Operating Manual

Model: 120-7s
Size:
Serial #:
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OCV Control Valves LLC

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Installation, Operating and Maintenance Instructions

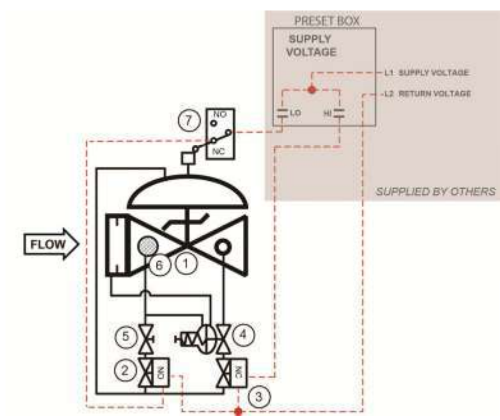
Model 120-7S

Two Stage Preset Valve with Flow-Limiting

GENERAL DESCRIPTION

The OCV Model 120-7S is specifically designed for fuel loading systems and is used in conjunction with a two-stage preset meter (Mechanical or Electronic). The preset controller may perform several system control functions and is supplied by other manufacturers. The 120-7S performs the following functions:

- **SINGLE-STAGE STARTUP WITH FLOW CONTROL**: When signaled by the preset, the 120-7S will open and limit flow from exceeding a flow setting.
- **TWO-STAGE SHUTDOWN**: Working off electrical signals from the preset, the 120-7S will close to the low flow position near the end of the load for "topping off" flow. At the end of the load, the valve will go fully closed.



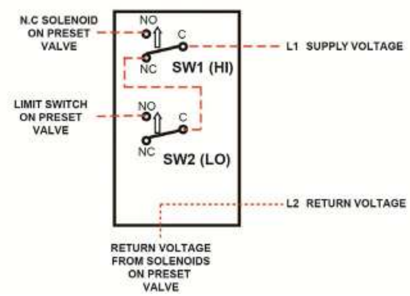
SCHEMATIC

The 120-7S consists of the following components, arranged as shown on the schematic diagram:

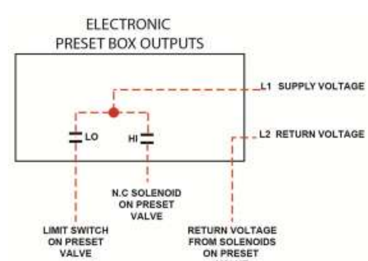
1. **Model 65 Basic Valve Assembly**, a hydraulically operated, diaphragm actuated, pilot controlled, globe valve which closes with an elastomer-on-metal seal.
2. **Model 450 Two Way, Normally Open Solenoid Pilot**. This pilot is energized to its closed position by the control circuit to enable the valve to hold its low flow position during the first stage of shutdown.
3. **Model 451 Two Way, Normally Closed Solenoid Pilot**. This pilot is the primary electrical control device on the valve. It is energized to its open position to enable the main valve to open, and deenergized to its closed position to make the main valve close.
4. **Model 2450 Rate of Flow Control Pilot.** A two-way, normally opened valve which senses the orifice plate differential across the diaphragm and balances it against an adjustable spring load. An increase in differential (flow rate) above the setpoint will tend to close the pilot.
5. **Model 141-2 Needle Valve** that is a fixed restriction device for the pressure reducing valve modulation. It also serves as the opening and closing speed for the main valve.
6. **Model 123 Inline Strainer** that protects the pilot system from solid contaminants in the line fluid.
7. **Model 150 Limit Switch Assembly**, a SPDT switch unit actuated by movement of the valve stem. It routes the electrical signals required for the two-stage closing function.

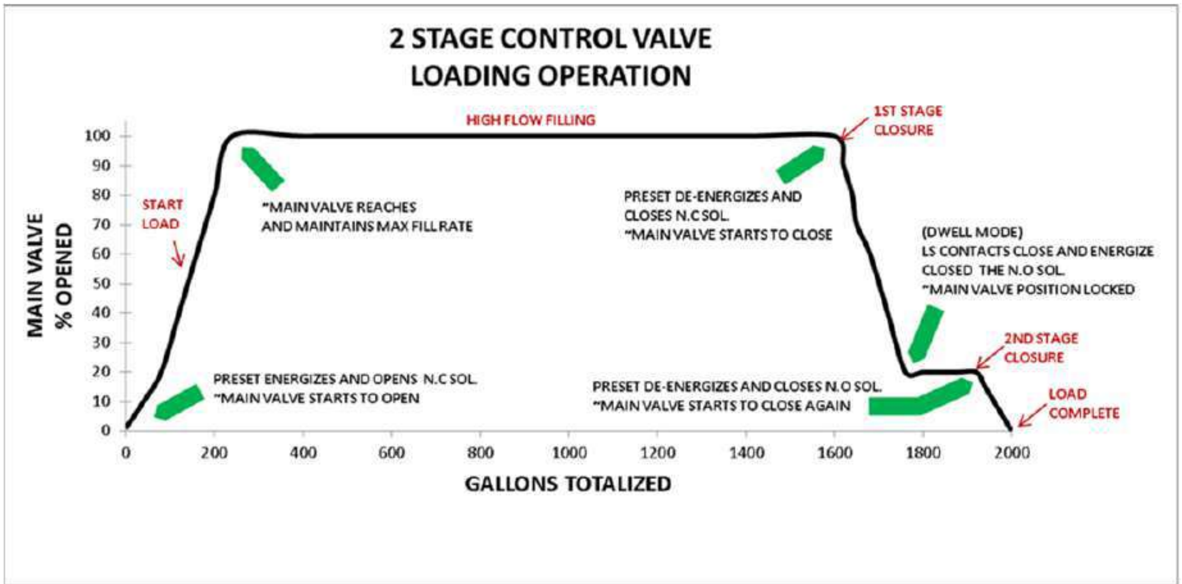
PRESET CONTROLLERS (Not supplied by OCV)

Mechanical Preset Controllers, like the Veeder Root 7600 and the LC M500, incorporate two SPDT switches which are mechanically toggled inside the preset after a certain percent of the load is complete. Historically, OCV has offered the previous version of this valve, the Model 120-7, to operate with these presets.



With the advent and growing popularity of **Electronic Preset Controllers,** like LCR2, EMR4, & Multiload, a different approach is needed. These presets have a much simpler switching arrangements, typically two outputs that operate only on-off as seen in simplified schematic. Depending on operating conditions, the older 120-7 may not work properly with the new electronic preset switching arrangement. The updated model 120-7**S** has been designed to operate reliably with BOTH electronic presets as well as the older mechanical types.





THEORY OF OPERATION

The 120-7S fill rate is controlled via OCV supplied solenoids & limit switch, as well as a customer supplied preset controller. The filling operations will be described in detail using given schematic, graph, and below table. Note that the actual preset controller output labels may vary. The schematic in this manual uses HI (high flow) and LO (low flow) for simplification.

	STATUS	HI FLOW FILLING		DWELL FLOW FILLING		END LOAD
SYSTEM	% GALLONS TOTALIZED	1%	90%	91%	91-99%	100%GPM
PRESET OUTPUTS	HI, SW1, S1 MECH / EL.	ON (CLOSED)		OFF(OPENED)		
	LO, SW2, S2 ELECT. PRESET	ON (CLOSED)				OFF (OPENED)
	LO, SW2, S2 MECH. PRESETS	OFF (OPENED)		ON (CLOSED)		OFF (OPENED)
CONTROL VALVE	N.C SOLENOID	ENERG.		DE-ENERG		
	N.O SOLENOID	DE-ENERG.			ENERG.	DE-ENERG
	LIMIT SWITCH	CLOSED	OPENED	OPENED	CLOSED	CLOSED
	65 MAIN VALVE	OPENING	OPENED	CLOSING	LOCKED	CLOSED

OPENING: A loading run is initiated via preset controller electronic outputs. The **HI** output directly energizes the normally closed solenoid (3), opening it, Also upon startup, the **LO** output, wired to the normally open solenoid through the limit switch, may or may not supply power to the normally open solenoid. Neither operation mode of the N.O Solenoid will affect opening of the main valve. Since the main valve (1) diaphragm chamber is venting to downstream through solenoid (3), the main valve will begin opening. For more details on main valve (1) function, refer to the 65 series section of the manual. After the main valve has opened far enough to increase flowrate to the setpoint of the flow control pilot (4), the main valve will stop opening to prevent flow from rising too high.

NOTE: If the valve opening is not adequate (i.e., the flow rate is too low), needle valve (5) adjusting knob should be carefully turned clockwise as described in “Startup and Adjustments” section.

FLOW CONTROL FUNCTION: To understand how the 120-7S flow limiting function works, it is best to start with the 141-2 needle valve (5) and 2450 flow sensing pilot (4). The 141-2, locked in at a position, can be looked at as a fixed restriction device, whereas, the 2450 pilot is a variable restriction constantly modulating open and closed as it is responding to changes in system flow. The 141-2 creates a pressure drop proportional to the flow through it and the flow through the 141-2 is controlled by the degree of opening of the 2450 pilot. Next, we will look at two scenarios, Open 2450 & Closed 2450

****Open 2450****When the 2450 opens, there is a higher flow and proportionally higher pressure drop across the 141-2 needle. With this large flow and pressure drop at the 141-2, the pressure on the downstream of the 141-2 is decreased.

****Closed 2450**** When the 2450 closes, there is a lower flow and proportionally lower pressure drop across the 141-2 needle. The pressure on the downstream of the 141-2 increases.

Now note that the diaphragm chamber of the main valve (1) is connected downstream of the needle valve. In this manner, the pressure in the diaphragm chamber of the main valve is in fact controlled by the variable restriction device, flow control pilot (4).

Putting it all together, as the orifice plate differential pressure (flow) tends to increase above the set point of the pilot, the pilot moves further closed. This results in an increase in pressure downstream of 141-2 needle valve and in the diaphragm chamber of the main valve. The main valve then closes slightly to drop flowrate to the set point. Conversely, as flowrate tends to decrease below the set point, the pilot moves further open. This results in a decrease in pressure in the diaphragm chamber of the main valve. The main valve then opens wider to bring the flow back up to the set point. The net result of all this is a constant modulating action by the pilot and main valve and a flow which remains constant despite fluctuations in system pressures.

Note: The flow control function is active only when both solenoids are in the “opened” position.

TWO-STAGE CLOSING: Shutdown is initiated by the preset counter a certain number of gallons before the end of the load. This number is adjustable in the preset. When the counter reaches this trip point, the **HI** output turns off which de-energizes the NC solenoid (3), closing it. Now full inlet pressure is directed to the diaphragm chamber of the main valve through the NO solenoid (2) and needle valve (5). The valve starts closed.

When the valve is nearly closed, the limit switch (7) contacts toggle from the "NO" position to the "NC" position. The preset control **LO** output will supply power through the now closed limit switch and will energize the NO solenoid, closing it. Now there is no flow either to or from the diaphragm chamber, and the valve is "hydraulically locked" in the low flow position. This is sometimes referred to as "dwell" flow.

When the preset counter reaches the end of the load, the **LO** output turns off, the NO solenoid is deenergized open, and the main valve (1) travels the short distance to full closed.

INSTALLATION

1. The 120-7S is furnished fully factory-assembled including all control line tubing.
2. Install the 120-7S on the discharge of the meter, observing the following:
    a. Before installing the valve, make sure there is no foreign material inside the valve.
    b. Make sure all tubing connections are secure.
    c. For ease of maintenance service of the valve and meter, it is recommended that an isolation valve be installed upstream of the meter.
3. Make sure the voltage of the solenoids matches that of the preset outputs.
4. Complete all wiring between the preset and valve as shown on the wiring diagram. Make sure that the wiring and conduit is appropriate for hazardous locations.

STARTUP AND ADJUSTMENTS

The following procedures should be followed for startup of the 120-7S. Flow control valves are provided with an integral upstream orifice plate that will allow flow adjustment within a 4:1 range. The orifice bore and pilot setting will be factory set for a flowrate specified by the customer. Below table shows standard factory flow ranges depending on size of control valve

SIZE	1.5"	2"	2.5"	3"	4"	6"	8"	10"
MIN FLOW, GPM	30	50	70	115	200	450	750	1050
MAX FLOW, GPM	120	200	280	460	800	1800	3000	4200

Note: Flow ranges may vary for specific applications.

If pilot does not require adjustment, skip steps 2, 3, 8, 9, &10. Note that if field adjustments are made to needle valve (5), all Startup and Adjustment steps should be performed to assure correct flow setting and valve opening and closing speeds.

1. A flow meter must be available to validate flow setting of the 120-7S.
2. Remove the plastic cap from the flow control pilot, and loosen the adjusting screw jam nut. Turn the adjusting screw counterclockwise until it is loose enough to be turned by hand.
3. From the factory the needle should be set and locked at 4 turns opened. Do not make any adjustments unless required in step 12.
   Caution: Adjustment of the needle valve will affect the 2450 flow setpoint. Also, adjusting the needle valve will affect both the opening and closing speed. Opening speed may not be affected if a large enough N.C solenoid orifice has been selected.
4. Perform limit switch adjustments as shown in the "Summary of Adjustments" section.
5. Connect the loading arm to a truck or other appropriate receiving vessel. *****If the flow control pilot is factory set**, throttle an isolation valve downstream of the 120-7S near closed. If isolation valves are not available, limit supply flow to control valve inlet via some other means. This is meant to prevent possible erratic operation due to compressible air inside main valve bonnet chamber.
6. Start the system by dialing in the number of gallons to be loaded and actuating the lever on the preset counter. The valve may open slightly.
7. Carefully loosen a pipe plug on the main valve bonnet until fluid appears around the threads. When only clear fluid (no air) is discharging, retighten the plug.
8. Reopen system isolation valve or resupply full system pressure as previously performed in step 5.
9. Slowly turn the adjusting screw of the flow control pilot (4) clockwise until flow increases to the setpoint.
10. Allow the load to complete and run several more loads to check for proper two stage closing operation and proper 120-7S opening and closing speeds.
11. If the load overshoots, closing speed adjustments can be made via the needle valve per step 12 or in some preset controller's per step 13.
12. Needle valve speed adjustments:
    a. To increase closing and slow opening speed, turn the needle valve (5) knob counter-clockwise ¼ turn and reset 2450 pilot. **Caution:** Too much adjustment will prevent opening of main valve. Adjust needle valve knob in ¼ turn increments and reset 2450 pilot as adjustments are made.
    b. To slow closing and increase opening speed, turn the needle valve knob clockwise ¼ turn and reset 2450 pilot. Do not close completely.

    Note: After any adjustments are made to the needle valve, a test load should be performed to validate proper opening/closing speeds & pressure setting.

13. The HI output OFF setting in an electronic preset can sometimes be adjusted to prevent overshooting the load run. This is the preferred method of closing speed adjustment. Follow preset controller instructions for more details.
14. After the 120-7S operation is verified through several filling cycles, tighten the adjusting screw jam nut on the 2450 and replace plastic cap.

SUMMARY OF ADJUSTMENTS

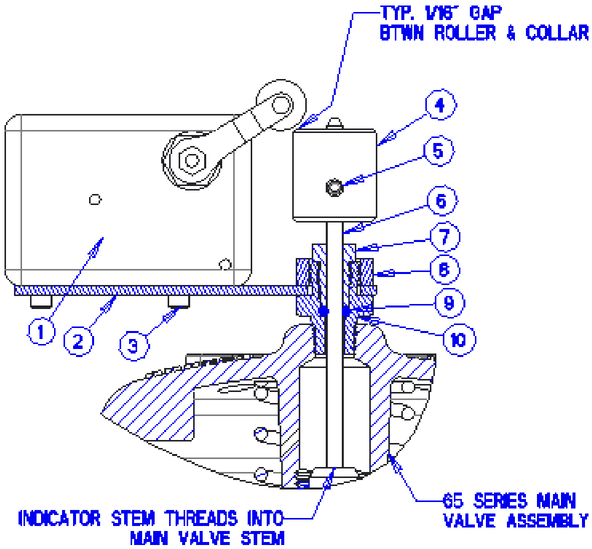
1. Flow Control Pilot (4):
    a. Clockwise to increase flow.

b. Counter-clockwise to decrease flow.

2. Needle valve (5):
   a. Clockwise – closing fully will prevent the main valve from closing at end of load. Decreases valve closing speed & increases the valve opening speed.
   b. Counter-clockwise – opening fully will prevent main valve from opening at beginning of load.
      - Increases valve closing speed.
      - May slow or prevent valve opening speed if turned too far Counter-clockwise: Needle valve is supplying more fluid to main valve bonnet than the N.C solenoid can exhaust to downstream. This will be seen as a lower than expected flow during HI flow filling because the main valve is not allowed to opened fully.

Caution: Any adjustment of needle valve may cause the flow setpoint to drift slightly.

3. Low flow position: Refer to diagram below. The valve's low flow position may be adjusted by loosening the 1/8" allen set screw (item 5) in the collar (item 4) on the indicator stem (item 6). From the factory, the limit switch roller arm is placed approximately 1/8" above the collar as a starting point.
   a. Lower the collar to increase the low flow rate
   b. Raise the collar to decrease the low flow rate.



MAINTENANCE

Required maintenance of the 120-7S is minimal. However, the following steps, periodically performed, will do much to keep the valve operating efficiently and properly.

1. Check for leaks at fittings and around flanges. Tighten as required.
2. Check for chipped or peeling paint. Touch up as required.
3. Check that all electrical wiring is secure.

TROUBLESHOOTING

In the event of malfunction of the 120-7S, the following outline should enable the technician to isolate the cause of the problem and to take the appropriate corrective action.

MAIN VALVE FAILS TO OPEN OR FLOW TOO LOW

1. N.C. solenoid (3) not energized — Check control signals from preset.
2. N.C. solenoid (3) stuck closed or coil burned out — Replace coil. See the Solenoid Valve section of this manual.
3. Diaphragm of main valve (1) ruptured or stem binding — See Model 65 Basic Valve section of this manual.
4. Needle Valve (5) adjusted too far counter-clockwise — See Adjustment Instructions.
5. Flow Control Pilot (4) adjusted too far counterclockwise — See Adjustment Instructions.
6. Stem of 2450 pilot binding — Disassemble pilot and determine cause. See the 2450 Pilot section of this manual

MAIN VALVE FAILS TO CLOSE OR PRESSURE TOO HIGH

1. N.C. solenoid (3) not deenergized — Check control signals from preset.
2. N.O. solenoid (2) energized — Check control signals from preset.
3. N.C. solenoid (3) stuck open — Disassemble and determine cause. See the Solenoid Valve section of this manual.
4. N.O. solenoid (2) stuck closed — Disassemble and determine cause. See the Solenoid Valve section of this manual.
5. Stem of main valve (1) binding — See the Model 65 Basic Valve section of this manual.
6. Flow Control pilot (4) diaphragm ruptured. See the 2450 pilot section of this manual.
7. Flow Control pilots (4) stem binding — Disassemble pilot and determine cause. See the 2450 Pilot section of this manual.
8. Needle Valve closed all the way – re-adjust per "startup and adjustments" section.
9. Inline strainer dirty – remove strainer and clean or replace. cated in upstream side port of main valve.

VALVE SKIPS LOW FLOW POSITION ON SHUTDOWN

1. N.O. solenoid (2) not being energized. — Check signals from preset.
2. Coil of N.O. solenoid (2) burned out — Replace coil. See the Solenoid Valve section of this manual.
3. N.O. solenoid (2) stuck open — Disassemble and determine cause. See the Solenoid Valve section of this manual.

VALVE DOES NOT GO TO FULL SHUT-OFF

1. N.O. solenoid (2) not being deenergized — Check signals from preset.
2. N.O. solenoid (2) stuck closed — Disassemble and determine cause. See the Solenoid Valve section of this manual.
3. Seat of main valve (1) damaged. — See the Model 65 Basic Valve section of this manual.

Installation, Operating, and Maintenance Instructions

Model 65/765

basic control valve

GENERAL DESCRIPTION

The OCV Series 65 is a hydraulically operated, diaphragm-actuated valve, *full port* valve. The globe configuration (Model 65) is available in sizes 1 ¼" thru 16" and 24". The angle configuration (Model 65A) is available in sizes 1 ¼" thru 12" and 16".

The Series 765 is the same as the Series 65, except that it is a *reduced port* valve. It is available only in the globe configuration in sizes 3" thru 24".

The diaphragm is nylon-fabric bonded with synthetic rubber and forms a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. A synthetic rubber seat disc forms a tight seal with the valve seat when pressure is applied above the diaphragm.

FUNCTIONAL DESCRIPTION

Because the Series 65/765 is a hydraulically operated valve, it requires a minimum line pressure of approximately 5 psig in order to function. The valve functions on a simple principle of pressure differential. The line pressure at the inlet of the valve is bypassed through the pilot control piping to the diaphragm chamber of the valve. This pressure, together with the valve spring, works against the pressure under the valve seat. Because the effective area of the diaphragm is greater than that of the seat, the valve is held tightly closed. As the controlling pilot(s) allow the pressure to bleed off the diaphragm chamber, the two opposing pressures begin to balance and the valve will begin to open. The valve can be used to perform a simple on-off function, or with the proper pilot system, a modulating, or regulating function.

In cases where the line fluid is unusually dirty, or is otherwise unsuitable for operating the valve, an independent operating pressure source may be employed. The pressure available from such a source must be equal to, or greater than, line pressure.

INSTALLATION

In order to insure safe, accurate and efficient operation of the OCV control valve, the following list of checkpoints and procedures should be followed when installing the valve.

1. Make a careful visual inspection of the valve to insure that there has been no damage to the external piping, fittings or controls. Check that all fittings are tight.
2. Thoroughly flush all interconnecting piping of chips, scale and foreign matter prior to mounting the valve.

CAUTION: Take appropriate care to protect personnel and equipment when lifting the valve for uncrating and for installation. Use appropriate lifting equipment. Lifting eyes are provided on 8" and larger valves to facilitate this task.

3. Install the valve in the line according to the flow arrow on the inlet flange. The arrow should point downstream.
4. When installing flanged-end valves, use the proper number and size of flange bolts when installing the valve (see Tables 1 & 2). Make sure flange gaskets are of the proper material for the service. To ensure a tight seal, flange bolts should be tightened evenly in a criss-cross pattern. Tables 1 & 2 also shows the proper final torque values for the flange bolts.

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5. Allow sufficient room around the valve for ease of adjustment and maintenance service.
6. After the lines are filled with liquid, bleed all air from the diaphragm chamber. This can be done by carefully loosening a pipe plug in the bonnet until fluid begins to appear around the threads. When only clear liquid (no air) is flowing, retighten the plug.

In addition, it is highly recommended that:

1. Isolation valves (e.g., gate or butterfly) be installed on the inlet and discharge sides of the valve to facilitate isolating the valve for maintenance.
2. Pressure gauges be installed at the inlet and outlet sides of the valve to provide monitoring of the valve during initial start-up and during operation. The body side ports, if unused by the pilot system, provide a convenient connection for the gauges.
3. All valves larger than 6" be installed horizontally, i.e., with the bonnet pointed up, for ease of adjustment and maintenance servicing.

MAINTENANCE

The OCV control valve requires no lubrication and a minimum of maintenance. However, a periodic inspection should be established to determine how the fluid being handled is affecting the efficiency of the valve. In a water system, for example, the fluid velocity as well as the substances occurring in natural waters, such as dissolved minerals and suspended particles, vary in every installation. The effect of these actions or substances must be determined by inspection. It is recommended that an annual inspection, which includes examination of the valve interior, be conducted. Particular attention should be paid to the rubber parts, i.e., the diaphragm and seat disc. Any obviously worn parts should be replaced.

REPAIR PROCEDURES

In the event of malfunction of the OCV control valve, troubleshooting should be conducted according to the procedures outlined for the specific model of valve. Then, if those steps indicate a problem with the main valve, this section will outline the procedures necessary to correct the problem.

Problems with the main valve can be classed in three basic categories:

1. VALVE FAILS TO OPEN

a. Diaphragm damaged* - See Procedure A
b. Stem binding - See Procedure B

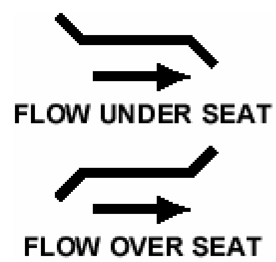
2. VALVE FAILS TO CLOSE

a. Diaphragm damaged* - See Procedure A
b. Stem binding - See Procedure B
c. Object lodged in valve - See Procedure B

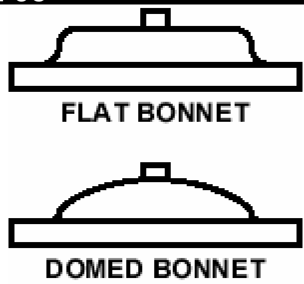
3. VALVE OPENS AND CLOSES BUT LEAKS WHEN CLOSED

a. Seat disc damaged - See Procedure C
b. Seat ring damaged - See Procedure D

**A diaphragm failure can prevent the valve from either opening or closing, depending on the flow direction. Most water service valves flow "under the seat", in which case a diaphragm failure will keep the valve from closing. On the other hand, most fuel service valves flow "over the seat", in which case a diaphragm failure will keep the valve from opening. To determine which you have, examine the bridge mark cast into the side of the valve body, and then compare it with the figures below.*



IMPORTANT: Over the years, OCV has made significant design changes to the 3", 4", 8", 10" and 12" valves. Therefore, before ordering rubber kits or other parts, you will need to determine which style valve you have (old or new). This can be easily determined by looking at the valve *bonnet*. As shown below, old-style valves have flat bonnets; new-style valves (except for the 3" full port and 4" reduced port valves) have domed bonnets.



For 3” valves, simply measure the *diameter* of the bonnet. Old-style bonnets have a 7-11/16” (195 mm) diameter; new style bonnets have an 8-3/4” (222 mm) diameter. That same 8-3/4” diameter flat bonnet is also used on the 4” reduced port valve.

PROCEDURE A: DIAPHRAGM REPLACEMENT

1. Wear appropriate clothing and equipment to protect the skin and eyes from exposure to the line fluid.
2. Isolate the valve from the system by closing upstream and downstream block valves.
3. Bleed all pressure from the valve.

WARNING! IT IS EXTREMELY IMPORTANT THAT ALL PRESSURE BE REMOVED FROM THE VALVE BEFORE DOING EVEN PARTIAL DISASSEMBLY.

4. Loosen one of the tubing connections on the bonnet. Allow any residual pressure to bleed off.
5. To minimize any possible fluid spillage, drain the upstream and downstream sides of the valve as much as possible. Unused side ports in the main valve body can be used for this purpose. They will bring the fluid level down to approximately the centerline of the piping.
6. Remove all tubing connected at the bonnet.
7. Remove the bonnet nuts.
8. Remove the bonnet. If the bonnet sticks in place, it may be loosened by rapping sharply around its edge with a rubber-headed mallet. NOTE: 8” and larger valves are equipped with eye bolts through which a chain can be fastened to aid in lifting the bonnet.
9. Remove the spring.
10. Remove the diaphragm plate capscrews and the diaphragm plate.
11. Remove the old diaphragm.
12. Making sure the dowel pin holes are in the proper location, place the new diaphragm over the studs and press down until it is flat against the body and spool.
13. Replace the diaphragm plate and the diaphragm plate capscrews.
14. Tighten all diaphragm plate capscrews snugly. See Table 4 for proper torque values.
15. Replace the spring.
16. Replace the bonnet and reinstall the bonnet nuts.
17. Tighten the bonnet nuts snugly using a criss-cross tightening pattern. See Table 3 for torque requirements.
18. Reinstall the control tubing.
19. Reopen the upstream and downstream block valves.
20. Before placing the valve back in service, perform the air bleed procedure described in the Installation section of this manual.

PROCEDURE B: CORRECTION OF BINDING STEM

1. Perform Steps 1 thru 9 of Procedure A, above.
2. Remove the spool assembly from the valve. NOTE: On smaller valves, this can be accomplished simply by grasping the stem and pulling upward. Valves 6” and larger have the top of the stem threaded to accept an eyebolt to aid in lifting the spool out of the body. 6” thru 12” valves are threaded 3/8-16. 14” and 16” valves are threaded 5/8-11. The 24” valve is threaded 3/4-10.
3. Carefully examine both ends of the stem for deep scratches, scoring or buildup of mineral deposits. Polish the stem if necessary using a fine grade of emery cloth.
4. Similarly, examine and polish the upper bushing (in the bonnet) and the lower guide (in the seat ring).
5. Reinstall the spool assembly.
6. Reassemble the valve, following Steps 15 thru 20 in Procedure A.

PROCEDURE C: SEAT DISC REPLACEMENT

1. Perform Steps 1 and 2 of Procedure B, above.
2. With the spool assembly removed from the body, remove the seat retainer screws.

3. Slide the seat retainer off the lower end of the stem.
4. Remove the seat disc from its groove in the spool. NOTE: The seat disc may fit quite tightly in the groove. If necessary, it may be pried out using a thin-bladed screwdriver or similar tool.
5. Install the new seat disc in the groove.
6. Reinstall the seat retainer and tighten the seat retainer screws.
7. Reassemble the valve, following Steps 5 and 6 of Procedure B.

PROCEDURE D: SEAT RING REPLACEMENT

NOTE: It is rare for a seat ring to require replacement. Minor nicks and scratches in the seating surface can usually be smoothed out with emery cloth.

1. Perform Steps 1 and 2 of Procedure B, above.
2. If you are working on a 3" or smaller valve, or a 4" old-style valve, follow Steps 4 thru 9, below.
3. If you are working on a new-style 4" valve, or any valve 6" or larger, follow Steps 10 thru 16, below.
4. Seat rings in the smaller valves are threaded into the valve body. To remove, you will need a special seat ring tool. One may be purchased from OCV, or one may be fabricated. (See Table 5 for details.)
5. Using the seat ring tool, unthread the seat ring from the body.
6. Remove the old o-ring from the counterbore in the body.
7. Install the new o-ring in the counterbore.
8. Using the seat ring tool, install the new seat ring.
9. Reassemble the valve, following Steps 5 & 6 of Procedure B.
10. Seat rings on larger valves are bolted into the body with socket head capscrews. In addition you will note that the seat ring is equipped with additional threaded holes that may be used for "jacking" the seat ring out of the body.
11. Remove the socket head capscrews.
12. Remove the old seat ring from the body by temporarily installing two or more of the capscrews in the "jacking" holes.
13. Install a new o-ring in the groove of the new seat ring. Lubricate the o-ring and outer seat ring wall with Vaseline® or similar lubricant.
14. Install the new seat ring in the body, making sure that the capscrew holes line up.
15. Replace and tighten all the capscrews.
16. Reassemble the valve, following Steps 5 and 6 of Procedure B.

TABLE 1
FLANGE BOLTING REQUIREMENTS – CLASS 150 FLANGES

VALVE SIZE (DN)	NO. OF BOLTS	BOLT SIZE	RECOMMENDED TORQUE (FT-LB)	RECOMMENDED TORQUE (N-M)
1 ¼" (32)	4	1/2-13 X 2.50" LONG	75	102
1 ½" (40)	4	1/2-13 X 2.50" LONG	75	102
2" (50)	4	1/2-13 X 2.50" LONG	75	102
2 ½" (65)	4	5/8-11 X 3.00" LONG	150	204
3" (80)	4	5/8-11 X 3.25" LONG	150	204
4" (100)	8	5/8-11 X 3.25" LONG	150	204
6" (150	8	3/4-10 X 3.50" LONG	250	339
8" (200)	8	3/4-10 X 3.75" LONG	250	339
10" (250)	12	7/8-9 X 4.00" LONG	378	513
12"(300)	12	7/8-9 X 4.25" LONG	378	513
14" (350)	12	1-8 X 4.50" LONG	583	791
16" (400)	16	1-8 X 4.75" LONG	583	791
18" (450)	16	1 1/8" X 5.00" LONG	782	1061
20" (500)	20	1 1/8 X 5.50" LONG	782	1061
24" (600)	20	1 1/4"-7 X 6.00" LONG	1097	1488

TABLE 2
FLANGE BOLTING REQUIREMENTS – CLASS 300 FLANGES

VALVE SIZE (DN)	NO. OF BOLTS	BOLT SIZE	RECOMMENDED TORQUE (FT-LB)	RECOMMENDED TORQUE (N-M)
1 ¼" (32)	4	5/8-11 X 2.75" LONG	150	204
1 ½" (40)	4	3/4-10 X 3.00" LONG	250	339
2" (50)*	6 2	5/8-11 X 3.00" LONG 5/8-11 X 2.25" LONG	150 150	204 204
2 ½" (65)	8	3/4-10X 3.25" LONG	250	339
3" (80)	8	3/4-10 X 3.50" LONG	250	339
4" (100)	8	3/4-10 X 3.75" LONG	250	339
6" (150)	12	3/4-10 X 4.25" LONG	250	339
8" (200)	12	7/8-9 X 4.75" LONG	378	513
10" (250)	16	1-8 X 5.50" LONG	583	791
12"(300)	16	1 1/8-7 X 5.75" LONG	782	1061
14" (350)	20	1 1/8-7 X 6.25" LONG	782	1061
16" (400)*	18 2	1 1/4-7 X 6.50" LONG 1 1/4-7 X 5.50" LONG	1097 1097	1488 1488
18" (450)	24	1 1/4-7 X 6.75" LONG	1097	1488
20" (500)	24	1 1/4-7 X 7.25" LONG	1097	1488
24" (600)	24	1 1/2-6 X 8.00" LONG	1750	2375

* TOP TWO HOLES ON VALVE FLANGES ARE DRILLED & TAPPED. USE THE SHORTER BOLTS LISTED IN THESE HOLES.

TABLE 3
BONNET BOLTING TORQUE SPECIFICATIONS
NEW-STYLE FULL PORT VALVES (SERIES 65)

VALVE SIZE (DN)	NO. OF STUDS	STUD SIZE	REC. TORQUE FT-LB (N-M)	VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)
1 ¼" (32)	8	3/8-16	31 (42)	8" (200)	12	7/8-9	378 (513)
1 ½" (40)	8	3/8-16	31 (42)	10" (250)	16	7/8-9	378 (513)
2" (50)	8	3/8-16	31 (42)	12" (300)	20	1 1/8-7	782 (1061)
2 ½" (65)	8	1/2-13	75 (102)	14" (350)	20	1 1/8-7	782 (1061)
3" (80)	8	1/2-13	75 (102)	16" (400)	20	1 1/4-7	1097 (1488)
4" (100)	8	3/4-10	250 (339)	24" (400)	28	1 1/2-6	1750 (2375)
6" (150)	12	3/4-10	250 (339)				

NEW-STYLE REDUCED PORT VALVES (SERIES 765)

VALVE SIZE (DN)	NO. OF STUDS	STUD SIZE	REC. TORQUE FT-LB (N-M)	VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)
3" (80)	8	3/8-16	31 (42)	12" (300)	16	7/8-9	378 (513)
4" (100)	8	1/2-13	75 (102)	16" (250)	20	1 1/8-7	782 (1061)
6" (150)	8	3/4-10	250 (339)	18" (300)	20	1 1/4-7	1097 (1488)
8" (200)	12	3/4-10	250 (339)	20" (350)	20	1 1/4-7	1097 (1488)
10" (250)	12	7/8-9	378 (513)	24" (400)	20	1 1/4-7	1097 (1488)

OLD-STYLE FULL PORT VALVES (SERIES 65)

VALVE SIZE (DN)	NO. OF SCREWS	STUD SIZE	REC. TORQUE FT-LB (N-M)	VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)
3" (80)	8	3/8-16	31 (42)	10" (250)	16	3/4-10	250 (339)
4" (100)	8	7/16-20	50 (68)	12" (300)	20	1 1/8-7	782 (1061)
8" (200)	12	3/4-10	250 (339)				

TABLE 4
DIAPHRAGM PLATE CAPSCREW TORQUE SPECIFICATIONS
NEW-STYLE FULL PORT VALVES (SERIES 65)

VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)	VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)
1 ¼" (32)	1	3/8-24 N	21.5 (29)	8" (200)	8	1/2-13 H	43 (58)
1 ½" (40)	1	3/8-24 N	21.5 (29)	10" (250)	12	1/2-13 H	43 (58)
2" (50)	4	1/4-20 A	6.3 (8.6)	12" (300)	12	1/2-13 H	43 (58)
2 ½" (65)	6	10-32 A	2.7 (3.7)	14" (350)	16	3/8-16 H	19.7 (27)
3" (80)	6	1/4-20 A	6.3 (8.6)	16" (400)	16	1/2-13 H	43 (58)
4" (100)	6	3/8-16 H	19.7 (27)	24" (400)	16	1-8 H	286 (383)
6" (150)	8	3/8-16 H	19.7 (27)				

NEW-STYLE REDUCED PORT VALVES (SERIES 765)

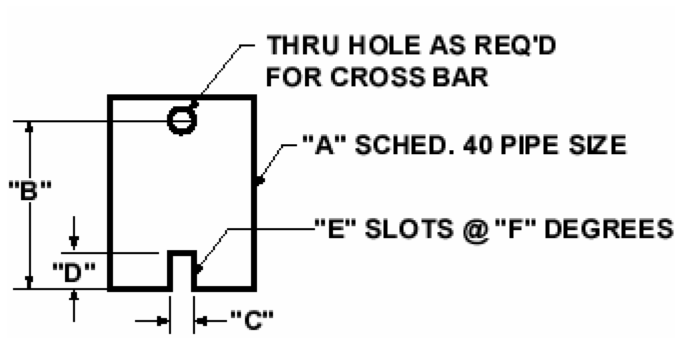
VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)	VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)
3" (80)	4	1/4-20 A	6.3 (8.6)	12" (300)	12	1/2-13 H	43 (58)
4" (100)	6	1/4-20 A	6.3 (8.6)	16" (250)	12	1/2-13 H	43 (58)
6" (150)	6	3/8-16 H	19.7 (27)	18" (300)	12	1/2-13 H	43 (58)
8" (200)	8	3/8-16 H	19.7 (27)	20" (350)	12	1/2-13 H	43 (58)
10" (250)	8	1/2-13 H	43 (58)	24" (400)	12	1/2-13 H	43 (58)

OLD-STYLE FULL PORT VALVES (SERIES 65)

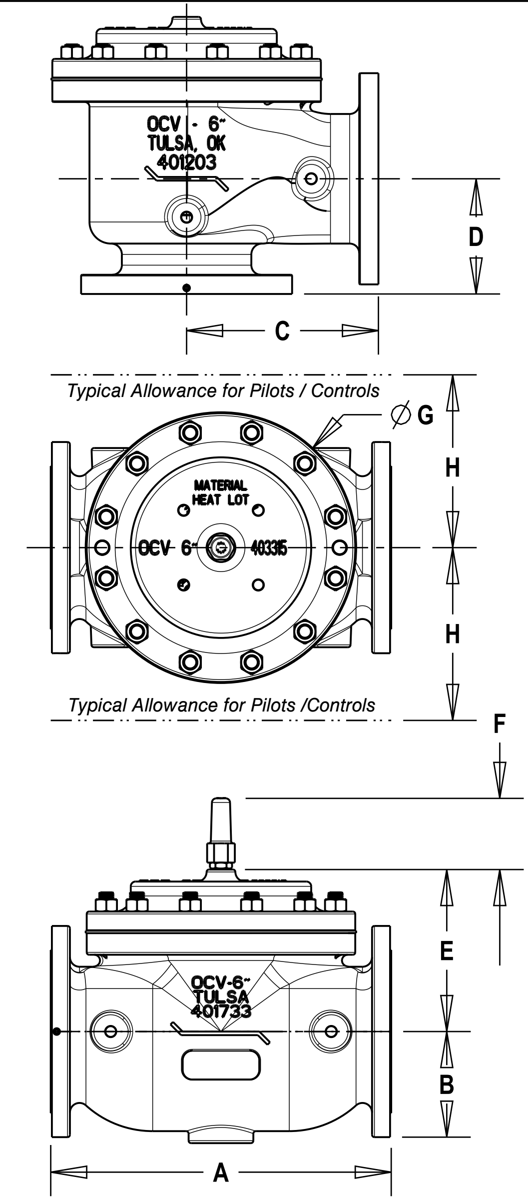
VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)	VALVE SIZE (DN)	NO. OF SCREWS	SCREW SIZE	REC. TORQUE FT-LB (N-M)
3" (80)	4	1/4-20 H	6.3 (8.6)	10" (250)	12	3/8-16 H	19.7 (27)
4" (100)	6	1/4-20 H	6.3 (8.6)	12" (300)	12	1/2-13 H	43 (58)
8" (200)	8	3/8-16 H	19.7 (27)				

N = SINGLE HEX NUT ON VALVE STEM
A = ALLEN-HEAD CAPSCREWS
H = HEX-HEAD CAPSCREWS

TABLE 5
SEAT RING TOOL DETAILS



VALVE SIZE FULL PORT	VALVE SIZE RED. PORT	"A" PIPE SIZE	"B" MIN. LENGTH	"C" SLOT WIDTH	"D" SLOT DEPTH	"E" # SLOTS	"F" SPACING
1 1/4"	--	3/4	6"	3/8"	3/8"	2	180°
1 1/2"	--	3/4	6"	3/8"	3/8"	2	180°
2"	3"	1 1/2	7"	3/8"	3/8"	2	180°
2 1/2"	--	2	8"	1/2"	1/2"	3	120°
3" NEW	4"	2 1/2	9"	1/4"	3/8"	3	120°
3" OLD	--	2 1/2	9"	5/8"	5/8"	2	180°
4" OLD	--	3	10"	5/8"	5/8"	2	180°



U.S. DIMENSIONS (INCHES)

DIM	END CONN.	1 1/4	1 1/2	2	2 1/2	3	4	6 STD	6 EXT	8	10	12	14	16	24
A	SCREWED	8 3/4	8 3/4	9 7/8	10 1/2	13	--	--	--	--	--	--	--	--	--
	GROOVED	8 3/4	8 3/4	9 7/8	10 1/2	13	15 1/4	20	--	--	--	--	--	--	--
	150# FLGD	8 1/2	8 1/2	9 3/8	10 1/2	12	15	17 3/4	20	25 3/8	29 3/4	34	39	40 3/8	62
	300# FLGD	8 3/4	8 3/4	9 7/8	11 1/8	12 3/4	15 5/8	18 5/8	21	26 3/8	31 1/8	35 1/2	40 1/2	42	63 3/4
B	SCREWED	1 7/16	1 7/16	1 11/16	1 7/8	2 1/4	--	--	--	--	--	--	--	--	--
	GROOVED	--	1	1 3/16	1 7/16	1 3/4	2 1/4	3 5/16	--	--	--	--	--	--	--
	150# FLGD	2 5/16	2 1/2	3	3 1/2	3 3/4	4 1/2	5 1/2	5 1/2	6 3/4	8	9 1/2	10 5/8	11 3/4	16
	300# FLGD	2 5/8	3 1/16	3 1/4	3 3/4	4 1/8	5	6 1/4	--	7 1/2	8 3/4	10 1/4	11 1/2	12 3/4	18
C ANGLE	SCREWED	4 3/8	4 3/8	4 3/4	6	6 1/2	--	--	--	--	--	--	--	--	--
	GROOVED	4 3/8	4 3/8	4 3/4	6	6 1/2	7 5/8	--	--	--	--	--	--	--	--
	150# FLGD	4 1/4	4 1/4	4 3/4	6	6	7 1/2	10	--	12 11/16	14 7/8	17	--	20 13/16	--
	300# FLGD	4 3/8	4 3/8	5	6 3/8	6 3/8	7 13/16	10 1/2	--	13 3/16	15 9/16	17 3/4	--	21 5/8	--
D ANGLE	SCREWED	3 1/8	3 1/8	3 7/8	4	4 1/2	--	--	--	--	--	--	--	--	--
	GROOVED	3 1/8	3 1/8	3 7/8	4	4 1/2	5 5/8	--	--	--	--	--	--	--	--
	150# FLGD	3	3	3 7/8	4	4	5 1/2	6	--	8	11 3/8	11	--	15 11/16	--
	300# FLGD	3 1/8	3 1/8	4 1/8	4 3/8	4 3/8	5 13/16	6 1/2	--	8 1/2	12 1/16	11 3/4	--	16 1/2	--
E	ALL	6	6	6	7	6 1/2	8	10	10	11 7/8	15 3/8	17	18	19	27
F	ALL	3 7/8	3 7/8	3 7/8	3 7/8	3 7/8	3 7/8	3 7/8	3 7/8	6 3/8	6 3/8	6 3/8	6 3/8	6 3/8	8
G	ALL	6	6	6 3/4	7 11/16	8 3/4	11 3/4	14	14	21	24 1/2	28	31 1/4	34 1/2	52
H	ALL	10	10	11	11	11	12	13	13	14	17	18	20	20	28 1/2

METRIC DIMENSIONS (MILLIMETERS)

DIM	END CONN.	DN32	DN40	DN50	DN65	DN80	DN100	DN150 STD	DN150 EXT	DN200	DN250	DN300	DN350	DN400	DN600
A	SCREWED	222	222	251	267	330	--	--	--	--	--	--	--	--	--
	GROOVED	222	222	251	267	330	387	508	--	--	--	--	--	--	--
	150# FLGD	216	216	238	267	305	381	451	508	645	756	864	991	1026	1575
	300# FLGD	222	222	251	283	324	397	473	533	670	791	902	1029	1067	1619
B	SCREWED	37	37	43	48	57	--	--	--	--	--	--	--	--	--
	GROOVED	--	25	30	37	44	57	84	--	--	--	--	--	--	--
	150# FLGD	59	64	76	89	95	114	140	140	171	203	241	270	298	406
	300# FLGD	67	78	83	95	105	127	159	--	191	222	260	292	324	457
C ANGLE	SCREWED	111	111	121	152	165	--	--	--	--	--	--	--	--	--
	GROOVED	111	111	121	152	165	194	--	--	--	--	--	--	--	--
	150# FLGD	108	108	121	152	152	191	254	--	322	378	432	--	529	--
	300# FLGD	111	111	127	162	162	198	267	--	335	395	451	--	549	--
D ANGLE	SCREWED	79	79	98	102	114	--	--	--	--	--	--	--	--	--
	GROOVED	79	79	98	102	114	143	--	--	--	--	--	--	--	--
	150# FLGD	76	76	98	102	102	140	152	--	203	289	279	--	398	--
	300# FLGD	79	79	105	111	111	148	165	--	216	306	298	--	419	--
E	ALL	152	152	152	178	165	203	254	254	302	391	432	457	483	686
F	ALL	98	98	98	98	98	98	98	98	162	162	162	162	162	203
G	ALL	152	152	171	195	222	298	356	356	533	622	711	794	876	1321
H	ALL	254	254	279	279	279	305	330	330	356	432	457	508	508	724

CHG	ECN	DATE	BY	
E				
D				
C				
B				
A				

REVISIONS

REF DWG NO'S

MATERIAL

TOLERANCES
UNLESS NOTED
.XX ±.015
.XXX ±.005
ANGULAR ±0.5°
MACH. FINISH 125

OCV Control Valves

TULSA OKLAHOMA USA

65D GENERAL VALVE DIMENSIONS

NO. REQ'D	DRAWN BY	DATE	SIZE	DRAWING NUMBER	REV
	RLA	3/8/16	A	65D_DIM_DWG	C
SCALE	CHKD BY	DATE			
NOT TO SCALE					

DESCRIPTION

MODEL 2450 RATE OF FLOW PILOT (Differential Pressure Type)

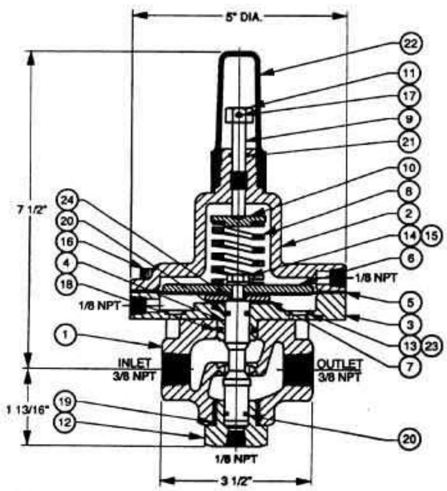
- Normally open, increasing differential closes
- Simple adjustment
- Large diaphragm area for sensing small changes in differential pressure
- Dual chamber, hydraulically balanced for accurate control
- Bronze or stainless steel construction
- All parts replaceable while mounted on valve

The Model 2450 is a two-way, normally open pilot that senses the differential pressure across an orifice plate; high pressure under its diaphragm and low pressure above the diaphragm. The orifice plate differential is proportional to the flow rate through it. The pilot balances the differential against an adjustable spring load. An increase in differential, hence rate of flow, above the spring set point tends to make the pilot close.

The Model 2450 is the standard pilot for OCV Series 120 Rate of Flow Control Valve. Sensing the differential across the valve's integral orifice plate, the pilot modulates the main valve to regulate or limit the required rate of flow.

MODEL 2450 MATRIX

MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	USED ON VALVE SIZE
Bronze, Buna-N	230105	3/8	1 ¼"-6"
Bronze, Buna-N	230116	1/2	8"-16"
Stn. Steel, Buna-N	230705	3/8	1 ¼"-6"
Stn. Steel, Buna-N	230716	1/2	8"-16"



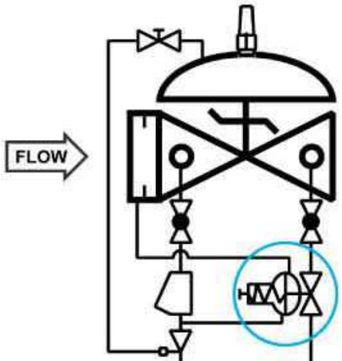
Model 2450 Differential Pilot:
1. Body
2. Adaptor
3. Bonnet
4. Stem
5. Diaphragm
6. Upper Diaphragm
7. Lower Diaphragm
8. Spring
9. Adjusting Screw
10. Spring Retainer
11. Drive Adaptor
12. Plug
13. Flat HD Screw
14. Hex HD Capscrew
15. Lock Washer
16. SKT HD Capscrew
17. Set Screw
18. O-Ring
19. O-Ring
20. O-Ring
21. O-Ring
22. Cap
23. O-Ring
24. O-Ring

MATERIALS

Bronze B61, Stainless Steel ASTM A743/CF8-M, Elastomers (diaphragm, seat disc, o-rings), Buna-N (Std.), Viton® (Opt.), EPDM (Opt.)
Viton is a registered trademark of DuPont Dow Elastomers

SCHEMATIC SYMBOL

The Model 2450 is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 120 Rate of Flow

MAINTENANCE

Rubber components are typically the only parts that may require periodic replacement.
These are available in kits consisting of the diaphragm and all O-rings.
Buna-N Kit-Part # 930005, Viton® Kit-Part # 930105, EPDM Kit-Part # 930405

TOLL FREE 1.888.628.8258 • phone: (918)627.1942 • fax: (918)622.8916 • 7400 East 42nd Place, Tulsa, OK 74145
email: sales@controlvalves.com • website: www.controlvalves.com

Rate of Flow Control Pilot 2450

installation, operating, and maintenance instructions

rate of flow control pilot

model 2450

GENERAL DESCRIPTION

The OCV Model 2450 Rate of Flow Control Pilot is a direct-acting, spring-loaded, diaphragm-type control pilot. It is available in bronze or stainless steel (stainless steel internals) construction, with either Buna-N or Viton elastomers. It is designed to maintain a constant, preset rate of flow through the main valve. It is manually adjustable by means of an adjusting screw located on top of the pilot. The 2450 is a constant-throttling device, maintaining precise, positive control of the main valve.

FUNCTIONAL DESCRIPTION

Basically, the 2450 controls the amount of pressure in the uper chamber of the main valve, hence the degree of opening or closing of the valve. The pilot senses the pressure differential across an orifice plate located on the inlet of the main valve. The upstream, or high pressure, side of the orifice plate is sensed under the pilot diaphragm and the downstream, or low pressure, is sensed above the diaphragm. The low pressure sense is assisted by the pilot spring. As the flow through the orifice plate increases, the differential pressure increases and begins to close the pilot. As the pilot closes, the pressure in the upper chamber of the main valve increases, causing the valve to close a proportionate amount in order to maintain the preset rate of flow. Conversely, as the rate of flow decreases, the pilot opens, allowing the main valve to open and compensate for the decrease in flow.

INSTALLATION AND ADJUSTMENT

The 2450 should be installed in the main valve control piping between either the ejector or the accelerator pilot (depending on valve model) and the downstream body tap. Flow should be in the direction indicated on the pilot body. Sensing lines (1/4" O.D. tubing) are installed from the downstream orifice flange tap to the upper sense tap of the pilot and from the upstream orifice flange tap to the lower sense tap of the pilot. Pilot adjustment is made with the adjusting screw located on top of the bonnet. Increase flow through the valve by turning the screw clockwise; decrease flow by turning the screw counterclockwise.

MAINTENANCE

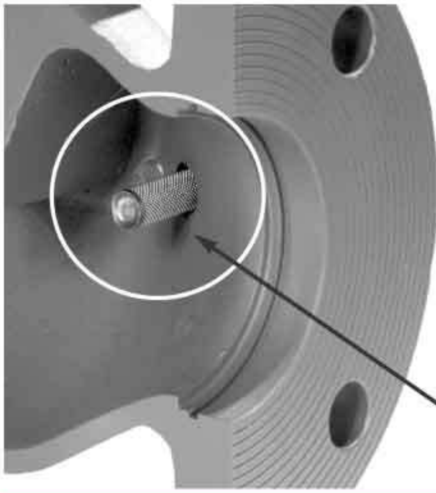
Because of the simplicity of design of the 2450 pilot, required maintenance is minimal. Fitting and bolts should be periodically checked for tightness and the body should be inspected for damage or excessive buildup of foreign material.

TROUBLESHOOTING

Troubleshooting of the 2450 is equally simple. Major troubleshooting points are as follows:

1. To check for ruptured diaphragm, disconnect the low pressure sense line from both the pilot and the valve flange. Plug the flange tap and pressurize the valve. A continuous discharge of fluid at the open sense port indicates a ruptured diaphragm.
2. An indication of the pilot stem binding may be checked by removing the pilot bonnet and moving the stem by hand. If excessive drag is evident, disassemble and pilot and determine the cause.
3. An erratic pilot action can result from a blockage in the port area of the valve stem or in the counterbalance area. Detach the sense line on the bottom plug and remove the plug. Clean out the counterbalance chamber as required. To remove the stem, hold the bottom of the stem with screwdriver in slot and remove the screw securing the diaphragm plates. The seat/stem assembly may now be removed through the bottom body port. Clean as necessary.

OCV Control Valves
7400 East 42nd Place / Tulsa, Oklahoma 74145 -4744 USA / (918) 627-1942 / 888-OCV-VALV / FAX 918-622-8916
e-mail: sales@controlvalves.com / website: www/controlvalves.com



DESCRIPTION

The 123 Inline Strainer installs in the inlet side port of the main valve, and protects the pilot system from solid contaminates in the line fluid. The screen prevents the entrance of particles into the pilot system piping while flow through the main valve washes the screen clean. Recommended use on petroleum valve applications where flushing or removal of the screen for cleaning is not practical or may be considered hazardous.

Strainer Shown Installed

DIMENSIONS

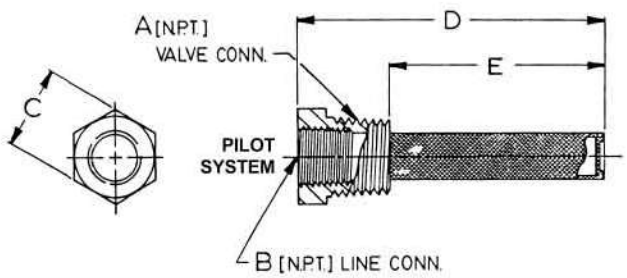
PART NUMBER	A	B	C	D	E	USED ON VALVE SIZE
660704	3/8	1/4	11/16	2 3/16	1 1/2	1 1/4"-6"
660705	1/2	3/8	7/8	2 1/4	1 1/2	8"-10"
660706	3/4	1/2	1 1/8	2 3/8	1 1/2	12"-16"

MATERIALS

Inline strainers are all-stainless steel construction.

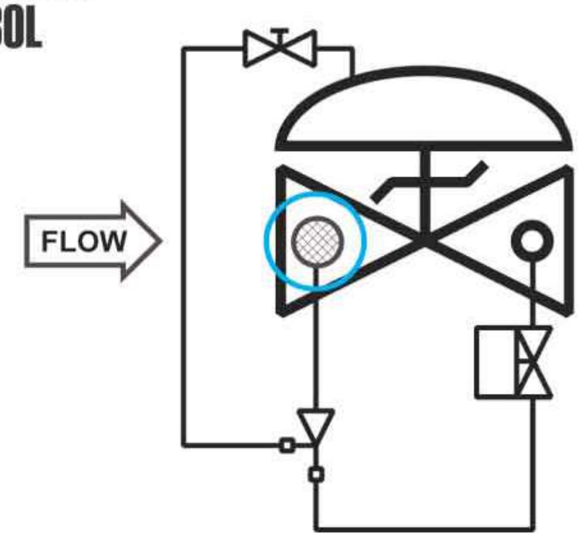
SCREEN SIZE

Standard screen is 40 mesh. Other mesh sizes are available.



SCHEMATIC SYMBOL

The Model 123 Inline Strainer is shown on OCV Valve Schematics as:



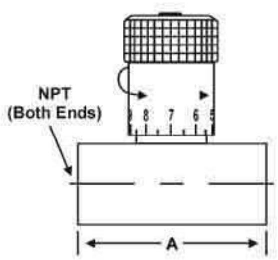
EXAMPLE: Shown here on a MODEL 115-2 Solenoid Valve.

◀Needle Valves shown
Sizes: 3/4" & 1/4"

DESCRIPTION

The Model 141-2 Needle Valve is an adjustable restriction device installed in the control circuit tubing. The setting of the needle valve meters the flow into and out of the main valve diaphragm chamber, thus controlling the response speed of the main valve. Depending on the application, the needle valve may be used as a closing speed control, opening speed control, or both simultaneously.

MODEL 141-2 MATRIX

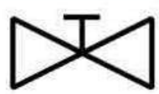


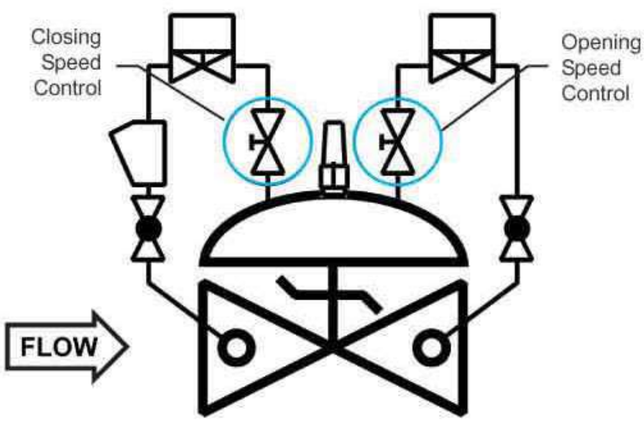
MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	A	USED ON VALVE SIZE*
Brass	683100	1/4	2	1 ¼"-2"
Brass	683101	3/8	2 1/4	2 ½"-6"
Brass	683102	1/2	2 5/8	8"-10"
Brass	683103	3/4	3 1/4	12"-16"
Stn. Steel	683700	1/4	2	1 ¼"-2"
Stn. Steel	683702	3/8	2 1/4	2 ½"-6"
Stn. Steel	682704	1/2	2 5/8	8"-10"
Stn. Steel	683703	3/4	3 5/8	12"-16"

Note: Needle valve size may vary on valve application. Consult factory.

SCHEMATIC SYMBOL

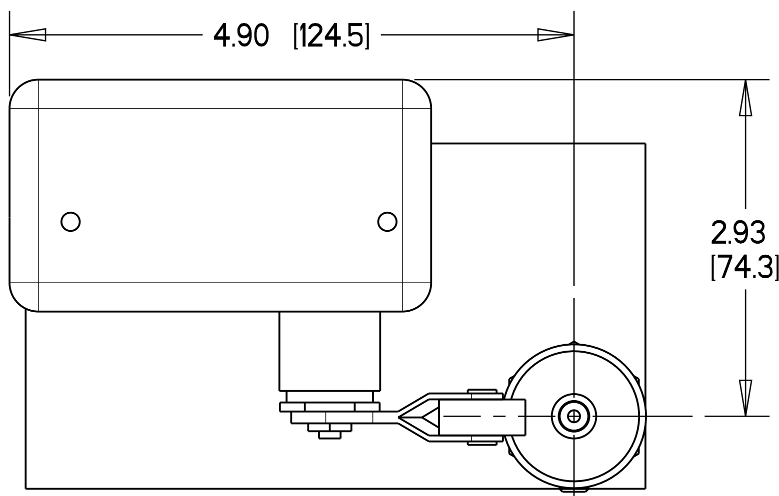
The Model 141-2 Needle Valve is shown on OCV Valve Schematics as:





EXAMPLE: Shown here on a MODEL 115-3 DIGITAL VALVE as separate opening and closing speed controls.

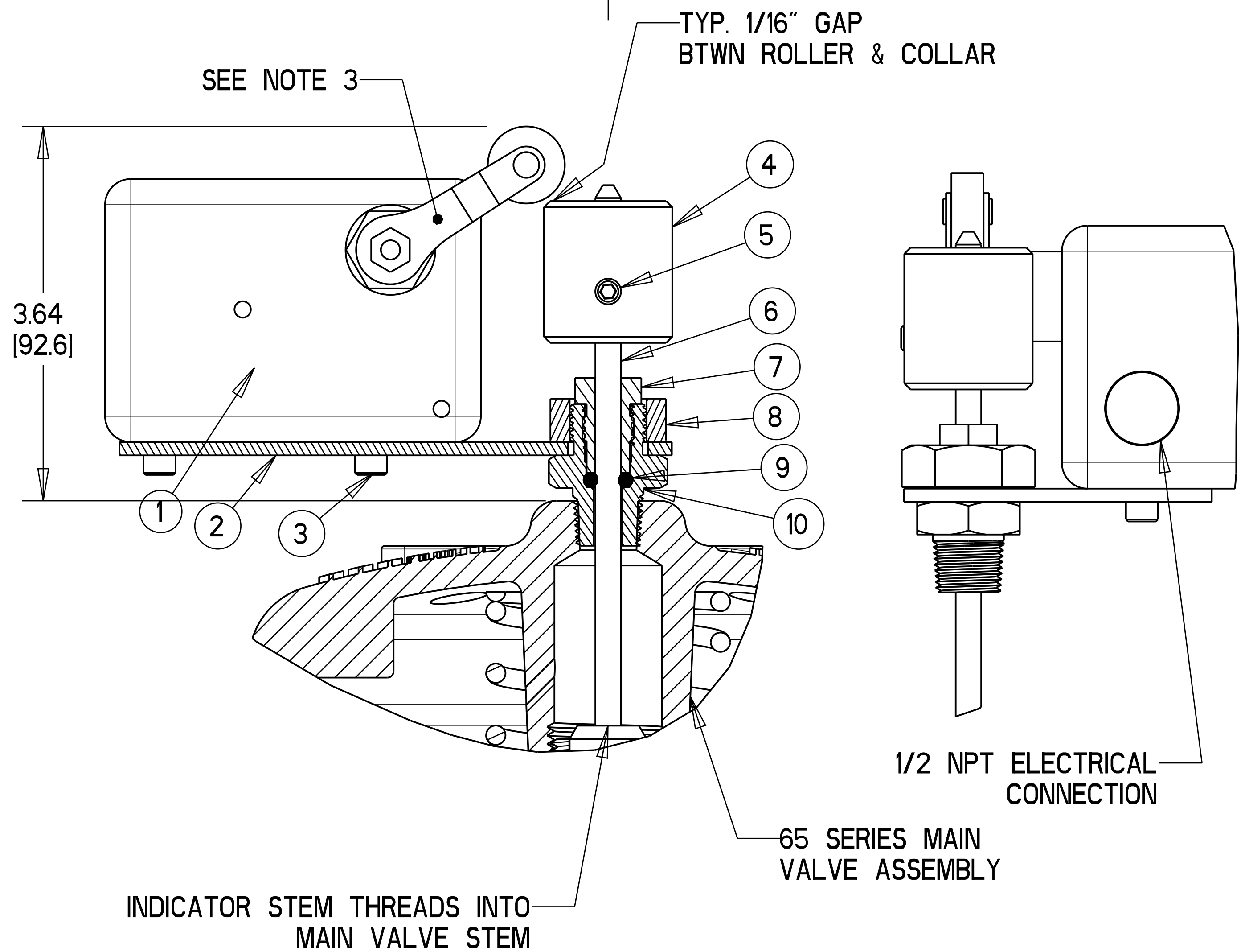
TOLL FREE 1.888.628.8258 • phone: (918)627.1942 • fax: (918)622.8916 • 7400 East 42nd Place, Tulsa, OK 74145
email: sales@controlvalves.com • website: www.controlvalves.com



INDICATOR STEMS (Ø0.25″)

P/N	LENGTH (INCHES)	MATERIAL	MAIN VALVE SIZES
316005	4.50	MONEL	1.25-1.5IN
316006	5.75		2-4IN
316008	7.88		6-8IN
316009	9.25		10-12IN
316010	10.75		14-16IN

ITEM	PART NUMBER	QTY	PART DESCRIPTION	MATERIAL
1	SEE TABLE	1	LIMIT SWITCH	SEE TABLE
2	316412	1	MOUNTING PLATE	STN STEEL
3	530702	2	CAPSCREW, 10-32 X 3/8	STN STEEL
4	316021	1	COLLAR	STN STEEL
5	530708	1	SET SCREW, COLLAR 1/4-20 X 1/2″	STN STEEL
6	SEE TABLE	1	INDICATOR STEM	SEE TABLE
7	300155	1	BUSHING	BRASS
8	590747	1	NUT, 3/4-16	STN STEEL
9	611108	1	O-RING	VITON-F
10	300753	1	ADAPTOR	STN STEEL



NOTES:
1. WEATHER-PROOF LIMITS:
   NEMA 4. RATED FOR 15 AMP 480 VAC/DC CONTACTS.
2. EXPLOSION-PROOF LIMITS:
   NEMA 1,7,9. RATED FOR 20 AMP
   UL LISTED, CSA CERTIFIED, ATEX APPROVED.
   NOT WEATHERPROOF RATED
3. LEVER TRAVEL IS SPRING DRIVEN CW FOR STANDARD CONFIGURATION (⌖).
   NON-STANDARD OPTIONS ARE AVAILABLE FOR CCW DIRECTION
4. LIMIT SWITCH HOUSINGS ARE DIE CAST ALUMINUM
5. INCHES [MM]. INCHES ARE STANDARD
6. TYPCIALLY USED IN PETROLEUM FLUID APPLICATONS.

⌖ STANDARD CONFIGURATION

LIMIT SWITCHES

	PART NUMBER	DESCRIPTION	RATINGS	SWITCH TYPE	65 CLOSED	65 OPENED
⌖	589000	OP-AR	WEATHERPROOF	SPDT	N.C CONTACT(S) CLOSED	N.C CONTACT(S) OPEN
⌖	589003	EX-AR	EXPLOSIONPROOF		N.O CONTACT(S) OPEN	N.O CONTACT(S) CLOSED
⌖	589002	OPD-AR	WEATHERPROOF	DPDT	SWITCH ROLLER OFF COLLAR	SWITCH ROLLER ON COLLAR
⌖	589001	EXD-AR-3	EXPLOSIONPROOF			
	589143	OP-AR30	WEATHERPROOF	SPDT	N.C CONTACT(S) OPEN	N.C CONTACT(S) CLOSED
	589017	EX-AR-30	EXPLOSIONPROOF		N.O CONTACT(S) CLOSED	N.O CONTACT(S) OPEN
	589009	OPD-AR30	WEATHERPROOF	DPDT	SWITCH ROLLER ON COLLAR	SWITCH ROLLER OFF COLLAR
	589177	EXD-AR30-3	EXPLOSIONPROOF			

CHG	ECN	DATE	BY	
E				
D				
C				
B				
A				

REVISIONS

REF DWG NO´S

MATERIAL: SEE TABLE

NO. REQ'D:

SCALE: 0.600

TOLERANCES
UNLESS NOTED
.XX ±.015
.XXX ±.005
ANGULAR ±0.5°
MACH FINISH 125

DRAWN BY	DATE
JRK	10-22-18
CHKD BY	DATE
RON	10-22-18

OCV Control Valves

TULSA OKLAHOMA USA

MODEL 150 HORIZONTAL LIMIT SWITCH (Ø1/4″ STEM, WITH O-RING SEAL)

SIZE	DRAWING NUMBER	REV
B	150_LIM_SW_HORIZ	

OCV Control Valves™ LLC

Global performance. **Personal** touch.