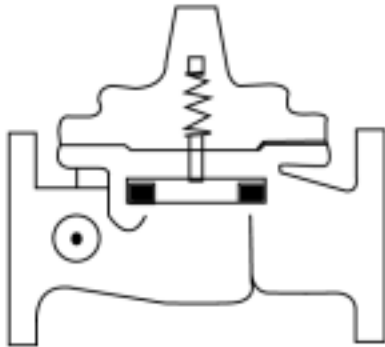


CLA-VAL

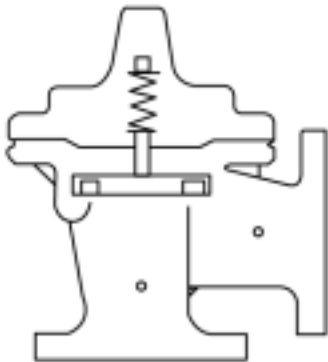
AUTOMATIC CONTROL VALVES

210-16/610-16

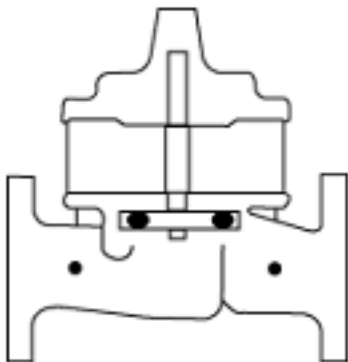
Place this manual with personal responsible
for maintenance of this valve



INSTALLATION



OPERATION



MAINTENANCE



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SHEET 2 OF 3

 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO. 210-16/610-16	DRAWING NO. 85007	REV H
	TYPE OF VALVE AND MAIN FEATURES ALTITUDE VALVE (WITH CDS6) EQUIPPED WITH RETURN FLOW FEATURE		DESIGN DRAW RNF 10-20-80 CHK'D MDR 10-23-80 APYD CH 10-23-80

OPERATING DATA

I. ALTITUDE VALVE FEATURE:

ALTITUDE CONTROL (2) IS A SPRING LOADED, 3-WAY, DIAPHRAGM ACTUATED CONTROL THAT SENSES PRESSURE IN THE RESERVOIR. WHEN RESERVOIR PRESSURE (LIQUID LEVEL) IS LOWER THAN THE SET POINT OF CONTROL (2), PORTS "1" AND "D" ARE INTERCONNECTED. THIS RELIEVES MAIN VALVE COVER PRESSURE TO ATMOSPHERE AND THE MAIN VALVE OPENS TO FILL THE RESERVOIR. RESERVOIR SENSING PRESSURE INCREASES AS THE LIQUID LEVEL RISES IN THE RESERVOIR. WHEN RESERVOIR PRESSURE INCREASES TO THE SET POINT OF CONTROL (2), CONTROL (2) SHIFTS, INTERCONNECTING PORTS "S" AND "1". THIS PRESSURIZES THE MAIN VALVE COVER AND THE MAIN VALVE CLOSES. ALTITUDE CONTROL (2) ADJUSTMENT: TURN THE SPRING ADJUSTING NUT CLOCKWISE TO INCREASE THE LIQUID LEVEL SHUTOFF POINT; COUNTERCLOCKWISE TO DECREASE THE LIQUID LEVEL SHUTOFF POINT.

II. RETURN FLOW FEATURE:

WHEN OUTLET PRESSURE IS HIGHER THAN INLET PRESSURE, SWING CHECK VALVE (5) OPENS. THIS RELIEVES MAIN VALVE COVER PRESSURE TO THE NORMAL INLET OF THE MAIN VALVE AND THE MAIN VALVE OPENS FOR RETURN FLOW.

III. CLOSING SPEED CONTROL:

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

IV. OPTIONAL FEATURE OPERATING DATA:

SUFFIX A (FLOW CLEAN STRAINER)

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

SUFFIX B (ISOLATION VALVES)

CK2 COCKS (B1) & (B2) ARE USED TO ISOLATE THE PILOT SYSTEM FROM MAIN LINE PRESSURE. THESE VALVES MUST BE OPEN DURING NORMAL OPERATION.

SUFFIX H (PILOT DRAIN TO OUTLET)

CDC CHECK VALVE (H) IS USED WHEN PILOT DRAIN TO ATMOSPHERE IS NOT DESIRED. WHEN OUTLET PRESSURE IS HIGHER THAN INLET PRESSURE, CHECK VALVE (H) CLOSES.

CAD REVISION RECORD - DO NOT REVISE MANUALLY


DATE	
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SEE SHEET 1.	
LTR	

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SHEET 3 OF 3

 CLA-VAL CO. NEWPORT BEACH, CALIFORNIA	CATALOG NO.	DRAWING NO.	REV
	210-16/610-16	85007	H
TYPE OF VALVE AND MAIN FEATURES		DESIGN	
ALTITUDE VALVE (WITH CDS6) EQUIPPED WITH RETURN FLOW FEATURE		DRAW	RNF 10-20-80
		CHK'D	MDR 10-23-80
		APVD	CH 10-23-80

OPERATING DATA-CONTINUED

SUFFIX S (OPENING SPEED CONTROL)

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

SUFFIX Y (Y-STRAINER)

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

V. CHECK LIST FOR PROPER OPERATION:

- () SYSTEM VALVES OPEN UPSTREAM AND DOWNSTREAM.
- () AIR REMOVED FROM THE MAIN VALVE COVER AND PILOT SYSTEM AT ALL HIGH POINTS.
- () CK2 COCKS (B1) & (B2) OPEN (OPTIONAL FEATURE).
- () PERIODIC CLEANING OF STRAINER (Y) IS RECOMMENDED (OPTIONAL FEATURE).
- () CV FLOW CONTROL (6) OPEN AT LEAST 1/4 TURN.
- () CV FLOW CONTROL (S) OPEN AT LEAST 1/4 TURN (OPTIONAL FEATURE).
- () RESERVOIR SENSING LINE PROPERLY CONNECTED.
- () CK2 COCK (7) OPEN DURING NORMAL OPERATION.

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INSTALLATION / OPERATION / MAINTENANCE



— MODEL — **100-01**
Hytrol Valve

Description

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

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



Installation

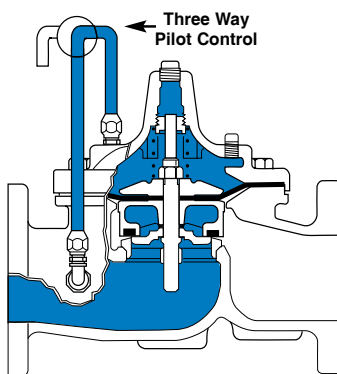
1. Before valve is installed, pipe lines should be flushed of all chips, scale and foreign matter.
2. It is recommended that either gate or block valves be installed on both ends of the 100-01 Hytrol Valve to facilitate isolating the valve for preventive maintenance and repairs.
3. Place the valve in the line with flow through the valve in the direction indicated on the inlet nameplate. (See "Flow Direction" Section)
4. Allow sufficient room around valve to make adjustments and for disassembly.
5. Cla-Val 100-01 Hytrol Valves operate with maximum efficiency when mounted in horizontal piping with the cover UP, however,

other positions are acceptable. Due to size and weight of the cover and internal components of 8 inch and larger valves, installation with the cover UP is advisable. This makes internal parts readily accessible for periodic inspection.

6. If a pilot control system is installed on the 100-01 Hytrol Valve, use care to prevent damage. If it is necessary to remove fittings or components, be sure they are kept clean and replaced exactly as they were.

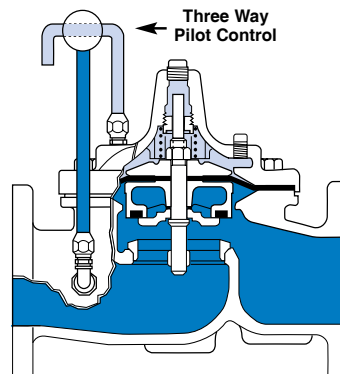
7. After the valve is installed and the system is first pressurized, vent air from the cover chamber and pilot system tubing by loosening fittings at all high points.

Principles of Operation



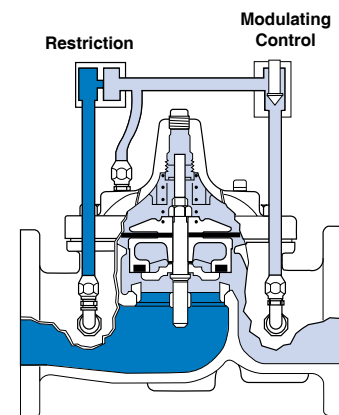
Tight Closing Operation

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



Full Open Operation

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

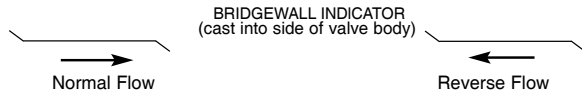


Modulating Action

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

Flow Direction

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



Recommended Tools

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

Troubleshooting

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

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

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

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

Three Checks

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

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

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

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

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

Diaphragm Check (#1)

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

COVER CHAMBER CAPACITY

(Liquid Volume displaced when valve opens)

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

Freedom of Movement Check (#2)

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

STEM TRAVEL

(Fully Open to Fully Closed)

Valve Size (inches)		Travel (inches)	
Inches	MM	Inches	MM
1 1/4	32	0.4	10
1 1/2	40	0.4	10
2	50	0.6	15
2 1/2	65	0.7	18
3	80	0.8	20
4	100	1.1	28
6	150	1.7	43
8	200	2.3	58
10	250	2.8	71
12	300	3.4	86
14	350	4.0	100
16	400	4.5	114
24	610	6.5	165

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

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

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

Tight Sealing Check (#3)

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

Maintenance

Preventative Maintenance

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

Disassembly

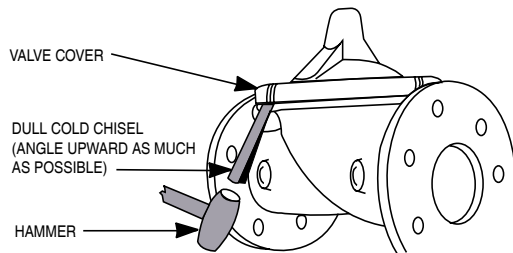
Inspection or maintenance can be accomplished without removing the valve from the line. Repair kits with new diaphragm and disc are recommended to be on hand before work begins.

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

1. Close upstream and downstream isolation valves **and independent operating pressure when used** to shut off all pressure to the valve.

2. Loosen tube fittings in the pilot system to remove pressure from valve body and cover chamber. After pressure has been released from the valve, use care to remove the controls and tubing. Note and sketch position of tubing and controls for re-assembly. The schematic in front of the Technical Manual can be used as a guide when reassembling pilot system.

3. Remove cover nuts and remove cover. If the valve has been in service for any length of time, chances are the cover will have to be loosened by driving upward along the edge of the cover with a **dull cold chisel**.



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

COVER CENTER PLUG SIZE

Valve Size	Thread Size (NPT)
1 1/4" — 1 1/2"	1/4"
2" — 3"	1/2"
4" — 6"	3/4"
8" — 10"	1"
12"	1 1/4"
14"	1 1/2"
16"	2"
24"	4 1/4"

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

VALVE STEM THREAD SIZE

Valve Size	Thread Size (UNF Internal)
1 1/4" — 2 1/2"	10 — 32
3" — 4"	1/4 — 28
6" — 14"	3/8 — 24
16"	1/2 — 20
24"	3 — 12

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

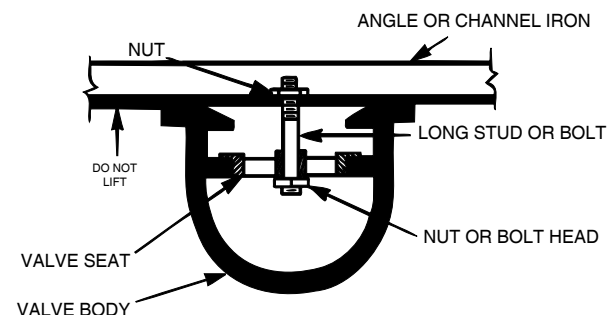
The use of a pipe wrench or a vise without soft brass jaws scars the fine finish on the stem. No amount of careful dressing can restore the stem to its original condition. Damage to the finish of the stem can cause the stem to bind in the bearings and the valve will not open or close.

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

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

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

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



Lime Deposits

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

Inspection of Parts

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

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

Reassembly

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

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

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

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

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

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

Test Procedure After Valve Assembly

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

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

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

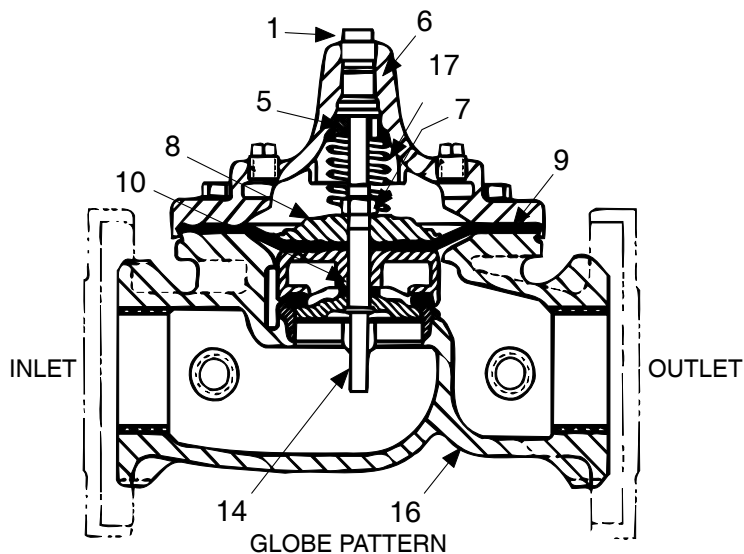
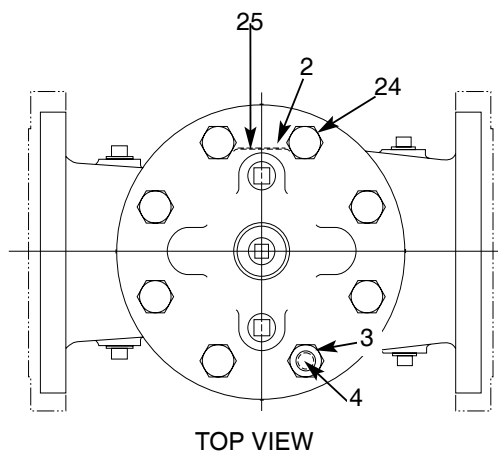
Due to the weight of the diaphragm assembly this procedure is not possible on valves 8" and larger. on these valves, the same determination can be made by carefully introducing a low pressure-less than five psi) into the valve body with the cover vented. **SEE CAUTION.** Looking in cover center hole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

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

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

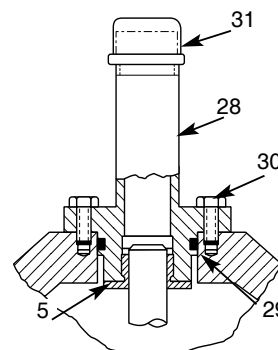
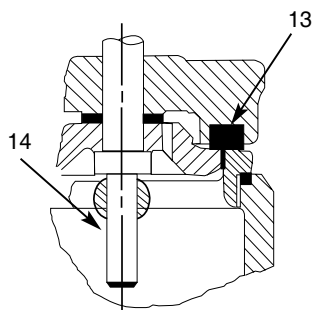
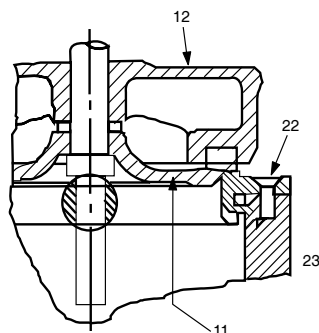
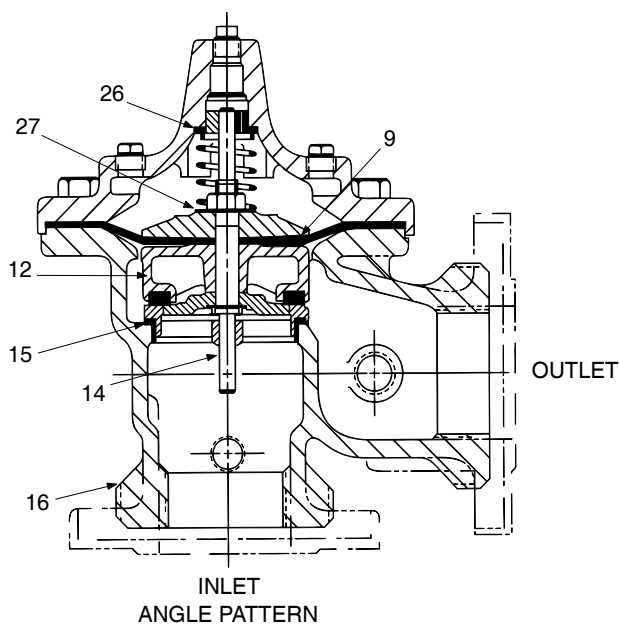
4. Remove pressure, then re-install the pilot system and tubing exactly as it was prior to removal. **Bleed air from all high points.**

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



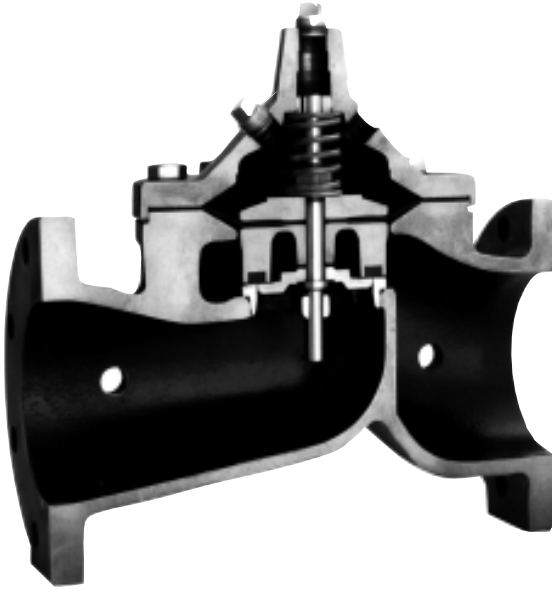
PARTS LIST

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





— MODEL — **100-20**
600 Series
Hytrol Valve



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

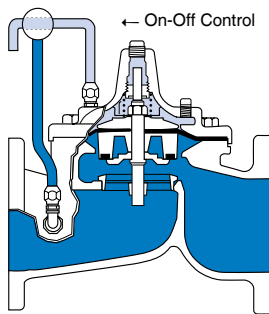
The Cla-Val Model 100-20 Hytrol Valve is a hydraulically operated, diaphragm actuated, globe or angle pattern valve. It consists of three major components: body, diaphragm assembly and cover. The diaphragm assembly is the only moving part.

The diaphragm assembly is guided top and bottom by a precision machined stem which utilizes a non-wicking diaphragm of nylon fabric bonded with synthetic rubber. A resilient synthetic rubber disc, retained on three and one-half sides by a disc retainer, forms a drip-tight seal with the renewable seat when pressure is applied above the diaphragm.

The reduced cavitation characteristics of the 100-20 Hytrol Valve is the basis for the Cla-Val 600 Series. The rugged simplicity of design and packless construction assure a long life of dependable, trouble-free operation. It's smooth flow passages and fully guided disc and diaphragm assembly assure optimum control when used in piping systems requiring remote control, pressure regulation, solenoid operation, rate of flow control or check valve operation.

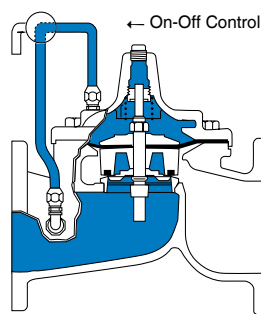
Available in various materials and in a wide range of sizes. It's applications are unlimited.

Principle of Operation



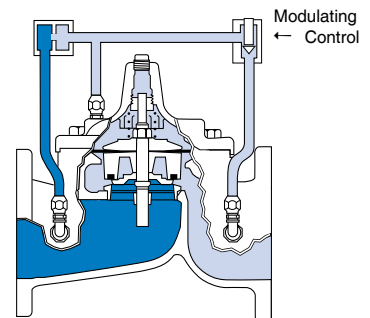
Full Open Operation

When pressure in the cover chamber is relieved to a zone of lower pressure, the line pressure at the valve inlet opens the valve, allowing full flow.



Tight Closing Operation

When pressure from the valve inlet is applied to the cover chamber, the valve closes drip-tight.



Modulating Action

The valve holds any intermediate position when operating pressure is equal above and below the diaphragm. Using a Cla-Val "Modulating" Control will allow the valve to automatically compensate for line pressure changes.



Specifications

Model 100 -20

Available Sizes

Pattern	Flanged
Globe	3", 4", 6", 8", 10", 12", 14", 16", 18", 20", 24", 30"
Angle	4", 6", 8"

Operating Temp. Range

Fluids
-40° to 180° F

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 lb.	300 lb.
ASTM A536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
ASTM B62	Bronze	B16.24	225	400
ASTM A743	Stainless Steel	B16.5	285	400
356-T6	Aluminum	B16.1	275	—

Note: *ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.

Materials

Component	Material Options				
	Ductile Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Body & Cover	Ductile Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Available Sizes	3" - 30"	3" - 30"	3" - 16"	3" - 16"	3" - 16"
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze	Stainless Steel	Aluminum
Trim: Disc Guide, Seat & Cover Bearing	Bronze is standard. Stainless Steel is optional.			Stainless Steel is standard.	
Disc	Buna-N® Rubber				
Diaphragm	Nylon Reinforced Buna-N® Rubber				
Stem, Nut & Spring	Stainless Steel				

Options

Epoxy Coating - suffix KC

An FDA approved fusion bonded epoxy coating for use with cast iron, ductile iron or steel valves. This coating is resistant to various water conditions, certain acids, chemicals, solvents and alkalis. Epoxy coatings are applied in accordance with AWWA coating specifications C550-90. Do not use with temperatures above 175° F.

Dura-Kleen® Stem - suffix KD

This stem is designed for applications where water supplies containing dissolved minerals create deposits that build-up on a standard stem and hamper valve operation. A patented self-cleaning design on the stem allows all valve sizes to operate freely in the harshest conditions.

Delrin® Sleeved Stem - suffix KG

The Delrin® sleeved stem is designed for applications where water supplies contain

dissolved minerals which can form deposits that build up on the valve stem and hamper valve operation. Scale build-up will not adhere to the Delrin® sleeve stem. Delrin® sleeved stems are not recommended for valves in continuous operation where differential pressures are in excess of 80 psi (2" and larger Hytrol valves).

Water Treatment Clearance - suffix KW

This additional clearance is beneficial in applications where water treatment compounds can interfere with the closing of the valve. The smaller outside diameter disc guide provides more clearance between the disc guide and the valve seat. This option is best suited for valves used in on-off (non-modulating) service.

Viton® Rubber Parts - suffix KB

Optional diaphragm, disc and o-ring fabricated with Viton® synthetic rubber. Viton® is well suited for use with mineral

acids, salt solutions, chlorinated hydrocarbons, and petroleum oils; and is primarily used in high temperature applications up to 250° F. Do not use with epoxy coatings above 175° F.

Heavy Spring - suffix KH

The heavy spring option is used in applications where there is low differential pressure across the valve, and the additional spring force is needed to help the valve close. This option is best suited for valves used in on-off (non-modulating) service.

For assistance in selecting appropriate valve options or valves manufactured with special design requirements, please contact our Regional Sales Office or Factory.



3" Globe, Flanged



6" Globe, Flanged



6" Angle, Flanged

Functional Data

Model 100 - 20

Valve Size		Inches	3	4	6	8	10	12	14	16	18	20	24	30
		mm.	80	100	150	200	250	300	350	400	460	510	610	760
C _V Factor	Globe Pattern	Gal./Min. (gpm)	62	136	229	480	930	1458	1725	2110	2940	3400*	3500*	7900*
		Litres/Sec. (l/s)	15	32.5	55	115	223	350	414	506	705	816	840	1895
	Angle Pattern	Gal./Min. (gpm)	—	135	233	545	—	—	—	—	—	—	—	—
		Litres/Sec. (l/s)	—	32	56	132	—	—	—	—	—	—	—	—
Equivalent Length of Pipe	Globe Pattern	Feet (ft)	293	251	777	748	621	654	750	977	983	1125	3005	2130
		Meters (m)	89.3	76.4	237.1	228.1	189.5	199.4	228.7	298.1	299.9	343.2	916.6	649.6
	Angle Pattern	Feet (ft)	—	254	751	580	—	—	—	—	—	—	—	—
		Meters (m)	—	77.6	229	176.9	—	—	—	—	—	—	—	—
K Factor	Globe Pattern		20.6	12.7	23.1	15.7	10.4	8.5	8.9	10.2	8.4	8.8	19.1	10.5
	Angle Pattern		—	12.9	22.3	12.2	—	—	—	—	—	—	—	—
Liquid Displaced from Diaphragm Chamber When Valve Opens	Fl. Oz		—	—	—	—	—	—	—	—	—	—	—	—
	U.S. Gal.		.032	.08	.17	.53	1.26	2.51	4	4	9.6	9.6	9.6	29.0
	ml		—	—	—	—	—	—	—	—	—	—	—	—
	Litres		.12	.30	.64	2.0	4.8	9.5	15.1	15.1	36.2	36.2	36.2	110

*Estimated

C_V Factor

Formulas for computing C_V Factor, Flow (Q) and Pressure Drop (ΔP):

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

K Factor (Resistance Coefficient)

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

Equivalent Length of Pipe

Equivalent lengths of pipe (L) are determined from the formula: $L = \frac{Kd}{12f}$
(U.S. system units)

Fluid Velocity

Fluid velocity can be calculated from the following formula: $V = \frac{.4085 Q}{d^2}$
(U.S. system units)

Where:

C_V = U.S. (gpm) @ 1 psi differential at 60° F water

□ □ □ or

□ = (l/s) @ 1 bar (14.5 PSIG) differential at 15° C water

d = inside pipe diameter of Schedule 40 Steel Pipe (inches)

f = friction factor for clean, new Schedule 40 pipe

□ (dimensionless) (from Cameron Hydraulic Data,

□ 18th Edition)

K = Resistance Coefficient (calculated)

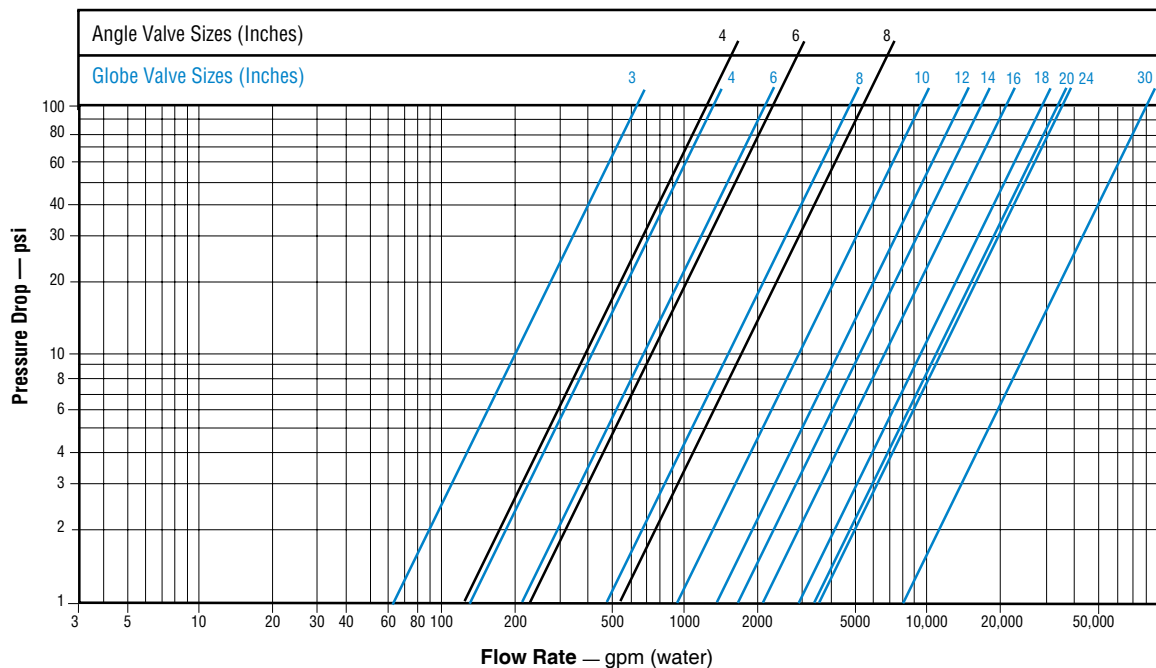
L = Equivalent Length of Pipe (feet)

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

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

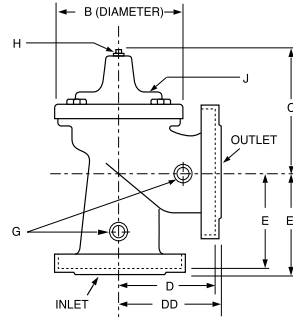
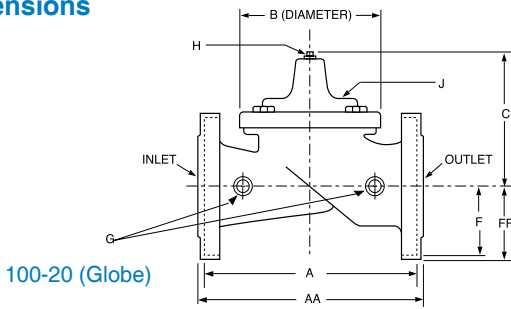
ΔP = Pressure Drop in (psi) or (bar)

Model 100-20 Flow Chart (Based on normal flow through a wide open valve)



Dimensions

Model 100 -20



100-20 (Globe)

100-20 (Angle)

VALVE SIZE (Inches)	3	4	6	8	10	12	14	16	18	20	24	30
A 150 ANSI	10.25	13.88	17.75	21.38	26.00	30.00	34.25	35.00	42.12	48.00	48.00	63.25
AA 300 ANSI	11.00	14.50	18.62	22.38	27.38	31.50	—	36.62	43.63	49.62	49.75	—
B DIA.	6.62	9.12	11.50	15.75	20.00	23.62	28.00	28.00	35.44	35.44	35.44	53.19
C MAX.	7.00	8.62	11.62	15.00	17.88	21.00	20.88	25.75	25.00	31.00	31.00	43.94
D 150 ANSI	—	6.94	8.88	10.69	—	—	—	—	—	—	—	—
DD 300 ANSI	—	7.25	9.38	11.19	—	—	—	—	—	—	—	—
E 150 ANSI	—	5.50	6.75	7.25	—	—	—	—	—	—	—	—
EE 300 ANSI	—	5.81	7.25	7.75	—	—	—	—	—	—	—	—
F 150 ANSI	3.75	4.50	5.50	6.75	8.00	9.50	11.00	11.75	15.88	14.56	17.00	19.88
FF 300 ANSI	4.12	5.00	6.25	7.50	8.75	10.25	—	12.75	15.88	16.06	19.00	—
G NPT Body Tapping	3/8	1/2	3/4	3/4	1	1	1	1	1	1	1	1
H NPT Cover Center Plug	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	2	2	2	2
J NPT Cover Tapping	3/8	1/2	3/4	3/4	1	1	1	1	1	1	1	1
Valve Stem Internal Thread UNF	10-32	1/4-28	1/4-28	3/8-24	3/8-24	3/8-24	3/8-24	3/8-24	1/2-20	1/2-20	1/2-20	3/4-16
Stem Travel	0.6	0.8	1.1	1.7	2.3	2.8	3.4	3.4	4.5	4.5	4.5	6.5
Approx Ship Wt. Lbs.	45	85	195	330	625	900	1250	1380	1500	2551	2750	6500

VALVE SIZE (mm)	80	100	150	200	250	300	350	400	450	500	600	750
A 150 ANSI	260	353	451	543	660	762	870	889	1070	1219	1219	1607
AA 300 ANSI	279	368	473	568	695	800	—	930	1108	1260	1263	—
B DIA.	168	232	292	400	508	600	711	711	900	900	900	1351
C MAX.	178	219	295	381	454	533	530	654	635	787	787	1116
D 150 ANSI	—	176	226	272	—	—	—	—	—	—	—	—
DD 300 ANSI	—	184	238	284	—	—	—	—	—	—	—	—
E 150 ANSI	—	140	171	184	—	—	—	—	—	—	—	—
EE 300 ANSI	—	148	184	197	—	—	—	—	—	—	—	—
F 150 ANSI	95	114	140	171	203	241	279	298	403	370	432	505
FF 300 ANSI	105	127	159	191	222	260	—	324	403	408	483	—
G NPT Body Tapping	3/8	1/2	3/4	3/4	1	1	1	1	1	1	1	1
H NPT Cover Center Plug	1/2	1/2	3/4	3/4	1	1	1 1/4	1 1/4	2	2	2	2
J NPT Cover Tapping	3/8	1/2	3/4	3/4	1	1	1	1	1	1	1	1
Valve Stem Internal Thread UNF	10-32	1/4-28	1/4-28	3/8-24	3/8-24	3/8-24	3/8-24	3/8-24	1/2-20	1/2-20	1/2-20	1/2-20
Stem Travel	15	20	28	43	58	71	86	86	86	114	114	165
Approx. Ship Wt. Kgs.	20	39	89	150	284	409	568	627	681	1157	1249	2951

Service and Installation

Cla-Val Control Valves operate with maximum efficiency when mounted in horizontal piping with the main valve cover UP, however, other positions are acceptable. Due to component size and weight of 10 inch and larger valves, installation with cover UP is advisable. We recommend isolation valves be installed on inlet and outlet for maintenance. Adequate space above and around the valve for service personnel should be considered essential. A regular maintenance program should be established based on the specific application data. However, we recommend a thorough inspection be done at least once a year. Consult factory for specific recommendations.



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Technical Bulletin



CDS6 Improvements

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.

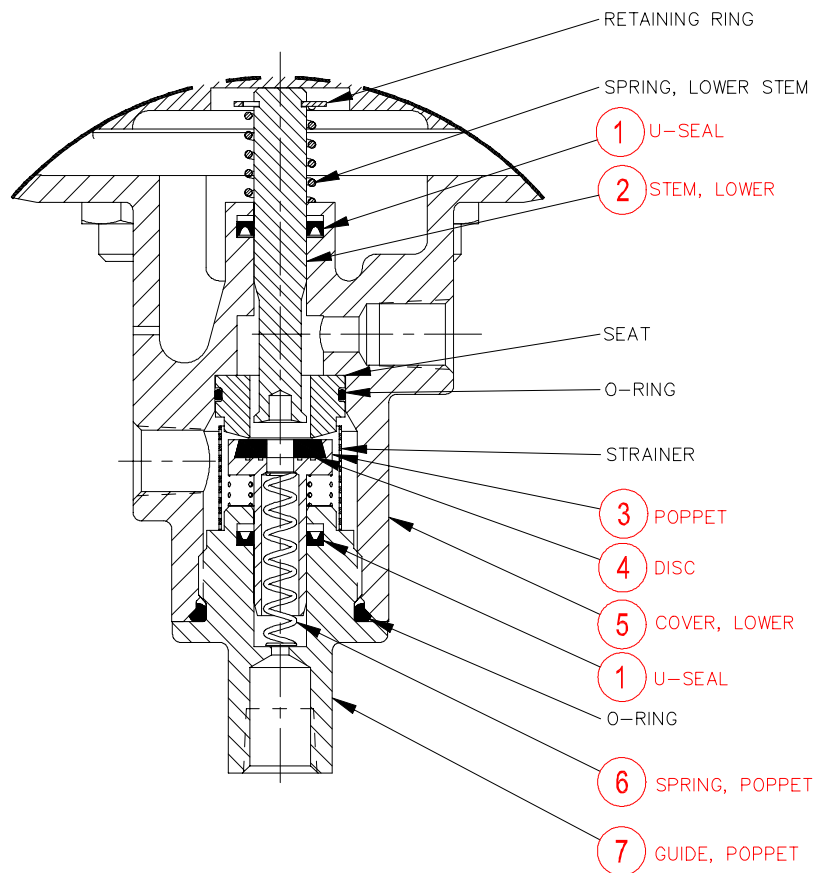
New parts inside the CDS6A are a) stem seals, b) disc and poppet assembly, c) lower stem, d) lower cover, e) poppet guide, and f) poppet spring. The CDS6A uses new low-friction seals on the lower stem and the disc and poppet assembly. Also, the new stem and poppet have a special low-friction nickel-Teflon 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.

Range (ft)	size	p/n	size	p/n
5 - 40	2 ½" & larger	20354701K	2" & smaller	20354706E
30 - 80	2 ½" & larger	20354702J	2" & smaller	20354707D
70 - 120	2 ½" & larger	20354703H	2" & smaller	20354708C
110 - 160	2 ½" & larger	20354704G	2" & smaller	20354709B
150 - 200	2 ½" & 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.



— 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.O)	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 setpoint 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 cocks in the main valve control lines should be closed before starting disassembly. Main valves 4" and larger have CK2 cocks 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 cock 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

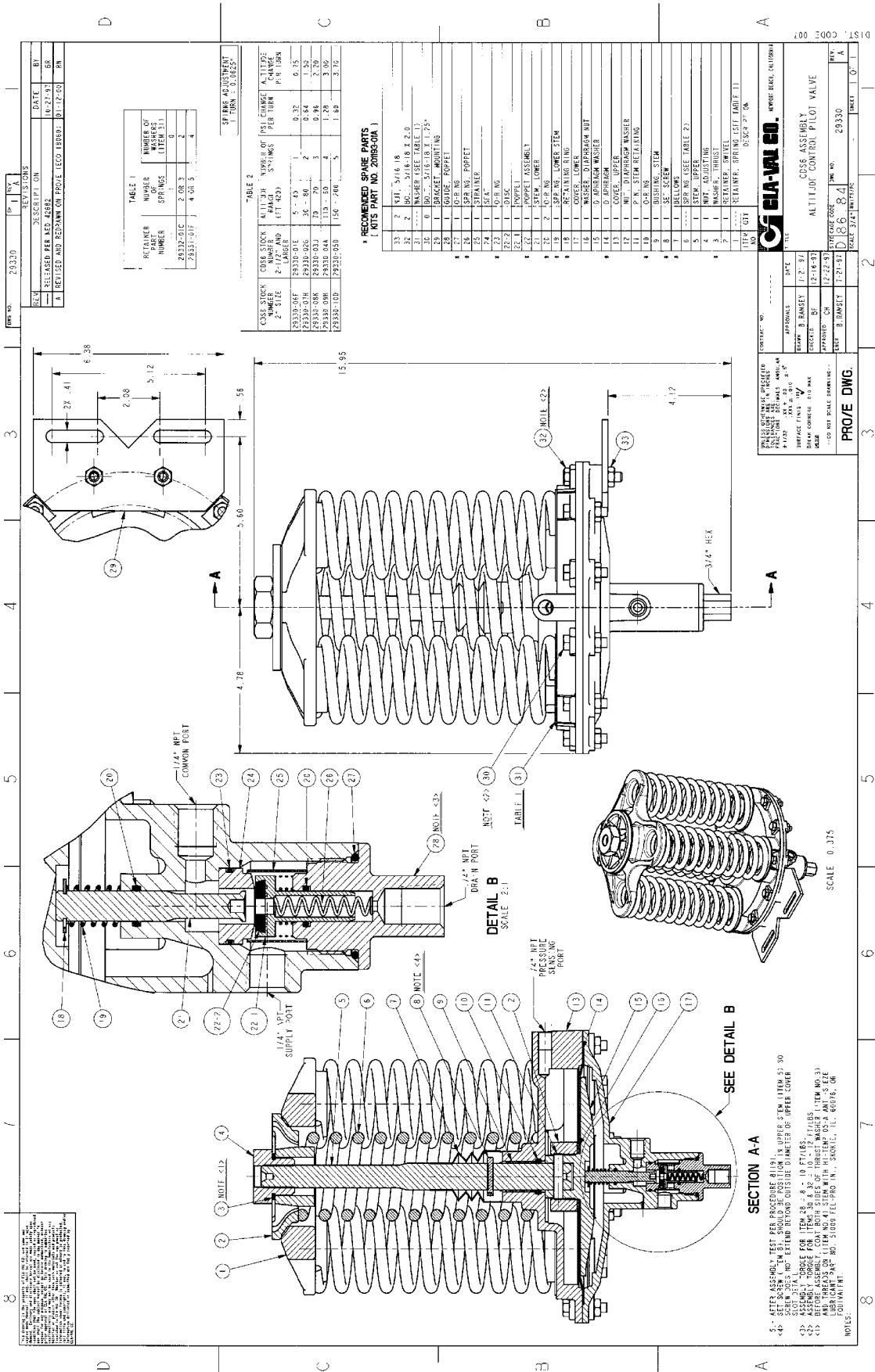
SYMPTOM	PROBABLE CAUSE	REMEDY
Vent leaks in lower cover (17)	Diaphragm (14) damaged Diaphragm nut (12) loose O-ring (20) damaged	Replace diaphragm Tighten nut (12) Replace O-ring (20)
Leakage past stem (5)	O-ring (10) damaged	Replace O-ring
Stem (5) movement restricted or erratic	*Sand or silt in sensing chamber above diaphragm Sensing line clogged Sensing line valve closed Sensing line sagging or bent collecting sediment	Remove foreign matter from sensing chamber Clean line Open valve fully 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) Silt packed in seat (24) and lower stem (21)	Remove screen and clean Clear area of blockage
Continuous drain leak. Main valve closed	Seat (24) damaged Disc in poppet assembly (22) damaged Foreign object between disc and seat (24)	Inspect and replace Inspect and replace poppet assembly (22) 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



REV. NO. 29332

REV.	DESCRIPTION	DATE	BY
1	RELEASED PER MED 42882	10-21-97	BR
2	REVISED AND RE-PAVING ON PRO/E ECO DIBSDP	01-17-00	BR

TABLE 1

RETAINER NUMBER	NUMBER OF SPRINGS	NUMBER OF ITEMS (ITEM 31)
29332-01C	2 OR 3	2
29332-01F	4 OR 5	4

TABLE 2

CASE STOCK NUMBER	CASE STOCK PART NO.	NUMBER OF PSI CHANGE	ALTI-JOT CHANGE PER TURN	CHANGE PER TURN
29332-01E	29332-01E	5 - 49	1	0.32
29332-01G	29332-01G	35 - 80	2	0.64
29332-01H	29332-01H	55 - 100	3	0.96
29332-01I	29332-01I	75 - 120	4	1.28
29332-01J	29332-01J	95 - 140	5	1.60
29332-01K	29332-01K	115 - 160	5	1.60
29332-01L	29332-01L	135 - 180	5	1.60

SPRING ADJUSTMENT
1 TURN = 0.32 PSI

CLAVAL VALVE CO.
1111 W. BROADWAY
CHICAGO, ILL. 60606

CONTRACT NO. _____ DATE _____
APPROVALS: _____
DESIGNER: B. BANSLEY
CHECKER: B. BANSLEY
DATE: 12-14-97

CROSS ASSEMBLY
ALTI-JOT CONTROL PILOT VALVE

PRO/E DWG.
SCALE 0.375



— MODEL —

X101

Valve Position Indicator & Pilot System Components

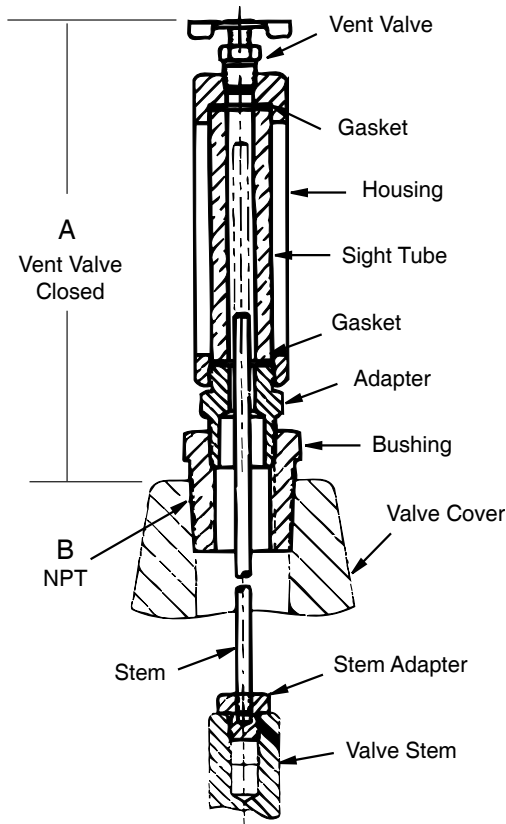


- Positive Visual Indicator
- Frictionless
- Leak Proof
- Easy Maintenance and Cleaning
- Protected Indicator Rod

The Cla-Val Model X101 Visual Position Indicator is designed to display Cla-Val valve position quickly and easily. A solid brass indicator rod fastened directly to the valve stem moves up and down inside a pyrex tube. The tube is contained within a brass housing which is open on two opposite sides to permit clear vision of the indicator rod.

To purge air that may be trapped in the valve cover, a vent valve in the top of the housing is provided. Model X101 valve position indicator is furnished complete for installation on specified size Cla-Val Automatic Control Valve.

Dimensions



Dimension "A" is height added to valve by indicator assembly

VALVE SIZE	A INCHES	B NPT
1"	5.88	1/4"
1 1/4"	3.21	1/4"
1 1/2"	3.21	1/4"
2"	3.33	1/2"
2 1/2"	3.33	1/2"
3"	3.33	1/2"
4"	4.52	3/4"
6"	4.52	3/4"
8"	5.83	1"
10"	7.70	1"
12"	8.20	1 1/4"
14"	8.20	1 1/2"
16"	10.81	2"
24"	12.04	1"

Specifications

Sizes:	1" thru 24"
Materials:	Brass, Pyrex Tube
Pressure Rating:	400 psi
Optional Material:	Stainless Steel or Aluminum

Installation

Can be installed on any Cla-Val basic main valve in a few minutes. Simply replace the fitting on top of the valve cover with the indicator assembly.

When Ordering, Please Specify

1. Valve Size
2. Catalog No. X101
3. Valve Series No. (Appears on Valve Nameplate)
4. Optional Material
Stainless Steel or Aluminum



CSM-11 Solenoid Control

Body Material

Standard: Bronze with Monel Trim

Option: Bronze with Stainless Steel Trim



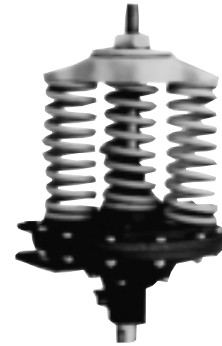
CDS6 Altitude Control

Wetted Body Material

Standard: Bronze with Stainless Steel Trim

No. of Springs

No. of Springs	Altitude Ranges
1	5 - 40 ft
2	30 - 80 ft
3	70 - 120 ft
4	110 - 160 ft
5	150 - 200 ft



CDC-1 Check Valve



Size	Body Material	Trim Material
3/8"-1/2"	Brass	Delrin

CSC Swing Check Valve



Size	Body Material	Trim Material
3/8"-1"	Brass	Brass/Buna N

CN Series - Needle Valves



Size	Body Material	Trim Material
1/4"-1"	Standard: Bronze Option: Stainless Steel	Brass Stainless Steel

CK Series - Shut-Off Cocks



Size	Body Material	Trim Material
3/8"-1"	Standard: Bronze Option: Stainless Steel	Stainless Steel/Teflon Stainless Steel/Teflon



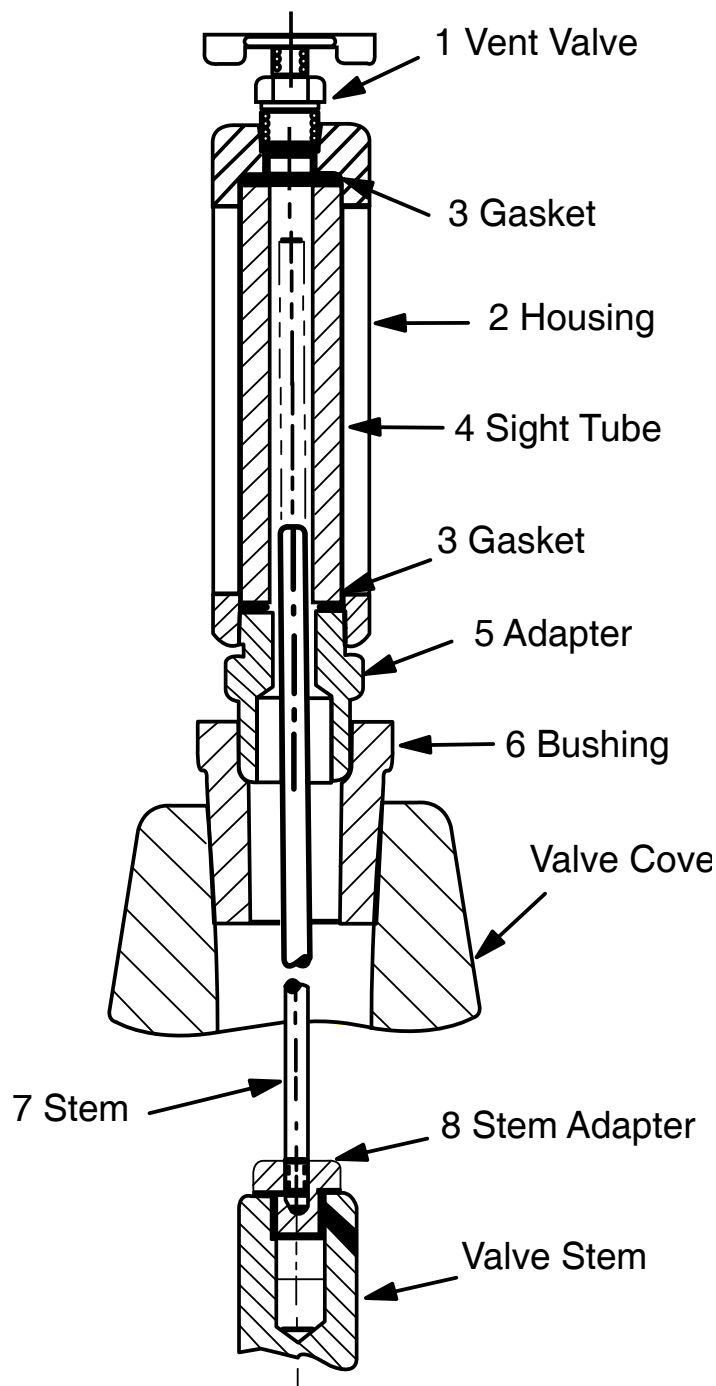
Represented By:

PARTS LIST



X-101

Valve Position Indicator



COMPLETE X101	
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

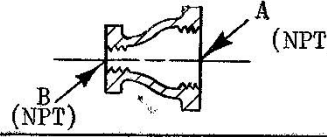
When ordering parts, please specify:

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

COMPUTER CVCL 1234

C **CLA-VAL CO.** NEWPORT BEACH, CALIFORNIA PP - P/F DRAWING NO. 67656 REV. M

BELL REDUCERS, PIPE



DESIGN		
BRAWN	D.S.	2-28-67
CHK'D.	Jm	3-3-67
APP'D.	Jm	3-3-67
SCALE	DC 026	

CLA-VAL PART NO. AND MATERIAL

BRONZE ASTM B534	STEEL	ST. STEEL	ALUM.	SEE BELOW	SIZE	
					A	B
67656-01H	67656-22D	67656-43K	67656-64F		1/4	1/8
-02F	-23B	-44H	-65C		3/8	
-03D	-24K	-45E	-66A		1/2	
-04B	-25G	-46C	-67J		3/4	
-05J	-26E	-47A	-68G		1	
-06G	-27C	-48J	-69E	316SST -101C	3/8	1/4
-07E	-28A	-49G	-70C	316SST -99B	1/2	
-08C	-29J	-50E	-71A		3/4	
-09A	-30G	-51C	-72J		1	
-10J	-31E	-52A	-73G	316SS -97F	1/2	
-11G	-32C	-53J	-74E	316SS -96H	3/4	3/8
-12E	-33A	-54G	-75B		1	1/2
-13C	-34J	-55D	-76K		3/4	
-14A	-35F	-56B	-77H		1	
-15H	-36D	-57K	-78F		1 1/4	
-16F	-37B	-58H	-79D	MONEL -85A	1 1/2	
-17D	-38K	-59F	-80B		1	3/4
-18B	-39H	-60D	-81K		1 1/4	
-19K	-40F	-61B	-82H		1 1/2	
-20H	-41D	-62K	-83F		1 1/4	
-21F	-42B	-63H	-84D		1 1/2	
-86J	-87G	-88E	-89C	MONEL -90A	2	1/2
-91J	-92G	-93E	-94C	316SS -102G	2	3/4
-98D				GALVINIZED IRON -95K	2 1/2	1
-100E					2-1/2	1/2

DC 11-12-91
GB 1-29-96
L ASTM B534 WAS ASTM B52, ECO 12502
M ADDED P/N -102G, NED 40678

BY	DATE
BH	12-9-85
KH	8-28-89

REVISION RECORD

A THRU H SEE REVISION FILE

J. ADD -100E, ECO 7715

K. ADD -101C, NED 35613

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CVCL 1 ② 3 4

DIST. CODE 007A

SHEET 1 OF 1



CLA-VAL CO.

NEWPORT BEACH, CALIFORNIA

CATALOG NO.
CSC

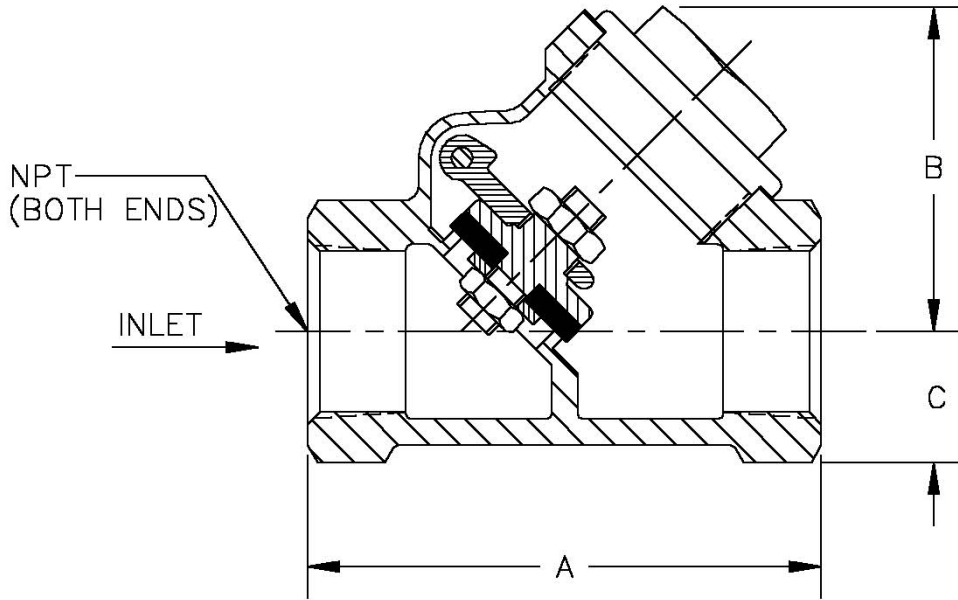
DRAWING NO.
92667

REV.
A

TYPE OF VALVE AND MAIN FEATURES

CSC SWING CHECK VALVE

DESIGN		
DRAWN	CH	11-5-76
CHK'D	MF	11-8-76
APV'D	JAZ	11-9-76



PIPE SIZE NPT	A	B	C
.25 (1/4)	2.13	1.63	.50
.38 (3/8)	2.13	1.63	.50
.50 (1/2)	2.44	1.69	.63
.75 (3/4)	2.94	1.88	.75
1.00 (1)	3.19	2.09	.94

CAD REVISION RECORD - DO NOT REVISE MANUALLY

LTR	DESCRIPTION	BY	DATE
A	REDRAWN ON CAD (ECO 14229)	EK	11-15-93

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INSTALLATION / OPERATION / MAINTENANCE

— 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 scribe, or similar sharp-pointed tool to remove O-ring from the stem.

INSPECTION

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

CLEANING

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

REPAIR AND REPLACEMENT

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

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

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

REASSEMBLY

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

TEST PROCEDURE

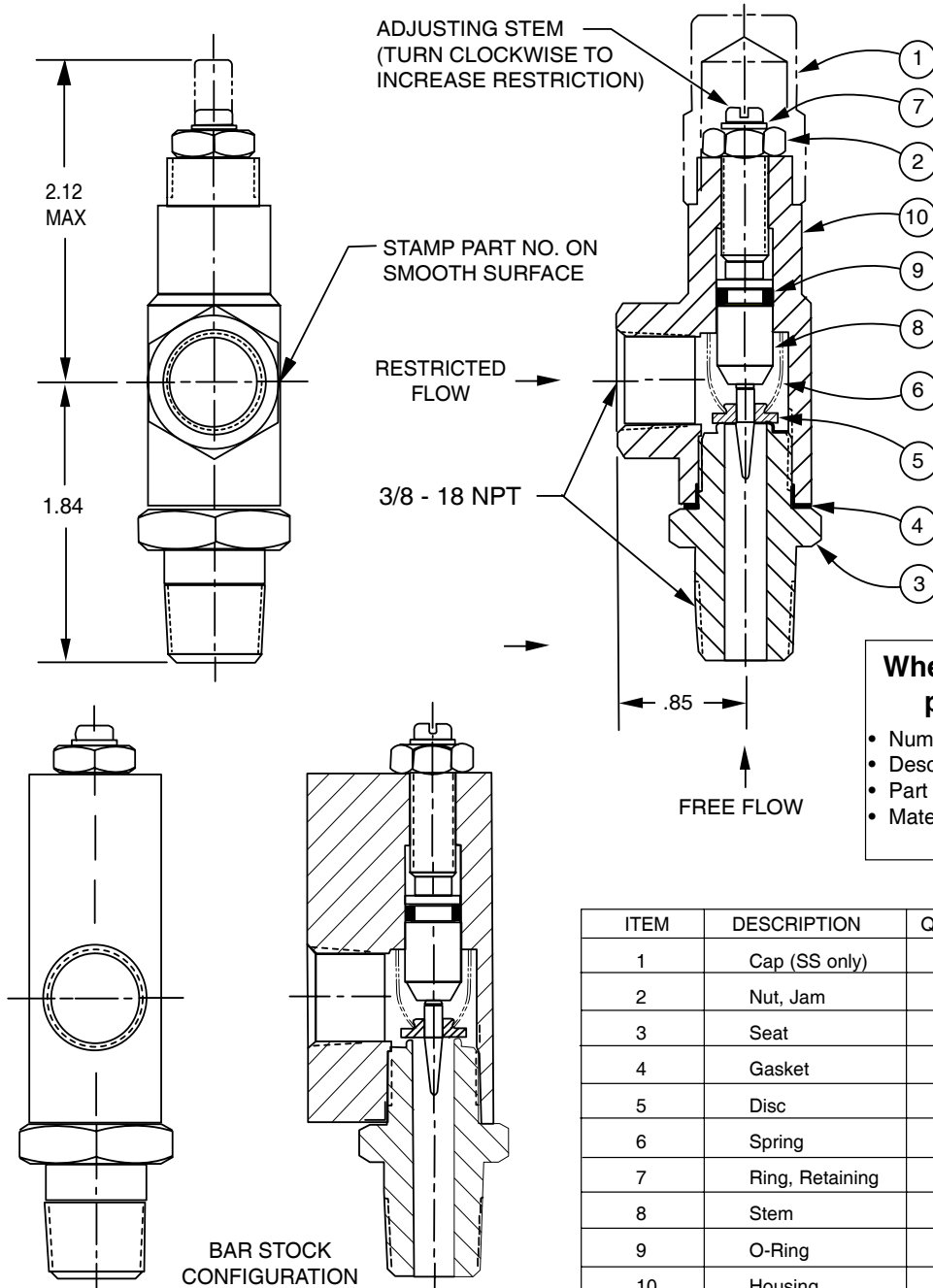
No testing of the flow Control is required prior to reassembly to the pilot control system on Cla-Val Main Valve.

PARTS LIST



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

CVCL 1 ② 3 4

DIST CODE 049

SHEET 1 OF 2



CATALOG NO.

DRAWING NO.

REV

67783

AS

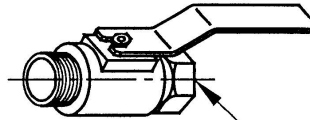
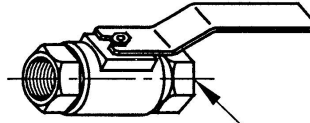
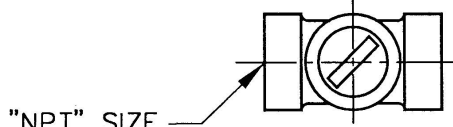
TYPE OF VALVE AND MAIN FEATURES

CK2 COCK/BALL VALVE

DESIGN

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

SCALE: NONE



CLA-VAL PART NO. AND MATERIAL

BRONZE WITH HANDLE	STEEL WITH HANDLE	IRON WITH HANDLE	316 SST WITH HANDLE	316 SST W/ LOCKING HANDLE	BRONZE WITH HANDLE	MONEL WITH HANDLE	SIZE "NPT"
67783-01K *	-09C	-17F	-25J SUPSD BY-26G		-41F SUPSD BY-01K		1/8"
-02H	-10A	-18D	-26G	-51E SUPSD BY-26G -52C	-42D SUPSD BY-02H		1/4"
-03F *	-11J	-19B	-27E	-46E SUPSD BY-27E -53A	-45G	-48A SUPSD BY-49J	3/8"
-04D	-12G	-20K	-28C	-54J	-43B SUPSD BY-04D	-49J	1/2"
-05A	-13E	-21H	-29A		-44K SUPSD BY-05A		3/4"
-06J	-14C	-22F	-30J				1"
-07G	-15K	-23D	-31G				1 1/4"
-08E	-16H	-24B	-32E				1 1/2"
-50G			-47C				2"

* SEE ENGINEERING APPROVED VENDORS TABLE (SHEET 2 OF 2).

03-07-01
 AK
 ADDED ** TO PN. 67783-01K TO SH. 1 (ECO 18551)

CAD REVISION RECORD - DO NOT REVISE MANUALLY	DESCRIPTION	BY	DATE
	A-AR SEE REVISION FILE		
	AS ADDED ANDERSON BRASS 1/8 FPT X 1/8 MPT TO SHEET 2 AND		

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INSTALLATION / OPERATION / MAINTENANCE

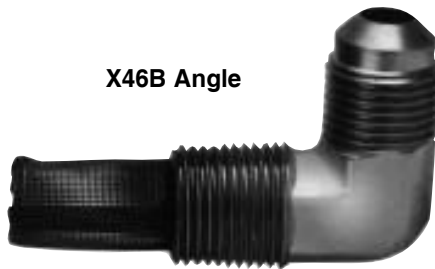


— MODEL — **X46**

Flow Clean Strainer



X46A Straight



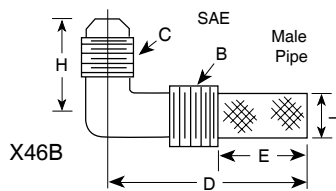
X46B Angle

- Self Scrubbing Cleaning Action
- Straight Type or Angle Type

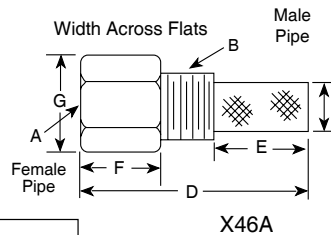
The Cla-Val Model X46 Strainer is designed to prevent passage of foreign particles larger than .015". It is especially effective against such contaminant as algae, mud, scale, wood pulp, moss, and root fibers. There is a model for every Cla-Val. valve.

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)



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

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

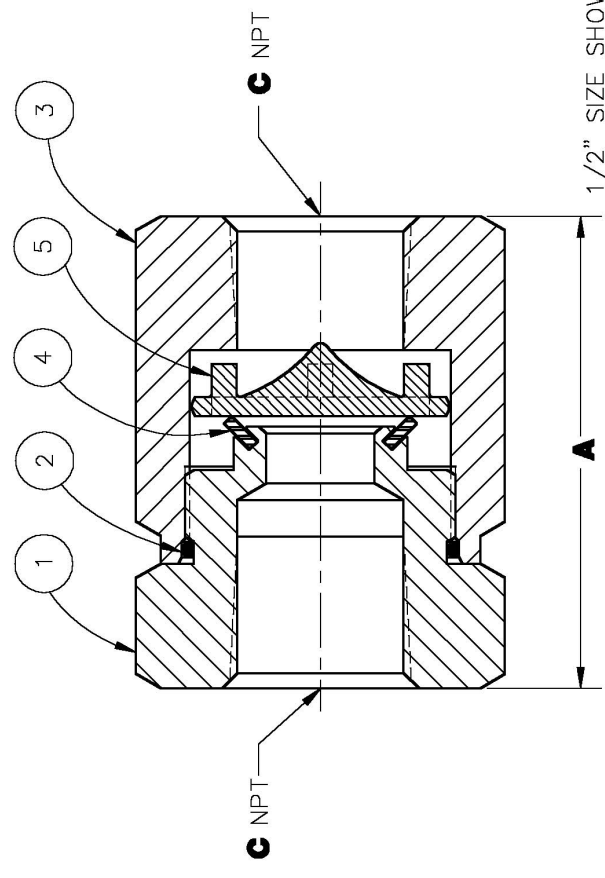
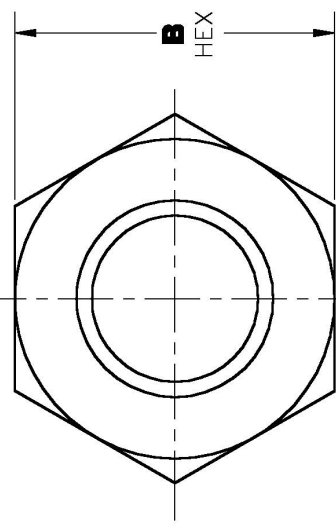
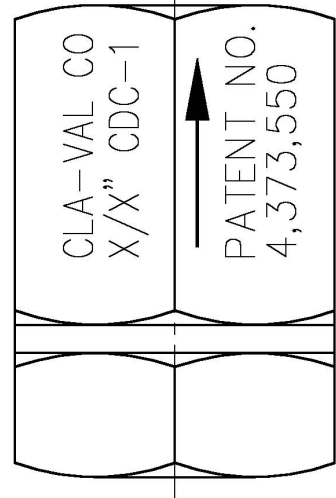
If there is any sign of damage, or if there is the slightest doubt that the Model X46 Flow Clean Strainer may not afford completely satisfactory operation, replace it. Use Inspection steps as a guide. Neither inner screen, outer screen, nor housing is furnished as a replacement part. Replace Model X46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

DWG NO. 98345 SH 1 REV E

This drawing is the property of CLA-VAL CO. and herein and contained therein. If any part is returned to it upon demand, delivery and disclosure hereof are made solely upon demand. This drawing is not to be used for any purpose other than that for which it was prepared, and its use for any other purpose is prohibited. CLA-VAL CO. and its subsidiaries and affiliates do not warrant the accuracy of any information shown hereon, and they assume no liability for any errors or omissions. CLA-VAL CO. and its subsidiaries and affiliates do not warrant the accuracy of any information shown hereon, and they assume no liability for any errors or omissions. CLA-VAL CO. and its subsidiaries and affiliates do not warrant the accuracy of any information shown hereon, and they assume no liability for any errors or omissions.

REVISION		DATE	APPROVED
REV	DESCRIPTION		
A-D	SEE REVISION FILE		
E	REVISED & REDRAWN ON CAD, WAS "D" SIZE (ECO 14229)	11-18-93	EK



DESCRIPTION	A	B	C
3/8" CHECK VALVE	2.06	1.06	.38 (3/8)-18 NPT
1/2" CHECK VALVE	2.12	1.38	.50 (1/2)-14 NPT

ITEM NO.	QTY	REGD	NON-ENCLATURE OR DESCRIPTION
5	1		PLATE, VALVE
4	1		SEAL, VALVE RING
3	1		RETAINER, VALVE
2	1		O-RING
1	1		RETAINER, SEAL

PARTS LIST	
CONTRACT NO.	
APPROVALS	DATE
DRAWN JC	11-30-84
CHECKED LFH	12-4-84
APPROVED CH	12-6-84
ENGR	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGULAR ±1/32 .XXX ±.01 ±.5° SURFACE FINISH 125/BREAK CORNERS .010 MAX --DO NOT SCALE DRAWING--

DIST. CODE 007A

CLA-VAL CO. NEWPORT BEACH, CALIFORNIA
 TITLE: 3/8" & 1/2" CDC-1 CHECK VALVE
 PATENT NO. 4,373,550
 CAGE CODE DWG NO. 98345
 REV. E
 SCALE 2/1 SHEET 1 OF 1

PARTS LIST



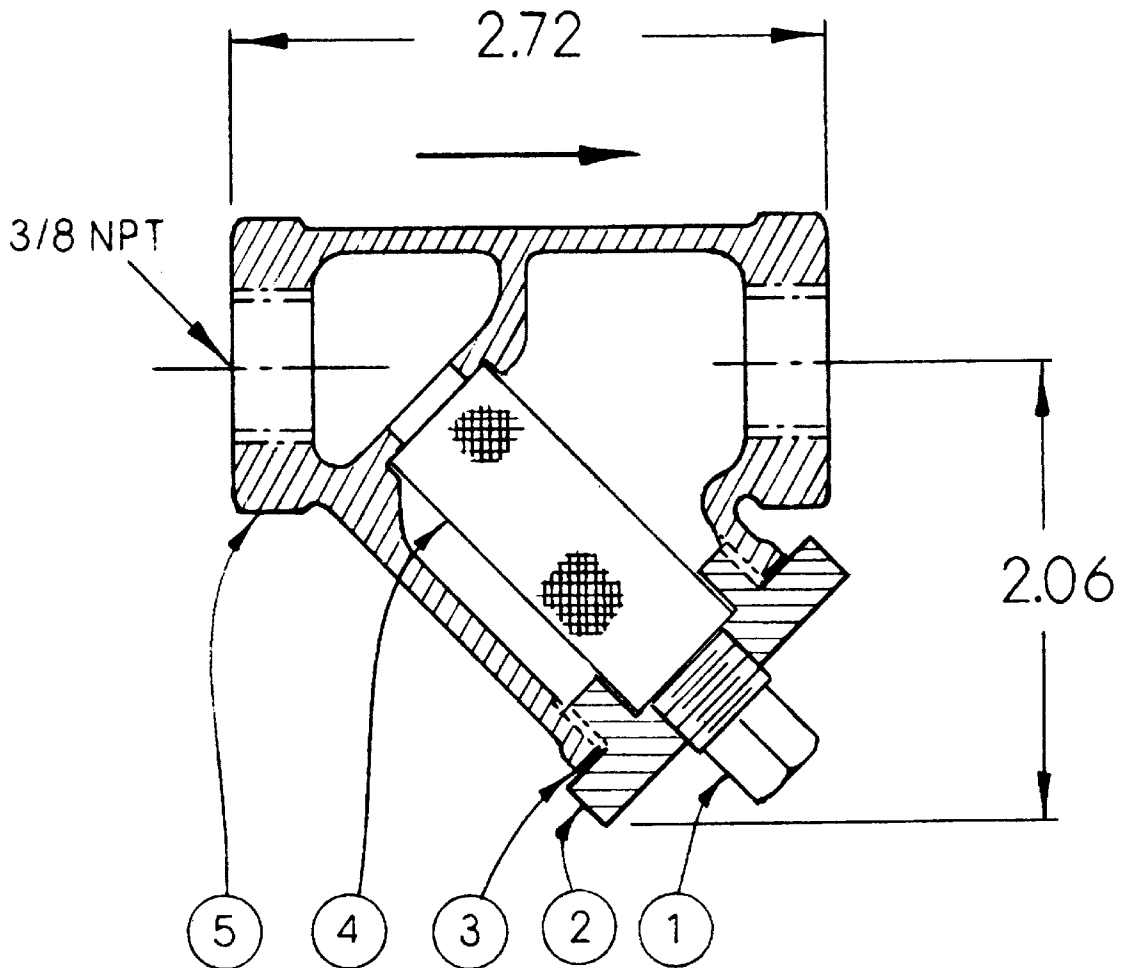
X43 Strainer

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

Standard 60 mesh pilot system strainer for fluid service.

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

*Replacement screen stock number 68373A.
All other parts available only in replacement assembly.





Cla-Val Product Identification

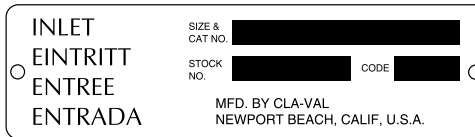
How to Order

Proper Identification

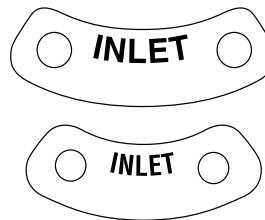
For ordering repair kits, replacement parts, or for inquiries concerning valve operation it is important to properly identify Cla-Val products already in service. Include all nameplate data with your inquiry. Pertinent product data includes valve function, size, material, pressure rating, end details,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

Identification Plates

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



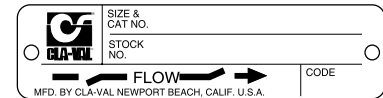
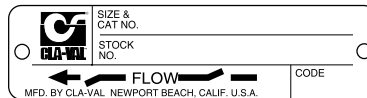
This brass plate appears on valves sized 2 1/2" and larger and is located on the top of the inlet flange.



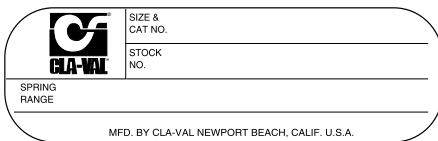
These two brass plates appear on 3/8", 1/2", and 3/4" size valves and are located on the valve cover.



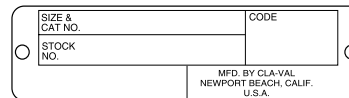
This brass plate appears on altitude valves only and is found on top of the outlet flange.



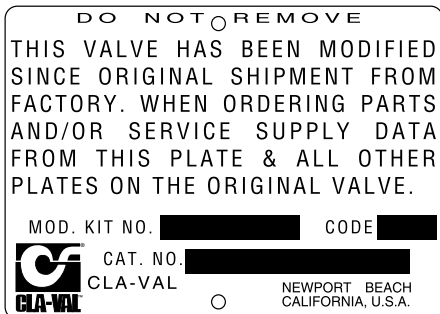
These two brass plates appear on 1" through 3" size screwed valves or 1" through 2" flanged valves. It is located on only one side of the valve body.



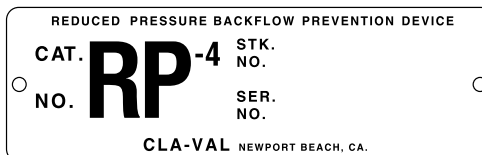
This tag is affixed to the cover of the pilot control valve. The adjustment range appears in the spring range section.



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



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



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



HOW TO ORDER

There are many valves and controls manufactured by Cla-Val that are not listed due to the sheer volume. For information not listed, please contact your local Cla-Val office or our factory office located at:

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

SPECIFY WHEN ORDERING

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

UNLESS OTHERWISE SPECIFIED

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

LIMITED WARRANTY

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

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

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

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

DISCLAIMER OF WARRANTIES AND LIMITATIONS OF LIABILITY

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

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

TERMS OF SALE**ACCEPTANCE OF ORDERS**

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

CREDIT TERMS

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

PURCHASE ORDER FORMS

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

PRODUCT CHANGES

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

PRICES

All prices are F.O.B. Newport Beach, California unless expressly stated otherwise on our acknowledgement of the order. Prices are subject to change without notice. The prices at which any order is accepted are subject to adjustment to the Seller's price in effect at the time of shipment. Prices do not include sales, excise, municipal, state or any other Government taxes. Minimum order charge \$75.00.

RESPONSIBILITY

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

RISK

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

EXPORT SHIPMENTS

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

RETURNED GOODS

1. Customers must obtain written approval from Cla-Val prior to returning any material.
2. Cla-Val reserves the right to refuse the return of any products.
3. Products more than six (6) months old cannot be returned for credit.
4. Specially produced, non-standard models cannot be returned for credit.
5. Rubber goods such as diaphragms, discs, o-rings, etc., cannot be returned for credit, unless as part of an unopened vacuum sealed repair kit which is less than six months old.
6. Goods authorized for return are subject to a 35% (\$75 minimum) restocking charge and a service charge for inspection, reconditioning, replacement of rubber parts, retesting, repainting and repackaging as required.
7. Authorized returned goods must be packaged and shipped prepaid to Cla-Val, 1701 Placentia Avenue, Costa Mesa, California 92627.



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Phone: 800-876-0036
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Email: Sales@mmcontrol.com

INSTALLATION / OPERATION / MAINTENANCE

— MODEL — **REPAIR KITS****Complete Replacement Diaphragm Assemblies for 100-01 and 100-20 Hytrol Main Valves**

For: Hytrol Main Valves with Ductile Iron, Bronze Trim Materials—125/150 Pressure Class Only.
FACTORY ASSEMBLED

Includes: Stem, Disc Guide, Disc, Disc Retainer, Spacer Washers, Diaphragm, Diaphragm Washer and Stem Nut.

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

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

For: Hytrol Main Valves—125/150 Pressure Class Only.

Supplied Shrink Wrapped (4" and smaller) or Bagged (6" and larger)

Includes: Diaphragm, Disc (or Disc Assembly) and spare Spacer Washers.

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

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

Repair Kits for 100-02/100-21 Powertrol and 100-03/100-22 Powercheck Main Valves**For:** Powertrol and Powercheck Main Valves—125/150 Pressure Class Only*Supplied Shrink Wrapped* (4" and Smaller) or Bagged (6" and larger)

Includes: Diaphragm, Disc (or Disc Assembly) and spare Spacer Washers.

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

Larger Sizes: Consult Factory.

Repair Kits for 100-04/100-23 Hy-Check Main Valves**For:** Hy-Check Main Valves—125/150 Pressure Class Only*Supplied Shrink Wrapped* (4" and Smaller) or Bagged (6" and larger)

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

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

Larger Sizes: Consult Factory.

Repair Kits for Pilot Control Valves

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

BUNA-N® (Standard Material)				VITON (For KB Controls)	
Pilot Control	Kit Stock Number	Pilot Control	Kit Stock Number	Pilot Control	Kit Stock Number
CDB	9170006C	CFM-7 & 7-A	1263901K	CDB-KB	9170012A
CDB-7	9170017K	CRA (w/bucking spring)	9170001D	CRA-KB	9170018H
CDH-2	18225D	CRD (w/bucking spring)	9170002B	CRD-KB (w/bucking spring)	9170008J
CDHS-2	44607A	CRD (no bucking spring)	9170003K	CRL-KB	9170013J
CDHS-2B	9170004H	CRD-22	98923G	CDHS-2BKB	9170010E
CDHS-2F	9170005E	CRL (55F, 55L)	9170007A	CDHS-2FKB	9170011C
CDHS-3C-A2	24657K	CRL-4A	43413E	CDHS-18KB (no bucking spring)	9170009G
CDHS-8A	2666901A	CRL-5 (55B)	65755B	102C-KB	1726202D
CDHS-18	9170003K	CRL-5A (55G)	20666E	Buna-N®	
CDS-4	9170014G	CV	9170019F	CRD DISC RET. (SOLID)	C5256H
CDS-5	14200A	X105L (O-ring)	00951E	CRD DISC RET. (SPRING)	C5255K
CDS-6	20119301A	102B-1	1502201F		
CFM-2, CFM-9, CFCM-M1	12223E	102C-2 & -3	1726201F		

Repair Assemblies (In Standard Materials Only)

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

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

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