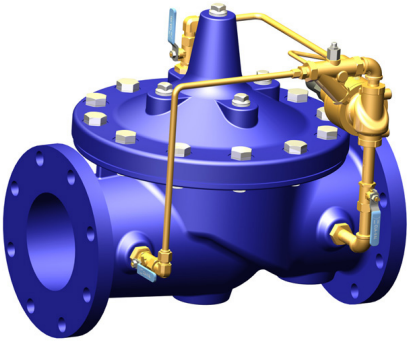
Service Training Manual

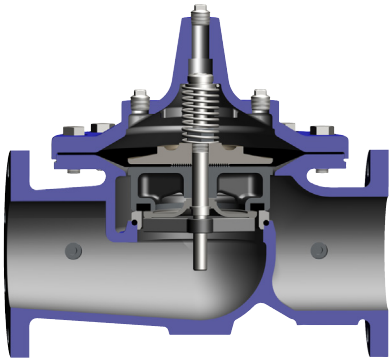
Section # 2

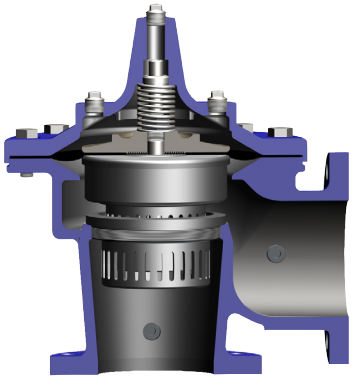
Pilots and Accessories

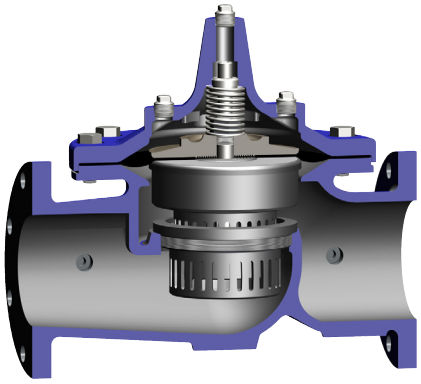












“Simple solutions plus learning with a purpose”

Section 2

CRD – Cla-Val Reducing Pilot

The CRD is a Normally Open pilot and will shift to close on rise in outlet pressure. The CRD pilot is used for most pressure reducing applications.

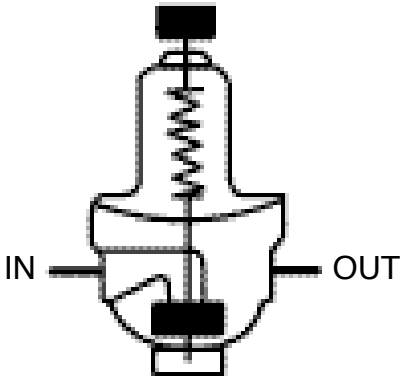
CRD

Normally Open – Shifts to closed on rise in sensed pressure

Adjustment Ranges – 2-30, 15-75, 30-300 psi

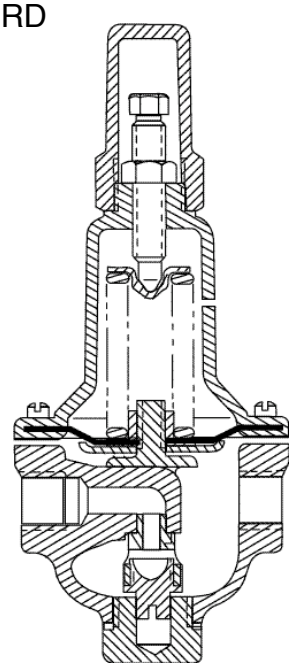
Maximum Working Pressure 400 PSI

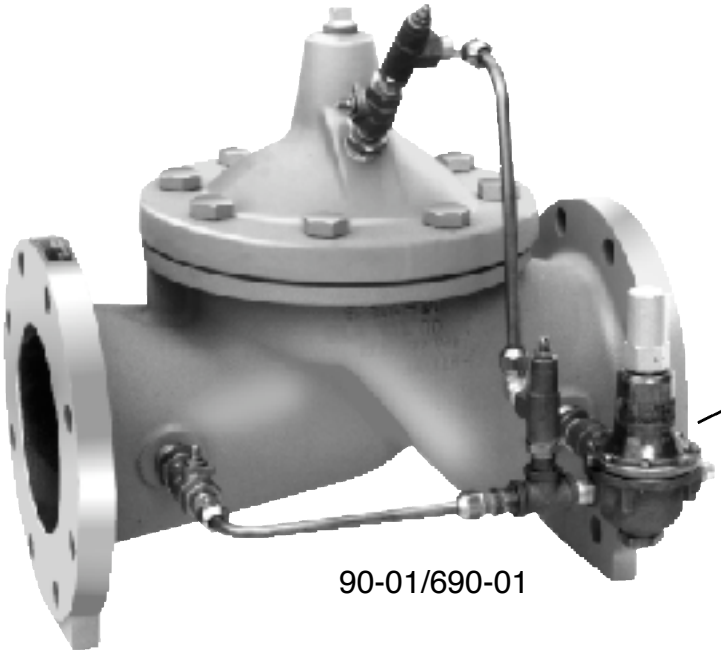
CRD



Schematic Symbol

CRD





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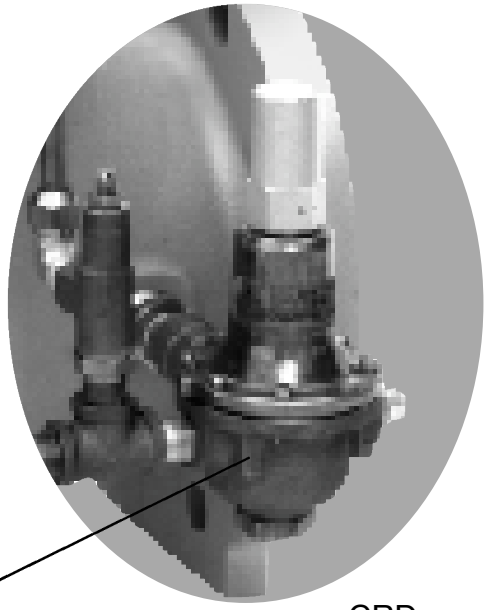

CRD

CLA-VAL

— MODEL — **CRD**

Pressure Reducing Control

DESCRIPTION

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

OPERATION

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

INSTALLATION

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

ADJUSTMENT PROCEDURE

The CRD Pressure Reducing Control can be adjusted to provide a delivery pressure range as specified on the nameplate.

Pressure adjustment is made by turning the adjustment screw to vary the spring pressure on the diaphragm. The greater the compression on the spring the higher the pressure setting.

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

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

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

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

MAINTENANCE

Disassembly

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

Reassembly

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

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

To check for proper alignment proceed as follows:
Rotate diaphragm clockwise and counterclockwise as far as possible. Diaphragm screw holes should rotate equal distance on either side of body screw holes ±1/8".

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

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

2 – 1

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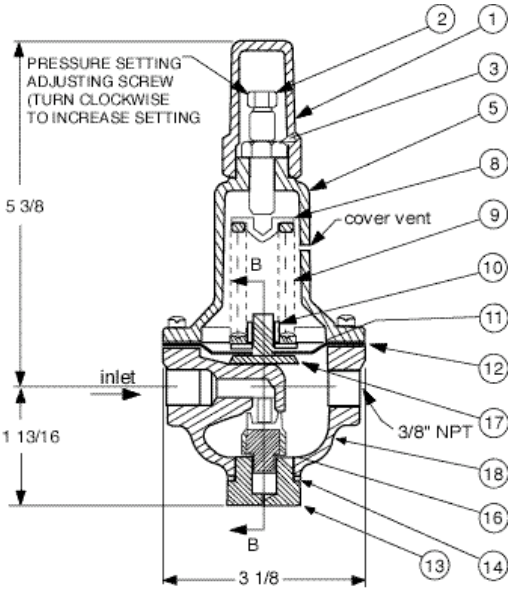
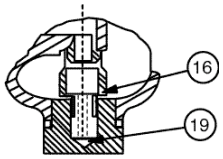
CLA-VAL

CRD

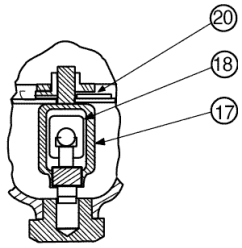
Pressure Reducing Control



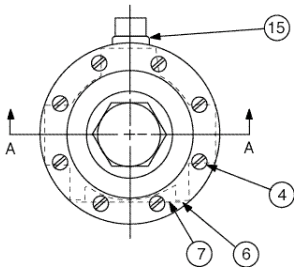
SECTION A-A
OPEN POSTION
FOR HIGH PRESSURE CONTROL



Body and Disc
Retainer Detail
for Low Pressure
Control



SECTION B-B
CLOSED POSITION



Size (inch)	Stock Number	Adjustment Range	
		psi	Ft of Water
3/8	71943-07A	2 - 6.5	4.5 - 15
3/8	71943-08J	2 - 30	4.5 - 69
3/8	71943-03K	15 - 75	35 - 173
3/8	71943-11C	20 - 105	46 - 242
3/8	71943-04H	30 - 300	69 - 692
Factory Set Pressure			**PSI per Turn**
	2 - 6.5 set @ 3.5 psi		.61
	2 - 30 set @ 10 psi		3.0
	15 - 75 set @ 20 psi		9.0
	20 - 105 set @ 60 psi		12.0
	30 - 300 set @ 60 psi		27.0
*Approximate-Final Adjustment should be with a pressure gauge and with flow.			

When ordering parts specify:

- All nameplate data
- Item Description
- Item number

*SUGGESTED REPAIR PARTS

Item	Description	Material	Part Number	List Price
1	Cap	PL	67628J	
2	Adjusting Screw	BRS	7188201D	
3	Jam Nut (3/8-16)	SS	6780106J	
4*	Machine Screw (Fil.Hd.) 8 Req'd	303	6757821B	
5	Cover	BRS	C2544K	
6	Nameplate Screw	SS	67999D	
7	Nameplate	BRS	C0022001G	
8	Spring Guide	302	71881H	
9	Spring (15-75 psi)	CHR/VAN	71884B	
	Spring (2 - 6.5 psi)	SS	82575C	
	Spring (2 - 30 psi)	SS	81594E	
	Spring (20 - 105 psi)	CHR/VAN	20561901H	
	Spring (30 - 300 psi)	CHR/VAN	71885J	
10	Hex Nut	303	71883D	
11	Diaphragm Washer	302	71891G	
12	Diaphragm	NBR	C6936D	
13	Plug, Body	BRS	V5653A	
14*	Gasket	Fiber	40174F	
15	Plug	BRS	6766003F	
16*	Disc Retainer Assy. (15 - 75 psi)	BZ/Rub	C5256H	
	Disc Retainer Assy. (2 - 30 psi)	BZ/Rub	C5255K	
	Disc Retainer Assy. (20 - 105 psi)	BZ/Rub	20561901H	
	Disc Retainer Assy. (30 - 300 psi)	BZ/Rub	C5256H	
17	Yoke	VBZ	V6951H	
18	Body & 1/4" Seat Assy	BR/SS	8339702G	
19*	Bucking Spring (2 - 30 psi)	302	V0558G	
20	Belleville Washer	STL	7055007E	
*	Repair Kit (No Bucking Spring)	Buna®-N	9170003K	
*	Repair Kit (with Bucking Spring)	Buna®-N	9170001D	

CRA – Cla-Val Reducing Pilot with a remote sensing port

The CRA is similar to a CRD but it also has an extra feature; it has a remote sense port. The CRA is a Normally Open pilot and will shift to close on rise in pressure. The CRA pilot is used for pressure reducing applications where a remote pressure needs to be sensed.

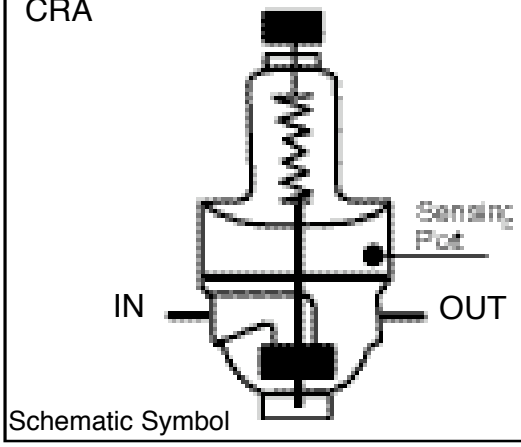
Normally Open – Shifts to close on rise in sensed pressure.

Adjustment Ranges – 2-35, 15-75, 30-300 psi

Maximum Working Pressure 400 PSI

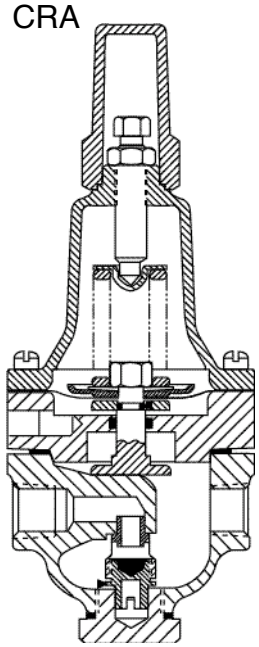
CRA

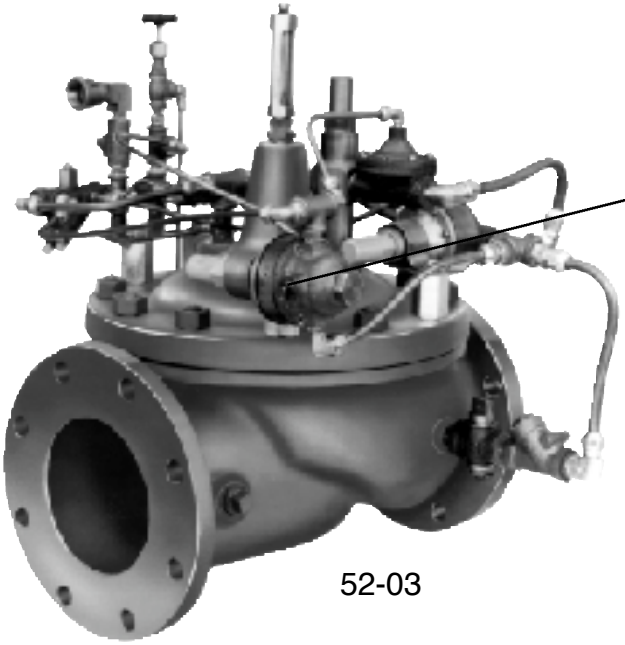
CRA



Schematic Symbol

CRA





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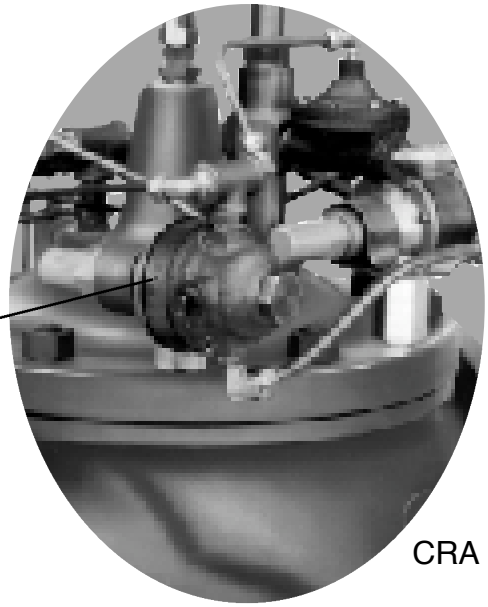

CRA

2 – 1

CLA-VAL

— MODEL — CRA

REMOTE SENSING TYPE

Pressure Reducing Control

DESCRIPTION

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

OPERATION

The CRA Pressure Reducing Control is normally held open by the force of the compression spring above the diaphragm; delivery pressure acts on the underside of the diaphragm. Flow through the valve responds to changes in pressure at the the sensing point.

INSTALLATION

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

ADJUSTMENT PROCEDURE

The CRA Pressure Reducing Control can be adjusted to provide a delivery pressure range as specified on the nameplate.

Pressure adjustment is made by turning the adjustment screw to vary the spring pressure on the diaphragm. The greater the compression on the spring the higher the pressure setting.

1. Turn the adjustment screw in (clockwise) to increase delivery pressure.
2. Turn the adjustment screw out (counter-clockwise) to decrease the delivery pressure. When pressure adjustment is completed, tighten jam nut on adjustment screw and replace protective cap.

Flow rates are not critical during pressure setting. The approximate min - imum flow rates given in the table are for the main valve on which the CRA is installed.

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

MAINTENANCE

Disassembly

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

Reassembly

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

1. Place yoke (17) in body and screw the disc retainer assembly (16) until it bottoms.
2. Install gasket (14) and spring (19) for 2-30 psi range onto plug (13) and screw into body. Disc retainer must enter guide hole in plug as it is assembled. Screw the plug in by hand. Use wrench to tighten only.
3. Place gasket (25) and powertrol body (21) on yoke extension (17). Refer to sectional view for proper reassembly of (21) onto body (18).
4. Place lower diaphragm washer (24), "O" ring (22), diaphragm (12), upper diaphragm washer (11), and belleville washer (20) on yoke extension (17). Screw on diaphragm nut (10) finger tight.
5. Place two machine screws (4) through (21) (25) and screw into body (18). Do not include the diaphragm (12) in this operation. This holds parts aligned for next step, and allows the diaphragm to move and be properly located during tightening of nut (10).
6. Hold the diaphragm so that screw holes in the diaphragm (12) and powertrol body (21) align. Tighten diaphragm nut (10) with a wrench. At the final tightening release the diaphragm and permit it to rotate approximately 5° to 10°. The diaphragm holes should now be properly aligned with the body holes.

To check for proper alignment proceed as follows:

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

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

7. Remove machine screws per step 5.
8. Install spring (9) with spring guide (8) on top of spring.
9. Install cover (5) using eight machine screws (4).
10. Replace adjusting screw (2) and nut (3), then cap (1).

SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to open when pressure lowers	No spring compression	Tighten adjusting screw
	Mineral buildup on yoke extension (17)	Disassemble and clean part, Replace "O" rings (22) and (23).
	Damaged spring	Disassemble and replace.
	Spring guide (8) is not in place	Disassemble and place guide (8) on top of spring (9).
	Yoke dragging on inlet nozzle	Disassembled and reassemble use procedure.
Fails to close when delivery pressure rises	Spring compressed	Back off adjusting screw
	Mineral deposit on yoke extension (17)	Disassemble and clean part. Replace "o" rings (22) and (23).
	Mechanical obstruction	Disassemble and remove obstruction
	Worn disc	Disassemble, remove and replace disc retainer assembly. (16)
	Yoke dragging on inlet nozzle	Refer to paragraph 6
Leakage from cover vent hole	Damaged diaphragm (12)	Disassemble and replace
	Loose diaphragm nut (10)	Remove cover and tighten nut

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CRA

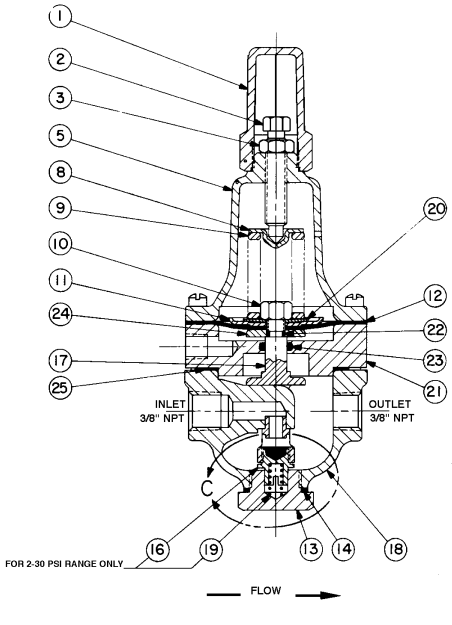
REMOTE SENSING TYPE

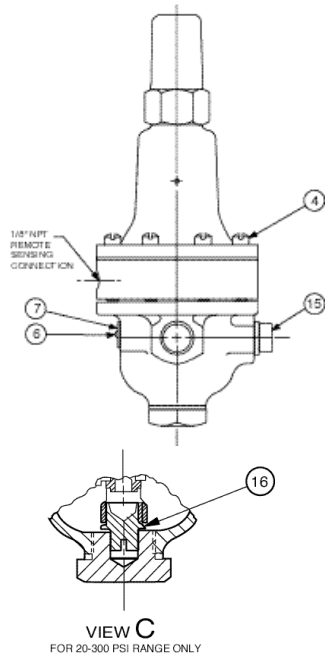
Pressure Reducing Control

When ordering parts specify:
- All nameplate data
- Description
- Item number

SIZE (inch)	STOCK NUMBER	SEAT DIA	ADJ. RANGE (psi)
3/8	79744-03D	1/4	15-75
3/8	79744-04B	1/4	30-300
3/8	79744-06G	1/4	2-30
Factory set pressure:			PSI*per turn
15-75 set @ 20 psi			9.0
30-300 set @ 60 psi			27.0
2-30@ 10 psi			3.0

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





ITEM	DESCRIPTION	MATERIAL	PART NUMBER	LIST PRICE
1	Cap	PL	67628J	
2	Adjusting Screw	BRS	7188201D	
3	Jam Nut, 3/8—16	303	6780106J	
4*	Machine Screw 10-32 x 1-1/4"(Fil.Hd.) (8 required)	SS	6757874A	
5	Cover	BRS	C2544K	
6	Nameplate Screw	SS	67999D	
7	Nameplate	BRS	C002201G	
8	Spring Guide	302	71881H	
9	Spring			
	(15-75 psi)	CHR VAN	71884B	
	(30-300 psi)	CHR VAN	71885B	
	(2-30 psi)	SS	81594E	
10	Hex Nut 5/16 - 18	303	71883D	
11	Diaphragm Washer (upper)	302	71891G	
12*	Diaphragm	NBR	C6936D	
13	Plug, Body	BRS	V5653A	
14*	Gasket	FIB	40174F	
15	Plug, 3/8 NPT	BRS	6766003F	
16*	Disc Retainer Assy (15-75 psi & 30-300 psi)	BR/RUB	C5256H	
	Disc Retainer Assy (2-30 psi)	BR/RUB	C5255K	
17	Yoke	VBZ	C1799A	
18	Body & Seat Assy, Seat only 1/4"	BS	8339701J	
19*	Bucking Spring (Required with 2-30 psi)	302	VO5586	
20	Belleville Washer	STL	7055007E	
21	Powertrol Body	BRS	C3388A	
22*	O-Ring	NBR	00708J	
23*	O-Ring	NBR	00746J	
24	Diaphragm Washer (lower)	BRS	C1804J	
25	Gasket	NBC	8059401D	
*	Repair Kit (no Bucking Spring) Item 19	Buna®-N	9170003K	
*	Repair Kit (with Bucking Spring) Item 19	Buna®-N	9170001D	

* Suggested Repair Parts

2—1

CRL – Cla-Val Relief Pilot

The Cla-Val CRL pilot is a Normally Closed pilot that shifts to Open on rise in sensed pressure. The CRL is used for most pressure relief or pressure sustaining applications.

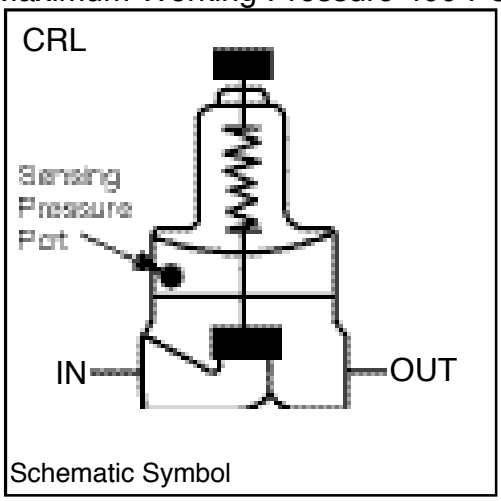
Normally Closed - Shifts to open on rise in sensed pressure

Adjustment Ranges
0-75, 20-200,100-300 psi
Contact Cla-Val for higher ranges

Maximum Working Pressure 400 PSI

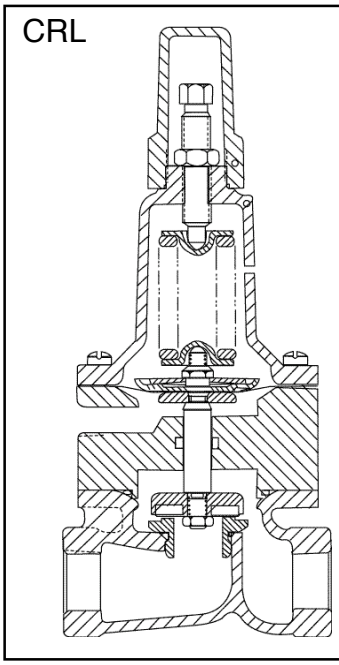
CRL

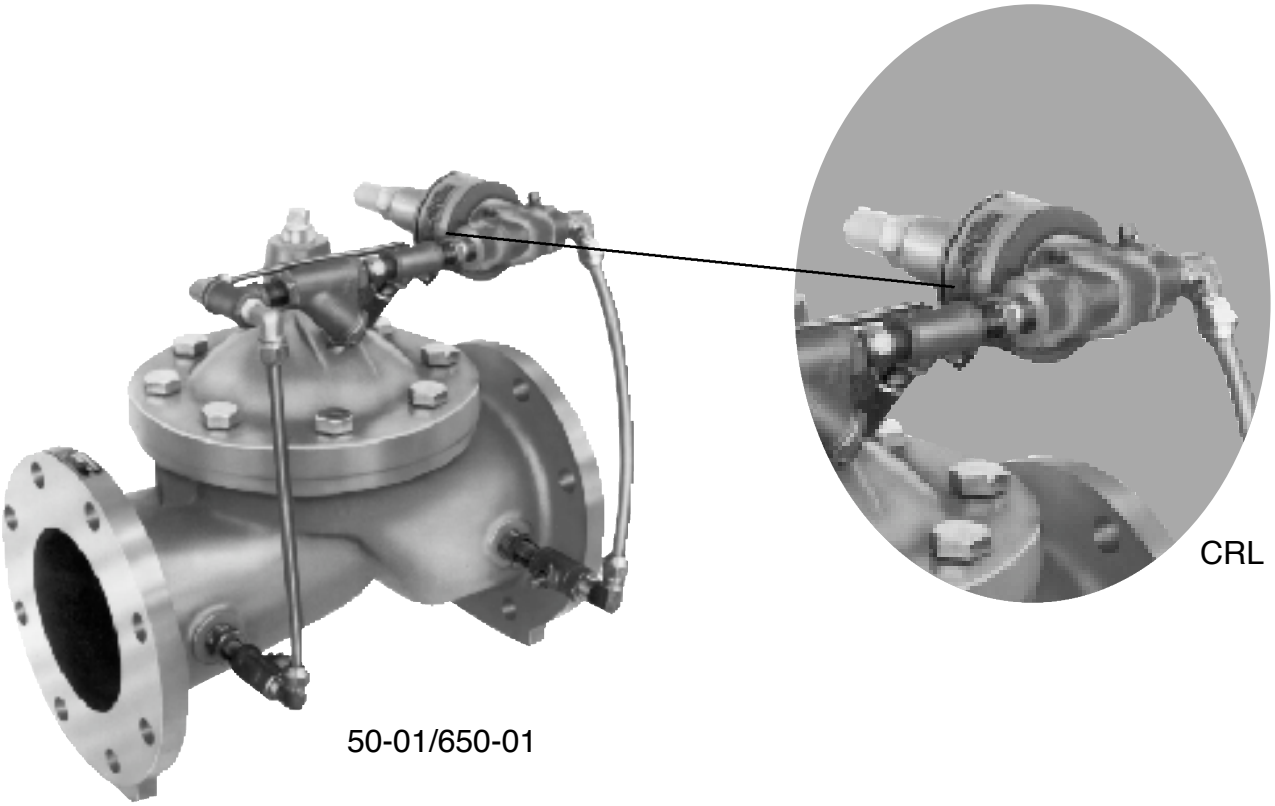
CRL



Schematic Symbol

CRL





CRL

50-01/650-01

CLA-VAL

— MODEL — CRL
Pressure Relief Control

DESCRIPTION

The CRL Pressure Relief Control is a direct acting, spring loaded, diaphragm type relief valve. It may be used as a self-contained valve or as a pilot control for a Cla-Val Main valve. It opens and closes within very close pressure limits.

INSTALLATION

The CRL Pressure Relief Control may be installed in any position. The control body (7) has one inlet and one outlet port with a side pipe plug (24) at each port. These plugs are used for control connections or gauge applications. The inlet in the power unit body (6) is the sensing line port. A flow arrow is marked on the body casting.

OPERATION

The CRL Pressure Relief Control is normally held closed by the force of the compression spring above the diaphragm; control pressure is applied under the diaphragm.

When the controlling pressure exceeds the spring setting, the disc is lifted off its seat, permitting flow through the control.

When controlling pressure drops below spring setting, the spring returns the control to its normally closed position.

ADJUSTMENT PROCEDURE

The CRL Pressure Relief Control can be adjusted to provide a relief setting at any point within the range found on the nameplate.

Pressure adjustment is made by turning the adjustment screw (9) to vary the spring pressure on the diaphragm. Turning the adjustment screw clockwise increases the pressure required to open the valve. Counterclockwise decreases the pressure required to open the valve.

When pressure adjustments are complete the jam nut (10) should be tightened and the protective cap (1) replaced. If there is a problem of tampering, lock wire holes have been provided in cap and cover. Wire the cap to cover and secure with lead seal.

DISASSEMBLY

The CRL Pressure Relief Control does not need to be removed from the line for disassembly. Make sure that pressure shut down is accompanied prior to disassembly. If the CRL is removed from the line for disassembly be sure to use a soft jawed vise to hold body during work.

Refer to Parts List Drawing for Item Numbers.

1. Remove cap (1), loosen jam nut (10) and turn adjusting screw counterclockwise until spring tension is relieved.
2. Remove the eight screws (4) holding the cover (3) and powerunit body (6). Hold the cover and powerunit together and place on a suitable work surface. See NOTE under REASSEMBLY.
3. Remove the cover (3) from powerunit body (6). The spring (12) and two spring guides (11).
4. Remove nut (13) from stem (19) and slide off the belleville washer (14), the upper diaphragm washer (15) and the diaphragm (16).
5. Pull the stem (19) with the disc retainer assembly (21) through the bottom of powerunit. The lower diaphragm washer (17) will slide off of stem top.
6. Remove jam nut (23) and disc retainer assembly (21) from stem. Use soft jawed pliers or vise to hold stem. The polished surface of stem must not be scored or scratched.
7. The seat (22) need not be removed unless it is damaged. If removal is necessary use proper size socket wrench and turn counterclockwise. Note: Some models have an integral seat in the body (7).

INSPECTION

Inspect all parts for damage, or evidence of cross threading. Check diaphragm and disc retainer assembly for tears, abrasions or other da m-age. Check all metal parts for damage, corrosion or excessive wear.

REPAIR AND REPLACEMENT

Minor nicks and scratches may be polished out using 400 grit wet or dry sandpaper fine emery or crocus cloth. Replace all O-rings and any damaged parts.

When ordering replacement parts, be sure to specify parts list item number and all nameplate data.

REASSEMBLY

In general, reassembly is the reverse of disassembly. However, the following steps should be observed:

1. Lubricate the O-Ring (18) with a small amount of a good grade of waterproof grease, (Dow Corning 44 medium grade or equal). Use grease sparingly and install O-ring in powerunit body (6).
2. Install stem (19) in powerunit body (6). Use a rotating motion with minimum pressure to let stem pass through O-ring.

   Do Not Cut O-Ring.
3. Install O-ring (5) at top of stem (19). Place lower diaphragm washer (17) on the stem with the serrated side up. Position diaphragm (16), upper diaphragm washer (15), with serration down, and belleville washer (14) with concave side down.
4. Position powerunit body (6) as shown on parts list drawing (top view).
5. Continue reassembly as outlined in disassembly steps 1 through 3.

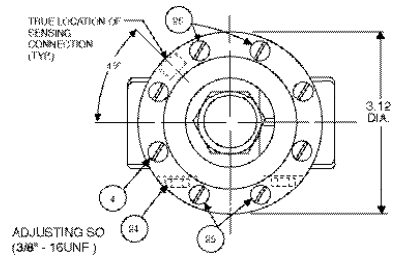
Note: Item (4) Screw will have a quantity of 8 for the 0-75 and 20-200psi design and a quantity of 4 for the 100-300psi design. Item (25) Screw is used on the 100-300psi design only. Install item (25), before item (4) for preload of item (12) spring.

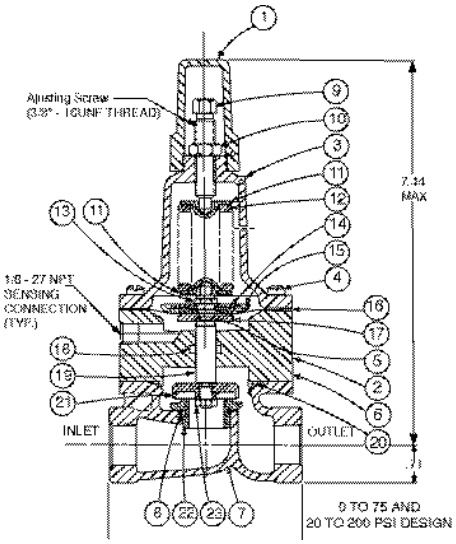
SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to open.	Controlling pressure too low.	Back off adjusting screw until valve opens.
Fails to open with spring compression removed.	Mechanical obstruction, corrosion, scale build-up on stem.	Disassemble, locate,and remove obstruction, scale.
Leakage from cover vent hole when controlling pressure is applied.	Diaphragm Damage	Disassembly replace damaged diaphragm.
	Loose diaphragm assembly.	Tighten upper diaphragm washer.
Fails to close.	No spring compression.	Re-set pressure adjustment.
Fails to close with spring compressed.	Mechanical obstruction.	Disassemble, locate and remove obstruction.

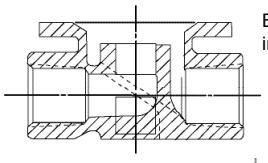
2 — 1

CRL

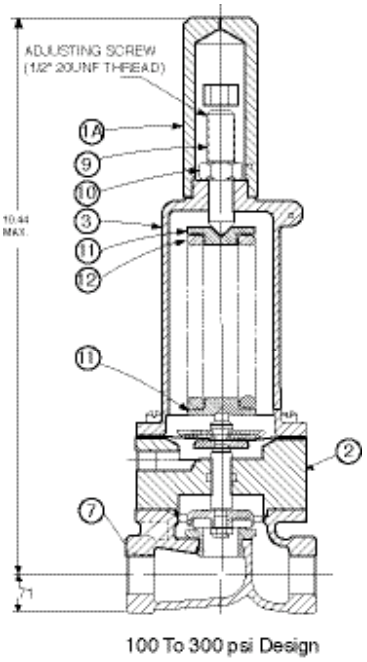
1/2" & 3/4" PRESSURE RELIEF CONTROL







Body with integral Seat



100 To 300 psi Design

SIZE	SPRING RANGE	PART NUMBER
1/2"	0-75 PSI	79222-01E
1/2"	20-200 PSI	79222-02C
1/2"	100-300 PSI	82809-01D
3/4"	0-75 PSI	79229-01K
3/4"	20-200 PSI	79229-02H
3/4"	100-300 PSI	86005-01E
For 100-450 PSI Contact Factory		

CRL RANGE PSI	APPROX. INCREASE FOR EACH CLOCK-WISE TURN OF ADJUSTING SCREW
0 to 75	8.5 PSI
20 to 200	28.0 PSI
100 to 300	18.0 PSI

When ordering parts please specify:
1. All Nameplate Data
2. Item Part Number
3. Item Description

Item	Description	Material	Part Number	Part Number	Part Number
			0-75	**20-200**	**100-300**
1	Cap	Plastic	67628J	67628J	1257601D
1A	Cap 100 to 300 psi Design	Plastic	1257601D	1257601D	1257601D
2	Nameplate	Brass	--	--	--
3	Cover	Bronze	C2544K	C2544K	44587E
4*	Screw Fil.Hd.10-32 x 1.88	303 SS	6757867E	6757867E	6757867E
5*	0-Ring	Rubber	00902H	00902H	00902H
6	Body, Powerunit	Bronze	7920504D	7920504D	7920504D
7	1/2" Body	Bronze	C7928K	C7928K	C7928K
	3/4" Body	Bronze	C9083B	C9083B	C9083B
8*	0-Ring, Seat	Rubber	00718H	00718H	00718H
9	Screw, Adjusting	Brass	7188201D	7188201D	7188201D
10	Nut Hex (Locking)	303 SS	6780106J	6780106J	6780106J
11	Guide, Spring	303 SS	71881H	71881H	1630301J
12	Spring,	CHR/VAN	71884B	71885J	1630201A
13	Nut, Stem, Upper	Bronze	73034B	73034B	73034B
14	Washer, Belleville	Steel	7055007E	7055007E	7055007E
15	Washer, Diaphragm (upper)	303 SS	71891G	71891G	71891G
16*	Diaphragm	Rubber	C1505B	C1505B	C1505B
17	Washer, Diaphragm (lower)	303 SS	45871B	45871B	45871B
18*	0-Ring, Stem	Rubber	00746J	00746J	00746J
19	Stem	303 SS	8982401F	8982401F	8982401F
20*	0-Ring, Body	Rubber	00767E	00767E	00767E
21*	Retainer Assembly, Disc	303 SS	C8964D	C8964D	C8964D
22	Seat	303 SS	62187A	62187A	62187A
23	Nut, hex, Stem, Lower	Bronze	6779806G	6779806G	6779806G
24	Pipe Plug	Bronze	6784701C	6784701C	6784701C
25*	Screw Fil.Hd, 10-32 x 2.25 (Qty 4 on 100-300 psi)	303 SS	6757867E	6757867E	6757867E
	FACTORY SET POINT		**50 PSI**	**60 PSI**	**100 PSI**
	REPAIR KIT*		9170007A	9170007A	9170007A

55F – Cla-Val Relief Pilot with external mounted sense line

The Cla-Val 55F pilot is a Normally Closed pilot that shifts to Open on rise in sensed pressure. It is like the CRL but has an extra feature; sense tubing is connected from the inlet of the pilot to the sensing port of the pilot. The 55F is often used as a stand-alone direct acting pressure relief valve.

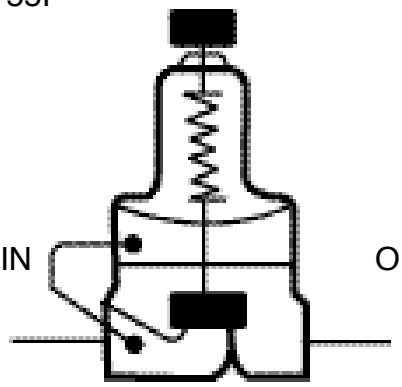
Normally Closed - Shifts to open
on rise in sensed pressure

Adjustment Ranges
0-75,20-200,100-300 psi

Maximum Working Pressure 400 PSI

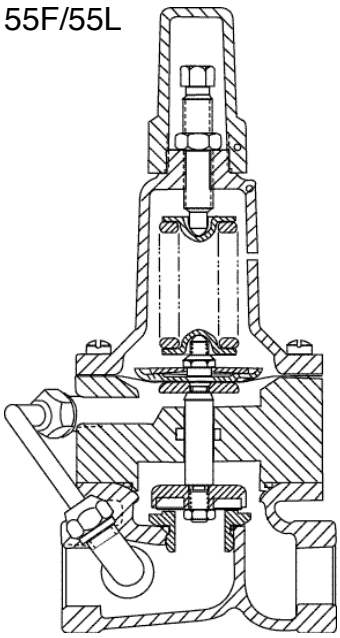
55F/55L

55F



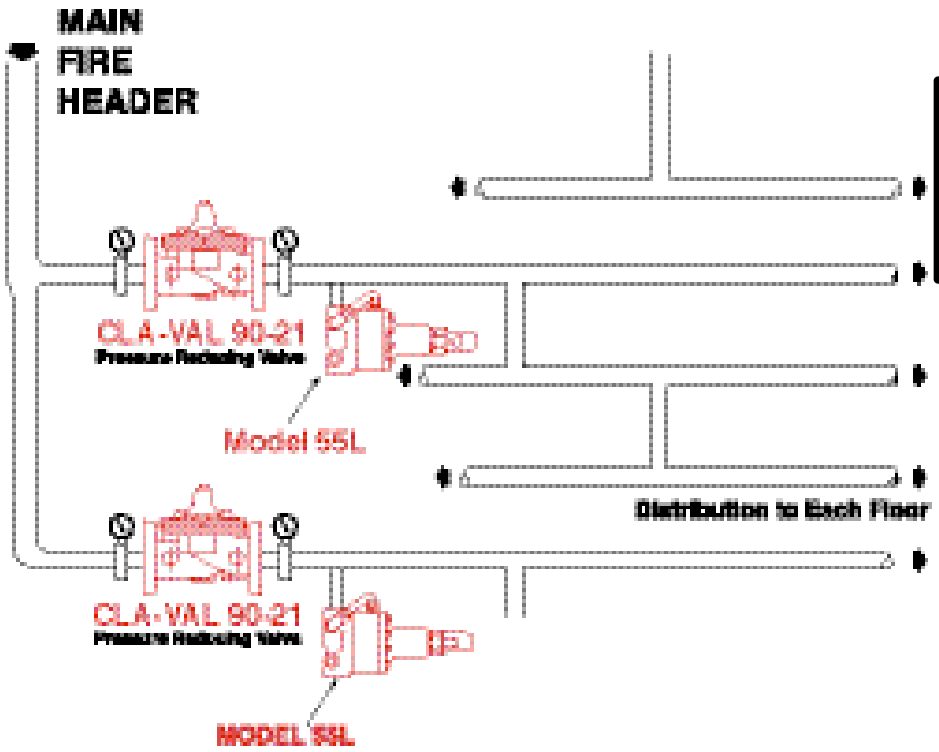
Schematic Symbol

55F/55L



Typical Applications

Fire Protection System Service
Using the **Model 55L** in a fire protection system or other closed type system, prevents pressure build-up whenever line pressure exceeds the setting of the spring. The valve will relieve excess pressure to atmosphere preventing damage to the distribution network.



2 – 1

—MODELS— CRL & 55F

Pressure Relief Valves

- **Direct Acting - Precise Pressure Control**
- **Positive Dependable Opening**
- **Drip Tight Closure**
- **No Packing Glands or Stuffing Boxes**
- **Sensitive to Small Pressure Variations**

The Cla-Val Model CRL and 55F Pressure Relief Valves are direct-acting, spring loaded, diaphragm type relief valves. Often used as pilot controls for Cla-Val Hytrol valves, they can also be used as self-contained pressure relief valves. These valves may be installed in any position and open and close within very close pressure limits.

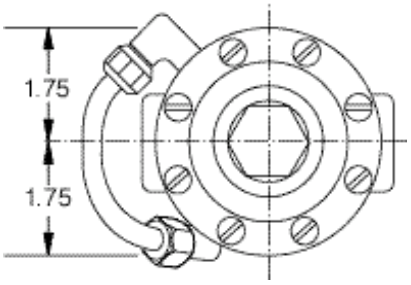
The Model CRL and 55F are normally held closed by the force of the compression spring above the diaphragm. Control pressure is applied under the diaphragm. When the controlling pressure exceeds the spring setting, the disc is lifted off its seat, permitting flow through the control. When control pressure drops below the spring setting, the spring forces the control back to its normally closed position. The controlling pressure is applied to the chamber beneath the diaphragm through an external tube on the Model 55F and a sensing port on the CRL.

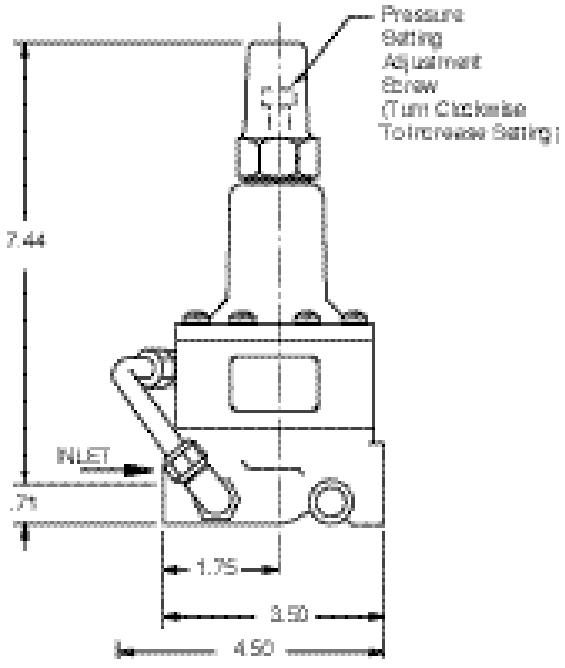
Pressure adjustment is simply a matter of turning the adjusting screw to vary the spring pressure on the diaphragm. The CRL & 55F are available in three pressure ranges: 0 to 75 psi, 20 to 200 psi, and 100 to 300 psi. To prevent tampering, the adjustment cap can be wire sealed by using the lock wire holes provided in the cap and cover.

Note: Also Available in Seawater Service Material

Dimensions (In Inches)

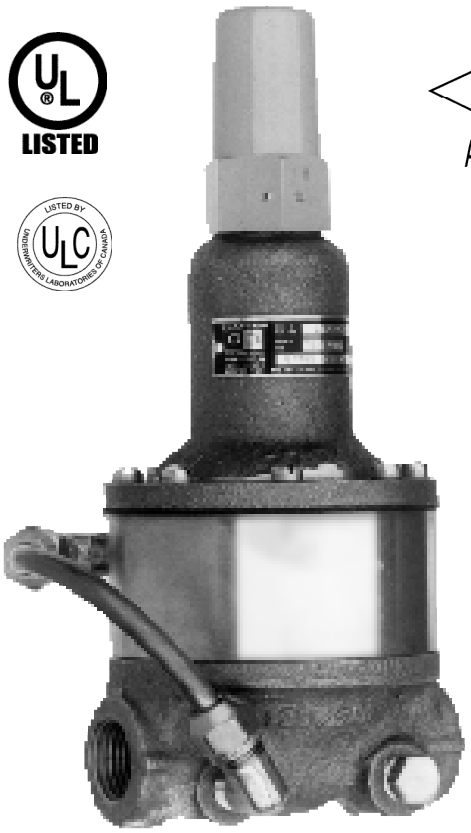
55F Model





— MODEL — **55L**

Pressure Relief Valve



- **UL Listed**
- **Factory Mutual Approved**
- **Direct Acting - Precise Pressure Control**
- **Positive Dependable Opening**
- **Drip Tight Closure**
- **No Packing Glands or Stuffing Boxes**
- **Sensitive to Small Pressure Variations**

The Cla-Val Model 55L **(UL Listed FM approved)** Pressure Relief Valve is a direct-acting, spring loaded, diaphragm type relief valve. The valve may be installed in any position and will open and close within very close pressure limits.

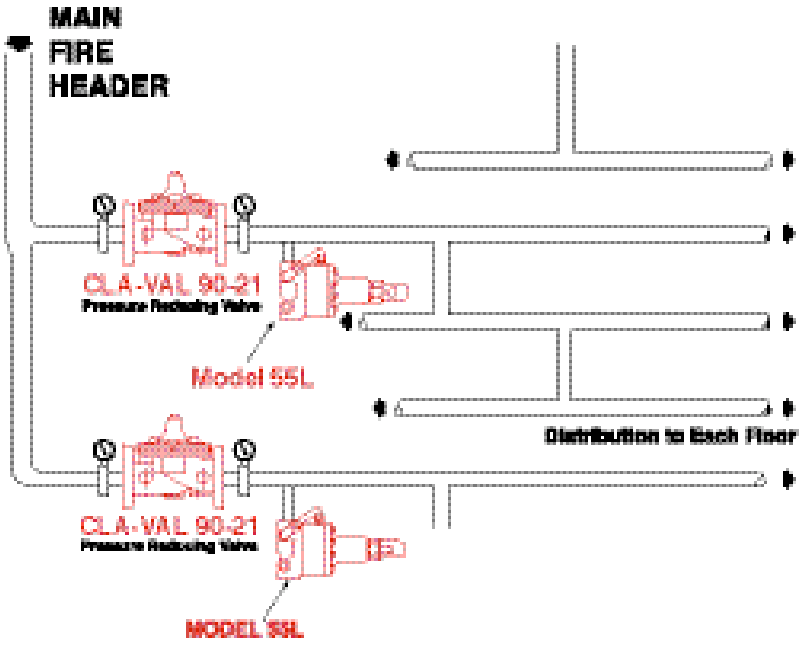
The Model 55L is normally held closed by the force of the compression spring above the diaphragm. When the controlling pressure applied under the diaphragm exceeds the spring setting, the disc is lifted off its seat, permitting flow through the control. When control pressure drops below the spring setting, the spring forces the control back to its normally closed position. The controlling pressure is applied to the chamber beneath the diaphragm through an external tube on the 55L.

Pressure adjustment is simply a matter of turning the adjusting screw to vary the spring load on the diaphragm. The 55L is available in two pressure ranges; 0 to 75 psi, 20 to 200 psi. To prevent tampering, the adjustment cap can be wire sealed by using the lock wire holes provided in the cap and cover.

Note: Also Available in Seawater Service Material

Typical Applications

Fire Protection System Service
Using the **Model 55L** in a fire protection system or other closed type system, prevents pressure build-up whenever line pressure exceeds the setting of the spring. The valve will relieve excess pressure to atmosphere preventing damage to the distribution network.



2-1

Specifications

Size 1/2" & 3/4" Threaded

Temperature Range Water, Air: to 180°F Max.

Materials

Body & Cover: Cast Bronze ASTM B62
Cast Aluminum 356-T6
Stainless Steel ASTM A743C7-167A

Trim: Brass & Stainless Steel 303

Rubber: Buna-N® Synthetic Rubber

Pressure Ratings Cast Bronze 400 psi Max.
Cast Aluminum 275 psi Max.
Stainless steel 400 psi Max.

Other Materials Available on special order

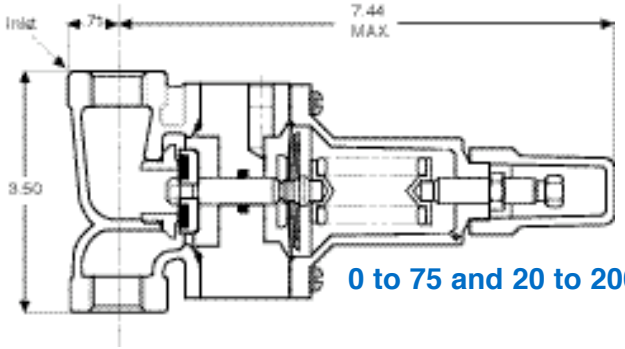
Adjustment Ranges 0 to 75 psi
20 to 200 psi
100 to 300 psi

CRL & 55F Range PSI	Approximate Increase For Each Clockwise Turn Of Adjusting Screw
0 to 75	8.5 psi
20 to 200	28.0 psi
100 to 300	18.0 psi

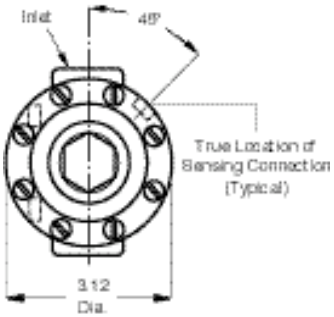
Flow Loss Chart (Full Open Valve)

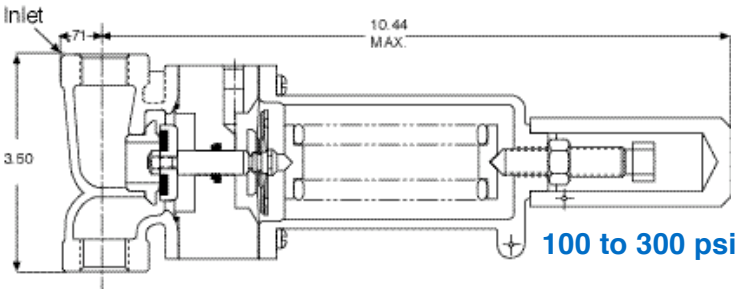
Valve Size	C_V Factor	Flow of Water - gpm				
		5	10	15	20	30
1/2"	6	0.7	2.7	6	11	
3/4"	8.5	0.3	1.4	3.1	5.5	

CRL Basic Valve Dimensions (In Inches)

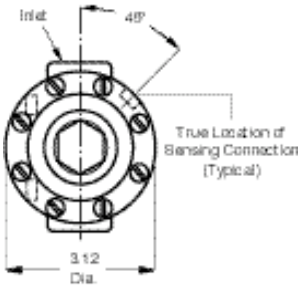


0 to 75 and 20 to 200 psi Design





100 to 300 psi Design



OPTIONAL X140 SECURITY CAP

- **Controlled Security for Pilot Control Adjustment**
- **Long Life Stainless Steel Construction**
- **Tamper-Resistant Design**
- **X140 Customer Supplied Padlock**
- **X140-1 Key and Six Pin Cylinder Lock Supplied**

Note:
See E-X140 Locking Security Cap

When Ordering, Please Specify

1. Catalog No. CRL & 55F
2. Valve Size
3. Adjustment Range Desired
4. Optional Materials
5. Optional Security Cap

CLA-VAL™

E-CRL/55F (R-6/06)

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

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4687 Christie Drive
Beamsville, Ontario
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Fax: 905-563-4040

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

www.cla-val.com

Represented By:

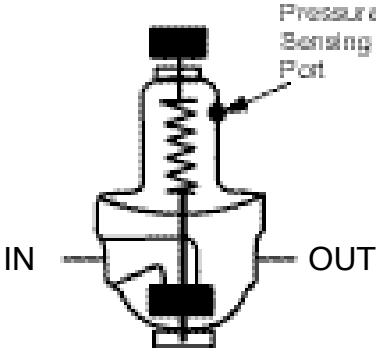
CDHS-18 Differential Control Valve
is a normally open, spring loaded, diaphragm type valve that operates hydraulically and is designed to close on a rising differential pressure. When used as a pilot control with Cla-Val Valves, it acts as a flow limiting control.

CDHS18

Normally Closed - Shifts to open on rise in sensed pressure

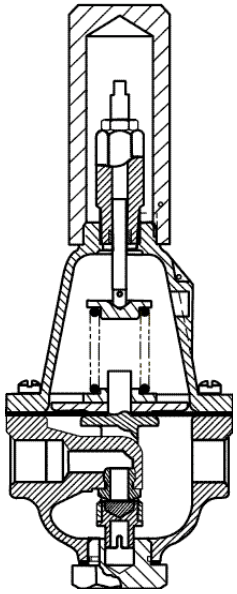
Adjustment Ranges
30-480 psi differential

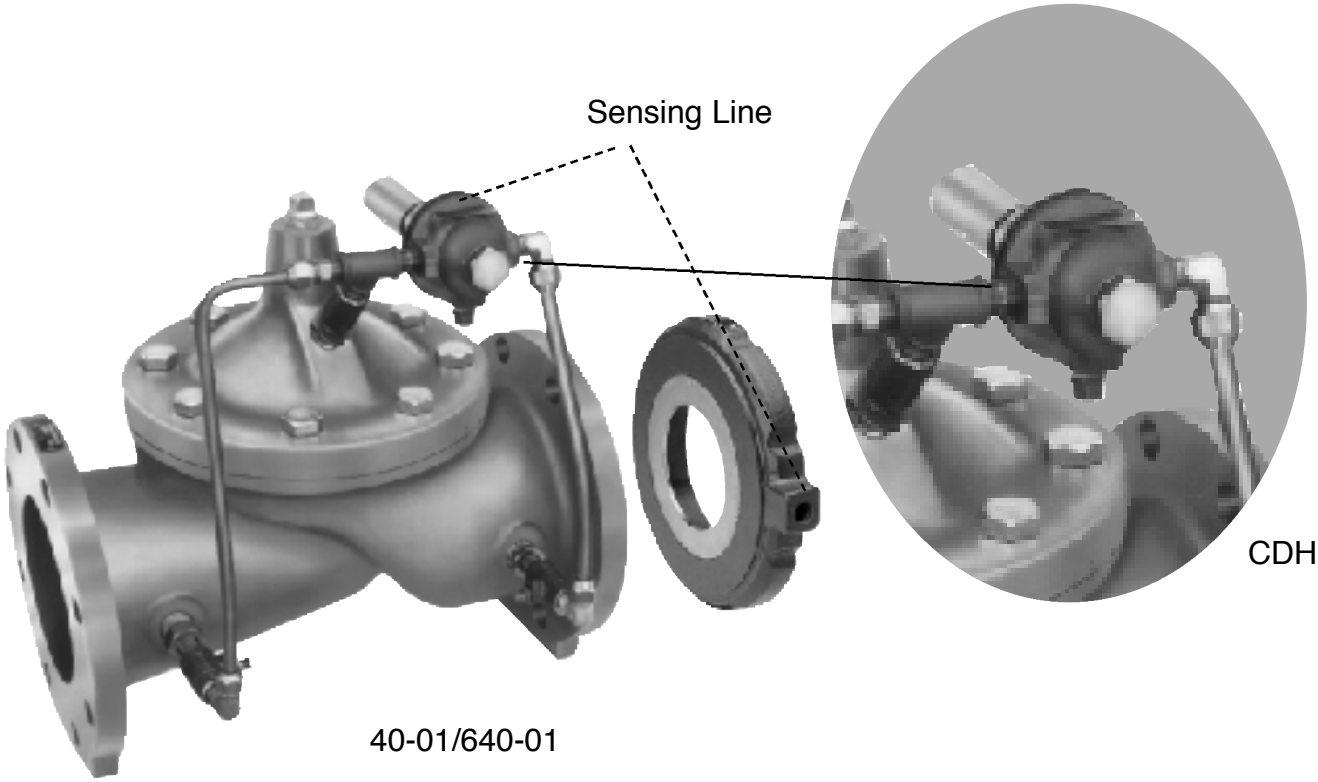
CDHS18



Schematic Symbol

CDHS18





CDHS18

40-01/640-01

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CLA-VAL

—MODEL— CDHS-18

3/8" Differential Control

DESCRIPTION

The Cla-Val CDHS-18 Differential Control Valve is a normally open, spring loaded, diaphragm type valve that operates hydraulically and is designed to close on a rising differential pressure. When used as a pilot control with Cla-Val Valves, it acts as a flow limiting control.

INSTALLATION

The Differential Control may be installed in any position. There is one inlet port and two outlet ports in the body for either straight or angle installation. The outlet port senses the high pressure or inlet to the differential producing device. One of the outlet ports can be used for a gauge connection. The port above the diaphragm (located in the control cover) is used to sense the low pressure or outlet side of the differential producing device. A flow arrow is marked on the body casting.

OPERATION

The Differential Control is normally held open by the compression spring and the sensing pressure above the diaphragm. When the rate of flow through the main valve increases, the sensing pressure above the diaphragm of the control decreases and the higher pressure at the outlet port closes the control; which, in turn, closes the main valve. When the rate of flow through the main valve decreases, the sensing pressure above the diaphragm increases. This opens the control and in turn opens the main valve. This action causes the main valve to modulate, limiting the flow rate to the setting of the control.

ADJUSTMENT

The Differential Control Valve can be adjusted to limit the rate of flow as specified on the data plate. Rate of flow adjustment is made by turning the adjustment screw to vary the spring pressure on the diaphragm. The greater the compression on the spring the higher the flow rate.

1. Turn the adjustment screw in (clockwise) to increase flow rate.
2. Turn the adjustment screw out (counterclockwise) to decrease flow rate.

DISASSEMBLY

The Differential Control Valve should be removed from the Hytrol Valve assembly. Make sure that pressure shutdown is accomplished prior to disconnecting assembly. During disassembly inspect all threads for damage or evidence of cross-threading.

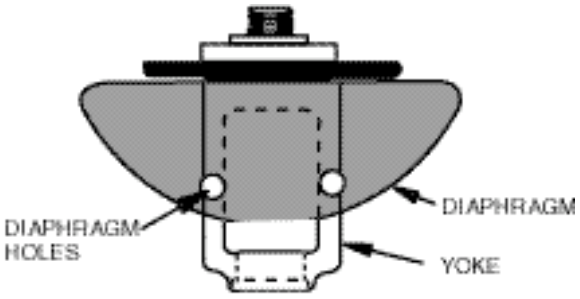
NOTE: A bench vice equipped with soft brass jaws should be used to hold the valve body during disassembly and reassembly. **DO NOT** tighten vice jaws more than enough to hold unit firmly. Excessive pressure may spring or crack casting

1. Remove adjusting screw cap (16).
2. Loosen lock nut on adjusting stem assembly (9) and turn adjusting screw counterclockwise to relieve tension on spring.
3. Remove bottom plug (8) and gasket (6).
4. Remove disc retainer assembly (5) and inspect sealing surface for damage or wear. Replace if necessary.
5 Remove 8 screws (12) and carefully lift off cover (2) spring guide (10) and spring (13) can now be removed.
6. Remove diaphragm assembly.
7. Remove diaphragm nut (7) and diaphragm washer (4).
8. Remove diaphragm (3), inspect for damage and replace if necessary.
9. Inspect all parts for damage, corrosion, wear, foreign particles, and cleanliness.
10. Repair minor nicks and scratches, these may be polished out using a fine grade of emery or crocus cloth.

REASSEMBLY

Prior to reassembly replace all parts which are damaged or worn. When ordering replacement parts be sure to specify item, part number, and all nameplate data.

1. Place diaphragm (3) on top of yoke (11) place diaphragm washer (4) over diaphragm with rounded edges down or next to diaphragm. Screw on diaphragm nut (7) with the spring guide shoulder in up position. The nut is not tightened at this time.
2. Align diaphragm flange holes with and folding diaphragm as shown. Tighten diaphragm nut, retaining alignment shown.
3. Place yoke assembly in body (1) and screw the disc retainer assembly (5) in until it bottoms.
4. Screw in plug (8).
   NOTE: The yoke arms can be viewed through the 3/8" NPT high pressure sensing outlet. There should be even spacing between the yoke arms and the 3/8' NPT inlet boss seat assembly. There must be no drag or friction between these parts. If there is drag, repeat step 2.
5. Align diaphragm flange holes with the body holes and position spring and spring guide (13) (10).
6. Replace cover (2) and secure with 8 screws (12).
7. Remove plug (8) and turn adjusting screw clockwise until the disc retainer assembly moves down.
8. Replace gasket (6) and plug (8).
9. Replace cap (16).



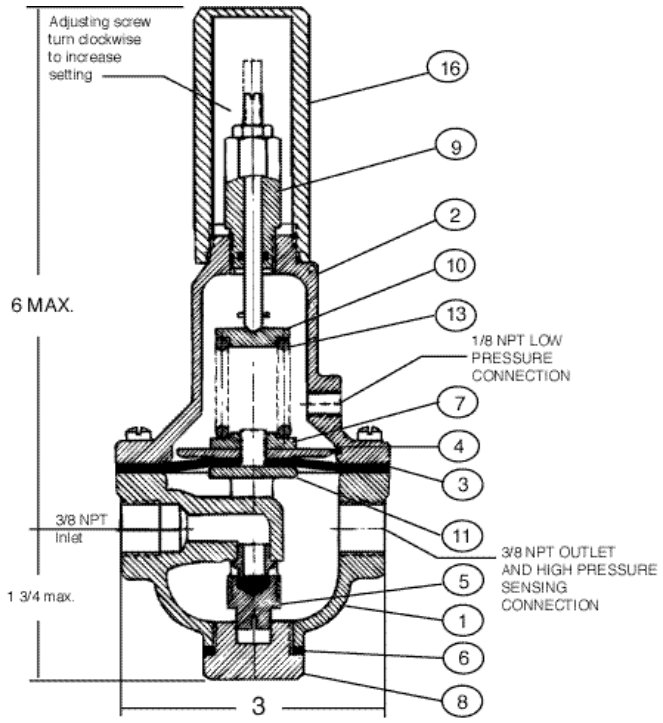
DIAPHRAGM HOLE ALIGNMENT

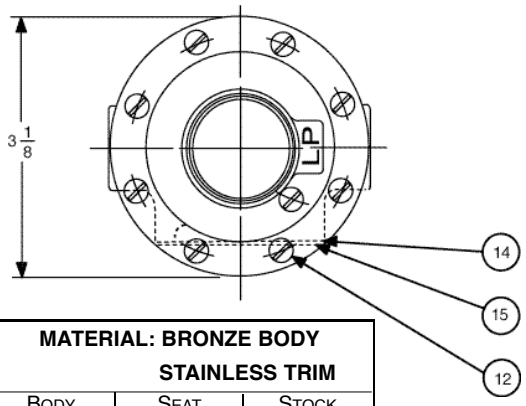
SERVICE SUGGESTIONS

SYMPTOM	PROBABLE CAUSE	REMEDY
Fails to Open	Controlling differential not changing	Check with gauge or manometers
	Diaphragm assembly stuck closed	Disassemble and free
	No spring compression	Screw in adjusting stem
	Foreign object under disc retainer	Disassemble and remove
Fails to Close	Insufficient controlling differential	Increase differential
	Foreign object under disc	Disassemble and remove
	Disphragm assembly stuck open	Disassemble and free
	Damaged diaphragm	Disassemble and replace
	Spring compressed solid	Back off adjusting stem

CDHS-18

3/8" Differential Control



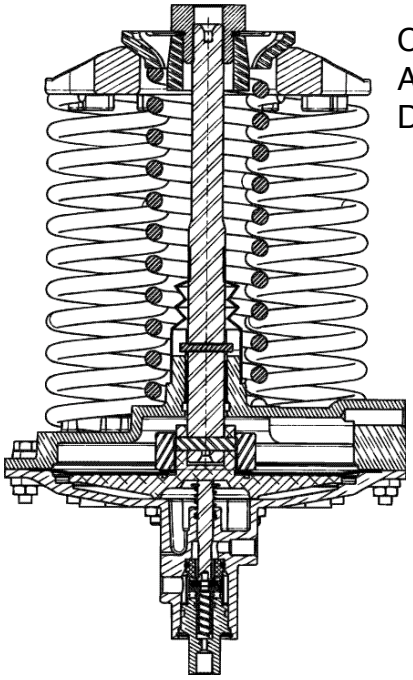


MATERIAL: BRONZE BODY STAINLESS TRIM		
Body Size	Seat Size	Stock Number
3/8"	1/4	68017
3/8"	1/4	69597*
*Same as 68017 except cover at 90°		

Repair Parts Kits*		Part Number
Standard	Buna-N®	9170003K
High Temp.	Viton®	9170009G

Item	DESCRIPTION	MATERIALS	PART NUMBER	LIST PRICE
1	Body & Seat Assembly	BFR/SS	83397-02G	
2	Cover	BRZ	C6657F	
* 3	Diaphragm	Buna N®	C6936JD	
4	Diaphragm Washer	BRS	C1803A	
* 5	Disc Retainer Assembly	BRS/RB	C5256H	
* 6	Gasket	FIB	40174F	
7	Diaphragm Nut	BRS	V5911C	
8	Plug, Body	BRZ	V5653A	
9	Adj. Stem Assembly	BZ/SS	C2002J	
10	Spring Guide	303	C1510B	
11	Yoke	BRZ	V6951H	
*12	Mach. Screw Fil. Hd. (8)	SS	67578-21B	
13	Spring	316SS	36773A	
14	Nameplate	BRS	C002201G	
15	Nameplate Screw	—	—	
16	Cap, Adj. Screw	PLS	12576-01D	

2 — 1



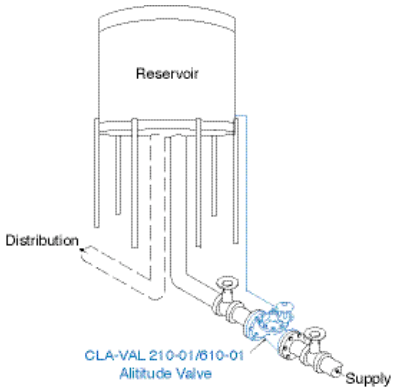
CDS6
Assembly
Drawing

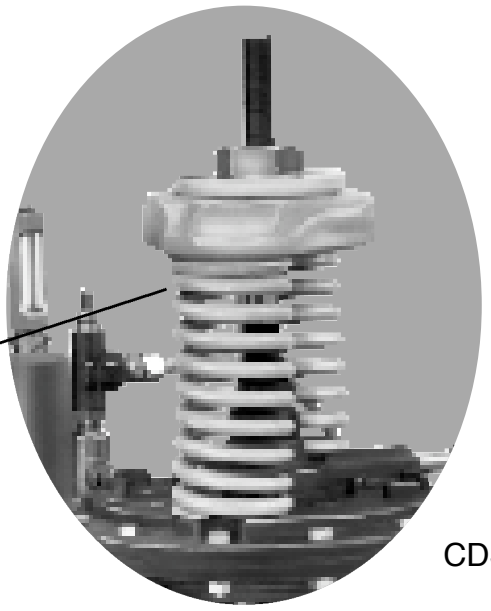
Altitude Range

5-40 Ft
30-80 Ft
70-120 Ft
110-160 Ft
150-200 Ft

CDS6

CDS6 Altitude Pilot Control
is a spring-loaded, three-way, diaphragm-actuated control that provides high-level shutoff for Cla-Val 210 Series Altitude Control Valves. The CDS6 controls the high water level in a reservoir or tank without the need for floats or other devices.



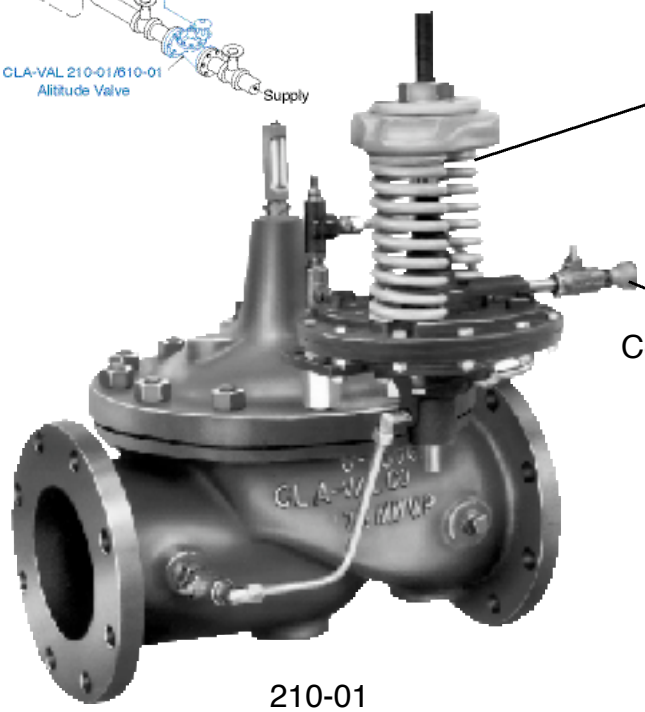


CDS6

Connection to tank

Spring Ranges

5-40 Ft
30-80 Ft
70-120 Ft
110-160 Ft
150-200 Ft



210-01

CLA-VAL

— MODEL — CDS6

ALTITUDE CONTROL

INTRODUCTION
The Cla-Val Model CDS6 Altitude Control is a spring loaded, 3-way, diaphragm-actuated control that provides high-level shut-off for Cla-Val Altitude Control Valves. It remotely senses pressure in the reservoir or tank. There are five altitude ranges available, 5 to 40 feet, 30 to 80 feet, 70 to 120 feet, 110 to 160 feet and 150 to 200 feet. The spring adjusting nut can be set to stop flow into the reservoir within these ranges.

INSTALLATION
The CDS6 Altitude Pilot Control is normally supplied mounted on a Cla-Val 210 Series Altitude Valve which should be installed in a horizontal run of pipe with the main valve cover up. Two line block valves are recommended for valve servicing. If the CDS6 is mounted from the main valve by a few feet, then it must be installed with adjustment springs up for ease of adjustment and servicing. Consult factory for recommendations.

After the Cla-Val 210 Series Altitude Valve is installed in the pipeline close to the reservoir, install the required remote sensing line from the CDS6 to the reservoir or tank. The sensing line allows the CDS6 to sense the static pressure head of the reservoir. The sensing line should not be installed in the flowing line between the valve and the reservoir or into turbulent flow area. These locations do not reflect the true static head of the reservoir.

The remote sensing line should be 3/4" or larger copper tubing or Schedule 40 PVC pipe. Galvanized pipe is not recommended. The sensing line should slope (minimum 2 degrees) upward from the CDS6 toward the reservoir to self -purge air out of the line. The sensing line should have no high points to entrap air. A shutoff valve at the reservoir connection is recommended. For above ground reservoirs, the connecting point for the sensing line should be a minimum of 12" to 18" above reservoir bottom (if filling from bottom) or at fill pipe connection (if filling from side). Minimum high-level set-point adjustment is approximately five feet above the remote sensing point of connection.

CDS6 STOCK NUMBER 2" SIZE	CDS6 STOCK NUMBER 2 1/2" SIZE & LARGER	ALTITUDE RANGE (FT H.0)	NUMBER OF SPRINGS	PSI CHANGE PER TURN	ALTITUDE CHANGE PER TURN
29330-06F	29330-01E	5 - 40	1	0.32	0.75
29330-07H	29330-02G	30 - 80	2	0.64	1.50
29330-08K	29330-03J	70 - 120	3	0.96	2.20
29330-09B	29330-04A	110 - 160	4	1.28	3.00
29330-10D	29330-05D	150 - 200	5	1.60	3.70

OPERATION, START-UP AND ADJUSTMENT
When the reservoir pressure (head) is lower than the set point of the spring on the CDS6 Altitude Control ports "1" and "D" are interconnected. This relieves the main valve cover pressure to atmosphere. Line pressure then opens the main valve to start filling the reservoir.
Reservoir sensing pressure increases as the liquid level rises in the reservoir. When the sensing pressure increases to the set point of the CDS6 control spring, the control shifts interconnecting port "S" and port "1". This pressurizes the main valve cover chamber and the main valve closes.

By turning the adjusting nut the liquid level shutoff point will be changed. Turn the adjusting nut clockwise to raise the liquid level shutoff point; counterclockwise to lower the liquid level shutoff point. Follow the general operation and start-up instructions regarding purging air from the valve control system.

MAINTENANCE AND INSPECTION
Under normal operating conditions the CDS6 Altitude Control will be trouble free. There is a visual check possible to determine if there is damage to the diaphragm in the control. The Lower Cover/Pilot (a) is vented to atmosphere by means of a small hole in the wall of the casting. If water is discharging out of this opening, the diaphragm should be inspected for damage.

One other visual check and indication of a problem is continuous discharge from the drain port ("D") at the bottom of the CDS6.

The volume of drained water will vary according to the valve size. Continuous draining after main valve has fully opened will indicate a problem. Refer to the service suggestions to check for probable causes and remedies.

DISASSEMBLY
During preventive maintenance or service to the CDS6 Altitude Control, all pressure to the control must be shutoff. The CK2 shutoff isolation valves in the main valve control lines should be closed before starting disassembly. Main valves 4" and larger have CK2 isolation valves installed, however main valves smaller than 4" normally do not, therefore requiring closure of shutoff valves in the main line at the valve inlet and outlet. The shutoff isolation valve or valve in the sensing line to the reservoir must also be closed.

WARNING: Failure to shutoff and release pressure prior to any disassembly can result in serious damage to equipment or injury to personnel.

1. Disconnect tubing at the CDS6 Altitude Control.
2. Remove two mounting caps screws and two lock washers.
3. Remove CDS6 Altitude Control from main valve to work bench or clean area. Parts must be kept clean.

DISASSEMBLY OF UPPER SPRING SECTION
1. Unscrew adjusting nut (4) from upper stem (5).
   NOTE: Count the number of turns required to remove the nut (4), record this information for reference when reassembling.
   The CDS6 Altitude Control can then be approximately reset for the same reservoir liquid level shut-off point.

2. Remove the thrust washer (3), swivel retainer (2) and spring retainers if applicable.

3. Remove Spring(s) (6), bellows (7) and set-screw (8)

4. Remove twelve hex nuts (33), and twelve bolts (32), and set mounting bracket (29) aside.

   Note: Assembly contains two (of twelve) longer bolts which are used for the mounting bracket.

5. Remove upper cover (13) from lower assembly, and push stem assembly through.

6. Remove diaphragm washer nut (12), diaphragm nut washer (16) and diaphragm (14)

7. Separate upper stem from diaphragm washer by removing stem retaining pin. (11)

8. Inspect all parts for damage, wear and mineral deposits. Check O-ring (10) for wear, inspect and remove any deposit in O-ring area. Also inspect diaphragm for wear or cracks. Clean parts thoroughly and replace damaged parts as necessary. If, upon disassembly, sand and silt are found in the CDS6 Altitude Control, every effort must be made to eliminate this problem. Filters, or relocating the reservoir sensing line may be required if deposits are found in the sensing chamber of the control.

REASSEMBLY OF UPPER SPRING ASSEMBLY

1. Reassembly is in general, the reverse of disassembly. NOTE: A light coating of Dow Corning 33 grease, or equivalent, should be applied to CDS6 Altitude Control stems (5), before reassembly.

2. When replacing adjusting nut (4) tighten the same number of turns as referred to in **note** in paragraph (1) of "Disassembly Of Upper Spring Section".

DISASSEMBLY OF LOWER PILOT VALVE SECTION

1. Disassemble control per steps 1 through 5 in "Disassembly of upper section", to work on lower (pilot) cover (17)

2. Remove lower stem (21) spring (19) and retaining ring (18) as an assembly, inspect stem for damage.

3. Remove Poppet guide (28) and o-ring (27) from lower cover (17).

4. Remove Poppet (22-1) and poppet spring (26) and inspect poppet and disc for damage.

5. Remove Strainer screen (25)

6. Remove seat (24), **Note**: be sure not to nick or ding exposed sealing surface. To prevent binding and damage, use a wood dowel to evenly tap out the seat from TOP of lower cover (area from which lower stem was removed).

7. Inspect all parts for damage, wear and mineral deposits. If there has been discharge from vent hole, remove o-ring (20) from lower cover (17) and poppet guide (28). Inspect o-rings for wear or damage and o-ring groove for material build-up. Clean and/or replace as necessary. Inspect seat (24) and disc poppet assembly (22) for wear or damage. If poppet and/or disc are damaged they must be replaced as an assembly (item 22). Otherwise clean and polish surfaces of moving parts with 600 wet/dry sandpaper. Also clean strainer screen (25) of any deposits

REASSEMBLY OF LOWER PILOT VALVE SECTION

1. Reassembly is in general, the reversal of disassembly. **Note**: A light coating of Dow Corning 33 grease, or equivalent should be applied to all o-rings and moving part surfaces (20,21,22-1 23 and 27).

2. Lay lower cover (17) on its top (do not damage serrated surface), insert the seat (24) with o-ring (23) in lower (pilot) cover with finger. Use a wood dowel to push the seat in fully with hand pressure ONLY. **Note**: damage to the seat can compromise the sealing ability of the control, and careful efforts must be applied on reassembly of this component.

3. Insert strainer (25).

4. Install poppet guide, o-ring, spring and poppet assembly. (See Note #1 for greasing)

5. Thread and securely fasten poppet guide assembly into lower cover (recommended 200-250 in/lbs.)

6. Turnover lower cover, and assemble as an assembly lower stem (21) retainer (18) and spring (19) into lower cover, being careful not damage o-ring (20).

COMPLETING ASSEMBLY

1. Reassembly of twelve nuts (33) and bolts (32) should be torqued to 200-250 in/lbs. **Note:** assembly contains two longer bolts (item 32) for the support bracket. These two bolts are to be assembled with bracket (29) on the two larger support flats located on the lower cover located 90 degrees from common/supply ports.

3. Install CDS6 Altitude Control assembly on main valve.

4. Replace tube lines and fittings exactly as removed.

SERVICE SUGGESTIONS

UPPER (SPRING) SECTION

SYMPTOM	PROBABLE CAUSE	REMEDY
Vent leaks in lower cover (17)	Diaphragm (14) damaged	Replace diaphragm
	Diaphragm nut (12) loose	Tighten nut (12)
	O-ring (20) damaged	Replace O-ring (20)
Leakage past stem stem (5)	O-ring (10) damaged	Replace O-ring
Stem (5) movement restricted or erratic	*Sand or silt in sensing chamber above diaphragm	Remove foreign matter from sensing chamber
	Sensing line clogged	Clean line
	Sensing line valve closed	Open valve fully
	Sensing line sagging or bent collecting sediment	Straighten and support sensing line to reservoir
	Sensing line has high point trapping air in the line	Straighten sensing line. Must slope upward from altitude control to the reservoir

*NOTE: if this problem occurs, a sand trap should be installed in the sensing line, or the line moved to a point on the reservoir where sand or silt cannot enter this line.

SERVICE SUGGESTIONS

LOWER (PILOT VALVE) SECTION

SYMPTOM	PROBABLE CAUSE	REMEDY
Vent in lower cover (17) leaks	O-ring (20) worn or damaged. See Upper Spring Section service suggestion	Replace O-ring (20)
Flow from supply port to valve cover port restricted	Clogged strainer screen (25)	Remove screen and clean
	Silt packed in seat (24) and lower stem (21)	Clear area of blockage
Continuous drain leak. Main valve closed	Seat (24) damaged	Inspect and replace
	Disc in poppet assembly (22) damaged	Inspect and replace poppet assembly (22)
	Foreign object between disc and seat (24)	Remove object
	O-ring (20) in poppet guide (28) damaged	Replace O-ring
Continuous drain leak. Main valve open	Main valve diaphragm worn or stem nut loose	Service main valve. Replace diaphragm or tighten stem nut

CLA-VAL

Technical Bulletin

CLA-VAL

CDS6 Improvements

April 2 2003

Recently, our Engineering Department redesigned a few internal parts of the CDS6 Pilot Control used on 210 Series Altitude Valves. These new parts improve its sensitivity at high differential pressures and allow it to work with inlet supply pressures up to 300 psi (previous maximum recommended pressure was 150 psi). The new control is identified as CDS6A and new part numbers are assigned to distinguish it from the original CDS6. Adjustment ranges remain the same.

New parts inside the CDS6A are a) stem seals, b) disc and poppet assembly, c) lower stem, d) lower cover, e) poppet guide, and f) poppet spring. The CDS6A uses new low-friction seals on the lower stem and the disc and poppet assembly. Also, the new stem and poppet have a special low-friction nickel-Teflon coating and are dimensionally interchangeable with CDS6 parts. The new lower cover and poppet guide have larger internal dimensions for the new seals and are not interchangeable with CDS6 parts. Also, the poppet spring has a heavier load and is not interchangeable. All other parts remain the same.

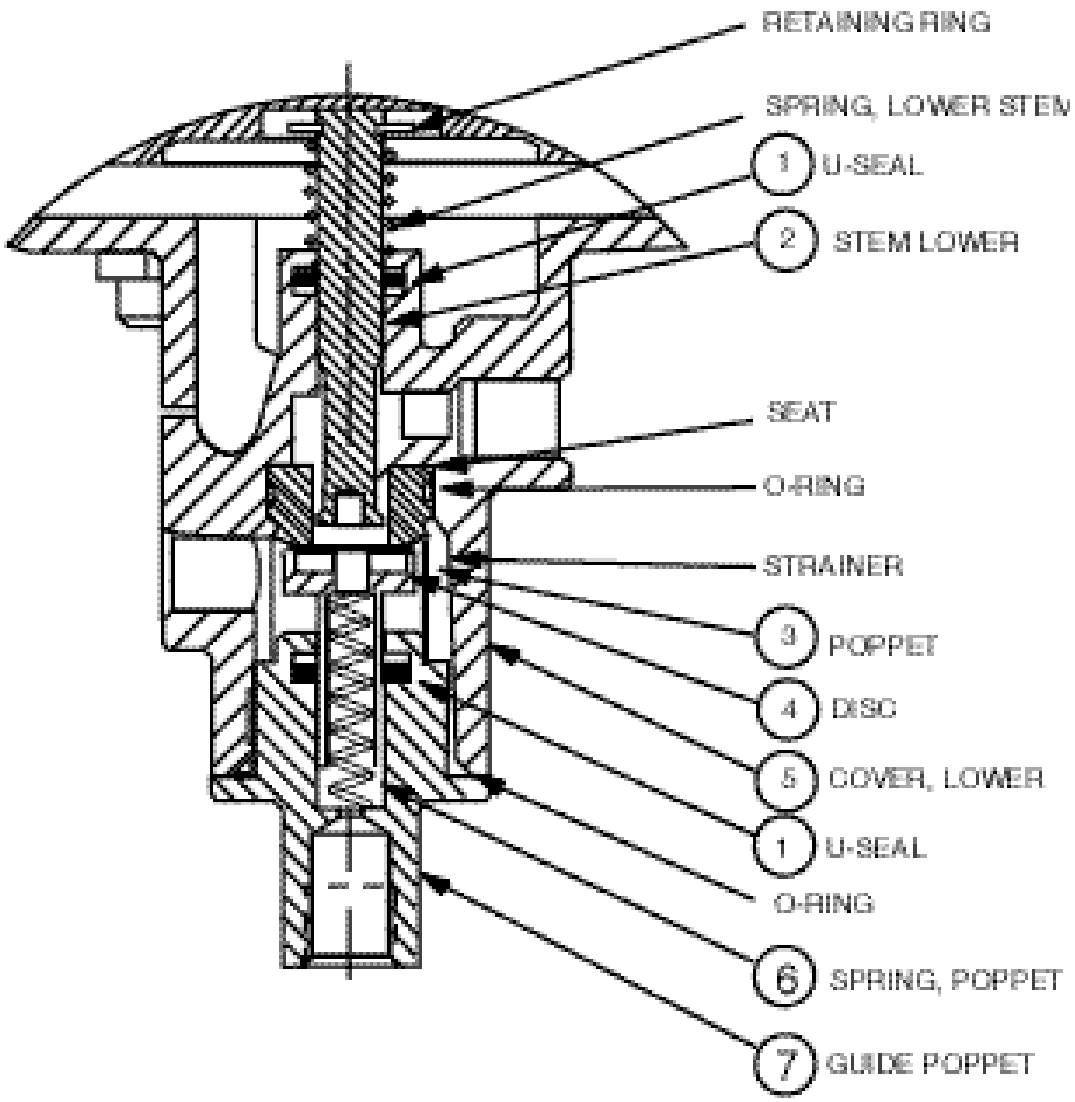
All bills of material for top assemblies using the CDS6 have been changed to the new control. It will take some time for us to change assembly drawings and deplete existing parts before we begin using the CDS6A. We plan to finalize the change during first quarter of 2003.

A new CDS6A repair kit is p/n 20349401C and will not work with existing CDS6 controls. The repair kit will include instructions and tools to install new stem seals. When servicing existing CDS6 controls the current repair kit p/n 20119301A should be used.

A modification kit consisting of all new parts and instructions is p/n 20354801G. Field modification is recommended only for installations where it is determined to be necessary.

2 – 1

Range (ft)	size	p/n	size	p/n
5 - 40	2 _" & larger	20354701K	2" & smaller	20354706E
30 - 80	2 _" & larger	20354702J	2" & smaller	20354707D
70 - 120	2 _" & larger	20354703H	2" & smaller	20354708C
110 - 160	2 _" & larger	20354704G	2" & smaller	20354709B
150 - 200	2 _" & larger	20354705F	2" & smaller	20354710J



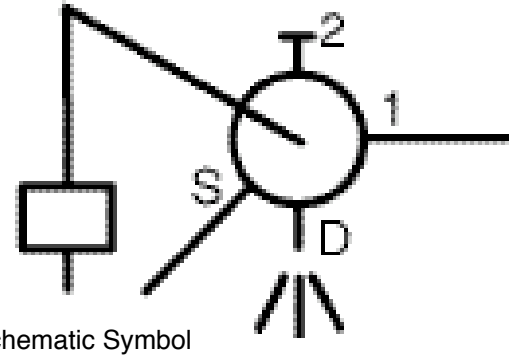
NEW CDS6A PARTS ARE ABOVE NUMBERED ITEMS.

A) All other parts are the same as current CDS6 parts.
B) Two new low-friction U-Seals, Item 1, will not fit into O-ring grooves of CDS6 lower cover and poppet guide. The machined groove dimensions are different between the O-ring version and the new U-seal version parts. New Lower Cover, Item 5, and Poppet Guide, Item 7, have proper dimensions for U-Seal.
C) Lower Stem, Item 2, and Poppet, Item 3, are dimensionally interchangeable with CDS6 parts that are now obsolete. These new parts have a special low-friction coating which may enhance CDS6 performance.
D) Poppet Spring, Item 6, has a heavier load rating and is not interchangeable with CDS6 poppet spring. Sensitivity will be greater than a 12" differential, if used in CDS6 controls.

CF1-C1 Float Control
is a float-actuated multiport pilot control which provides non-modulating, two-position, on-off operation. It is used primarily to operate remotely located Cla-Val valves requiring three-way or four-way pilot valve operation for level control. Control can be remotely located.

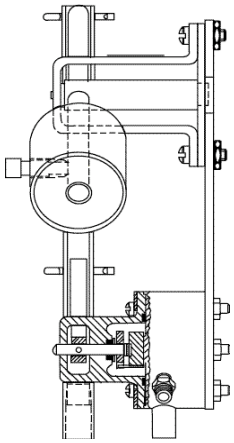
CF1-C1

CF1-C1



Schematic Symbol

CF1-C1



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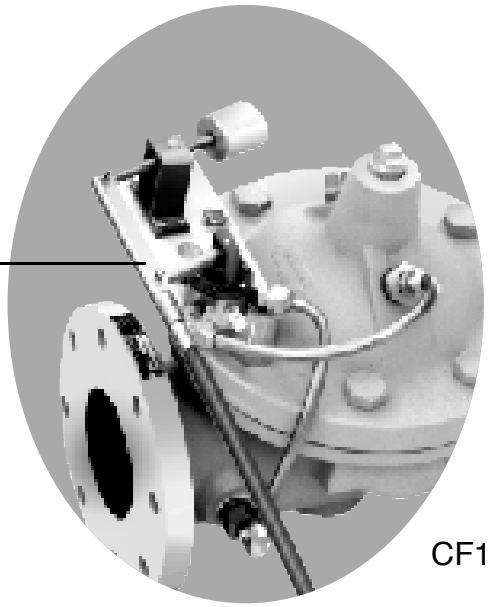


CF1-C1

2–1

CF1 Series

CF1 Series Float Controls

Initial Adjustment CF1 Series Float Controls

Check installation to be sure that liquid surface is not subject to wind or currents, if so, a stilling well should be installed around the float and rod assembly. A short section of 8" pipe (PVC) mounted vertically in the tank around the float and rod is suggested.

1. See parts sheet (other side of this sheet) for proper assembly of the float rod, float, and stop collars and for threading into the Link Assembly of the CF1-C1.

2. Balance the Float Rod Assembly. This compensates for the buoyancy of the float rod in the water. Temporarily remove float by removing float rod and float from the link assembly. Remove float from float rod, reinstall rod assembly (leave stop collars on float rod) back into link assembly.

Adjust counterweight on rod to balance the weight of the float rod assembly less the float. Loosen setscrew on counterweight and move weight in or out round rod remains horizontal without shifting. Tighten setscrew. Check by pushing up or down on float rod assembly and seeing that entire assembly returns to balanced position. Replace float between the stop collars. The counterweight size changes as float rod is lengthened. Consult factory for more information.

3. Set Float High Level Shut-Off. Move float rod to "up" position. Adjust the upper stop collar on the float rod assembly approximately three inches above the desire high water level. Move float rod to "down" position. Adjust the lower stop collar on the float rod assembly approximately three inches below the desired low water level. Tighten collar set screws.

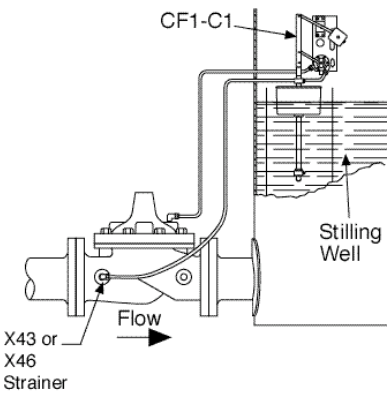
4. If the closing level is too high, allowing tank to overflow, then the top stop collar on the float rod should be lowered. If the opening level is too low, then the bottom stop collar should be raised.

If the counterweight has been properly adjusted the float will move freely on the float rod, without causing the pilot arm to raise or lower, until the float actually contacts one of the stop collars.

5. For reference: with a new control and supply pressure less than 40 psi the maximum level differential available will be: 18 to 20 inches with PVC float and rod assembly and 48 to 50 inches with Stainless Steel or Brass float and rod assembly.

Installation Data

The float control is mounted above the high water level in the tank. The valve is installed in the line leading to the tank and is connected to the float control pilot by tubing. (Min. 3/8" tubing)
When line pressure is used to operate the valve, tubing connections are made from the float control pilot to the valve cover, and also to the inlet side of the valve. An X43 “Y” Strainer or X46 Flow Clean Strainer must be installed in the inlet side of the valve. The control may be installed at any elevation above the valve, providing that the flowing line pressure in psi is equal to, or greater than, the vertical distance in feet between the valve and the float control. An independent source of air or water may be used to operate the valve. The pressure from this independent source must constantly be equal to or greater than pressure at the valve inlet. The independent source is connected to the float control pilot in place of the supply line connected to the inlet side of the valve. If the Model 100-01 under the control of the CF1-C1 is 8" or larger, auxiliary Hytrols may be required. Consult factory for details.



NOTE:

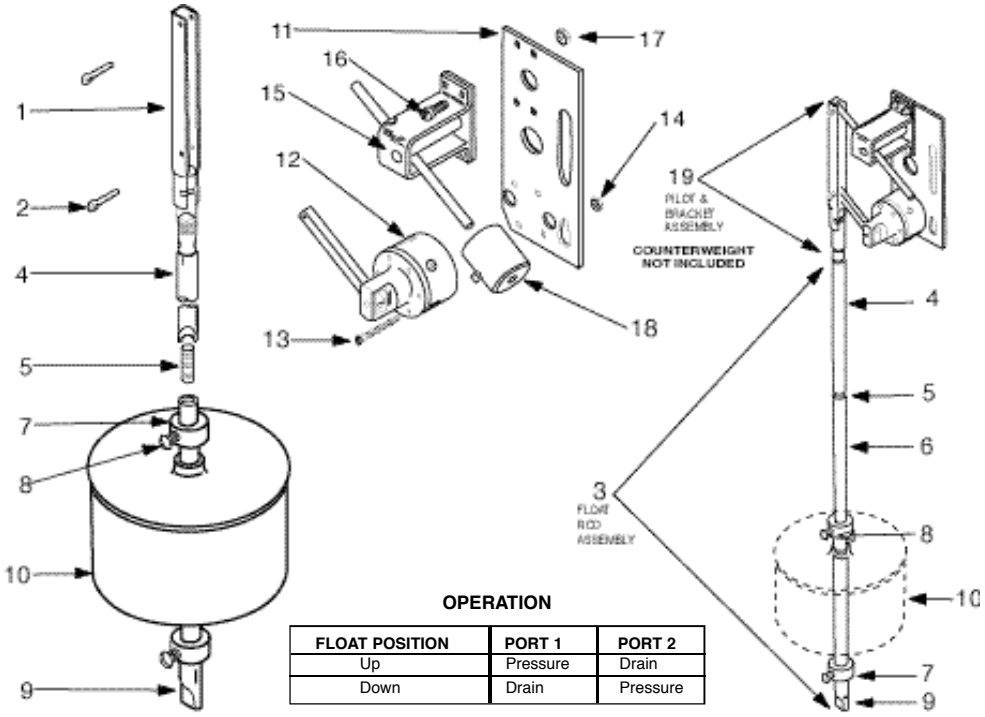
A stilling well (Min. 8" I.D.) must be provided around the float if the liquid surface is subject to turbulence, ripples or wind.

Note: We recommend protecting Float Control tubing and valve from freezing temperatures.

CLA-VAL

CF1-C1

Float Control

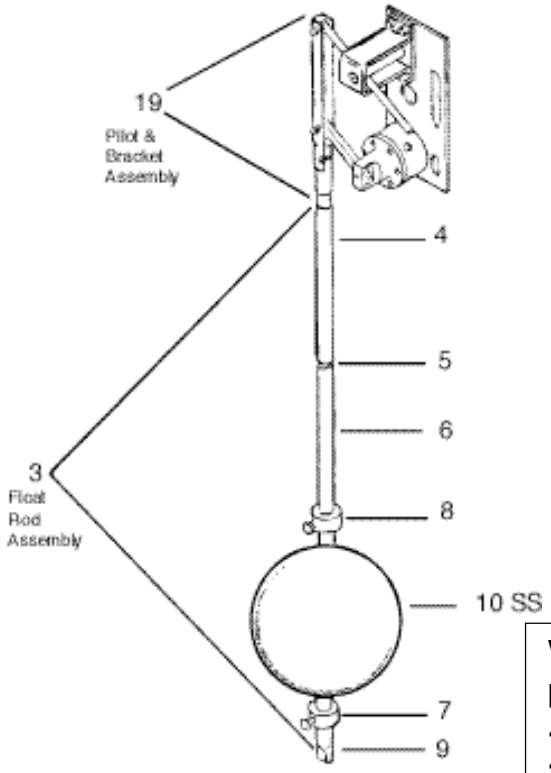


OPERATION

FLOAT POSITION	PORT 1	PORT 2
Up	Pressure	Drain
Down	Drain	Pressure

ITEM	DESCRIPTION
1	Link Assembly
2	Cotter Pins (2 req'd)
3	Float Rod Assembly (2 ft.)
	FLOAT ROD ASSY. BREAKDOWN ITEMS 4 - 9
4	Upper Float Rod (1 ft.)
	Upper Float Rod (2 ft.)
5	Stud (Req. for connecting upper and lower rods and one for each extension rod)
6	Extension Float Rod (1 ft.)
	Extension Float Rod (2 ft.)
7	Stop Collar (2 req'd)
8	Set Screw (1 ea. stop collar)
9	Lower Float Rod (1 ft.)
	Lower Float Rod (2 ft.)
10	Float Ball (Standard Plastic)
10 SS	Float Ball (Optional Stainless Steel)
11	Base and Mounting Plate
12	Pilot Valve Assembly CF1-Cl
13	Machine Screw 6/32 x 1 1/2" (6 req'd.)
14	Hex Nut 6/32 (6 req)
15	Counter Balance Bracket Assy.
16	Machine Screw 10/32 x 9/16" (4 req'd.)
17	Hex Nut 10/32 (4 req'd.)
18	Counterweight (varies with rod length, includes set screw)
19	Pilot & Bracket Assembly CF1-Cl
	COUNTERWEIGHT NOT INCLUDED

Optional Stainless Steel Float



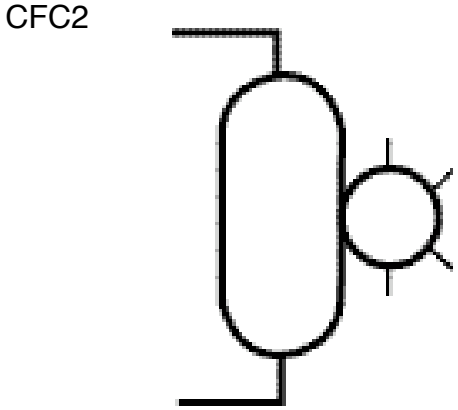
When ordering parts, please specify:

- All nameplate data
- Description
- Item Number

CFC2 Float Control
is a float-actuated multiport pilot control which provides non-modulating, two-position, on-off operation. It is used primarily to operate remotely located Cla-Val Main Valves requiring three-way or four-way pilot valve operation.

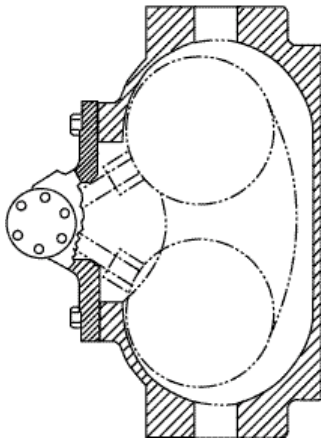
CFC2

CFC2

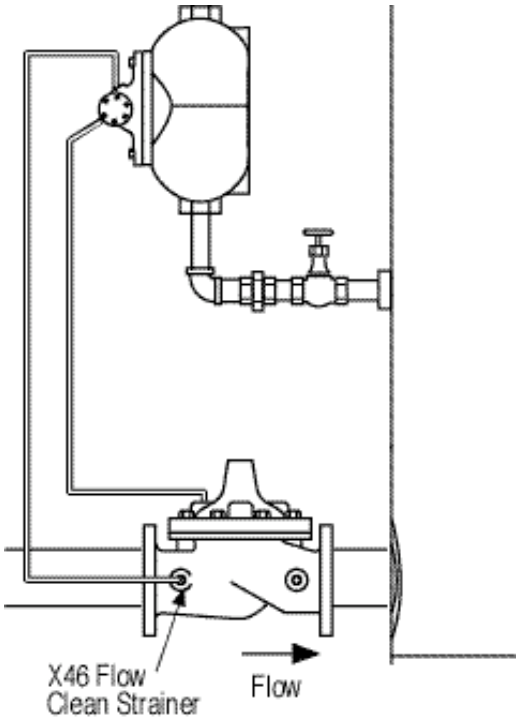


Schematic Symbol

CFC2



CFC2



— MODEL — **CFC2**

Float Control For Closed Tanks

- **Accurate Liquid Level Control**
- **Fully Hydraulic Operation**
- **Simple Design, Easy Maintenance**
- **No Lubrication Necessary**
- **No Gears, No Mechanical Linkage Between Valve and Control**

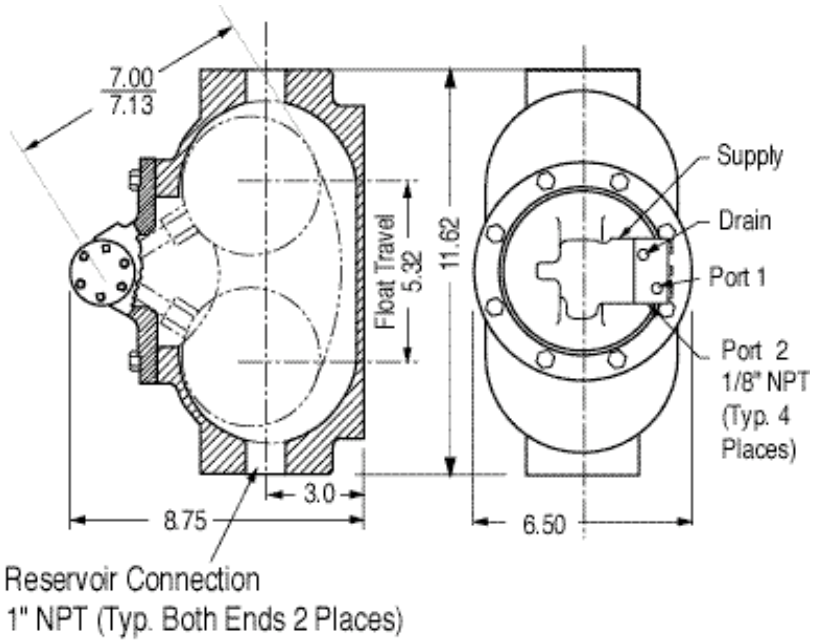
The Cla-Val Model CFC2 Float Control is a float-actuated multiport pilot control which provides non-modulating, two-position, on-off operation. It is used primarily to operate remotely located Cla-Val Valves requiring three-way or four-way pilot valve operation. Designed for use in closed tanks, this control operates on a minimum level change of approximately 1". Maximum level change of 5 1/2" is needed for full capacity.

Note: We recommend protecting the control tubing and valve from freezing temperatures.

Specifications

Control Piping Connections	1/8" NPT
Reservoir Connections	1" NPT
Pressure Rating	0-300 psi
Temperature Rating	Water: to 180°F.
Materials	In contact with operating fluid: Brass, stainless steel, monel, with Buna-N® Seals Float chamber: Cast Iron Pilot valve housing: Bronze Materials in contact with operating fluid: Brass, Stainless Steel, Monel with Buna-N® Seals Float ball: Stainless Steel Float arm: Brass Other material available: Cast steel or aluminum chamber and pilot valve housing. All stainless steel
Level Differential	Approximately 1" minimum required to change pilot valve operation. 5 5/16" required to develop full capacity.
Operating Fluids	Clean liquids or gases compatible with specified materials.
Shipping Weight	12 Lbs.

Dimensions (In Inches)



2-1

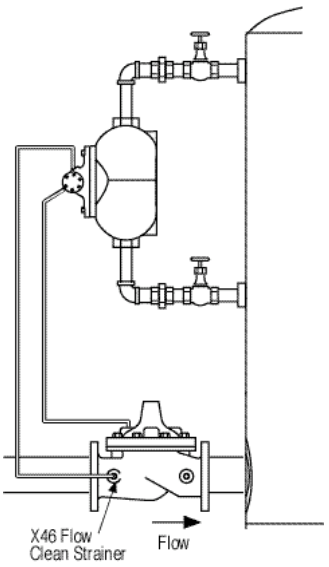
Installation Data

The float control is mounted at the high water level in the tank. The remote Cla-Val valve is installed in the line leading to the tank and is connected to the float control pilot by tubing. (Min. 3⁄8" for valves 6" and smaller, 3⁄4" or larger for valves 8" or larger.)

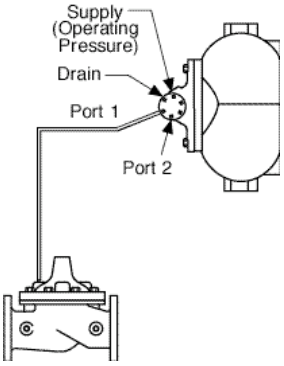
When line pressure is used to operate the valve, tubing connections are made from the float control pilot to the valve cover, and also to the inlet side of the valve. An X46 Flow Clean Strainer must be installed in the inlet side of the valve. The control may be installed at any elevation above the valve, providing that the flowing line pressure in psi is equal to, or greater than, the vertical distance in feet between the valve and the float control.

An independent source of air or water may be used to operate the valve. The pressure from this independent source must constantly be equal to or greater than pressure at the valve inlet. The independent source is connected to the float control pilot in place of the supply line connected to the inlet side of the valve. If the Model 100-01 under the control of the CFC2 is 8" or larger, auxiliary Hytrols may be required. Consult factory for details.

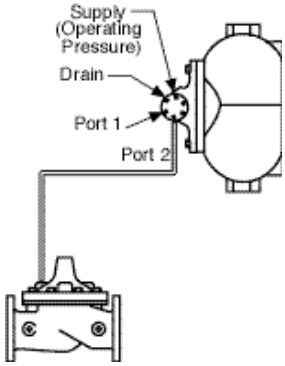
Note: We recommend protecting the control tubing and valve from freezing temperatures.



For Controlling Hytrol Valve



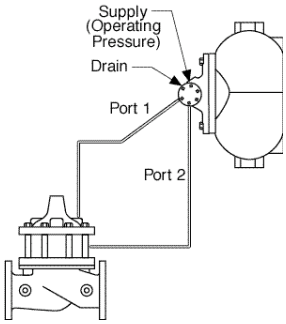
Float Up Closes Valve



Float Down Closes Valve

When Ordering, Please Specify

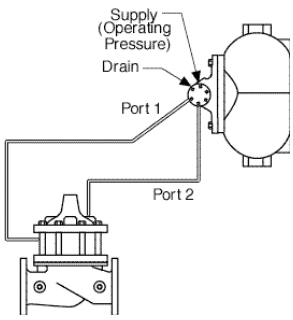
1. Catalog No. CFC2-C1
2. Size and type of Valve to be controlled.
3. Materials if different from standard
4. Specify gravity of fluid if other than water.

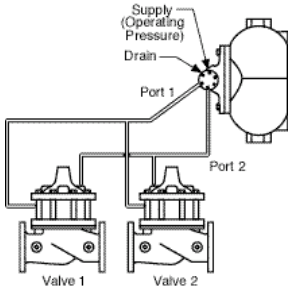


For Controlling Powertrol Valves

Float Up Closes Valve

Float Up Opens Valve

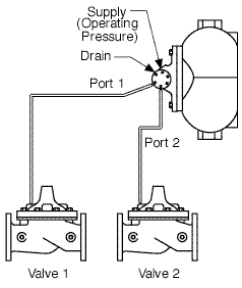




For Controlling Two Valves Simultaneously

Operation

Float Position	Valve 1	Valve 2
UP	CLOSED	OPEN
DOWN	OPEN	CLOSED



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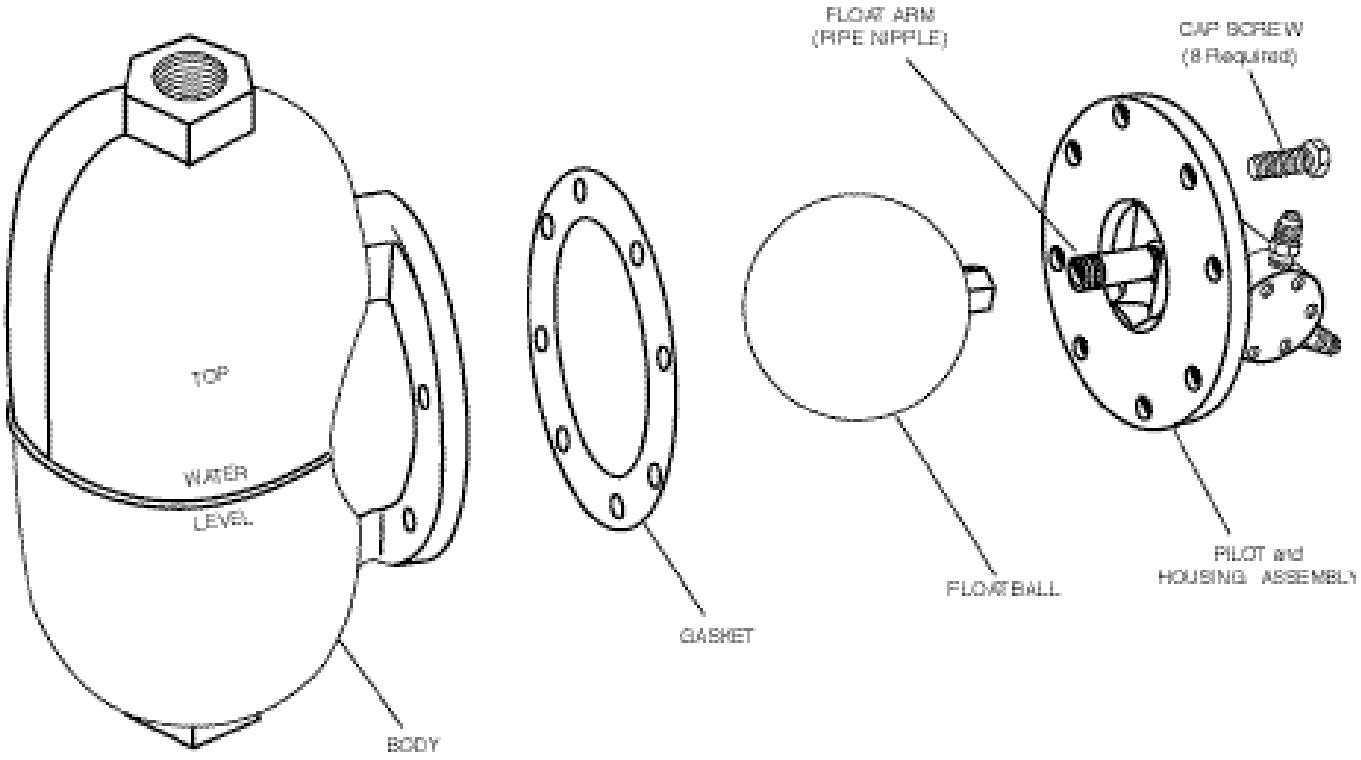
CLA-VAL

— MODEL — **CFC2**

Float Chamber Control



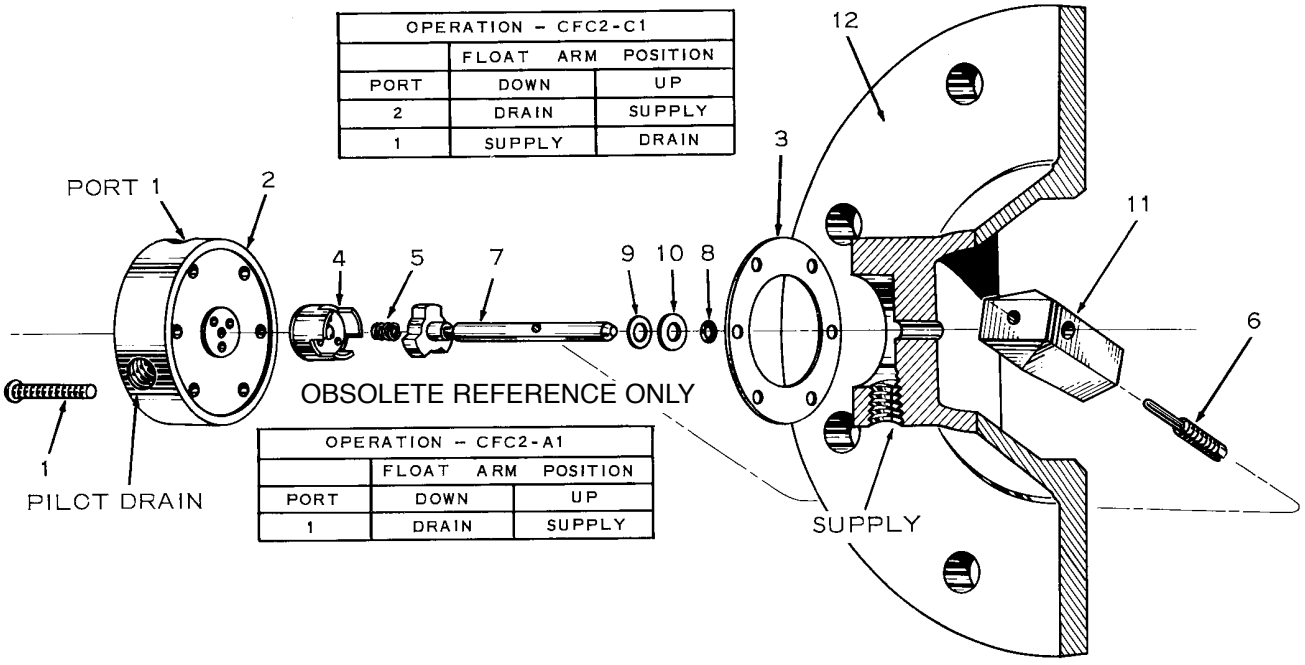
Description	Material
Float Ball	Stainless Steel
*Gasket	Neoprene
Cap Screws	Steel Cad.
3/8-16 x 7/8	Plated
Body	Iron
Float Arm Pipe Nipple 1/4"x1/2" npr	Bronze/Stainless Steel

2 — 1

CLA-VAL

— Model — **CFC2**

Pilot & Housing Assembly For Float Chamber Control



PILOT & HOUSING ASSEMBLY (BRONZE W/STAINLESS STEEL)		
ITEM	DESCRIPTION	MATERIAL
1	Machine Screw, Rd. Hd., 6/32 x 1", 6 Required	Brass
*2	Distributor for C426-1	S.S.
	Distributor for C-2035	S.S.
	Distributor for C-2149-1	S.S.
*3	Gasket	Buna-N®
*4	Disc Assembly	S.S.
		S.S.
*5	Spring	S.S.
6	Pin, Lock	S.S.
7	Stem Assembly	Brass - S.S.
*8	"O" Ring	Buna-N®
9	Washer	Brass
10	Washer, Thrust	Brass
11	Arm, Float	Brass
12	Housing	Bronze

* Repair Kit Parts

Technical Bulletin

CFC2-A1-3 Float Chamber Control CONVERSION

(also CFC2-A2-3 Float Chamber Control)

This control is obsolete and is replaced by the CFC2-C1 Float Chamber Control. The differences between these controls are few. Refer to E-CFC2-C1 data sheet.

A. The pilot housing assembly is now installed on the float chamber so that the distributor is on the right of the vertical centerline of the control. The word "top" is cast into the pilot housing flange. There is an "O" ring seal between the pilot housing and the float chamber instead of earlier flat gasket.

B. The disc and distributor are the same as those of the CF1-C1 Float Pilot Control.

C. The CFC2-C1 has 4 ports. "Supply" is found on the housing. "Port 1", "Port 2" and "Drain" are located and marked on the Distributor. Port 2 is for special applications and will have a pipe plug in it. "Supply" port on the distributor is not used and has an Allen socket plug in it.

1. When service is required for the CFC2-A1-3 (or CFC2-A2-3) Control, then conversion to CFC2-C1 is recommended.

2. For converting to the current design control, use Repair Parts Kit for the CFC2-C1 control. Order Kit P/N 2674701E (in standard materials). Also, use this kit for maintenance or servicing the CFC2-C1 control after conversion. This kit includes new disc, distributor, ‘O’ rings, gasket, spring and screws. Spare Parts Kit P/N 9696630E had only 'O' ring, gasket and spring and is obsolete and no longer available.

3. The new CFC2-C1 pilot housing flange seal is redesigned from a flat gasket to a groove for an 'O' ring seal with the chamber. This 'O' ring is in repair parts kit. The flat gasket is still available, order part number C3580C, it is also in the kit.

4. Be sure to install parts so that the pilot housing is mounted with the distributor located to the right of the vertical centerline of the control. Pilot tubing and connections will have to be relocated when converting.

5. The repair kit comes with a 1/8" hex-head pipe plug to be installed in pilot port 2. This will give the ON-OFF operation from Port 1 the same as the previous CFC2-A1. By removing this plug from Port 2 and installing in Port 1, the operation of the control becomes that of the previous CFC2-A2. By not installing the plug, the operation becomes that of the previous CFC2-C1.

Also, there is a 1/8" Allen socket pipe plug to be installed in the "S" supply port on the distributor. Once installed THIS PLUG SHOULD NOT BE REMOVED. Supply pressure is to be connected to the supply port on the pilot housing of the control.

Pilot Identification

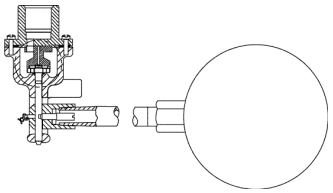
CFM2 Modulating Float Control
is a precision-lapped, rotary-disc, plate-type valve directly operated by the movement of a float ball. It is designed to control a Cla-Val Hytrol Main valve to maintain level in liquid storage tanks.

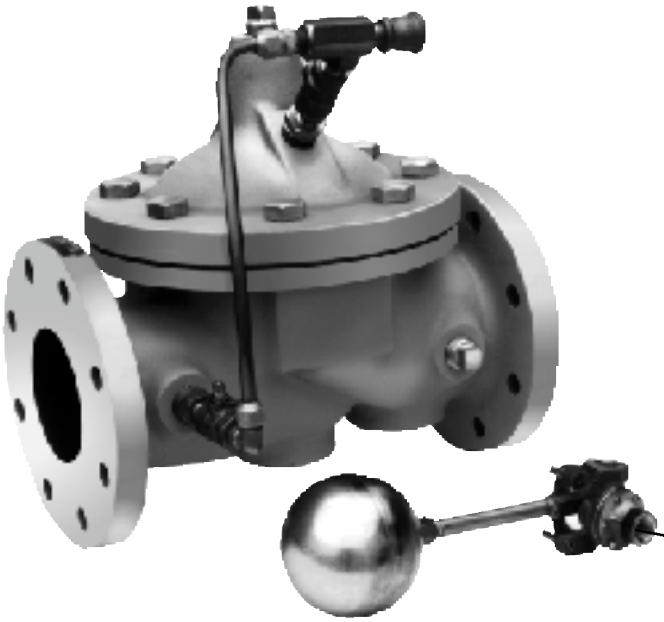
CFM2

CFM2

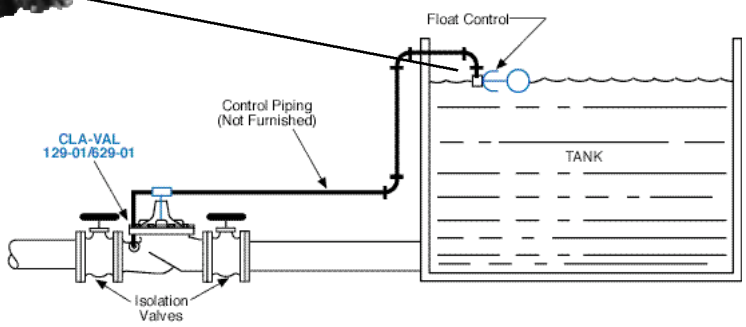
Schematic Symbol

CFM2





129-01/629-01



CLA-VAL

— MODEL — CFM2
Modulating Float Control

DESCRIPTION
The Type CFM2 Float Control is a precision-lapped, rotary-disc, plate-type valve directly operated by the movement of a float ball. It is designed to control a Cla-Val Hytrol Main valve to maintain level in liquid storage tanks.

OPERATION
Any change in the level of the storage tank is detected instantly by the ball of the Float Control mounted inside the tank. The float ball is attached to a lever arm which transmits a turning motion to the valve disc as the float rises and falls.

In the closed position, the holes in the valve disc do not meet with the holes in the distributor, and completely prevent all flow through the Float Control. In the half-open or modulating position, the holes in the valve disc only partially coincide with the holes in the distributor, permitting a restricted flow through the Float Control. In the open position, the holes in the valve disc line up completely with the holes in the distributor permitting full flow through the Float Control.

INSTALLATION
The Float Control can be installed to be either fully closed or fully open when float is in the "up" position. Normal applications require the Control to be installed so that it is in the closed position when the float ball is raised.

DISASSEMBLY
Follow the sequence of item numbers assigned to the parts in the cross-sectional illustration for recommended order of disassembly. Mark parts so they may be reassembled in their proper position.

CLEANING
Wash all parts with cleaning solvent, Federal specification P-S-661, or approved equivalent. Dry with compressed air, or a clean, lint-free cloth. Protect parts from damage and dust until reassembled.

INSPECTION
Inspect all threads for damage or evidence of cross-threading. Check float ball for crushing and punctures. Check spring for visible distortion, cracks and breaks. Inspect distributor and valve disc for clogged holes.

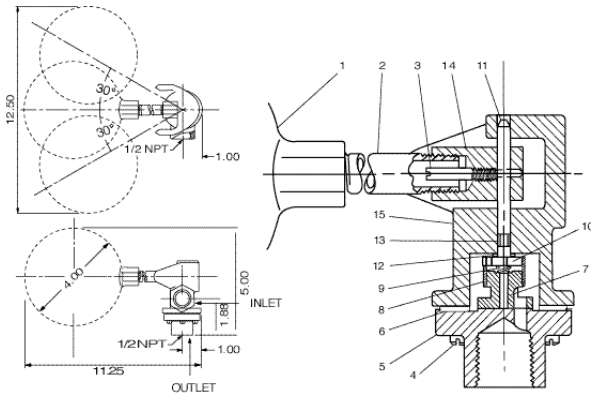
REPAIR AND REPLACEMENT
Replace O-Ring packing and distributor gasket each time valve is overhauled. Replace float ball if at all crushed or punctured. Minor nicks and scratches may be polished out using a fine grade of emery or crocus cloth.

Replace all parts which are defective, and any which create the slightest doubt that they may not afford completely satisfactory operation. Use inspections outlined above as a guide.

Lapping of disc and distributor in the field is not recommended because of the difficulties involved in getting perfectly flat surfaces. If repair is need on either of these parts, replace the control with a spare, and return defective unit to Cla-Val for repair.

REASSEMBLY
Replace valve disc in the position previously marked to obtain proper flow pattern through holes.

TEST PROCEDURE
Attach a source of pressure (air or water) to "inlet" port and check for tight sealing when float is "up".



ITEM	DESCRIPTION	QTY	PART NO.
1	FLOAT	1	
2	ARM EXTENSION NIPPLE	1	
3	LOCK PIN	1	
4	SCREW -RD HD MACHINE	6	
5	DISTRIBUTOR	1	
6	GASKET	1	
	DISC ASSEMBLY	1	
7	DISC	1	
8	SKIRT	1	
9	SPRING	1	
	STEM ASSEMBLY	1	
10	DRIVER	1	
11	STEM	1	
12	THRUST WASHER	1	
13	O-RING PACKING	1	
14	FLOAT ARM	1	
15	HOUSING	1	

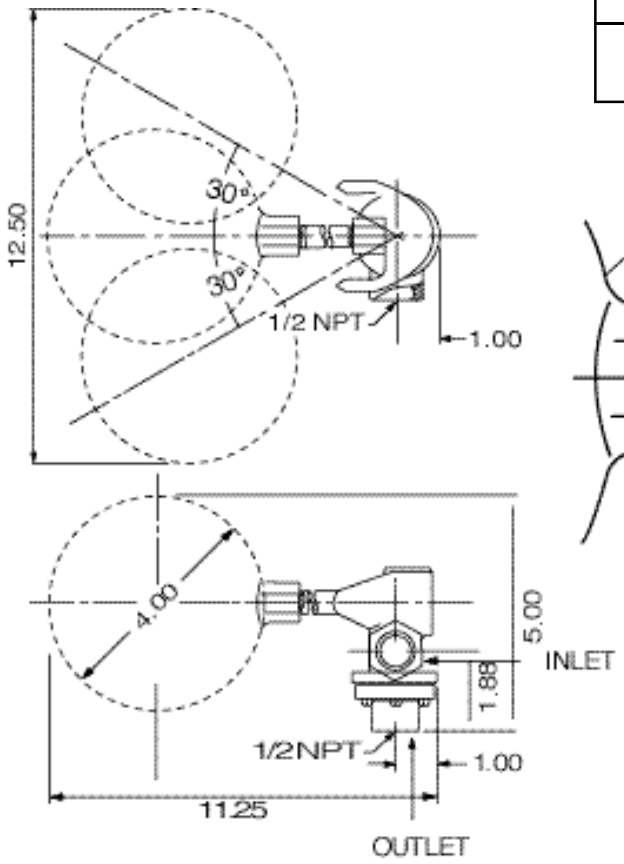
2 — 1

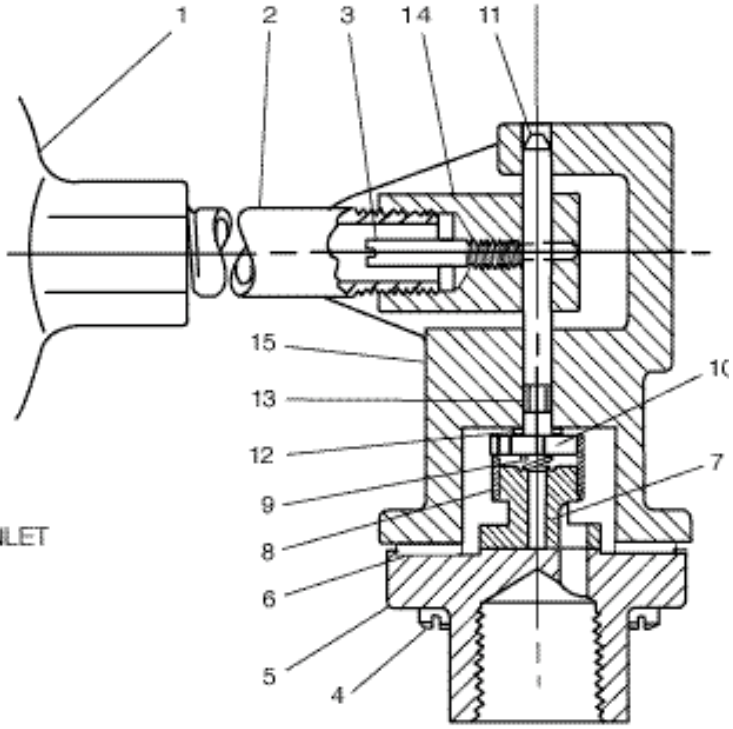
CLA-VAL

CFM2

Modulating Float Control

SIZE	DESCRIPTION
1/2"	W/COPPER FLOAT BALL, BRASS ARM AND BRASS ARM EXTENSION
1/2"	W/S.S. FLOAT BALL, ARM & ARM EXTENSION





Item	Description
1	**Float Ball**
2	**Arm Extension 1/4" Dia. X 5" Long**
3	**Lock Pin**
4	**Machine Screw, Fil. Hd. 6.32 x 5/8 (6 Req'd)**
5*	**Distributor**
6*	**Gasket**

Item	Description
7 & 8*	**†Disc Assembly (7-Disc / 8-Skirt)**
9*	**Spring**
10 & 11	**†Stem Assembly (10-Driver) (11-Stem)**
12	**Thrust Washer**
13*	**"0" Ring 3855-B**
14	**Float Arm**
15	**Housing**

†Permanently Joined Assembly

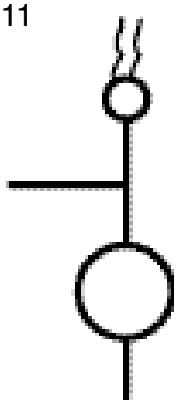
Pilot Identification

CSM-11 Solenoid Control with Manual Operator
is a direct-acting solenoid valve for use in four-way, three-way, and interceptor service. It is a continuous duty type which assures positive and dependable operation over the entire pressure range.

Cla-Val can refurbish into new condition when needed.

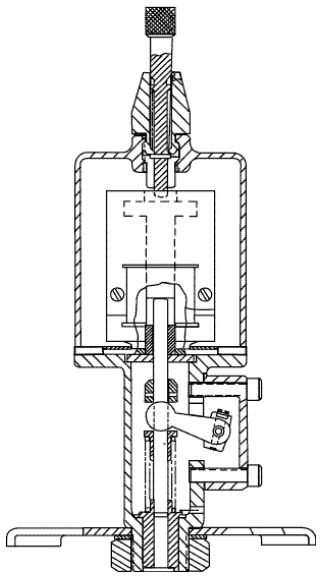
CSM11

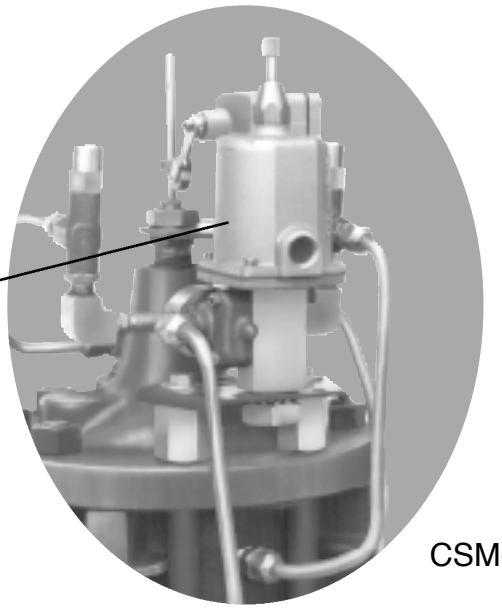
CSM11



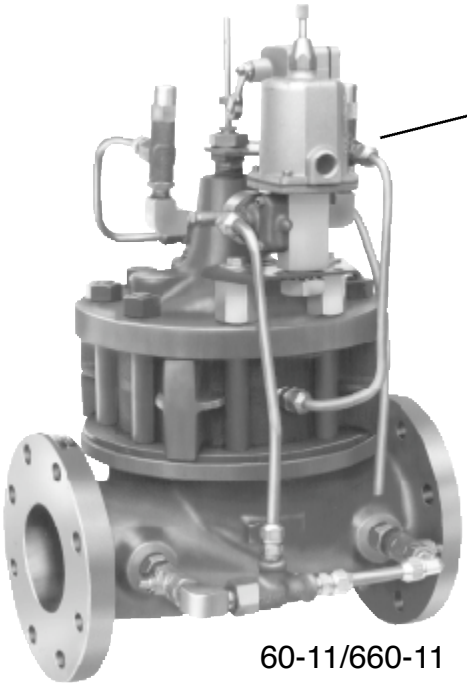
Schematic Symbol

CSM11





CSM-11



60-11/660-11

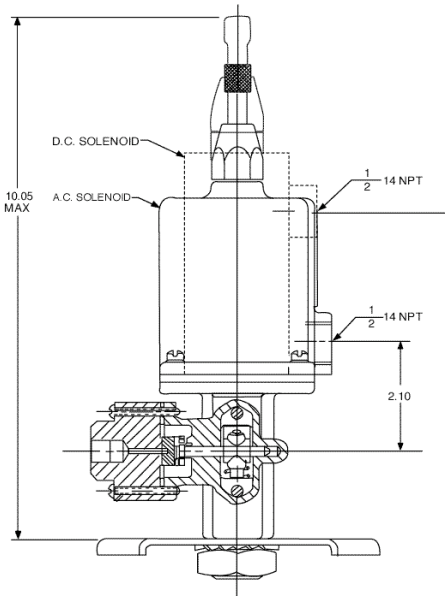
2–1

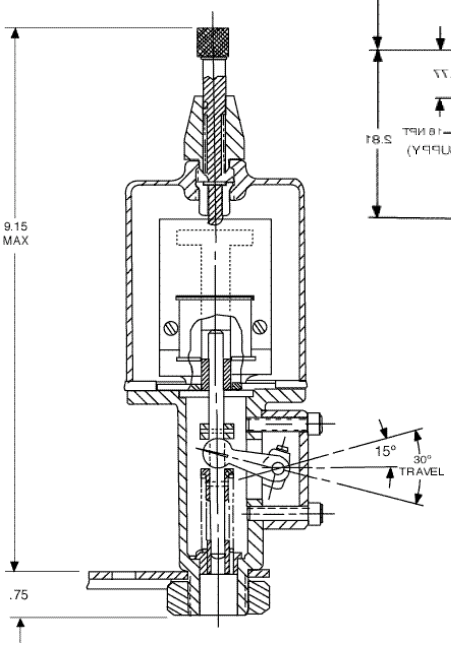
— MODEL — **CSM-11**

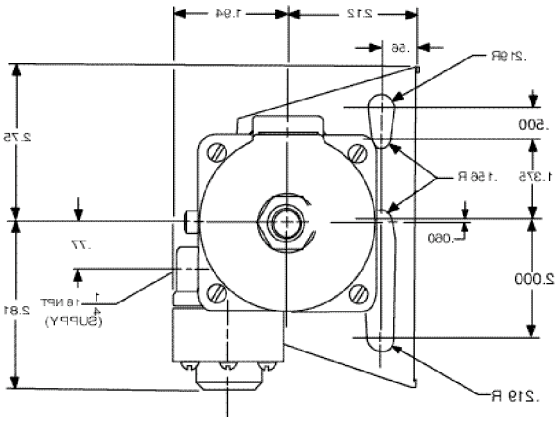
Solenoid Control with Manual Operator

- **Positive Operation Through Full Pressure Range**
- **Both Manual and Electrical Operation**
- **Coil is Protected Against Foreign Matter by Seal-tight Gasket Cover**
- **Moving Parts of Solenoid are Cushioned**
- **Modular Pilot Assembly Provides for Easy Replacement and Minimum Down Time**

The Cla-Val CSM-11 is a direct-acting solenoid valve for use in four-way, three-way, and interceptor service. It is a continuous duty type which assures positive and dependable operation over the entire pressure range. The valve is positioned to direct pressure into pre-determined flow patterns by means of the solenoid and connecting linkage. The valve is a rotary disc, plate type, lapped for drip tight operation. The control is designed for manual as well as electric operation.



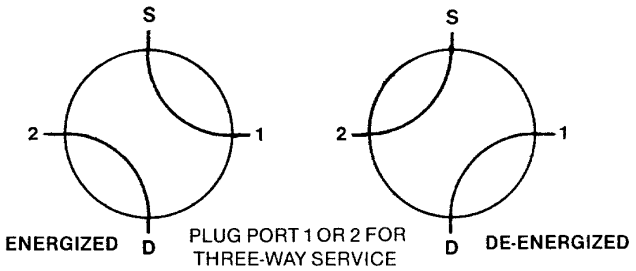




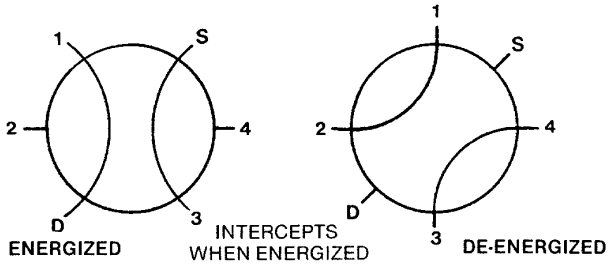
Operation

The Cla-Val Co. CSM-11 Solenoid Control meets varied service requirements depending upon the flow pattern used. Catalog number SUFFIXES are used to designate specific flow patterns. Other variations are available on special order.

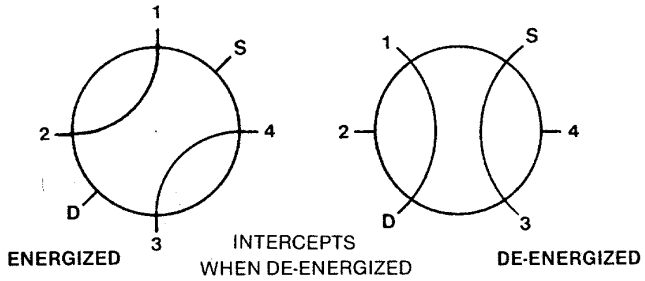
FOUR-WAY SERVICE: **CATALOG NO. CSM-11-A2-2**



INTERCEPTOR SERVICE: **CATALOG NO. CSM-11-N2-4**



INTERCEPTOR SERVICE: **CATALOG NO. CSM-11-CQ2-4**



Purchase Specifications

The control shall include a continuous duty direct acting solenoid, and shall be designed for both manual and electrical operation. The valve shall be integral, of a rotary disc, plate type, and shall be actuated by the solenoid through a linkage. The control shall be similar in all respects to the CSM-11 Solenoid Control as manufactured by Cla-Val., Newport Beach, California.

When Ordering, Please Specify

1. Catalog No. CSM-11
2. Include suffix of desired type of service
   Four-way or Interceptor
3. Voltage and Hertz

Power Consumption

Volts	Amperes		Volts	Amperes		Coil Resistance (ohms)
(DC)	Holding	Pull In	(AC 60 Hz)	Holding	Inrush	
24	.603	24	24	2.88	25.4	0.5
28	.629	15.6	120	.575	5.1	14.1
32	.500	18.6	208	.330	2.93	40
48	.293	10.8	240	.288	2.54	56
115	.122	4.42	440	.156	1.38	174
125	.119	4.44	480	.143	1.27	233
250	.072	2.45				

Volts	Amperes		Coil Resistance (ohms)
(AC 50 Hz)	Holding	Inrush	
110	.48	4.6	15.7
220	.24	2.3	66
240	.22	2.1	88

Service Specifications

Solenoid Enclosure	General Purpose, NEMA Type 3
Size (Fluid Connection)	1/4" NPT Supply Port and 1/8" NPT Connector Ports
Operating Media	Water, air, gas (compatible with materials)
Coil Insulation	Class A (molded)
Operating Pressure	300 psi maximum working pressure
Temperature	Water to 150° maximum
Materials (Fluid Contacts)	Bronze, Stainless Steel and Monel* Aluminum Body—Stainless Steel Trim

*Other materials available - consult factory.

2-1

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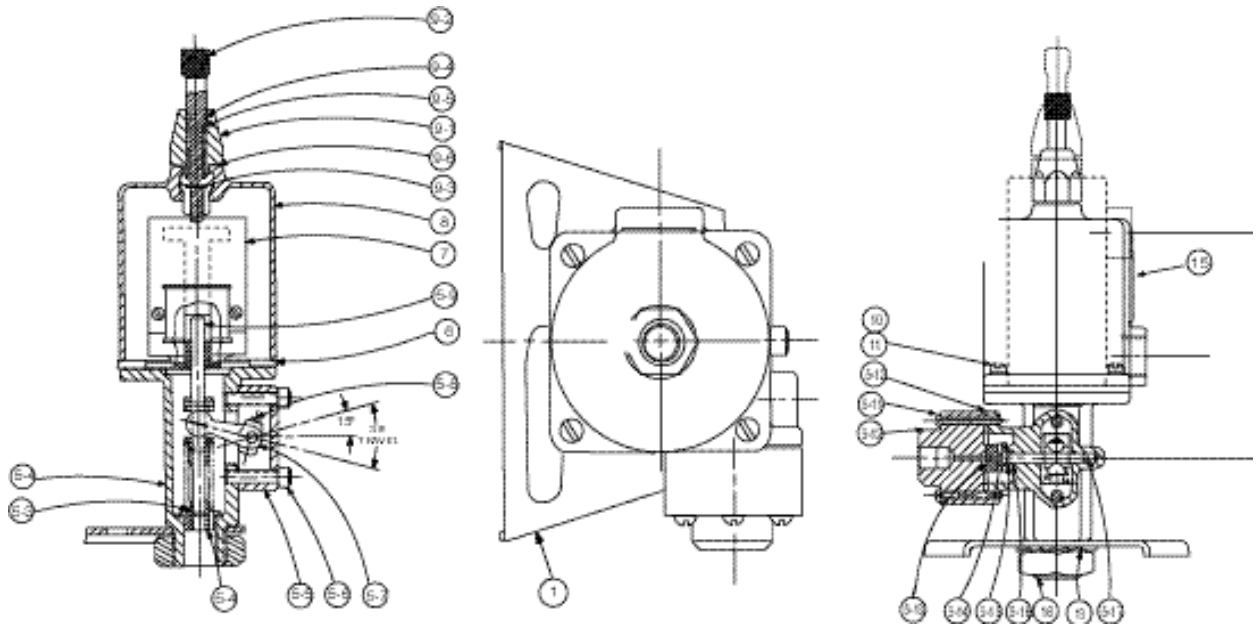
www.cla-val.com

Represented By:

CLA-VAL

CSM-11

Solenoid Control



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

When ordering parts, please specify:

- All Nameplate Data
- Item Number
- Description
- Material
- Recommended Spare Parts

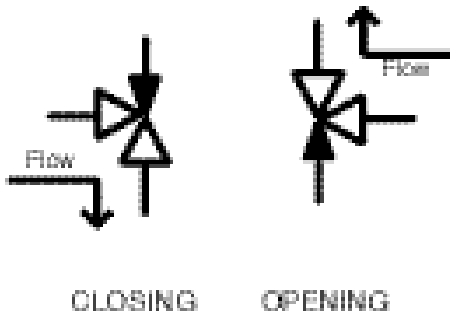
CV-Speed control

is used to control opening or closing speed. The CV allows restricted flow in one direction and restricted flow in the opposite direction. To be cleaned up sample only.

End Connection 3/8 male NPT and 3/8" Female NPT
Bronze or Stainless Steel body/ stainless steel trim.
Maximum working Pressure 400 PSI

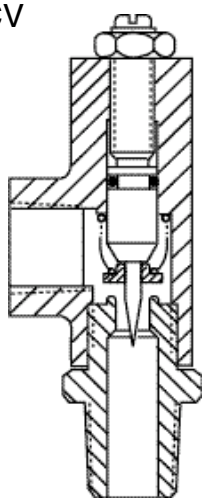
CV

CV



Schematic Symbol

CV



CLA-VAL

— MODEL — CV

Flow Control

DESCRIPTION

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

OPERATION

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

INSTALLATION

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

DISASSEMBLY

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

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

INSPECTION

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

CLEANING

After disassembly and inspection, cleaning of the parts can begin. Water service usually will produce mineral or lime deposits on metal parts in contact with water. These deposits can be cleaned by dipping the parts in a 5-percent muramic 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.

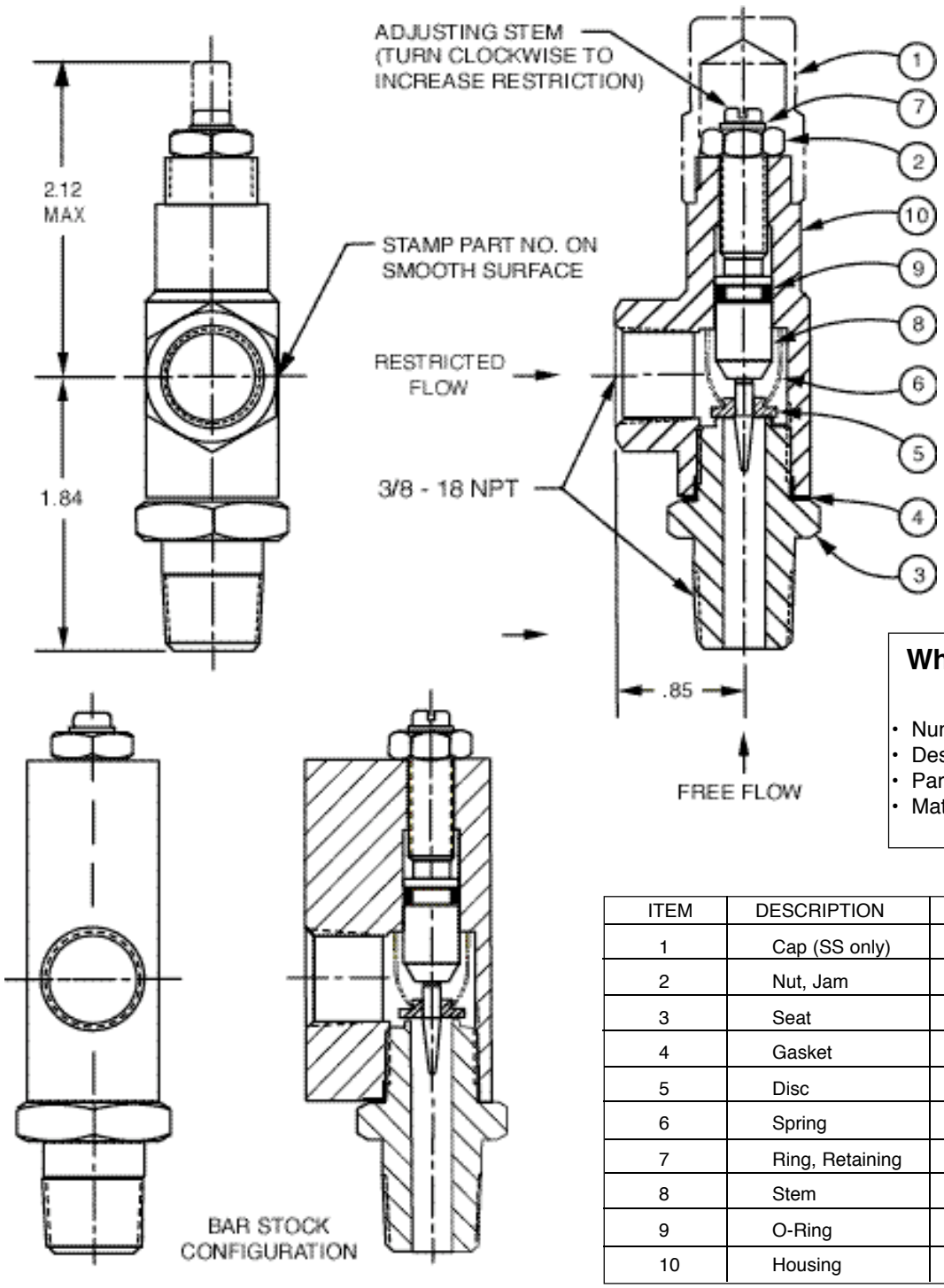
TEST PROCEDURE

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

CLA-VAL

CV

3/8" Flow Control



When ordering parts, please specify:

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

ITEM	DESCRIPTION	QUAN.
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

2-1

Regulator Spring Color Coding Chart

Dwg#47117

*THESE FIGURES ARE ONLY APPROXIMATE. FINAL ADJUSTMENTS SHOULD BE MADE WITH A PRESSURE GAGE.

WIRE SIZE	SPRING NUMBER	COLOR	WIRE MATERIAL	CATALOG NUMBER	PSI RANGE	*PSI PER TURN
.080 DIA.	C0492D	BLUE	S.S.	CDB-7 CRL-5A	0-7 0-7	.75 .75
.018 DIA.	82575C	--	S.S.	CRD CRD-10A	1.9-6.5 1.9-6.5	.61 .49
.116 DIA.	81594E	--	S.S.	CRD CRD-10A	2-30 2-30	3.0 2.4
.120 DIA.	V5654J	GREEN	CHR VAN	CRL-5A CRD	5-25 10-40	4.0 4.0
.162 DIA.	32447F	NATURAL	S.S.	CDB-7 CRL-5A CRL-13	10-60 10-60 10-60	12.0 12.0 12.0
.162 DIA.	V5695B	YELLOW	MUSIC WIRE	CDB-7 CRL-5A CRL-13	20-80 20-80 20-80	14.5 14.5 14.5
.207 DIA.	C1124B	CAD PLT	MUSIC WIRE	CDB-7 CRL-13 CRL-5A	50-150 50-150 50-150	29.5 29.5 29.5
.225 DIA.	V6515A	RED	MUSIC WIRE	CDB-7 CRL-13 CRL-5A	65-180 65-180 65-180	44.0 44.0 44.0
.115 X .218	71884B	RED	CHR VAN	CRL CRD CRD-10A	0-75 15-75 15-75	8.5 9.0 7.2
.118 X .225	71886J	GREEN	CHR VAN	CRL CRD CRD-10A	20-200 30-300 30-300	28.0 27.0 22.4
.225 X .295	1630201A	CAD PLT	CHR VAN	CRL CRL-5A	100-300 100-300	18.00 18.00
.440 X .219	48211H	CAD PLT	STEEL	CRA-18 CRD-22 CRL-4A	200-450 200-450 100-450	17.0 17.0 17.0
.187	20561901H	BLACK	STEEL	CRD	20-105	12.0

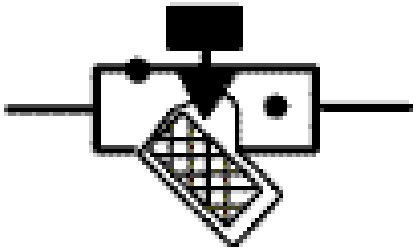
WIRE SIZE	SPRING NUMBER	COLOR	WIRE MATERIAL	CATALOG NUMBER	PSI RANGE	*FEET PER TURN
.080 DIA.	C0492D	BLUE	S.S.	CRA CRD-2	4.5-15 4.5-15	.82 .82
.375 DIA.	87719B 1 SPRING 2 SPRING 3 SPRING 4 SPRING 5 SPRING	EPOXY COATED	CHROME SILICON	CDS-5	 5-40 30-80 70-120 110-120 150-200	 1.0 2.0 3.0 4.0 5.0
.072 DIA.	V5097A	--	302SS	CVC	1-17	.7
.375 DIA.	2933502H 1 SPRING 2 SPRING 3 SPRING 4 SPRING 5 SPRING	EPOXY COATED	CHROME SILICON	CDS-6	 5-40 30-80 70-120 110-120 150-200	 .75 1.50 2.20 3.00 3.70

THE FOLLOWING CONTROL & SPRING P/N#'S WERE REMOVED, 32656B, 31554K, 44591G, V65695B, & V5695B.
ADDED CRL-13, CRL-5A, CRA, CRA-10A, CHANGED SPRING RANGES TO MATCH CURRENT CONTROLS.

X42N-2 Strainer and Needle Valve Assembly

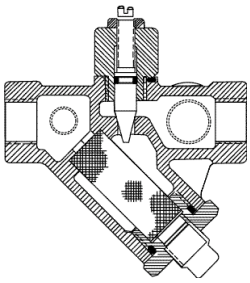
X42N-2

X42N-2



Schematic Symbol

X42N-2



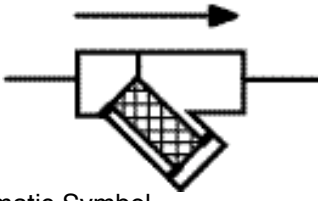
X43- Y-Strainer

is used to keep solids out of the pilot system. The standard is 40 mesh (Note other materials available)

Available in 1/4" - 3/4" female NPT
Bronze body, brass plug, stainless steel screen
Maximum Working Pressure 400 psi

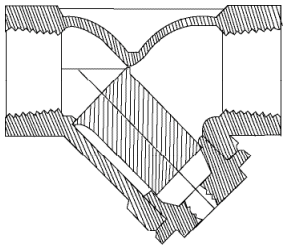
X43

X43



Schematic Symbol

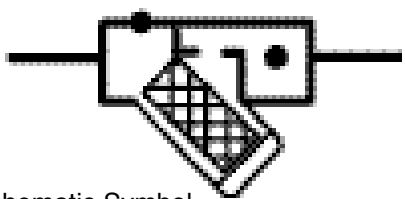
X43



X44A Strainer and Orifice Assembly

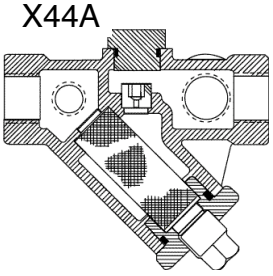
X44A

X44A



Schematic Symbol

X44A



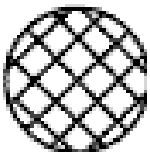
2 – 2

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.

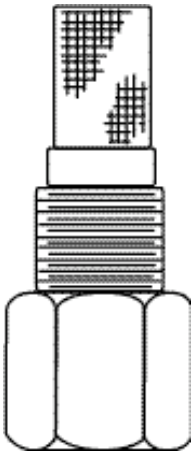
X46

X46



Schematic Symbol

X46



X47A Ejector

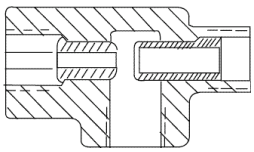
X47A Ejector is a compact, precision fitting, incorporating a primary and a secondary jet, designed to create a low-pressure area at the suction port.

X47A

X47A

Schematic Symbol

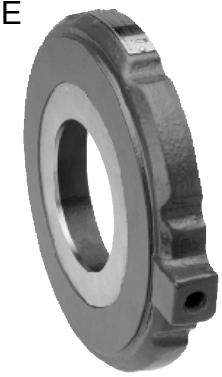
X47A



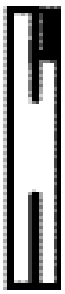
X52E Orifice Plate Assembly

X52E Orifice Plate Assembly is typically used with Cla-Val flow control valves. The orifice plate is an essential component used to generate a specific predictable pressure drop in the system.

X52E

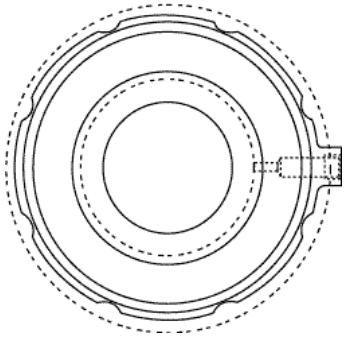


X52E



Schematic Symbol

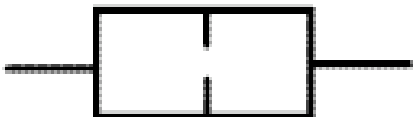
X52E



X58C Restriction Assembly
is composed of a modified standard (45 degree flare) tube connector with a precision delrin orifice fitting installed.

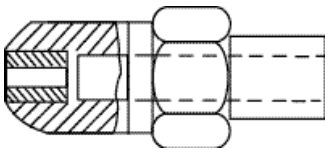
X58C

X58C



Schematic Symbol

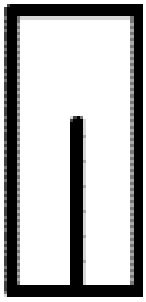
X58C



X101 Valve Position Indicator -
is very helpful in troubleshooting

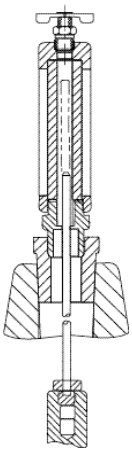
X101

X101



Schematic Symbol

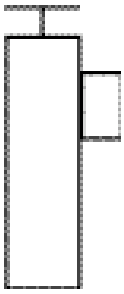
X101



X102 Flow Limiting Assemblies
regulates flow through Cla-Val Automatic Valves from full flow to shut-off. These adjustable assemblies control flow by limiting the amount of the valve opening. Limited to 6" & smaller.

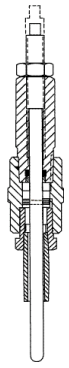
X102

X102



Schematic Symbol

X102

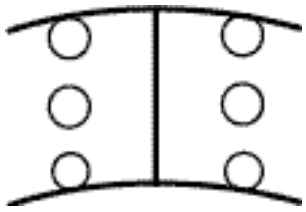


2 — 2

X103 Spring Lift

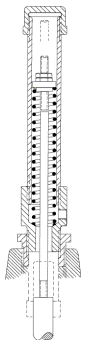
X103

X103



Schematic Symbol

X103

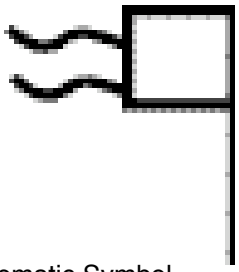


X105LCW Limit Switch Assemblies

X105L 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.

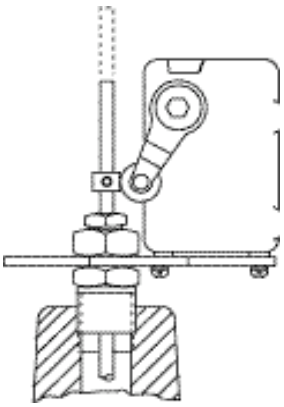
X105LCW

X105LCW



Schematic Symbol

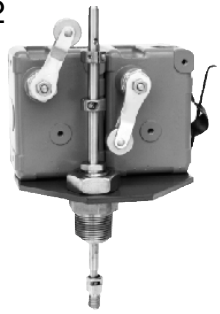
X105LCW



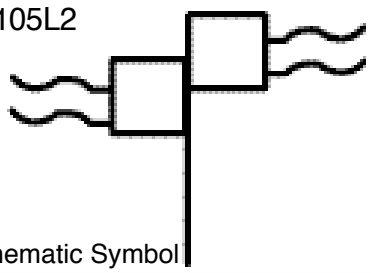
X105L2W Limit Switch Assemblies

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.

X105L2

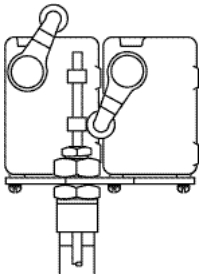


X105L2



Schematic Symbol

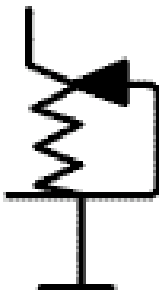
X105L2



X117C Valve Position Transmitter
is an accurate monitor of valve position. Through an industry standard 4-20 mA output, the X117C delivers the level of accuracy required for computer control valve systems (SCADA type).

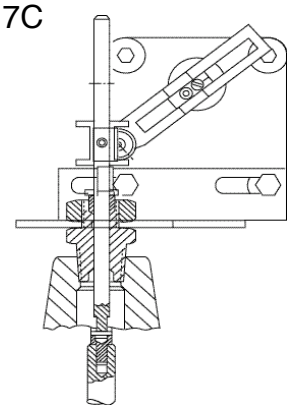
X117C

X117C



Schematic Symbol

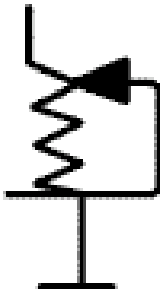
X117C



X117D Valve Position Transmitter
is an accurate monitor of valve position. Through an industry standard 4-20 mA output, the X117D delivers the accuracy required for computer control valve systems (SCADA type).

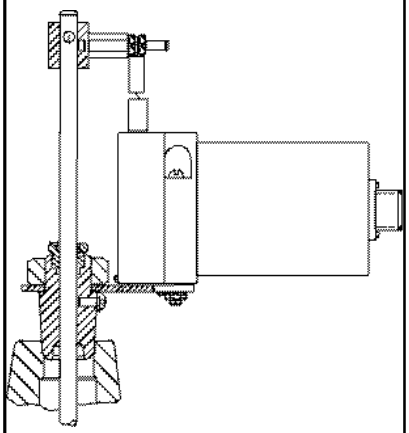
X117D

X117D



Schematic Symbol

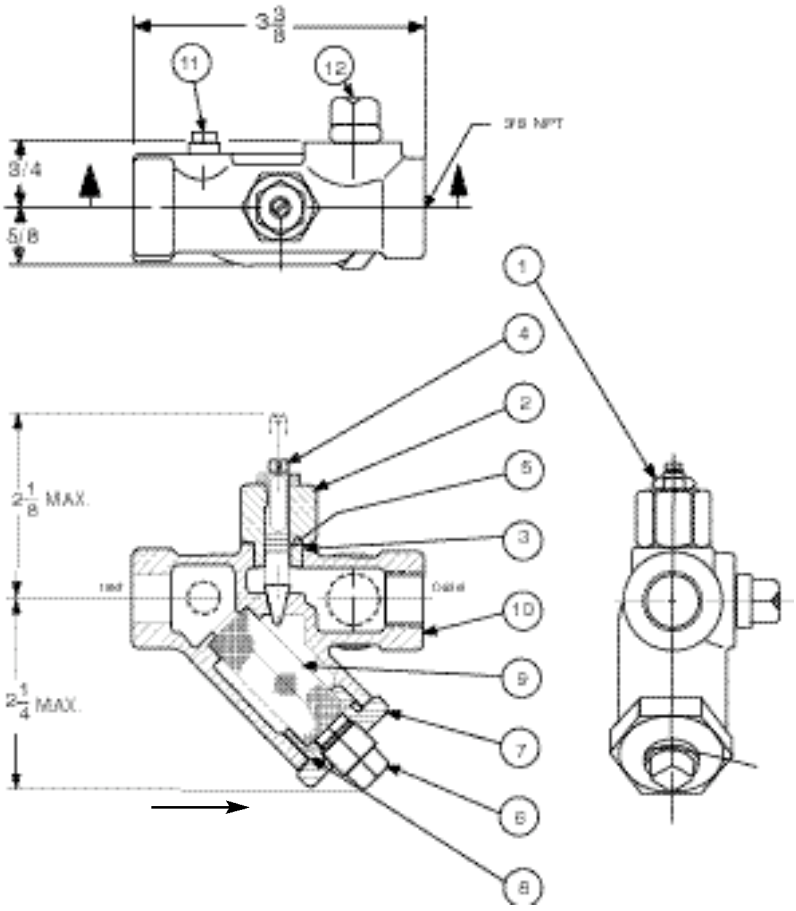
X117D



CLA-VAL

X42N-2

Strainer and Needle Valve Assembly



When ordering parts, please specify:

- All nameplate data
- Item Number
- Description

Size	Stock Number
3/8" x 3/8"	68372C

ITEM	DESCRIPTION	MATERIAL	PART NO.
1	Jam Nut —Hex	Sil Brz	
2	Bonnet	S.S.	
3	"O" Ring—Bonnet	Syn Rub	
4	Stem	S.S.	
5	"O" Ring—Stem	Syn Rub	
6	Plug—Pipe 1/4	Bre.	
7	Strainer Plug	303	
8	"O" Ring—Plug	NBR	
9	Screen	Monel	
10	Body	Rd Brs	
11	Plug—Pipe 1/8	Brass	
12	Plug—Pipe 3/8	Brass	

CLA-VAL

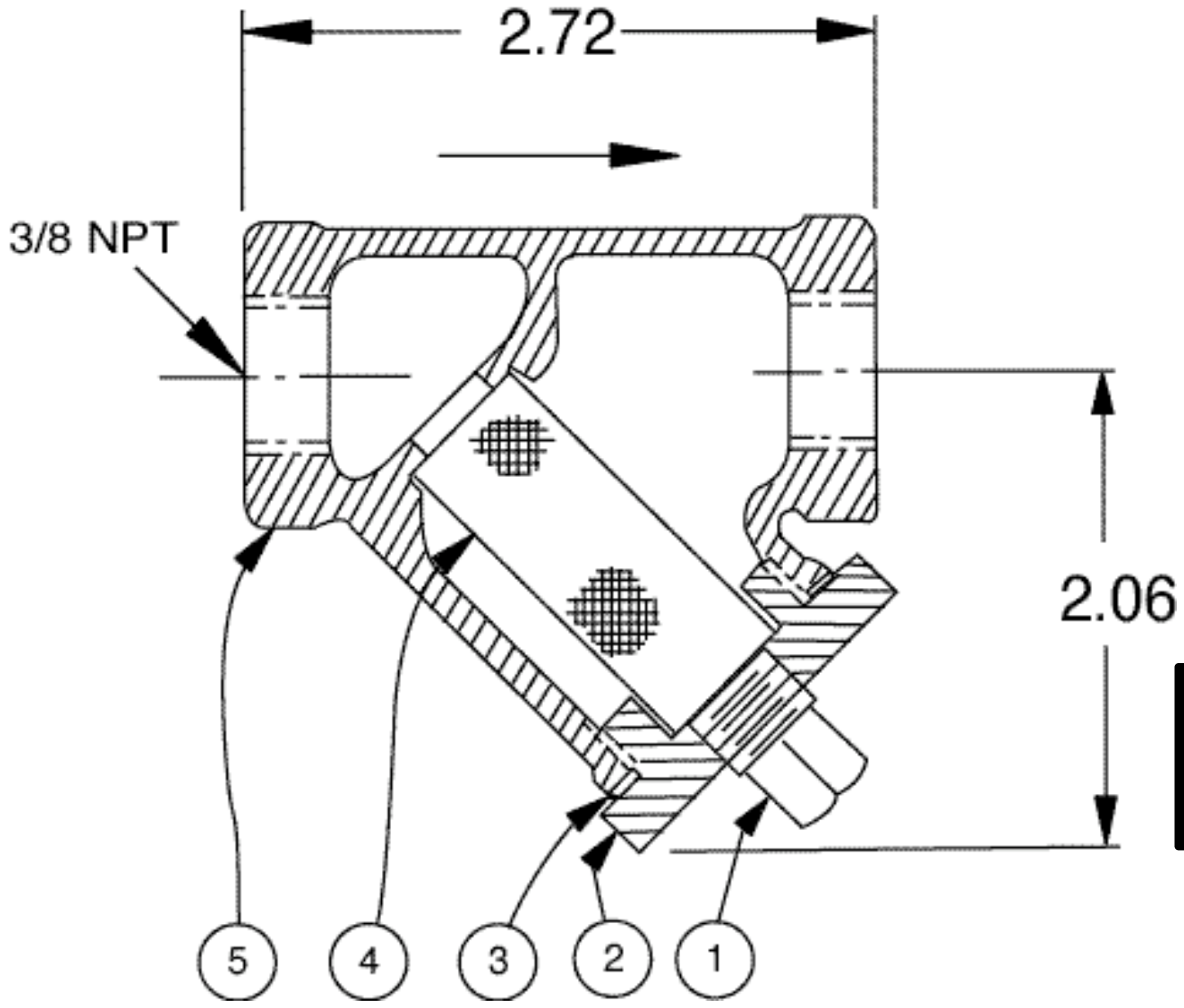
X43
Strainer

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

No parts available. Rreplacement assembly only.

Standard 60 mesh pilot system strainer for fluid service.

SIZE	STOCK NUMBER
3/8 x 3/8	33450J



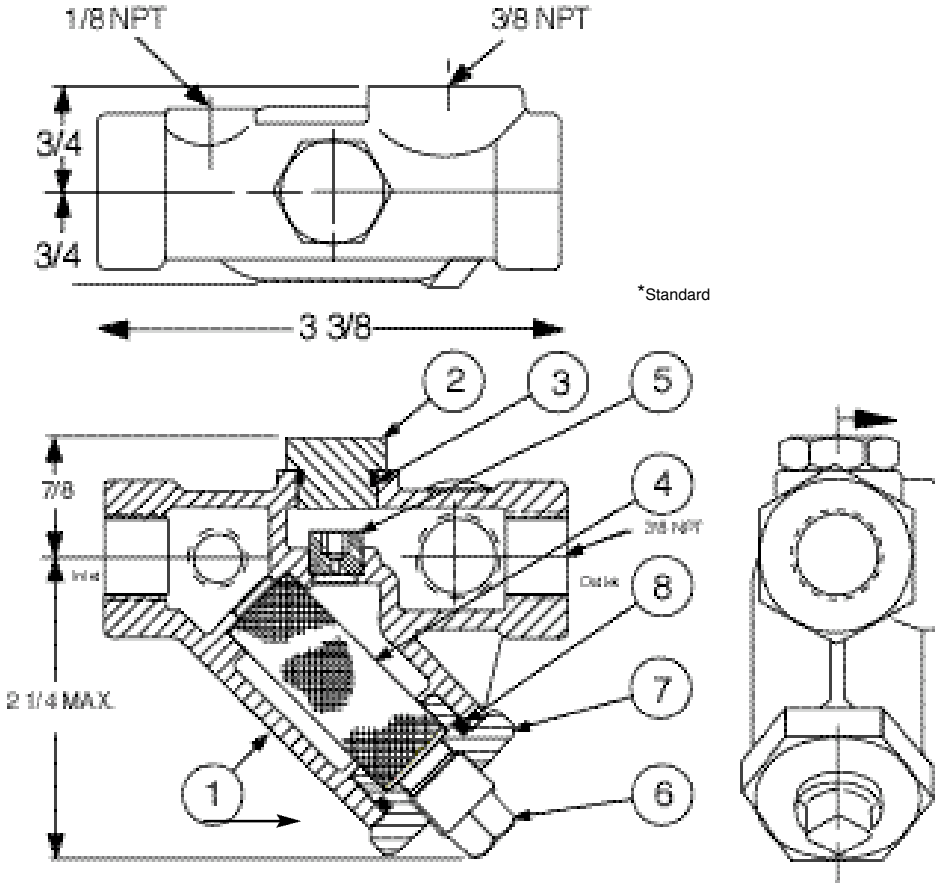
2-2

CLA-VAL

X44A

Strainer and Orifice Assembly

BRONZE BODY — S.S. ORIFICE



When ordering parts, please specify:

- All Nameplate Data
- Item Number
- Description
- Recommended Spare Parts

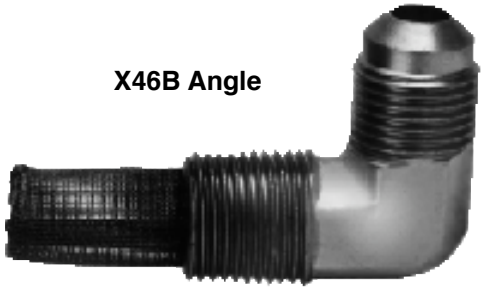
ITEM	DESCRIPTION	MATERIAL	QTY.
1	Body	Red Brs.	1
2	Plug, Top	Brass	1
3	"O" Ring, Plug Top	Syn. Rub.	1
4	Screen	Monel	1
5	Orifice Plug	Delrin	1
6	Plug, Pipe	Brass	1
7	Strainer Plug	S.S.	1
8	"O" Ring, Strainer Plug	Syn. Rub.	1

CLA-VAL

— MODEL —**X46**

Flow Clean Strainer

X46A Straight



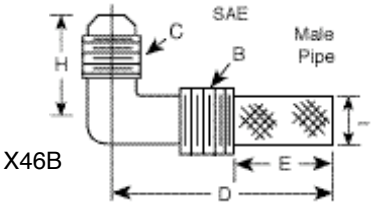
X46B Angle

- **Self Scrubbing Cleaning Action**
- **Straight Type or Angle Type**

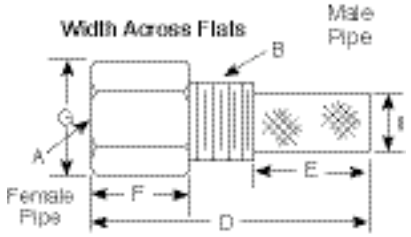
The Cla-Val Model X46 Strainer is designed to prevent passage of foreign particles larger than .015". It is especially effective against such contaminant as algae, mud, scale, wood pulp, moss, and root fibers. There is a model for every Cla-Val. valve.

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

Dimensions (In Inches)



X46B



X46A

X46 Angle Type B (In Inches)					
B (NPT)	**C** (SAE)	**D**	**E**	**H**	**I**
1/8	1/4	1-3/8	5/8	7/8	1/4
1/4	1/4	1-3/4	3/4	1	3/8
3/8	1/4	2	7/8	1	1/2
3/8	3/8	1-7/8	7/8	1	1/2
1/2	3/8	2-3/8	1	1-1/4	5/8

X46A Straight Type A (In Inches)						
A (NPT)	**B** (NPT)	**D**	**E**	**F**	**G**	**I**
1/8	1/8	1-3/4	3/4	1/2	1/2	1/4
1/4	1/4	2-1/4	1	3/4	3/4	3/8
3/8	3/8	2-1/2	1	7/8	7/8	1/2
3/8	1/2	2-1/2	1-1/4	1/2	7/8	3/4
1/2	1/2	3	1-1/4	1	1-1/8	3/4
3/8	3/4	3-3/8	2	1/2	1	7/8
3/4	3/4	4	2	1	1-1/2	7/8
3/8	1	4-1/4	2-3/4	1/2	1-3/8	7/8
1	1	4-1/2	2-3/4	1-1/4	1-3/4	7/8
1/2	1	4-1/4	2-3/4	1/2	1-3/8	7/8

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).

2 — 2

CLA-VAL™

— MODEL — X47A Ejector

DESCRIPTION

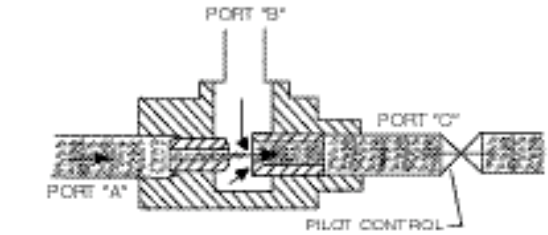
The Cla-Val Model X47A Ejector is a compact, precision fitting, incorporating a primary and a secondary jet, designed to create a low-pressure area at the suction port.

OPERATION

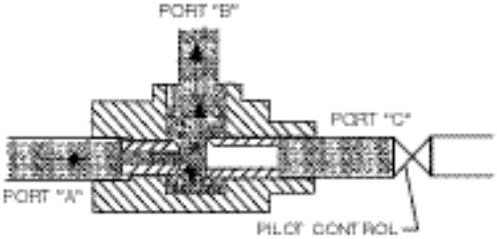
The X47A Ejector is designed for use in a pilot control system on a Cla-Val Main Valve. Pressure is applied to the inlet port (A). As the fluid passes through the center portion of the X47A Ejector, the high velocity entrains particles of fluid from suction port (B), which results in a reduced pressure at this port.

In actual operation, the pressure port (A) is connected to the upstream side of the Main Valve; the discharge port (C) is connected to the Pilot Control; and the suction port (B) is connected to the cover chamber of the Main Valve.

Fluid line pressure enters at the inlet port (A). When the Pilot Control is closed, no flow occurs through the X47A Ejector, and full line pressure is directed into the Main Valve cover chamber, closing the Main Valve tight. As the Pilot Control opens, and flow through the X47A Ejector begins, pressure at the suction port (B) decreases until the Main Valve is permitted to open. Further changes in the flow rate resulting from opening and closing of the Pilot Control produce corresponding changes in the flow through the Main Valve.



PILOT CONTROL OPEN



PILOT CONTROL CLOSED

DISASSEMBLY

Do not attempt to remove primary or secondary jets from X47A Ejector housing.

INSPECTION

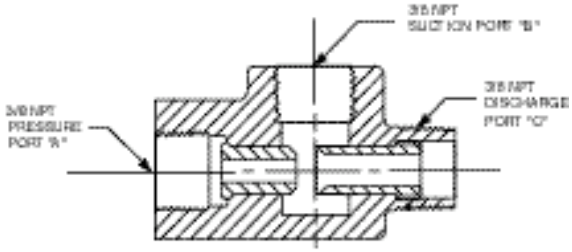
Inspect port threads for damage or evidence of cross-threading. Check primary and secondary jets for clogging or embedded foreign particles. Check for breaks, cracks, fatigue, and other signs of damage.

CLEANING

After inspection, cleaning of the X47A 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 X47A 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) 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

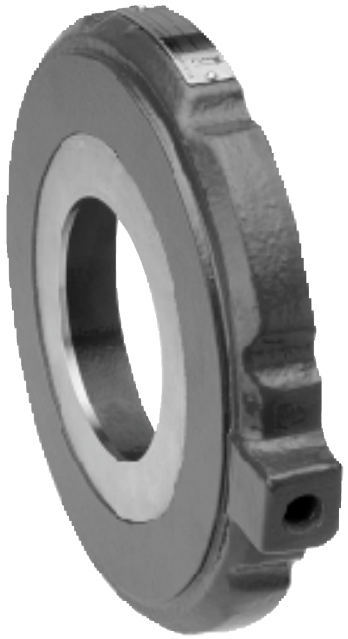
If there is any sign of damage, or if there is the slightest doubt that the X47A Ejector may not afford completely satisfactory operation, replace it. Use Inspection steps as a guide. Neither the primary jet, secondary jet, or bare housing is furnished as a replacement part. Replace X47A Ejector as a complete unit.



NOTE: OBTAIN AS COMPLETE ASSEMBLY ONLY. SPECIFY NUMBER STAMPED ON SIDE OF EJECTOR WHEN RE-ORDERING.

— MODEL — **X52E**

Orifice Plate Assembly



- **Wafer Design**
- **Fits ANSI 125, 150, 250, 300**
- **Optional Materials Available**
- **Easy to use size Selection Chart**

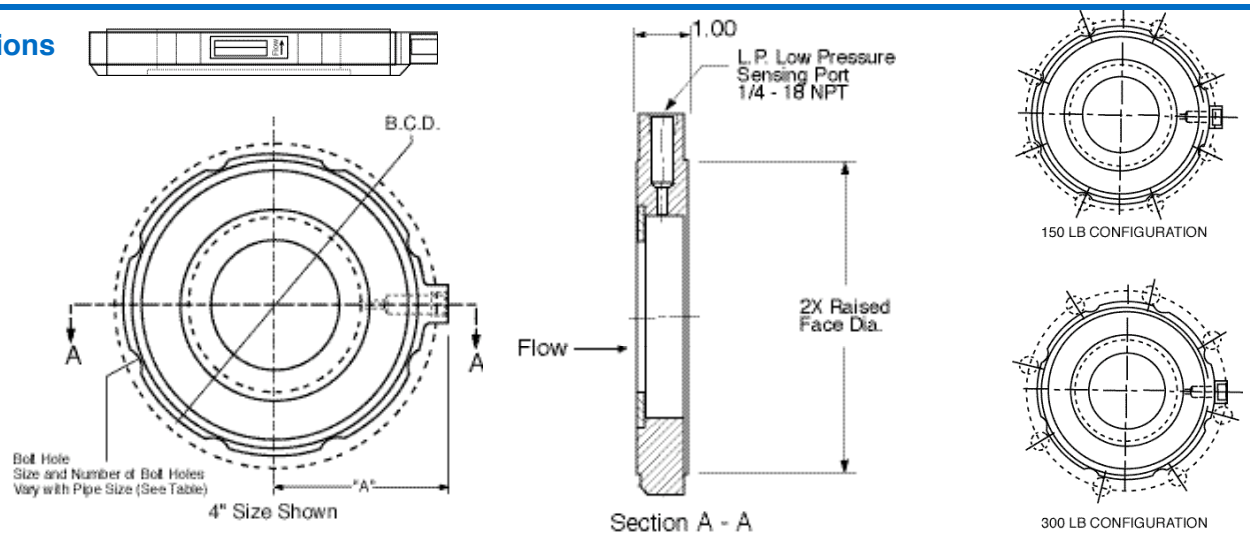
The Cla-Val Model X52E Orifice Plate Assembly is typically used with Cla-Val flow control valves. The orifice plate is an essential component used to generate a specific, predictable pressure drop in the system. The X52E uses a wafer design holder which offers a compact light-weight assembly that is easy to install. The X52E has a Chamfered "Inlet" side so even after installation, correct orientation can be easily verified.

The orifice plate portion of the assembly is made of 302 stainless steel with other materials options also available. The plate is machined to a recommended "square edge". The plate holder portion of the assembly is Ductile Iron standard. Fusion-bonded epoxy coating is an option. The holder may be made of other materials.

Selecting an orifice plate bore size is made by using charts provided.

We recommend installation of this assembly with the sensing port to the side of the pipeline to prevent air pockets and obstructions in the sensing line. Installation adjacent to a butterfly valve is not recommended as the orifice plate assembly may interfere with the opening of this type of valve.

Dimensions



NOMINAL PIPE SIZE (inches)		1½	2	2½	3	4	6	8	10	12	14	16
Diameter of Flange		3.63	4.25	5.00	5.75	7.00	9.75	12.00	14.12	16.50	19.00	21.12
Diameter of Raised Face		2.88	3.63	4.13	5.00	6.19	8.50	10.63	12.75	15.00	16.25	18.50
"A" Dim from CL to top of boss		2.31	2.62	3.00	3.38	4.00	5.38	6.50	7.62	8.75	10.00	11.06
Diameter of Bolt Circle (B.C.D.)		3.88	4.75	5.50	6.00	7.50	9.50	11.75	14.25	17.00	18.75	21.25
150 Lb.	Number of Bolts	4	4	4	4	8	8	8	12	12	12	16
	Radius of Bolt Holes	.31	.38	.38	.38	.38	.44	.44	.50	.50	.56	.56
300 Lb.	Diameter of Bolt Circle	4.50	5.00	5.50	6.63	7.88	10.63	13.00	15.25	17.75	20.25	22.50
	Number of Bolts	4	8	8	8	8	12	12	16	16	20	20

2 — 2

Sizing An Orifice Plate Bore

1. In determining a bore size, the nominal flow rate (or range of flow) and the pipe size in which the orifice plate assembly will be installed must be known.
2. Sizing a bore for:

A constant flow rate:

Select the sizing chart that matches pipe size and locate the flow rate under the nominal column which is closest to required flow; select the corresponding bore size dimension.

Example:

A 6" pipe with a desired constant flow of 700 gpm. Using the 6" chart, the closest flow in the nominal column is 670 gpm which has a corresponding bore size of 3.80".

6" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
4.60	490	1960	1100
4.40	435	1740	980
4.20	380	1520	850
4.00	330	1320	750
3.80	300	1200	670
3.60	265	1060	590
3.40	230	920	520
3.20	200	800	450
3.00	175	700	395
2.80	150	600	340
2.60	130	520	295
2.40	110	440	245

A flow range:

Select the sizing chart that matches pipe size and locate required flow range between the minimum and maximum limits of an orifice bore. Frequently the flow range will fit between more than one bore size. To resolve this, decide the flow rate that system will be operated at most frequently. Locate the flow which is closest to this under the nominal flow column, and select the corresponding bore size dimension.

Example:

A 6" pipe with a flow range of 300-1000 gpm. Using the 6" chart, more than one bore size can accommodate this range. The most frequent flow rate will be 500 gpm. Using the nominal flow column, the closest flow is 520 gpm which has a corresponding bore size of 3.40"

6" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
4.60	490	1960	1100
4.40	435	1740	980
4.20	380	1520	850
4.00	330	1320	750
3.80	300	1200	670
3.60	265	1060	590
3.40	230	920	520
3.20	200	800	450
3.00	175	700	395
2.80	150	600	340
2.60	130	520	295
2.40	110	440	245

Orifice Plate Bore Chart

2"* Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
1.55	55	220	125
1.50	50	200	115
1.40	42	168	95
1.20	29	116	65
1.00	19	76	45
.80	12	50	28

*For 1 1/2" bore information please consult the factory

2½" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
1.87	80	330	180
1.60	55	220	120
1.40	40	160	88
1.20	28	115	62
1.00	19	80	43
.80	12	50	28

3" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
2.29	120	480	270
2.20	105	420	240
2.00	84	336	190
1.80	65	260	145
1.60	50	200	115
1.40	38	152	86
1.20	28	112	62
1.00	19	76	43

4" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
3.00	205	820	450
2.80	170	680	390
2.60	140	560	310
2.40	115	460	260
2.20	96	384	215
2.00	78	312	175
1.80	63	252	140
1.60	49	196	110
1.40	38	152	84
1.20	28	112	62

6" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
4.60	490	1960	1100
4.40	435	1740	980
4.20	380	1520	850
4.00	330	1320	750
3.80	300	1200	670
3.60	265	1060	590
3.40	230	920	520
3.20	200	800	450
3.00	175	700	395
2.80	150	600	340
2.60	130	520	295
2.40	110	440	245

8" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
6.00	830	3320	1850
5.80	760	3040	1700
5.60	680	2720	1550
5.40	620	2480	1400
5.20	570	2280	1275
5.00	515	2060	1150
4.80	470	1880	1050
4.60	425	1700	950
4.40	385	1540	860
4.20	345	1380	780
4.00	310	1240	700

10" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
7.50	1300	5200	2900
7.00	1075	4300	2400
6.50	880	3520	1950
6.00	730	2920	1650
5.50	600	2400	1350
5.00	490	1960	1100
4.50	390	1560	870
4.00	310	1240	690
3.50	235	940	525
3.00	175	700	385

12" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
9.00	1850	7400	4200
8.50	1575	6300	3500
8.00	1350	5400	3000
7.50	1150	4600	2600
7.00	980	3920	2200
6.50	840	3360	1875
6.00	700	2800	1575
5.50	580	2320	1300
5.00	480	1920	1075
4.50	385	1540	870

14" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
10.00	2350	9400	5200
9.50	2025	8100	4500
9.00	1750	7000	3900
8.50	1500	6000	3400
8.00	1300	5200	2900
7.50	1150	4600	2500
7.00	960	3840	2150
6.50	820	3280	1850
6.00	700	2800	1550
5.50	585	2340	1300
5.00	480	1920	1075
4.50	385	1540	860

16" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
11.50	3100	12400	7000
11.00	2700	10800	6100
10.50	2400	9600	5400
10.00	2100	8400	4700
9.50	1850	7400	4200
9.00	1650	6600	3650
8.50	1450	5800	3250
8.00	1250	5000	2850
7.50	1100	4400	2450
7.00	950	3800	2150
6.50	810	3240	1800
6.00	700	2800	1550
5.50	575	2300	1300

18" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
13.00	5200	15500	9000
12.00	4100	12300	7100
11.50	3700	11000	6400
11.00	3300	9850	5700
10.50	2950	8800	5100
10.00	2600	7850	4550
9.50	2350	6200	3600
9.00	2100	6200	3600
8.50	1850	5500	3200
8.00	1650	4850	2800
7.50	1400	4250	2450
7.00	1250	3650	2100

20" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
14.00	6000	18000	10500
13.50	5300	16000	9500
13.00	4800	14500	8500
12.50	4300	12900	7500
12.00	3900	11700	6700
11.50	3400	10500	6100
11.00	3200	9500	5500
10.50	2900	8600	5000
10.00	2600	7700	4500
9.50	2300	6100	3600
9.00	2000	6100	3600
8.50	1800	5400	3200

24" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
17.00	8500	25500	15000
16.00	7500	21500	12500
15.00	6100	18400	10500
14.50	5700	17000	9800
14.00	5200	15600	9000
13.50	4800	14400	8300
13.00	4400	13200	7600
12.50	4000	12100	7000
12.00	3700	11100	6400
11.50	3400	10100	5800
11.00	3100	9200	5300
10.50	2800	8300	4800
10.00	2500	7500	4400

36" Valve/Pipe Size

Bore Size	Flow — gpm		
	Min	Max	Nominal
26.00	20000	60000	35000
24.00	16000	48500	28000
22.00	13000	39000	22500
21.00	12000	35000	20500
20.00	10500	31000	18000
19.00	9500	28000	16000
18.00	8500	24500	14500
17.00	7500	22000	12500
16.00	6500	19300	11000
15.00	5600	16900	9800
14.00	4900	14600	8500
13.00	4200	12600	7300

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www.cla-val.com

Represented By:

X-52 Series Orifice Assemblies

The X52 Series Orifice Assembly consists of a calibrated, precision-machined orifice plate and flange holder. It is typically supplied with 40 Series valves. Flange holder material is same as main valve body. The 1/8" thick orifice plate (X55A) is made of 303 Stainless Steel with 316 Stainless Steel optional. Small screws hold the orifice plate into the holder (at approximately half the thickness of holder) on X52B and X52D-1 assemblies. The orifice plate is staked in place (at inlet side) on X52A-1 and X52E assemblies. The X52 is assembled prior to epoxy coating when an epoxy coated main valve is specified (orifice bore is masked). Pressure class (125/150 or 250/300) must be specified for proper fit in pipeline. X52E is a wafer style redesign of the X52A-1 and is suitable for 150 and 300 class flanges.

Cat. No.	Dwg.	Sensing Holes	Thickness	Comments
X52E	201278	One 1/4" NPT for downstream sensing	1"	NEW wafer style assembly. Replaces X52A-1(after Jan 2001). Suitable for 150 and 300 class flanges. Used with CDHS-18 pilot Intended for downstream of valve.
X52A-1	81225	One 1/4" NPT for downstream sensing	1"	Current assembly. Replaced old 2 sensing hole assembly when we changed pilot from CDHS-2 to CDHS-18. (circa mid 1970's) Intended for downstream of valve.
X52B	41241	Two 1/8" NPT for sensing DP	3/4"	Obsolete. For AF valves and available in aluminum or steel only. Used with CDHS-2 pilot. Intended for upstream of valve.
X52D-1	43831	-Two 1/8" NPT for sensing DP -One 1/2" NPT for pilot supply	1 1/2"	Current assembly. Used with CDHS-2 pilot. Intended for upstream of valve.

X55A is catalog number for orifice plate used in X52 assemblies. Typically used for replacement in existing holders or for installation in customer supplied flange holder.

X55B is catalog number for paddle type orifice plate installed between two pipe flanges. Paddle handle is stamped with bore size. For flow control applications, two pipeline tap connections for pilot valve sensing must be customer supplied. When used for cavitation control it is typically mounted downstream of control valve. Pressure class (125/150 or 250/300) must be specified for proper fit in pipeline.

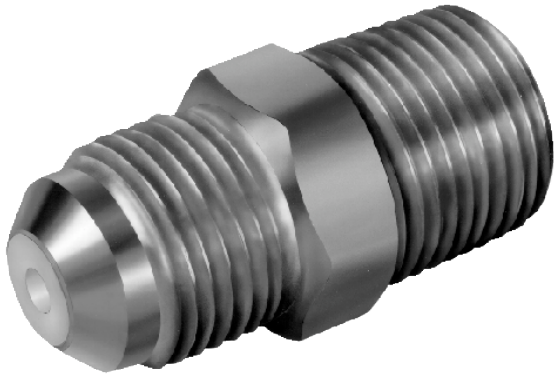
CLA-VAL

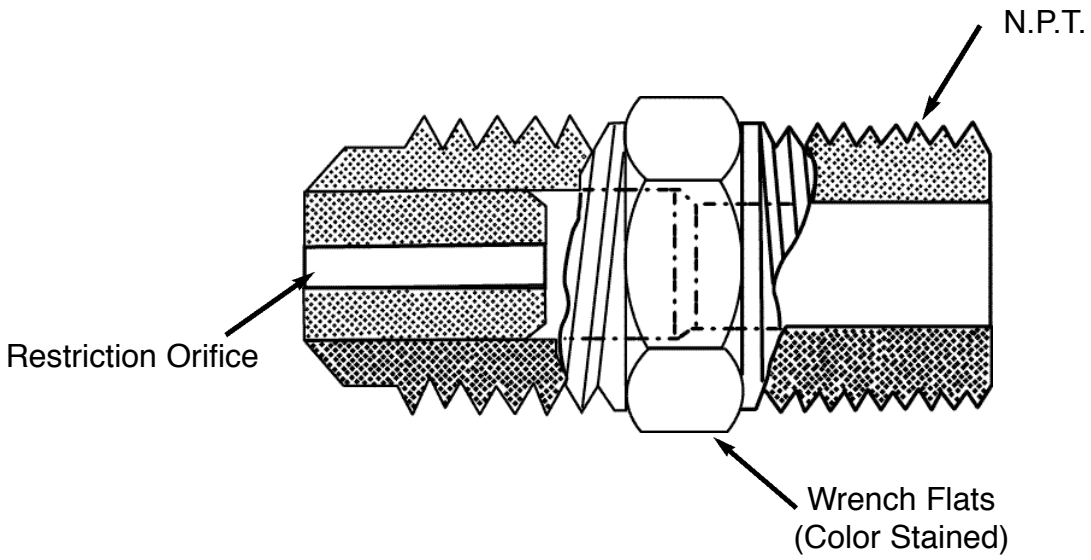
— MODEL — **X58C**

Restriction Assembly

Description

The Cla-Val Model X58C Restriction Assembly is composed of a modified standard (45 degree flare) tube connector with a precision delrin orifice fitting installed. Flow direction is from tube to pipe connections. Orifice size color code is stained onto brass tube connector wrench flats. The X58C is installed as a part of pilot control systems on Cla-Val Valves.





Note: No replacement parts available - to be sold as complete assembly only.

When ordering please specify: Valve size, Stock Number

X58C Pilot System Orifice Restriction Fittings

SUITABLE FOR 3" AND SMALLER VALVES (BLUE)

Size TxNPT	Orifice	Mat'l	Part Number
3/8" x 3/8"	.094 (3/32)	BP	68565B (std)
3/8" x 3/8"	.094 (3/32)	BS	9932901D
3/8" x 3/8"	.094 (3/32)	TP	9787003E (SWS)
3/8" x 3/8"	.094 (3/32)	TS	9787015J
3/8" x 3/8"	.062 (1/16)	BP	46946A
3/8" x 3/8"	.062 (1/16)	BS	64672K
3/8" x 3/8"	.062 (1/16)	TP	9787001J

SUITABLE FOR 4" AND LARGER VALVES (RED)

Size TxNPT	Orifice	Mat'l	Part Number
3/8" x 3/8"	.125 (1/8)	BP	64673H (std)
3/8" x 3/8"	.125 (1/8)	BS	4883405F
3/8" x 3/8"	.125 (1/8)	TP	9787002G (SWS)
3/8" x 3/8"	.125 (1/8)	TS	9787016G
3/8" x 3/8"	.188 (3/16)	BP	43302K

Made from Tube Connector (Male Tube x Male NPT)

Material CODE
1st letter = fitting, 2nd letter = orifice insert
B = Brass
P = Delrin Plastic
S = 303 Stainless Steel
T = 316 Stainless Steel Parker fitting

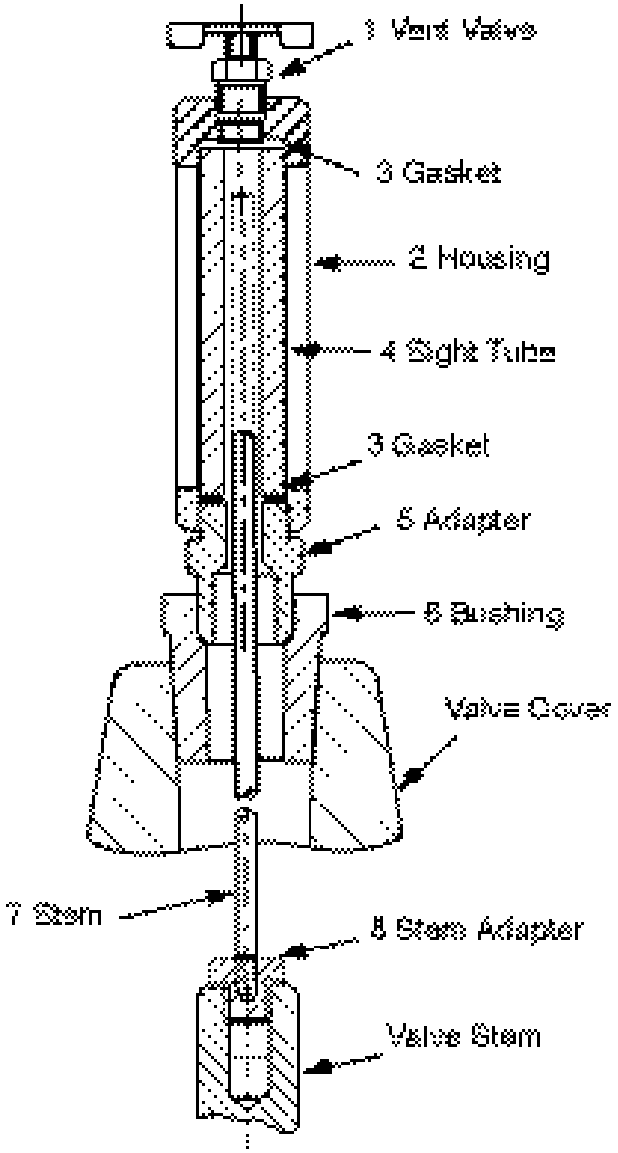
NOTE:
High Differential Pressure (100+dpsi) over time can cause Delrin orifice to extrude or copper tubing to erode.
Usually recommend upgrade to Stainless Steel.

CLA-VAL

X-101

Valve Position Indicator

COMPLETE X101- BRONZE	
SIZE	STOCK NO.
1 1/4 - 1 1/2	C2812A
2	C8972G
2 1/2	C2607E
3	C2609A
4	9710001A
6	9710002J
8	C8581F
10	C9187A
12	31420D
14	30256C
16	30251D



ITEM	DESCRIPTION	MATERIAL
1	Vent Valve	Brass
2	Housing	Brass
3	*Gasket (2 Required)	Buna-N®
4	*Sight Tube	Pyrex
5	Adapter	Brass
6	Busing	Brass
7	Stem	Brass
8	Stem Adapter	Brass

When ordering parts, please specify:
- All Nameplate data
- Item Number
- Description
- Material
- Part Number

* Repair Kit Parts

CLA-VAL™

— MODEL — X102

Flow Limiting Assembly & Pilot System Components

X102A

X102B

X102D

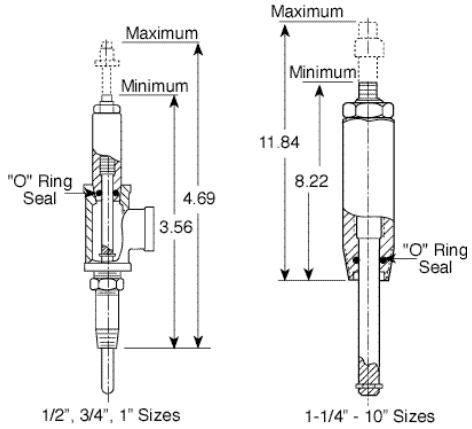
- **Automatic Operation**
- **Corrosion Resistant**
- **No Lubrication**
- **Easy Adjustment**
- **Easy Maintenance**

The Cla-Val Model X102 Flow Limiting Assemblies regulate flow through Cla-Val Automatic Valves from full flow to shut-off. These adjustable assemblies control flow by limiting the amount of the valve opening.

The X102A and X102D maintain a pressure seal during adjustment by means of an internal "O" Ring.

The X102B is pressure sealed by means of an external resilient washer, compressed when the Jam Nut is tightened, after adjustment.

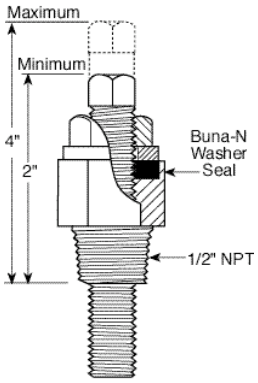
X102A



1/2", 3/4", 1" Sizes

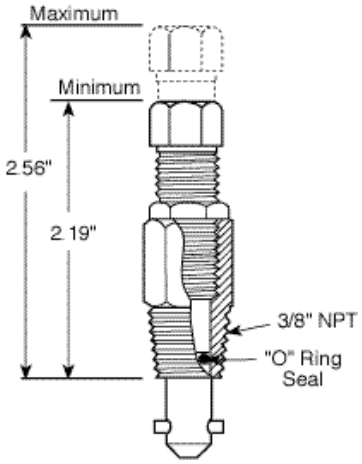
1-1/4" - 10" Sizes

X102B



1 1/4" - 3" 7100 Series Valves

X102D



1" 7100 Series Valves

Specifications

Pressure Ratings:

Valves 1/2" through 3" .....150 psi maximum
Valves 4" and 6".....100 psi maximum
Valves 8" .....30 psi maximum
Valves 10" .....20 psi maximum

Materials:

Body (all models) .....Brass
Stem X102A .....303 Stainless Steel
X102B .....Brass
X102D .....Brass

When Ordering, Please Specify

When ordering please specify the following information:

1. Flow Limiting Assembly Catalog Number
2. Valve Catalog Number
3. Valve Size

2 — 2

CLA-VAL

— MODEL — **X103**

Spring Lift

DESCRIPTION

The Spring Lift Assembly is externally mounted on the Clayton valve cover, and houses an extension stem and a compression spring. The upper nd of the extension stem is threaded to provide spring tension adjustment, the lower end is attached to the valve stem.

OPERATION

The Spring Lift Assembly is designed to assure a wide open valve position. This is a normal position when there is no pressure in the main valve cover chamber, under static and during certain flowing conditions. An independent source of operating pressure generally will be required when low line pressure exists.

ADJUSTMENT

CAUTION– The Spring Lift Assembly will pull the valve open should the Independent Operating Pressure Fail. Consult factory for complete details.

Normally, the tension on the spring should be great enough to hold the valve wide open when the system is not in use. This adjustment can be made before the valve is installed. If the valve is installed. If the valve is in the system, remove all pressure before proceeding. (Refer to P-X103 sectional view).

1. Remove cap 1 and nipple 2.
2. Lift the spring lift stem 6 manually. If any upward travel is evident, increase spring tension until no upward travel is felt. If no upward travel is felt it can be assumed the adjustment has been made. However, to insure that too much tension has not been applied previously, decrease the spring tension until an upward travel can be felt when pulling on the spring stem; then carefully increase the spring tension until the upward travel has been removed.

To increase spring tension:

1. Loosen jam nut 3.
2. Turn lower adjusting nut clockwise until proper tension is obtained.
3. Tighten jam nut 3.
4. Replace nipple 2 and cap 1.

To decrease jam nut 3.

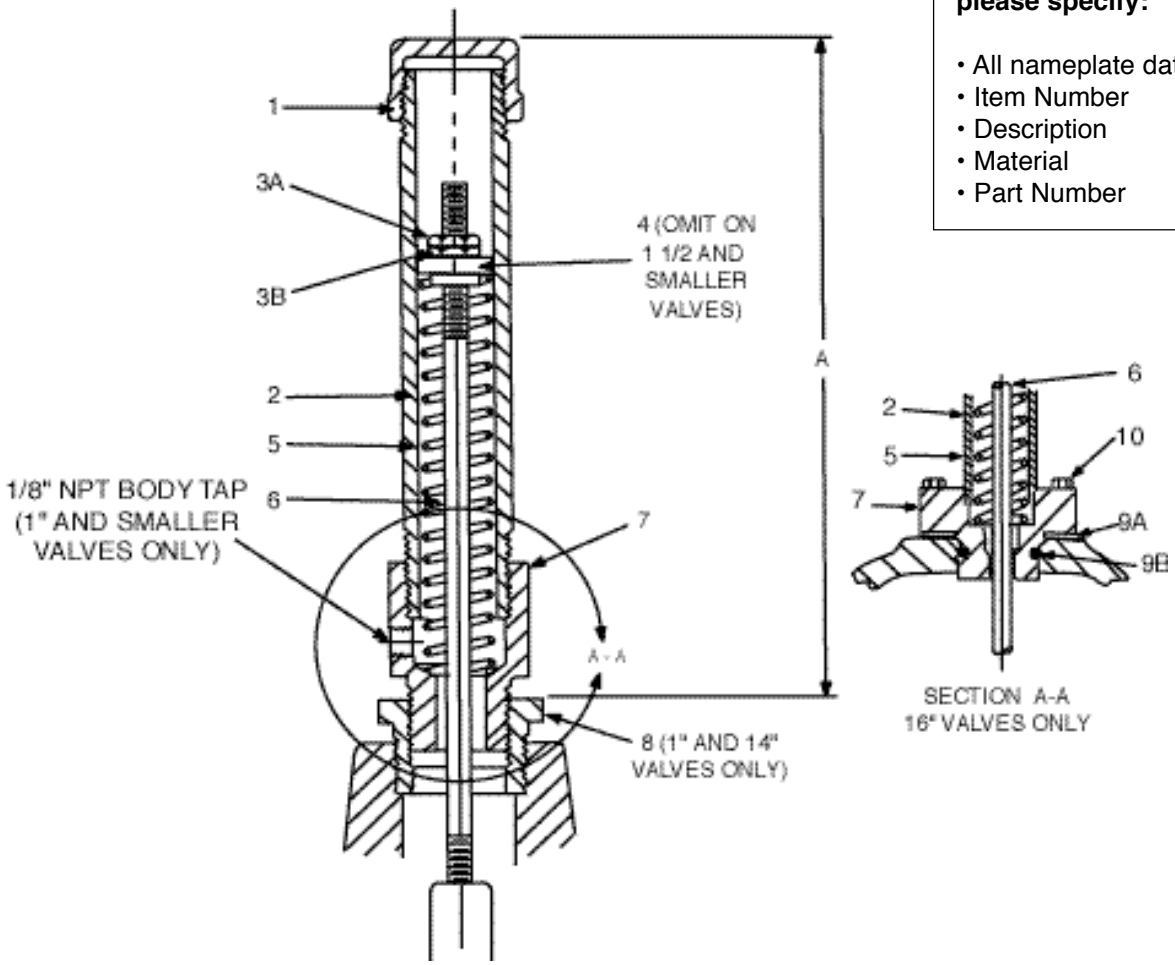
1. Loosen jam nut 3.
2. Turn lower adjusting nut counter-clockwise until proper spring tension is obtained.
3. Tighten jam nut 3.
4. Replace nipple 2 and cap 1.

X103
Spring Lift

CAUTION– The Spring Lift Assembly will pull the valve open should the Independent Operating Pressure Fail. Consult factory for complete details.

When ordering parts, please specify:

- All nameplate data
- Item Number
- Description
- Material
- Part Number

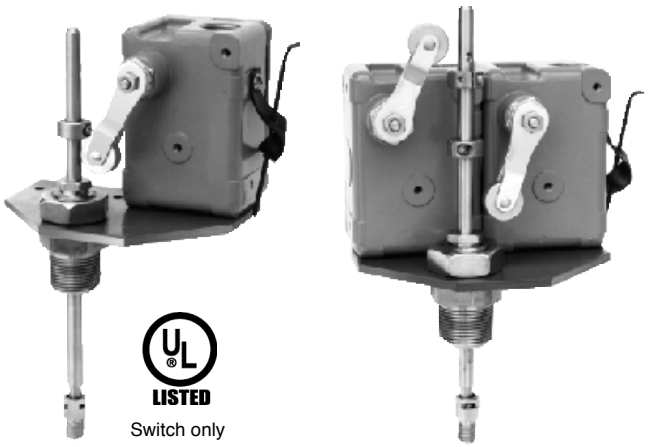


PARTS LIST / DIMENSIONS

ITEM NO.	DESCRIPTION	Valve Size - Inches	Dimension A
1	Pipe Cap	1/2 - 3/4 - 1	3.75
2	Nipple	1 1/2	3.31
3	Nut	2- 2 1/2	3.75
4	Spring Guide	3	6.13
5	Spring	4	7.25
6	Stem	6	9.13
7	Body	8	10.00
8	Pipe Bushing	10	17.50
9	Gasket	12	26.50
10	Cap Screw	14	24.00
		16	19.50

MODEL X105L
X105L2

Limit Switch Assemblies



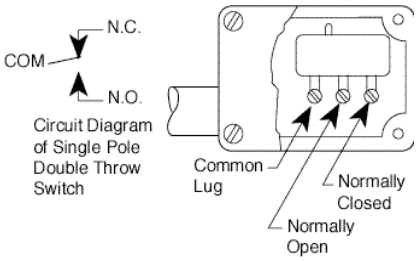
Switch only

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

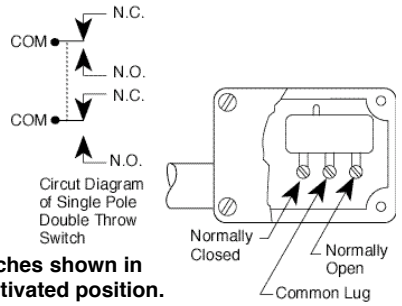
The Cla-Val Model X105L/X105L2 Limit Switch Assembly is a rugged, dependable and positive acting switch assembly actuated by the opening or closing of a Cla-Val control valve on which it is mounted. The single pole, double throw micro switch can be connected either to open or to close an electrical circuit 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

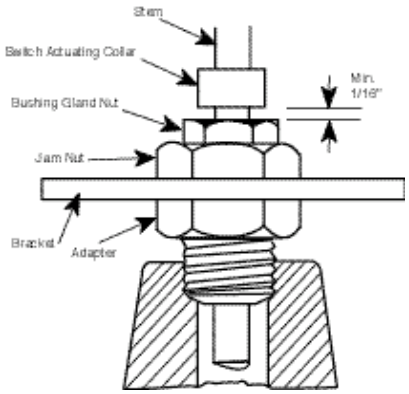


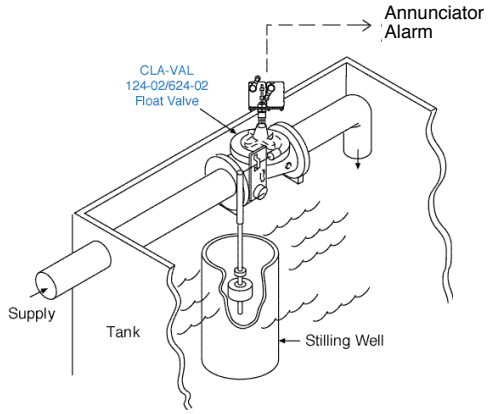
Switches shown in unactivated position.

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 24" valve) must be provided between the collar and the bushing gland nut when valve is in the fully closed position.

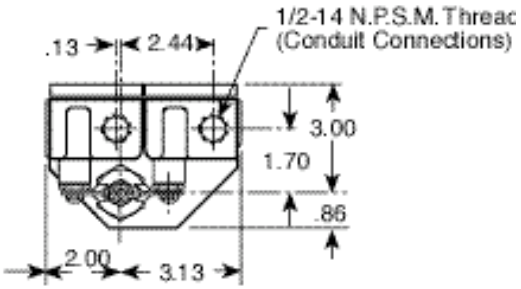




Typical Application

Used for any electrical operation which can be performed by either opening or closing a switch; such as alarm systems, process control, pump control, motor starting or stopping, etc. Readily attached to most Cla-Val Valves.

Dimensions (In Inches)



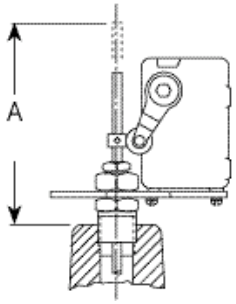


Fig. 2
Valve Size
1 1/4" Thru 24"
X105LCW
X105LCX

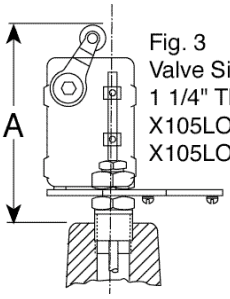


Fig. 3
Valve Size
1 1/4" Thru 8"
X105LOW
X105LOX

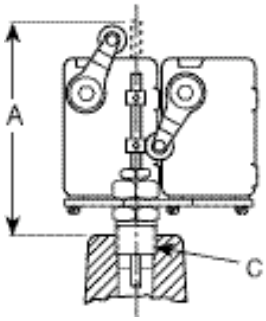


Fig. 1
Valve Size
1 1/4" Thru 8"
X105L2W
X105L2X

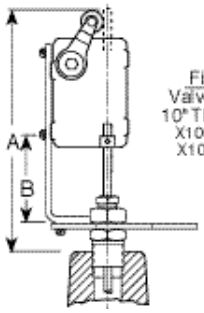


Fig. 4
Valve Size
10" Thru 24"
X105LOW
X105LOX

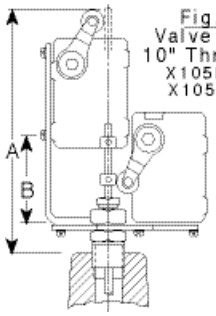


Fig. 5
Valve Size
10" Thru 30"
X105L2W
X105L2X

VALVE SIZE	11/4" & 11/2"	2" & 21/2"	3"	4"	6"	8"	10"	12"	14"	16"	20"	24"	30"
Dim "A"	10.19	7.16	7.34	7.00	6.69	6.91	9.88	9.59	9.16	10.78	10.78	10.78	10.78"
Dim "B"						1.69	2.44	2.94	2.94	2.94	2.94	2.94	2.94
C (NPT)	1/4	1/2	1/2	3/4	3/4	1	1	11/4	11/2	2	2	2	2

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
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

2 — 2

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

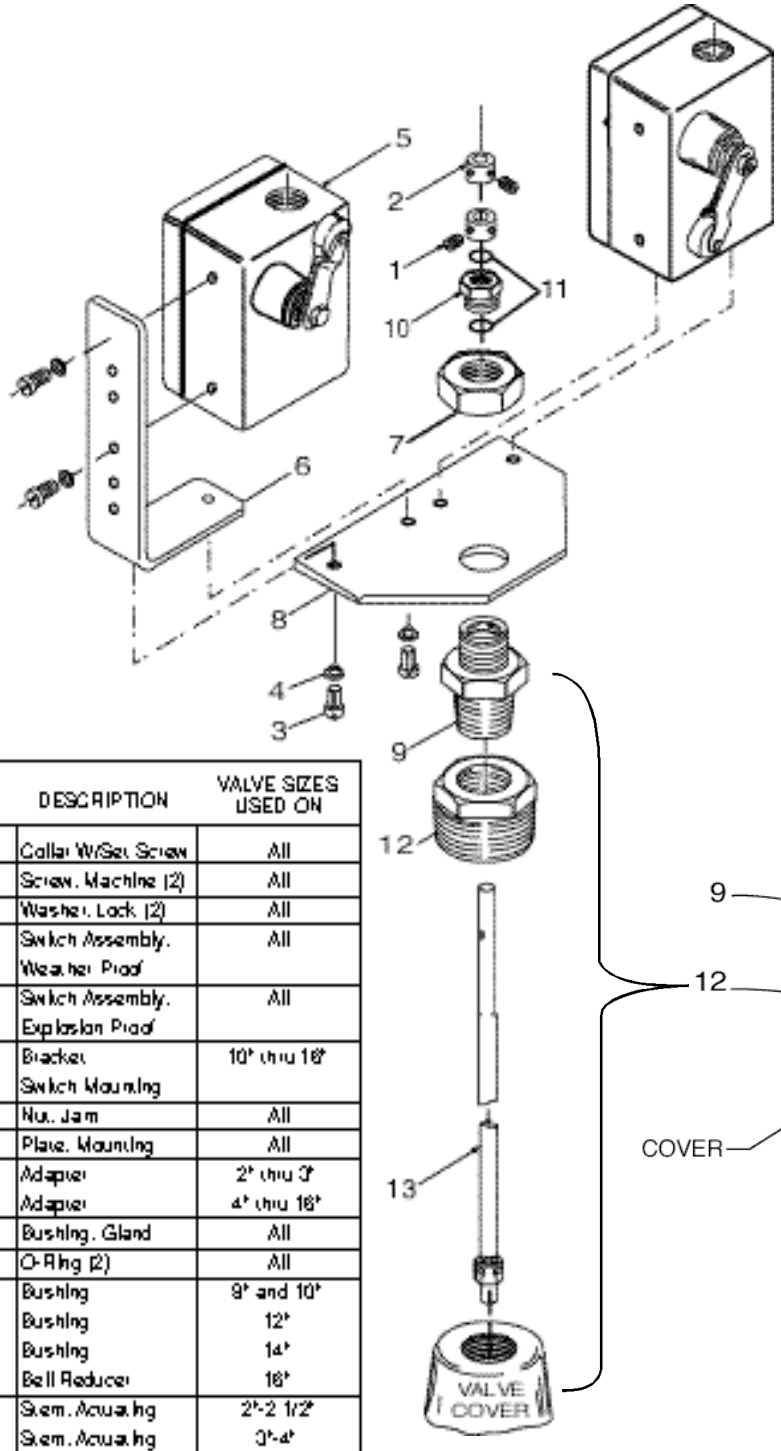
www.cla-val.com

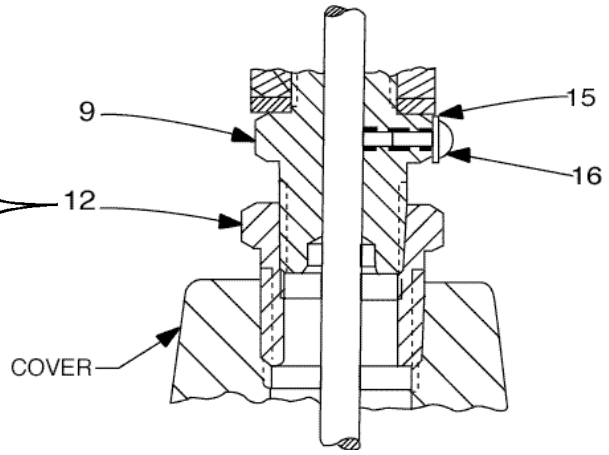
Represented By:

CLA-VAL

X105L

Limit Switch Assembly





ITEM	PART NUMBER	DESCRIPTION	VALVE SIZES USED ON
1-2	90047-01C	Collar W/Set Screw	All
3	67979-21B	Screw, Machine (2)	All
4	67994-20F	Washer, Lock (2)	All
5	34607K	Switch Assembly, Weather Proof	All
	34603J	Switch Assembly, Explosion Proof	All
6	64310G	Bracket, Switch Mounting	10" thru 16"
7	67915-08J	Nut, Jam	All
8	60874G	Plate, Mounting	All
9	2939201J	Adapter	2" thru 3"
	2939202G	Adapter	4" thru 16"
10	60399C	Bushing, Gland	All
11	00951E	O-Ring (2)	All
12	67644-17K	Bushing	8" and 10"
	67644-19H	Bushing	12"
	67644-19F	Bushing	14"
	67656-91J	Bell Reducer	16"
13	99701-01F	Stem, Actuating	2"-2 1/2"
	99701-02D	Stem, Actuating	3"-4"
	99701-03B	Stem, Actuating	6"-8"
	99701-04K	Stem, Actuating	10"-12"-14"
	99701-05G	Stem, Actuating	16"
15	6551201H	Fiber Washer	All
16	6924421K	Screw 8-32 x 3/8	All

When ordering parts, please specify:

- Item Number
- Description
- Part Number

X105L Series Adjustment Procedure

Applies to ALL X105L, X101C, X117C and X117D Series Assemblies

Bleed Air Procedure

When bleeding air out of valve cover chamber, loosen small bleed screw on Adapter (it is found on one of the large wrench flats) enough to allow air to slowly bleed from the valve cover. Do not take screw out. When a steady flow of water occurs retighten screw.

If X105L does not have bleed screw (before 1998) then use the following procedure. First, lower valve pressure below 60 psi. Loosen gland-bushing enough to allow air to slowly bleed through the threads. Do not unscrew gland-bushing too far, this will dislodge the sealing O-ring. When the gland-bushing is retightened, it can easily damage the O-ring. When a steady flow of water occurs, slowly retighten gland-bushing by hand only till no water comes out. With wrench, tighten only one-half turn or until snug. Do NOT over tighten. If water continues to leak, then the O-ring is damaged and needs to be replaced (Part number 00951E).

INITIAL ADJUSTMENT

For X105LCW, X105LCX, X117DLCW and X117DLCX Assemblies:

1. Valve must be in fully CLOSED position.

2. Adjust "roller arm" so that the wheel is close to but not touching the vertical valve actuating stem. The arm should be angled downward towards the stem.

3. Place collar on stem above wheel. Move collar down until it pushes roller away from actuating stem enough to activate switch. You should be able to hear the "click" of the switch when this occurs. Without moving collar, tighten its screw to fasten it in this position on the actuating stem. The collar should trip the switch just before the valve is fully closed.

4. A minimum gap is required of 1/16" (1/8" for 24" valves) between the collar and the gland-bushing when the valve is in the closed position. The disc in the diaphragm assembly compresses when the main valve is pressurized in the closed position. This causes the actuating collar to move closer to the gland-bushing. If sufficient spacing is not provided, the force generated causes the swivel to break and the roll pin to shear off. When this occurs, the actuating stem should be replaced.

CLA-VAL

— MODEL — **X117C**

Valve Position Transmitter

DESCRIPTION

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

INSTALLATION

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

OPERATION

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

Wiring

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

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

CALIBRATION

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ADJUSTING OPTIONAL LIMIT SWITCHES

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

1. Lift cam follower arm.

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

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

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

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

5. Release cam follower arm.

MAINTENANCE

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

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

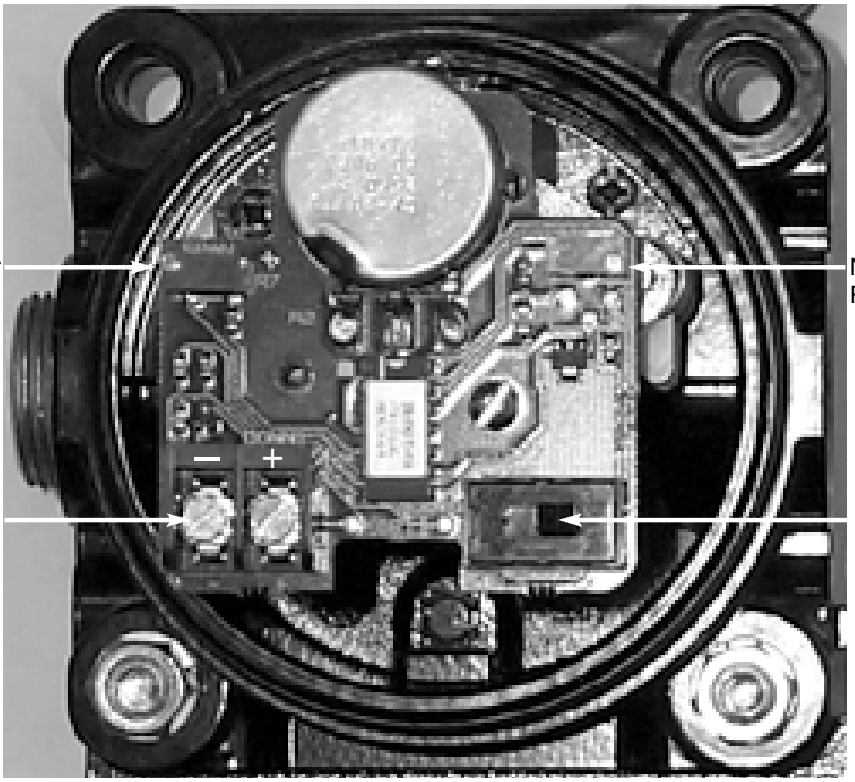


Figure 2. Rear View with Cover Removed

REFERENCE:

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

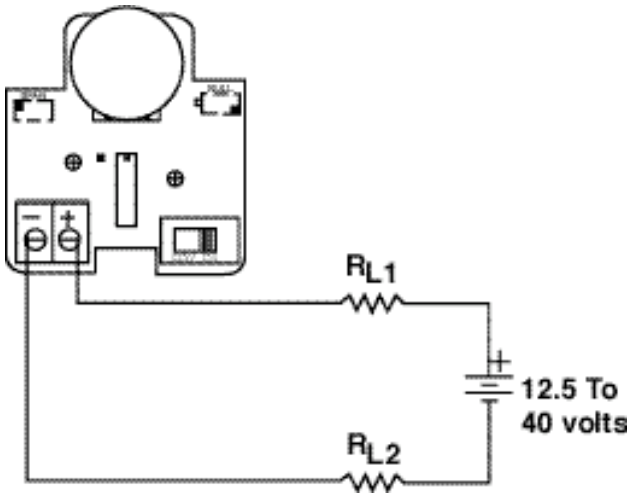
SPECIFICATIONS:

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

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

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

Typical Wiring Connections:

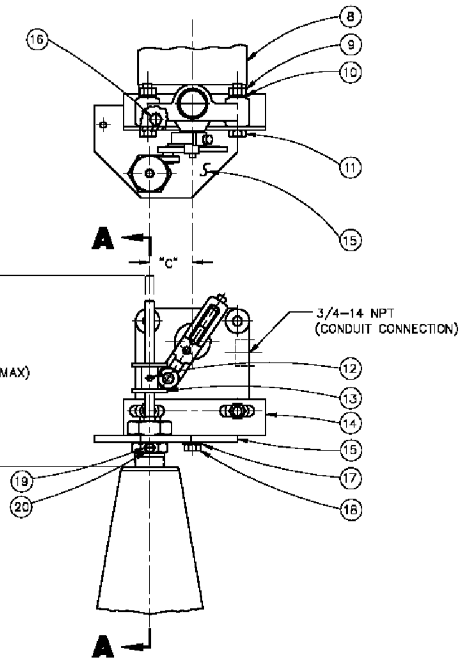


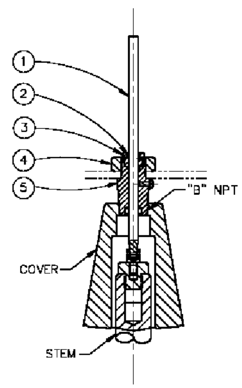
CATALOG NUMBER	SWITCH
X117C	ANALOG OUTPUT ONLY, SHORT HOUSING
X117CLS	ANALOG, 15 AMPS SPOT EXPLOSION PROOF

DWG NO. 16767 SH 1 REV C

REVISIONS

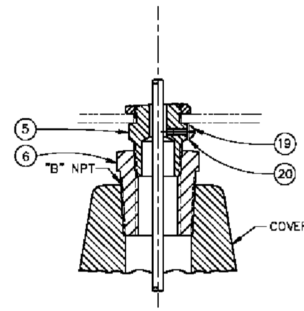
REV	DESCRIPTION	DATE	APPROVED
A-B	SEE REVISION FILE.		
C	REDRAWN ON CAD, ADDED ITEMS 19 & 20. (ECO 16671)	8-20-97	MW



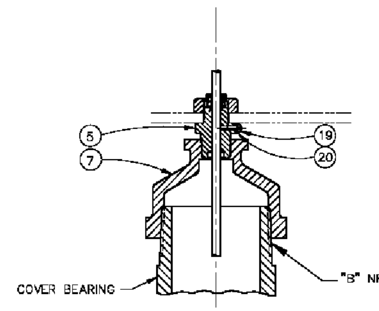


2" THRU 6" SIZES
(6" SIZE SHOWN)

SECTION A - A
(ROTATED 90° C.C.W.)



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



16" SIZE ONLY

VALVE SIZE	1 1/4" 1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	16"
"A" MAX	10.19	7.16	7.16	7.34	7.00	6.69	6.91	9.68	9.09	9.16	10.78
"B" NPT	1/4"	1/2"	1/2"	1/2"	3/4"	3/4"	1"	1"	1 1/4"	1 1/2"	2"
"C"	.50	.75	.88	1.00	1.13	1.50	1.88	2.00	2.88	3.00	3.25

PARTS LIST

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

--- DO NOT SCALE DRAWING ---

CONTRACT NO. — — — — —

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

CLA-VAL CO. NEWPORT BEACH, CALIFORNIA

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

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

SCALE N.T.S. SHEET 1 OF 1

MW 8-25-97

DIST. CODE 007A

2 - 2

CLA-VAL

— MODEL — **X117D**

Valve Position Transmitter

DESCRIPTION

The Cla-Val Model X117D Valve Position Transmitter is designed to provide analog signal (4 - 20 mA, 2 wire) output of valve position for Cla-Val Main Valves. A stem extension is fitted to the main valve stem with the position transmitter mechanically linked to it. The valve stem is mechanically linked to the electronics for an output signal that is in direct proportion to valve position. Provisions are made for bleeding air from valve cover through a small bleed screw and washer located on adapter.

INSTALLATION

Normally, the X117D is supplied mounted on the Cla-Val main valve. If X 117D has not been installed at factory, then install stem, adapter, mounting bracket with transmitter (in that order) as shown on drawing No. 200000.

OPERATION

The signal from the position sensing linkage mechanism is converted to a two-wire 4 to 20 mA current output appearing at the output terminals. The excitation voltage ranges from 12 to 35 Volts DC. The minimum supply voltage is a function of total loop resistance. It may be calculated using the formula:

V(min) = (0.02 x Load Resistance) + 12 VDC

WIRING

Loosen jam nut holding transmitter and bracket to adapter when connecting transmitter to field wiring. Tighten jam nut after connections and adjustments are made.

Use good field wiring practices for low voltage DC analog instrumentation wiring (suggest minimum of 18-gauge multistrand wire). Avoid potential ground loops. Calibration of transmitter should be done with a temporary hookup of test equipment before final wiring connections are made.

Units with NEMA 6, IP-68 enclosures have permanently attached 8' shielded cable leads. Use Red wire for positive and Black wire for negative.

Units before Feb. 2000 have NEMA 6 enclosure with MS3102E-14S-6PAmphenol plug and socket for attaching leads. Use "A" contact for positive and "B" contact for negative.

For best noise immunity, use twisted pair shielded cable to connect field wiring to the transmitter. The shield of the cable should be open at the transducer and grounded at the other end. Units with permanently attached cable are supplied with shield open inside transmitter.

CALIBRATION

1. When properly adjusted, the transmitter will have the valve closed position within 0% to 30% of total transmitter range and the valve open position within 80% to 100% of total transmitter range. At valve closed position the transmitter will have a 4 mA output and at fully open position the transmitter will have a 20 mA output.

IMPORTANT CAUTION: The transmitter wire rope mechanism is spring loaded to retract and can be damaged by a sudden release

of the wire rope. Use care to insure that it is returned to the transmitter very slowly during start up and operation. This damage may not be covered by warranty.

2. You will need the following tools to calibrate and align the X117D:
   A.) A small flat blade screwdriver (.105 Max. width x .023" max. thickness) with non-metallic handle to fit the span and null potentiometer
   B.) A 4-20 mA calibration/tester or multiamp-tester/meter or some means of measuring the 4-20 mA transmitter output
   C.) Hand tools to adjust and tighten X117D assembly during calibration

3. Preliminary mechanical settings. (Refer to Drawing No. 200000) Be sure that the valve is in the fully **closed** position. See Technical Manual for the main valve for information on this. Check that line isolation or block valves are closed.

Adjust Nut Coupler (9) up or down on stem until gap between wire rope end and transmitter housing is according to table (below). The Hex Coupler (10) is used to tighten nut coupler to stem. A minimum gap is required, see Reference Table. (Refer to Drawing No. 200000)

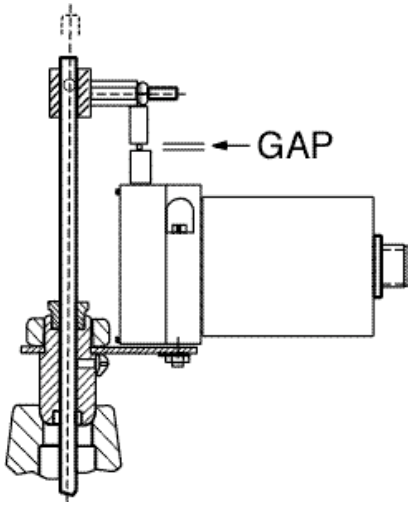
Long threaded end of Hex Coupler (10) has two hex nuts (11) for adjusting position of end of wire rope directly over the opening in the top of the transmitter. Use one hex nut on each side of the wire rope end. Wire rope should go vertically up and down without noticeable angle from vertical.

4. Temporarily connect calibration equipment (milliamp meter and power supply or portable instrumentation tester) to transmitter wiring. Calculate total loop resistance to determine minimum load resistor. See OPERATION section. Remove two calibration cover screws found on housing end.

Refer to calibration equipment and adjust transmitter potentiometer marked “NULL” until the meter reads 4 mA. A clockwise turn increases output. Use care in adjusting the potentiometer while turning the screwdriver.

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

6. With valve in fully open position, inspect position of wire rope and nut coupler. (See Step 3). Adjust if necessary.



Coupler gap is set with valve in fully closed position. This establishes the minimum mechanical position for 4 mA output.

ADJUSTMENT: Zero and span adjustments allow setting the 4 mA position (valve closed) within 0% to 30% of total transmitter range and setting the 20 mA position (valve fully open) within 80% to 100% of total transmitter range.

Refer to calibration equipment (see Step 4) and adjust potentiometer marked “SPAN” until the meter reads 20 mA. A clockwise turn increases output. Use care in adjusting the potentiometer while turning the screwdriver.

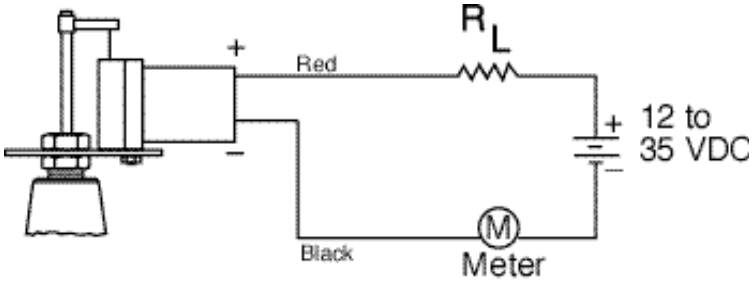
7. There is some interplay between:
   1.) the “span” and “null” settings,
   2.) the 4 to 20 mA signal and,
   3.) the actual valve open and closed positions.

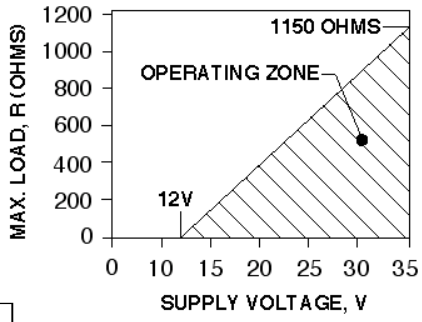
Repeat steps 4-6 above. Cycle valve from open to closed positions and check settings as necessary to achieve desired valve position signal accuracy.

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

MAINTENANCE

The X117D is constructed of durable materials which normally requiring no lubrication or periodic maintenance. The two ‘O’ rings (2) (p/n 00951E) in the adapter (5) that seal against the stainless steel actuating stem (1) will need replacement if signs of leakage at the stem occur.

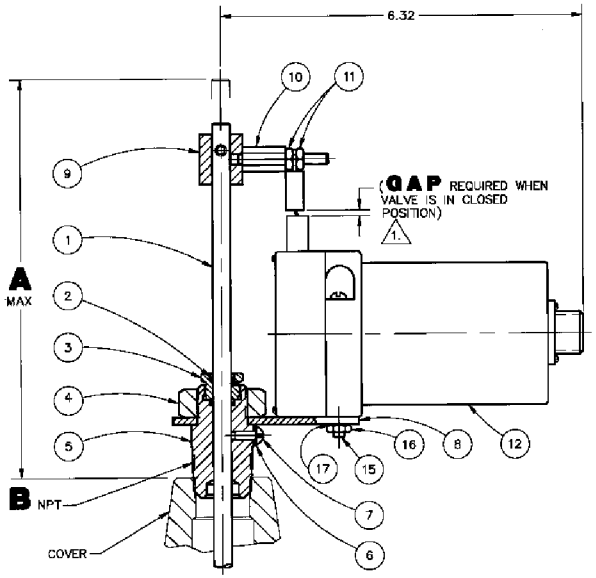




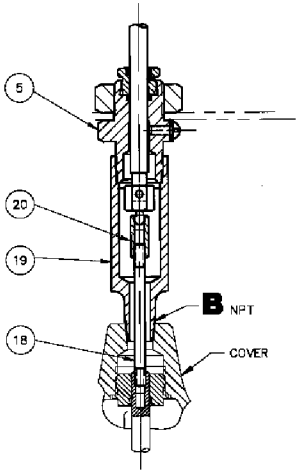
X117D Part Number	Valve Size (inch) 100-01	Valve Size (inch) 100-20	Valve Stem Travel (inch)	“GAP” Coupler Setting **GAP** (inch)	Transmitter Total Range
20000019F	1 1/4		0.400	3/16"	1"
20000019F	1 1/2		0.490	3/16"	1"
20000020A	2	3	0.590	1/8"	1"
20000020A	2 1/2		0.714	1/16"	1"
20000021A	3		0.835	1/16"	1"
20000001A	4	6	1.109	9/16"	2"
20000002A	6	8	1.584	3/16"	2"
20000003A	8	10	2.242	7/16"	3"
20000004A	10	12	2.711	1/8"	3"
20000005A	12	16	3.343	5/16"	4"
20000006A	14	N/A	3.920	9/16"	5"
20000007K	16	20 & 24	4.584	3/16"	5"
20000008J	24	N/A	6.504	2 1/4"	10"

DWG NO. 200000 SH 1 REV D

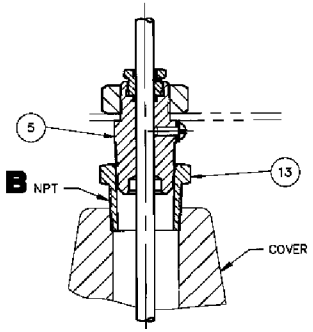
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
–	RELEASED FOR PRODUCTION. (NED 43195)	5-18-98	VL
A	ADDED BALLOON CALLOUTS 15, 16 & 17 & NO.15, 16 & 17 TO PART LIST (ECO 17225)	6-10-98	AK
B	REVISED DIM "A" FOR ALL SIZES (ECO 17739)	6-4-99	AK
C	CHANGED QUANTITY OF ITEM 11 FROM 1 TO 2; REMOVED DIM. .200/.100 GAP AND ADDED GAP DIM. TO THE TABLE (ECO 18357)	10-11-00	AK
D	ADDED SIZES 1 1/4", 1 1/2", 2", 2 1/2" & 3" TO THE DWG (NED 46402)	10-01-01	AK



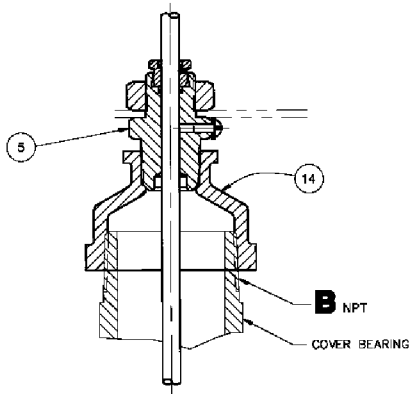
2", 2 1/2", 3", 4" & 6" SIZES ONLY
(4" SIZE SHOWN)



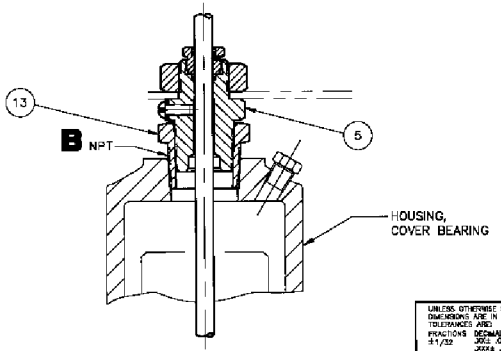
1 1/4" & 1 1/2" SIZES ONLY
(1 1/4" SIZE SHOWN)



8", 10", 12" & 14" SIZES ONLY
(8" SIZE SHOWN)



16" SIZE ONLY



24" SIZE ONLY

VALVE SIZE	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"	6"	8"	10"	12"	14"	16"	24"
A (MAX)	10.68	10.68	7.75	7.50	7.65	10.00	10.00	10.62	10.75	11.44	12.75	12.75	14.75
B NPT	1/4"	1/4"	1/2"	1/2"	1/2"	3/4"	3/4"	1"	1"	1 1/4"	1 1/2"	2"	1"
GAP	1/8"	1/8"	1/8"	1/8"	1/8"	1/2"	1/16"	3/8"	1/16"	1/16"	1/8"	1/16"	1 1/2"

ITEM NO.	QTY REQD	NOMENCLATURE OR DESCRIPTION
20	1	ADAPTER, STEM (1 1/4" & 1 1/2" SIZES ONLY)
19	1	ADAPTER, SWITCH ASSY (1 1/4" & 1 1/2" SIZES ONLY)
18	1	STUD (1 1/4" & 1 1/2" SIZES ONLY)
17	2	LOCKWASHER #10
16	2	NUT, HEX
15	2	SCREW, FILLISTER HEAD 10-32 X 2.50
14	1	REDUCER, BELL PIPE (16" SIZE ONLY)
13	1	BUSHING, HEX PIPE (8"-14" & 24" SIZES ONLY)
12	1	TRANSDUCER ASSEMBLY, POSITION
11	2	NUT, HEX 10-32
10	1	HEX, COUPLER
9	1	NUT, COUPLER
8	1	PLATE, MOUNTING
7	1	SCREW, RDH 8-32 X 3/8"
6	1	WASHER, FIBER
5	1	ADAPTER
4	1	NUT, HEX (ASF JAM)
3	1	BUSHING, GLAND
2	2	O-RING
1	1	STEM ASSEMBLY

PARTS LIST

1. GAP IS SET WITH VALVE IN FULLY CLOSED POSITION. THIS ESTABLISHES THE MINIMUM MECHANICAL POSITION FOR 4mA OUTPUT.

NOTE: UNLESS OTHERWISE SPECIFIED.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. TOLERANCES ARE: FRACTIONS DECIMALS ANGULAR ±1/32 .XXX ±.01 ±.5° .XX ±.02 .XXX ±.010 MAX = +.00 -.03 MIN = +.03 -.00 SURFACE FINISH 125 BREAK CORNERS .010 MAX —DO NOT SCALE DRAWING—

CONTRACT NO. ———

APPROVALS	DATE
DRAWN VL	5-18-98
CHECKED CE	6-2-98
APPROVED EK	6-2-98
ENGR	

CLA-VAL CO. NEWPORT BEACH, CALIFORNIA

TITLE: X117D VALVE POSITION TRANSMITTER 1 1/4" – 24" SIZE

SIZE D | CAGE CODE 86184 | DWG NO. 200000 | REV D

SCALE 1/1 | SHEET 1 OF 1

AK 10-23-01

DIST CODE 007