

combination rate-of-flow control and pressure reducing valve

installation, operating,
and
maintenance instructions

model 120G-2

GENERAL DESCRIPTION

The OCV Model 120G-2 rate-of-flow/pressure reducing valve is designed to perform the following functions:

1. Reduce a higher upstream pressure into a lower, **constant** downstream pressure.
2. Prevent the flow rate through the valve from exceeding a predetermined maximum.

The 120G-2 consists of the following components:

1. **Model 65 Basic Valve**, a hydraulically-operated, diaphragm-actuated, globe or angle valve which closes with an elastomer-on-metal seal.
2. **Model 1340 Pressure Reducing Pilot**, a two-way, normally-open pilot valve which senses downstream pressure under its diaphragm and balances it against an adjustable spring load. An increase in downstream pressure tends to make the pilot close.
3. **Model 2450 Rate-of-Flow Control Pilot**, a two-way, normally-open pilot valve which senses the differential pressure created across an orifice plate integrally mounted in the upstream or downstream flange of the main valve and balances it against an adjustable spring load. This differential is proportional to the flow rate through the valve. An increase in differential tends to make the pilot close.
4. **Model 126 Ejector**, a simple "tee" fitting with a fixed orifice in its upstream port. It provides the proper pressure to the diaphragm chamber of the main valve depending on the position of the rate-of-flow control pilot.
5. **Model 141-3 Flow Control Valve**, a needle-type valve which provides adjustable, restricted flow in one direction and free flow in the opposite direction. On the 120G-2, the flow control valve is connected as an **opening speed control**.
6. **Model 159 Y-Strainer** (standard on water service valves) or **Model 123 Inline Strainer** (standard on fuel service valves). The strainer protects the pilot

system from solid contaminants in the line fluid.

7. Two **Model 141-4 Ball Valves** (standard on water service valves, optional on fuel service valves), useful for isolating the pilot system for maintenance or troubleshooting.

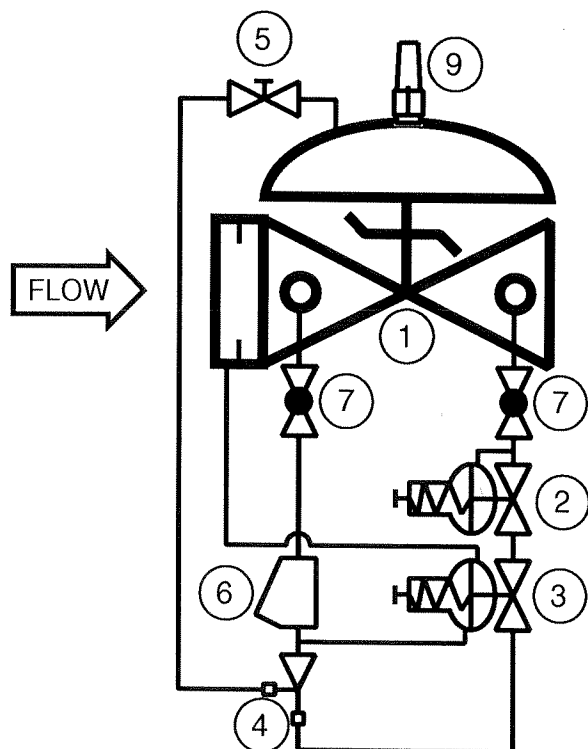
At user option, the 120G-2 may also be equipped with the following:

1. Model 155 Visual Indicator.
2. Model 150 Limit Switch Assembly (includes visual indicator).
3. Model 141-3 Closing Speed Control.

THEORY OF OPERATION (refer to schematic diagram):

A. PRESSURE REDUCING ACTION:

To understand how the 120G-2 operates, it is best to



begin with the EJECTOR. Due to the orifice in its upstream port, the ejector creates a pressure drop proportional to the flow through it. The flow through the ejector is in turn controlled by the degree of opening of the PRESSURE REDUCING PILOT. The wider the pilot opens, the greater the flow through the ejector and the lower the pressure downstream of the orifice. Conversely, the more the pilot closes, the lower the flow through the ejector and the greater the pressure downstream of the orifice.

Now note that the main valve diaphragm chamber is connected at the branch port of the ejector, which is downstream of the orifice. In this manner, the pressure in the diaphragm chamber of the main valve is in fact controlled by the rate-of-flow control pilot. As the diaphragm pressure decreases, the main valve opens; as the diaphragm pressure increases, the main valve closes. Putting it all together, as downstream pressure tends to increase above the set point of the pressure reducing pilot, the pilot moves further closed. This results in an increase in pressure in the diaphragm chamber of the main valve. The main valve then closes slightly to restore the downstream pressure to the set point. Conversely, as downstream pressure 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 downstream pressure 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 downstream pressure which remains constant despite fluctuations in demand or inlet pressure.

B. RATE-OF-FLOW CONTROL ACTION

A similar action occurs if the flow rate through the valve reaches the set point of the **Rate-of-Flow Control Pilot**. This pilot is sensing the differential pressure, proportional to flow rate, across the integrally-mounted orifice plate. Under normal conditions, the rate-of-flow pilot will be wide open and thus have no effect on valve operation. However, if the flow rate, hence the differential, reaches the set point, the pilot moves further closed, throttling the main valve in the manner described above and preventing the flow rate from rising any further. When this action occurs, the downstream pressure will naturally fall below the set point of the reducing pilot and will remain low until demand is once again reduced below the maximum.

INSTALLATION

The 120G-2 is furnished fully factory-assembled and ready for installation at the appropriate point in the system. The user is referred to the Basic Valve section of this manual for full installation details.

STARTUP AND ADJUSTMENT

The following procedures should be followed in the order presented in order to effect an initial startup of the 120G-2.

1. Install a pressure gauge of the proper range downstream of the 120G-2.
2. Install some means of measuring flow in series with the 120G-2.
3. Remove the plastic cap from the pressure reducing pilot and loosen the adjusting screw jam nut. Turn the adjusting screw **clockwise** to a full stop.
4. Remove the plastic cap from the rate-of-flow pilot. Turn the adjusting screw **counterclockwise** until it is loose enough to be turned by hand.
5. Turn the adjusting screw of the flow control valve fully **clockwise**, then back it off **three full turns**.
6. Start the pump, or otherwise start the system flowing. The main valve will at this time be either fully closed or open only a very small amount.
7. Carefully loosen one of the pipe plugs in the main valve bonnet until fluid appears around the threads. When only clear fluid (no air) is discharging, retighten the plug.
8. Open downstream valves to give as much demand as possible.
9. Slowly turn the adjusting screw of the rate-of-flow control pilot **clockwise** until flow rate reaches the predetermined maximum. Replace the plastic cap.
10. Check the downstream pressure. If it is lower than the desired set point, decrease demand as required in order to bring the pressure to a point **above** the desired set point.
11. Slowly turn the adjusting screw of the pressure reducing pilot **counterclockwise** until downstream pressure decreases to the desired set point. Tighten the adjusting screw jam nut and replace the plastic cap.
12. If there are small-scale oscillations in the downstream pressure, slowly turn the adjusting screw of the flow control valve **clockwise** until the oscillations disappear. **CAUTION:** Never close this

valve fully. To do so will prevent the main valve from opening.

13. If readjustment should ever be required:
 - a. **PRESSURE REDUCING PILOT:** Clockwise to increase pressure; counterclockwise to decrease pressure.
 - b. **RATE-OF-FLOW PILOT:** Clockwise to increase flow; counterclockwise to decrease flow.
 - c. **FLOW CONTROL VALVE:** Clockwise to decrease opening speed; counterclockwise to increase closing speed.

MAINTENANCE

Due to the simplicity of design of the 120G-2, required maintenance is minimal. However, the following checks, periodically performed, will do much to keep the valve operating properly and efficiently.

1. Check for chipped or peeling paint.
2. Check for leaks at fittings and around flanges and connections. Tighten as required.
3. If the valve is equipped with a Y-strainer, check the screen for buildup of solid material. Clean as required. This point is most important, as a clogged strainer can keep the valve from operating properly. On new installations, it is recommended that the strainer be checked every day or two until experience dictates a greater or lesser interval.

TROUBLESHOOTING

In the event of malfunction of the 120G-2, the following guide should enable the technician to isolate the specific cause of the problem.

A. MAIN VALVE FAILS TO OPEN - PRESSURE OR FLOW CANNOT BE SET HIGH ENOUGH:

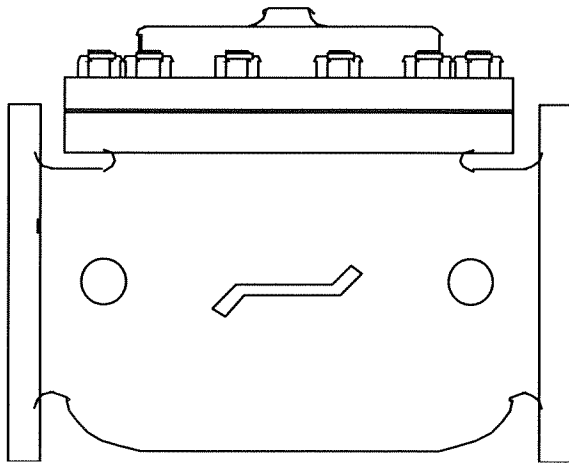
1. Valve closed downstream of 120G-2. Open as required.
2. Downstream pilot system ball valve closed. Open as required.
3. Flow control valve fully closed. See Adjustment instructions.
4. Pressure reducing pilot adjusted too far counterclockwise. See Adjustment instructions.
5. Rate-of-flow pilot adjusted too far counterclockwise. See Adjustment instructions.
6. Stem of pressure reducing pilot binding. See 1340

section of this manual.

7. Stem of rate-of-flow pilot binding. See 2450 section of this manual.
 8. Stem of main valve binding. See the Model 65 Basic Valve section of this manual.
- ### B. MAIN VALVE FAILS TO CLOSE - PRESSURE OR FLOW CANNOT BE SET LOW ENOUGH:
1. Upstream pilot system ball valve closed. Open as required.
 2. Strainer clogged. Clean as required.
 3. Pressure reducing pilot adjusted too far clockwise. See adjustment instructions.
 4. Rate-of-flow pilot adjusted too far clockwise. See adjustment instructions.
 5. Diaphragm of pressure reducing pilot ruptured. This will be evidenced by a discharge of fluid from the vent port in the pilot bonnet. Disassemble pilot and replace diaphragm.
 6. Close downstream pilot system ball valve.
 - a. If main valve closes, proceed to Step 7.
 - b. If main valve remains open, proceed to Step 9.
 7. Pressure reducing pilot stem binding or seat badly deteriorated. Disassemble pilot and determine cause. See 1340 section of this manual.
 8. Rate-of-flow pilot diaphragm ruptured or stem binding. Disassemble pilot and determine cause. See 2450 section of this manual.
 9. Close all pilot system ball valves and loosen a pipe plug in the main valve bonnet. A **continuous** discharge of fluid from the loosened plug indicates that the main valve diaphragm is ruptured. See Basic Valve section of this manual

NOTE: Certain valves, predominantly those in fuel service, are assembled "fail closed." In this case, a ruptured diaphragm would keep the valve from opening, rather than keep it from closing. To determine which type you have, examine the "bridge mark" cast into the side of the main valve body and compare it with the diagram below. If the bridge mark slants **downward** on the upstream end, the valve is "fail closed." If the bridge mark slants **upward** on the upstream end, the valve is "fail open."

10. Main valve stem binding or object in valve. Disassemble valve and determine cause. See Basic Valve section of this manual.



installation, operating, and maintenance instructions

series 65 basic control valve

GENERAL DESCRIPTION

The OCV Series 65 is a hydraulically-operated, diaphragm-actuated valve. It is available in either a globe (Model 65) or angle (Model 65A) configuration. 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. An elastomeric seat disc forms a tight seal with the valve seat when pressure is applied above the diaphragm.

FUNCTIONAL DESCRIPTION

Because the Series 65 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.
3. Install the valve in the line according to the flow arrow on the inlet flange. The arrow should point downstream.
4. Allow sufficient room around the valve for ease of adjustment and maintenance service.

In addition, it is highly recommended that:

1. Isolation valves (eg., 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 ex-

amination of the valve interior, be conducted. Particular attention should be paid to the elastomeric 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, then compare it with the figures below.

PROCEDURE A: DIAPHRAGM REPLACEMENT

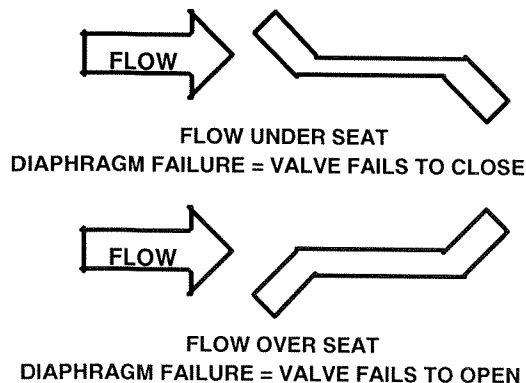
1. Isolate the valve from the system by closing upstream and downstream block valves.
2. Loosen one of the tubing connections on the bonnet. Allow any residual pressure to bleed off.
3. Remove all tubing connected at the bonnet.
4. Remove the bonnet nuts.
5. Remove the bonnet. If the bonnet sticks in 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.

6. Remove the spring.
7. Remove the diaphragm plate capscrews and the diaphragm plate.
8. Remove the old diaphragm.
9. 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.
10. Replace the diaphragm plate and the diaphragm plate capscrews.
11. Tighten all diaphragm plate capscrews snugly.
12. Replace the spring.
13. Replace the bonnet and reinstall the bonnet nuts.
14. Tighten the bonnet nuts snugly using a criss-cross tightening pattern.
15. Reinstall the control tubing.
16. Reopen the upstream and downstream block valves.
17. Before placing the valve back in service, perform the air bleed procedure described in the first section of this manual.

PROCEDURE B: CORRECTION OF BINDING STEM

1. Perform Steps 1 thru 6 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.

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 12 thru 17 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.

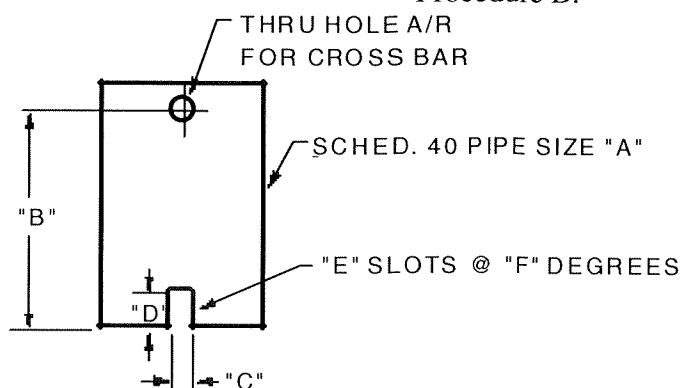
5. Install the new seat disc in the groove.
6. Reinstall the seat retainer and tighten the seat retainer screws.
7. Reassemble the valve, following Steps 5 and 6 of Procedure B.

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.

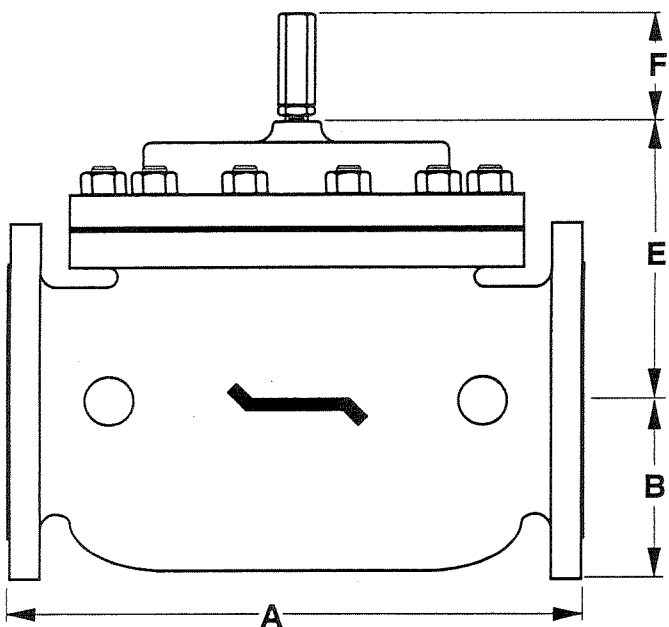
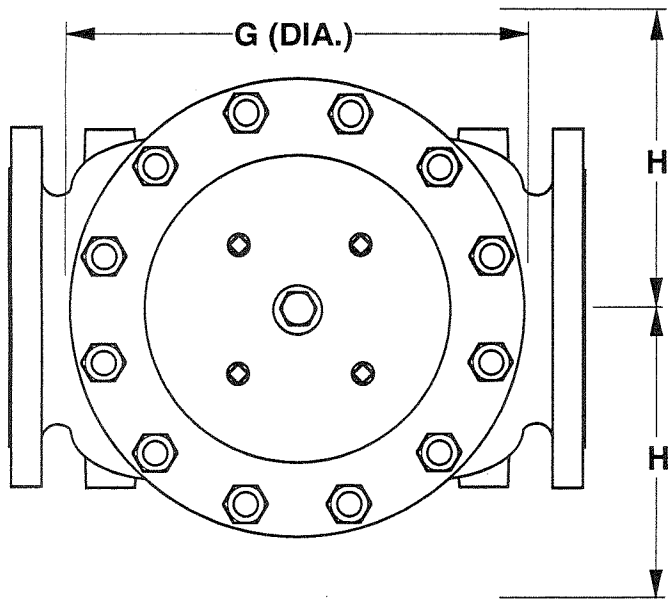
1. Perform Steps 1 and 2 of Procedure B, above.
2. If you are working on a 4" or smaller valve, follow Steps 3 thru 9, below.
3. If you are working on a 6" or larger valve, follow Steps 10 thru 16, below.

4. Seat rings in valves 4" and smaller are threaded into the valve body. To remove, you will need a special seat ring tool. You may fabricate one using standard pipe as shown in the sketch below, or one may be purchased from OCV.
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 in valves 6" and larger 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.

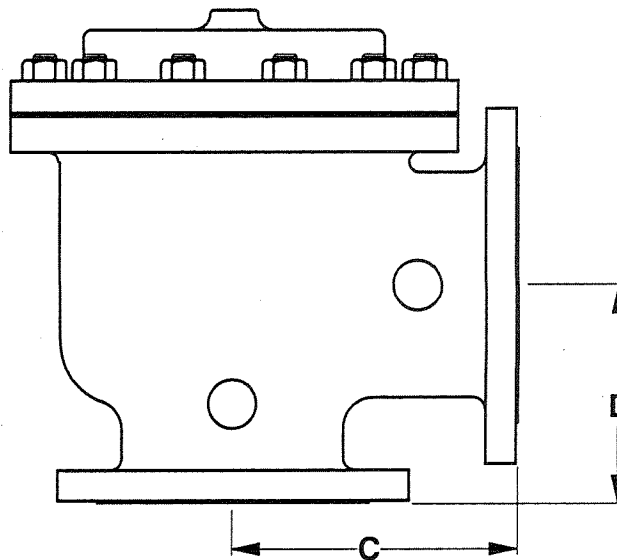


VALVE SIZE	"A" PIPE SIZE	"B" MIN. LENGTH	"C" SLOT WIDTH	"D" SLOT DEPTH	"E" NO. OF SLOTS	"F" SLOT SPACING
1-1/4"	3/4"	6"	3/8"	3/8"	2	180°
1-1/2"	3/4"	6"	3/8"	3/8"	2	180°
2"	1-1/2"	7"	3/8"	3/8"	2	180°
2-1/2"	2"	8"	1/2"	1/2"	3	120°
3"	2-1/2"	9"	5/8"	5/8"	2	180°
4"	3"	10"	5/8"	5/8"	2	180°

REVISED 3-17-97




DIM	ANSI CLASS	VALVE SIZE												
		1 1/4	1 1/2	2	2 1/2	3	4	6	8	10	12	14	16	24
A	SE	8.75	8.75	9.88	10.50	13.00	—	—	—	—	—	—	—	—
	150	8.50	8.50	9.38	10.50	12.00	15.00	17.75	25.38	29.75	34.00	39.00	40.38	62.00
	300	8.75	8.75	9.88	11.12	12.75	15.62	18.62	26.38	31.12	35.50	40.50	42.00	63.75
B	SE	1.44	1.44	1.69	1.88	2.25	—	—	—	—	—	—	—	—
	150	2.31	2.50	3.00	3.50	3.75	4.50	5.50	6.75	8.00	9.50	10.62	11.75	16.00
	300	2.62	3.06	3.25	3.75	4.12	5.00	6.25	7.50	8.75	10.25	11.50	12.75	18.00
C	SE	4.38	4.38	4.75	6.00	6.50	—	—	—	—	—	—	—	—
	150	4.25	4.25	4.75	6.00	6.00	7.50	10.00	12.69	14.88	17.00	—	20.81	—
	300	4 3/8	4.38	5.00	6.38	6.38	7.81	10.50	13.19	15.56	17.75	—	21.62	—
D	SE	3.12	3.12	3.88	4.00	4.50	—	—	—	—	—	—	—	—
	150	3.00	3.00	3.88	4.00	4.00	5.50	6.00	8.00	11.38	11.00	—	15.69	—
	300	3.25	3.25	4.12	4.38	4.38	5.81	6.50	8.50	12.06	11.75	—	16.50	—
E	ALL	6.00	6.00	6.00	7.00	6.50	7.92	10.00	11.88	15.38	17.00	18.00	19.00	27.00
F	ALL	3.88	3.88	3.88	3.88	3.88	3.88	3.88	6.38	6.38	6.38	6.38	6.38	8.00
G	ALL	6.00	6.00	6.75	7.69	8.75	11.75	14.00	21.00	24.50	28.00	31.25	34.50	52.00
H	ALL	10.00	10.00	11.00	11.00	11.00	12.00	13.00	14.00	17.00	18.00	20.00	20.00	28.50

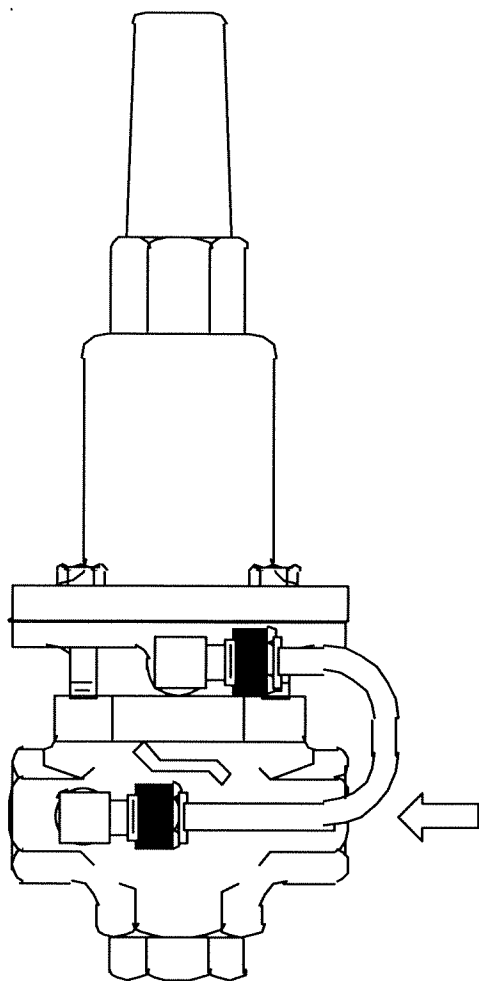


NOTE: 3" VALVE DIMENSIONS
ARE FOR NEW MODEL 3100

4" VALVE DIMENSIONS ARE FOR
NEW MODEL 4400

REV. A SDJ 6-6-02
REV. B SDJ 2-3-03

TOLERANCES		 OCV Control Valves TULSA, OKLAHOMA U.S.A.		
UNLESS NOTED				
FRACTIONAL $\pm 1/64$		GENERAL VALVE DIMENSIONS		
DECIMAL $\pm .005$				
MACH. FINISH 125/				
ANGULAR $\pm 1/2^\circ$				
DRAWN BY	DATE	SIZE	DRAWING NUMBER	REV.
SDJ	10-6-97			
CHKD. BY	DATE	A	65D	B



installation, operating, and maintenance instructions

pressure reducing pilot

model 1340

GENERAL DESCRIPTION

The Model 1340 Pressure Reducing Pilot is a normally-open, direct-acting, spring-loaded, diaphragm-type control pilot. As the primary control pilot for the OCV Series 127 control valves, it is designed to maintain a constant preset discharge pressure from the main valve. It is a constant throttling device, maintaining precise, positive control of the main valve.

The 1340 may also be used by itself as a downstream pressure regulator.

The 1340 is available in bronze or stainless steel construction and with 3/8 NPT or 1/2 NPT end connections.

The 1340 is available with four different adjustment ranges:

5-30 psi	65-180 psi
20-80 psi	100-300 psi

FUNCTIONAL DESCRIPTION

The 1340 controls the pressure in the diaphragm chamber of the main valve, hence the degree of opening or closing of the valve. The downstream pressure is sensed under the diaphragm of the pilot and is balanced against

an adjustable spring load. As the downstream pressure decreases below the set point, the pilot opens wider, decreasing the pressure in the diaphragm chamber of the main valve, opening the valve a proportionate amount. Conversely, as downstream pressure increases above the set point, the pilot closes further, increasing the pressure in the diaphragm chamber of the main valve, closing the valve a proportionate amount. The net result is a constant modulating action of the pilot and main valve, keeping the downstream pressure at the set point within very close limits.

INSTALLATION AND ADJUSTMENT

The 1340 is normally installed in the main valve control piping between the ejector and the downstream body tap. Flow must be in the direction indicated. In most cases, a sense line is factory installed between the diaphragm sense port and the downstream pilot body side port, as shown in the drawing. The pilot can also be remote sensed by running a line (typically 1/4" O.D. tubing) from the 1/8 NPT connection under the pilot diaphragm to the desired downstream point where the pressure control is desired.

Pressure adjustment is made by means of the single adjusting screw:

Clockwise adjustment **increases** downstream pressure.

Counterclockwise adjustment **decreases** downstream pressure.

MAINTENANCE

Required maintenance of the 1340 is minimal. Fittings and bolts should be periodically checked, and the body should be inspected for damage or excessive buildup of foreign material.

TROUBLESHOOTING

Other than improper adjustment, there are basically only three malfunctions which can occur with the 1340 pilot. These, and the symptoms they can cause, are as follows:

1. **PILOT DIAPHRAGM RUPTURED:** Results in failure of the main valve to close and/or downstream pressure that is too high. A ruptured pilot diaphragm will be evidenced by leakage through the vent hole in the pilot bonnet.
2. **PILOT SEAT DISC DETERIORATED:** Results in a downstream pressure that drifts too high under dead-end (zero flow) conditions.
3. **PILOT STEM BINDING:** Typically results in poor pressure control, though in extreme cases, it can result in failure of the main valve to open or close.

REPAIR PROCEDURES

Refer to the 1340 assembly drawing for parts identification.

A. DIAPHRAGM REPLACEMENT

1. Prior to disassembling the pilot, turn the adjusting screw (10) fully counterclockwise until it is loose enough to be turned with the fingers.
2. Remove the four bonnet capscrews (17).
3. Remove the bonnet (2). Set the spring (9) and spring retainers (11) aside in a safe place.
4. Remove the plug (4) from the bottom of the pilot.
5. Using a 7/16" socket as a backup on capscrew (12), remove hex nut (16), lockwasher (22), upper diaphragm plate (8) and o'ring (20).
6. Remove old diaphragm (5).

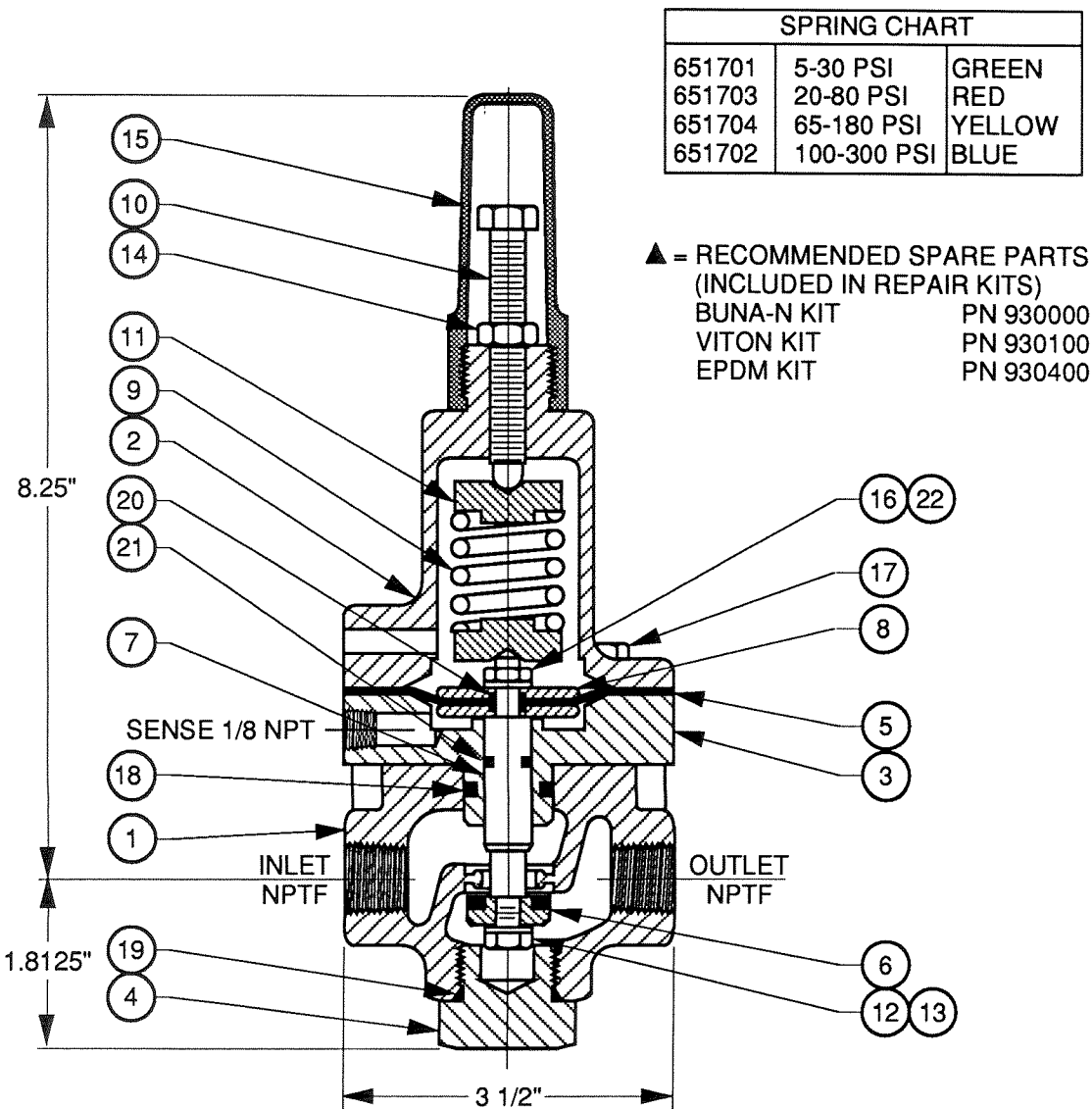
7. Inspect both diaphragm plate o'rings (20). Replace if necessary.
8. Place new diaphragm on stem (7).
9. Replace upper diaphragm plate (8), o'ring (20), lockwasher (22) and hex nut (16). Tighten securely.
10. Reinstall plug (4).
11. Hold spring (9) and spring retainers (11) together in the proper orientation, and insert them into the bonnet (2).
12. Place the bonnet over the adapter, and insert the bonnet capscrews (17). Tighten securely.
13. Place valve back in service, following the startup and adjustment procedures given in the main portion of this manual.

B. SEAT DISC REPLACEMENT

1. Follow Steps 1 through 4 under DIAPHRAGM REPLACEMENT, above.
2. Using a 7/16" socket as a backup on capscrew (12), remove hex nut (16), lockwasher (22), diaphragm plates (8) and o'rings (20).
3. Remove stem (7) and seat disc (12) through bottom of pilot.
4. Remove capscrew (12), seal washer (13) and old seat disc (6).
5. Place new seat disc, new seal washer and capscrew (12) on stem. Tighten securely.
6. Reinsert stem through bottom of pilot.
7. Reinstall diaphragm plates (8), o'rings (20), diaphragm (5), lockwasher (22) and hex nut (16). Tighten securely.
8. Reassemble pilot following Steps 10 through 13 under DIAPHRAGM REPLACEMENT, above.

C. STEM REPAIR

1. Follow Steps 1 through 3 under SEAT DISC REPLACEMENT, above.
2. Inspect stem and o'ring (21) carefully.
3. Remove any foreign material or light scratches from the stem with a fine grade of emery cloth. A badly scored stem should be replaced.
4. Replace o'ring (21).
5. Lubricate the o'ring and stem liberally with Vaseline® or similar lubricant.
6. Reassemble pilot following Steps 6 through 8 under SEAT DISC REPLACEMENT, above.



ITEM	PART NO	QTY	DESCRIPTION	MATERIAL
1	302102	1	BODY	3/8" NPTF
	302104			1/2" NPTF
	302702			3/8" NPTF
	302704			1/2" NPTF
2	304102	1	BONNET	BRONZE
	304702			STN STEEL
3	300129	1	ADAPTOR	BRONZE
	300719			STN STEEL
4	692502	1	PLUG	ZINC PLTD STL
	310730			STN STEEL
5	694002	1	DIAPHRAGM	BUNA-N / NYLON
	694102			VITON / NYLON
	694016			EPDM / NYLON
6	310703	1	SEAT DISC	BUNA-N / SS
	310709			VITON / SS
	310707			EPDM / SS
7	314704	1	STEM	STN STEEL
	314004			MONEL
8	308102	2	DIAPHRAGM PLATE	BRASS
	308702			STN STEEL
9	CHART	1	SPRING	STN STEEL
10	300700	1	ADJUSTING SCREW	STN STEEL
11	300134	2	SPRING RETAINER	BRASS
	300729			STN STEEL
12	531700	1	HEX HEAD CAPSCREW	STN STEEL
13	685760	1	LOCKWASHER	STN STEEL
14	590717	1	HEX NUT	STN STEEL
15	692002	1	CAP	PVC
16	590712	1	HEX NUT	STN STEEL
17	531701	4	HEX HEAD CAPSCREW	STN STEEL
18	611116	1	O-RING	VITON
	614116			EPDM
19	610912	1	O-RING	BUNA-N
	611912			VITON
	914912			EPDM
20	611010	2	O-RING	VITON
	614010			EPDM
21	611012	1	O-RING	VITON
	614012			EPDM
22	685700	1	LOCKWASHER	STN STEEL

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rate of flow control pilot

installation, operating, and maintenance instructions

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 upper 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.

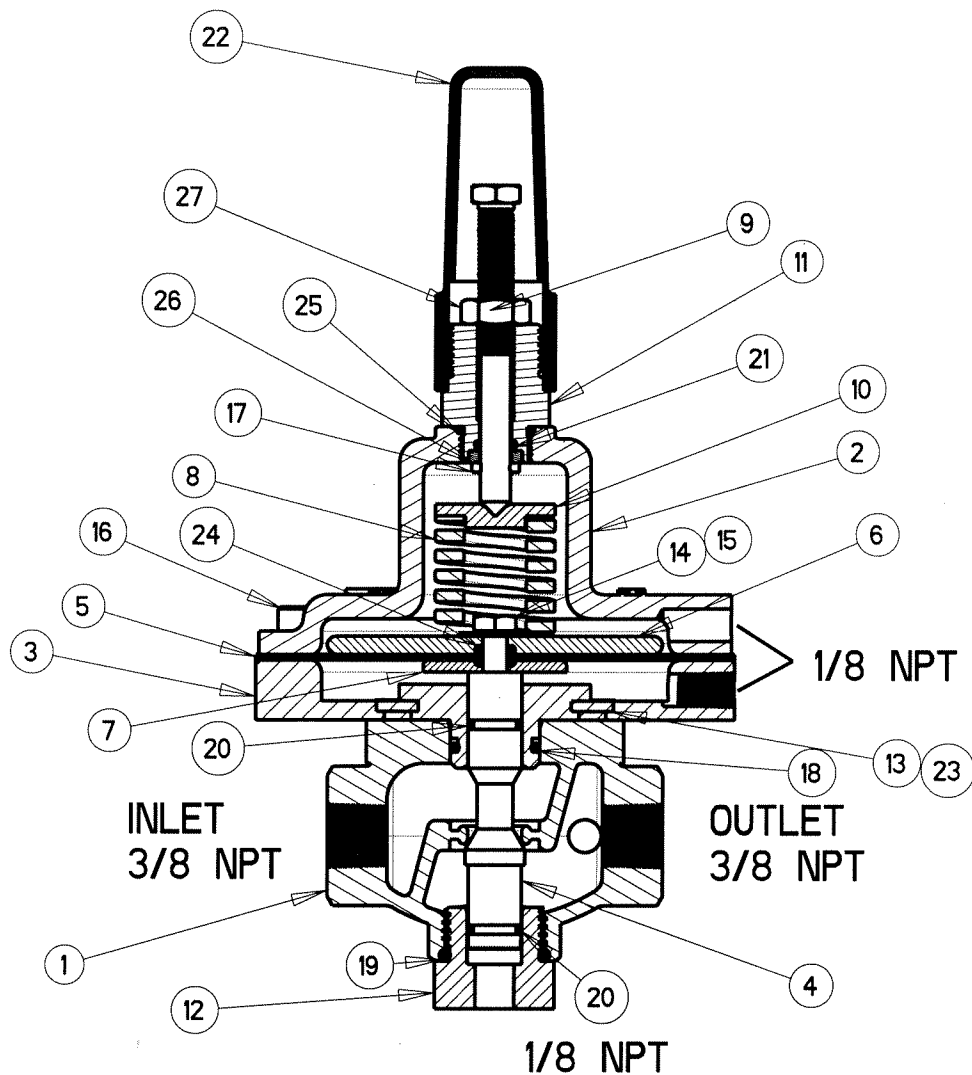
MAINTENANCE

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.



27	590717	1	HEX NUT	STN. STEEL
26	320718	1	BUSHING	STN. STEEL
25	610017	1	O-RING	BUNA-N
24	611010	1	O-RING	VITON
23	611011	4	O-RING	VITON
22	692002	1	CAP	BUTYRATE
21	611011	1	O-RING	VITON
20	611013	2	O-RING	VITON
19	610912	1	O-RING	BUNA-N
18	611116	1	O-RING	VITON
17	620712	1	CODDER PIN	STN. STEEL
16	530701	8	SKT HD CAPSCREW	STN. STEEL
15	685700	1	LOCK WASHER	STN. STEEL
14	531700	1	HEX HD CAPSCREW	STN. STEEL
13	532702	4	FLAT HD SCREW	STN. STEEL
12	310725	1	PLUG	STN. STEEL
11	320816	1	ADJUSTING SCREW ADAP.	STN. STEEL
10	300710	1	SPRING RETAINER	STN. STEEL
9	320724	1	ADJUSTING SCREW	STN. STEEL
8	651408	1	SPRING	CR-V STEEL
7	308702	1	LOWER DIAPH. PLATE	STN. STEEL
6	308720	1	UPPER DIAPH. PLATE	STN. STEEL
5	694004	1	DIAPHRAGM	BUNA-N/NYLON
4	314720	1	STEM	STN. STEEL
3	300706	1	ADAPTER	STN. STEEL
2	304730	1	BONNET	STN. STEEL
1	302702	1	BODY	STN. STEEL
ITEM	PART NO.	QTY	DESCRIPTION	MATERIAL

				MATERIAL	TOLERANCES	OCV Control Valves			
E					UNLESS NOTED XX ± 0.15 XXX ± 0.05 ANGULAR $\pm 0.5^\circ$ MACH. FINISH 125	TULSA OKLAHOMA USA			
D						RATE-OF-FLOW CONTROL PILOT			
C									
B									
A					NO. REQ'D	DRAWN BY	DATE	SIZE	DRAWING NUMBER
CHG	ECN	DATE	BY		SCALE	B.K.	11-9-07	A	2450
REVISIONS				REF DWG NO'S	1/2				

DESCRIPTION

MODEL 126 EJECTOR

The Model 126 ejector is a simple tee fitting with a fixed orifice in its inlet port. It provides the proper supply pressure to the main valve diaphragm chamber, allowing various two-way control pilots to control the valve position.



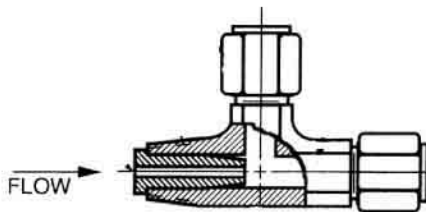
MODEL 126 EJECTOR DIAGRAM

Brass Construction / Stainless Steel Construction

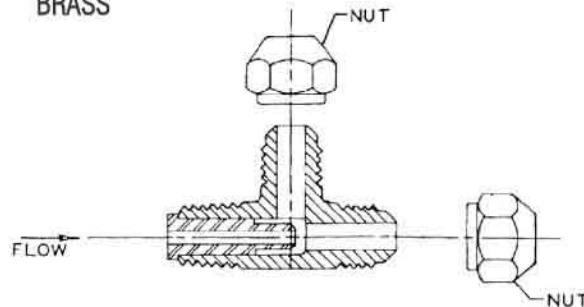
MATERIAL	PART NUMBER	P (NPT)	T-TUBE O.D.	STD. ORIFICE	USED ON VALVE SIZES
Brass	213100	3/8"	3/8"	.125"	1 1/4"-6"
Brass	214100	1/2"	1/2"	.188"	8"-10"
Brass	215100	3/4"	3/4"	.188"	12"-16"
316 Stn. Steel	213700	1/4"	3/8"	.090"	1 1/4"-6"
316 Stn. Steel	214700	3/8"	1/2"	.125"	8"-10"
316 Stn. Steel	215700	1/2"	3/4"	.188"	12"-16"

Orifice bushings are stainless steel.

STAINLESS

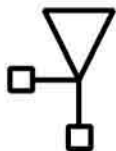


BRASS

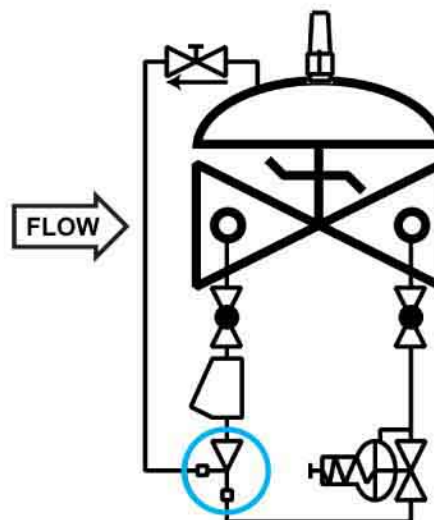


SCHEMATIC SYMBOL

The Model 126 Ejector is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 127-3 Pressure Reducing Valve

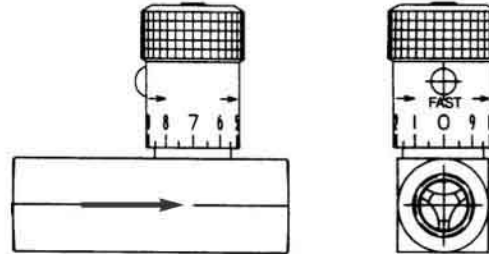


DESCRIPTION



The Model 141-3 Flow Control Valve is an adjustable restriction device, installed in the control circuit tubing. The flow control valve differs from a standard needle valve in that it includes an internal check valve. Thus it allows free flow in one direction (through the check) and restricted flow in the other direction (through the needle). The setting of the flow control valve meters the flow into or out of the main valve diaphragm chamber,

thus controlling either the opening or closing speed of the main valve. These can be installed in series for separate opening and closing speed control. Restricted flow is in the direction of the flow arrow on the body.

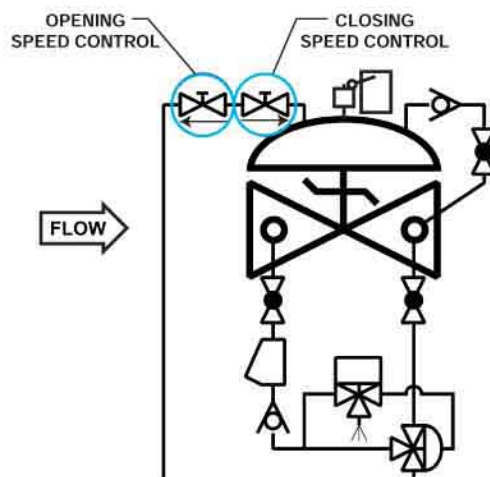


MODEL 141-3 MATRIX

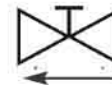
MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	A	USED ON VALVE SIZE*
Brass	682100	1/4	2 3/8	1 1/4"-2"
Brass	682101	3/8	2 3/4	2 1/2"-6"
Brass	682102	1/2	3 1/4	8"-10"
Brass	682103	3/4	3 7/8	12"-16"
Stn. Steel	682700	1/4	2 3/8	1 1/4"-2" Stn.
Stn. Steel	682701	3/8	2 3/4	2 1/2"-6"
Stn. Steel	682702	1/2	3 1/4	8"-10"
Stn. Steel	682703	3/4	3 5/8	12"-16"

Note: Flow control valve use and size may vary on valve application. Consult factory.

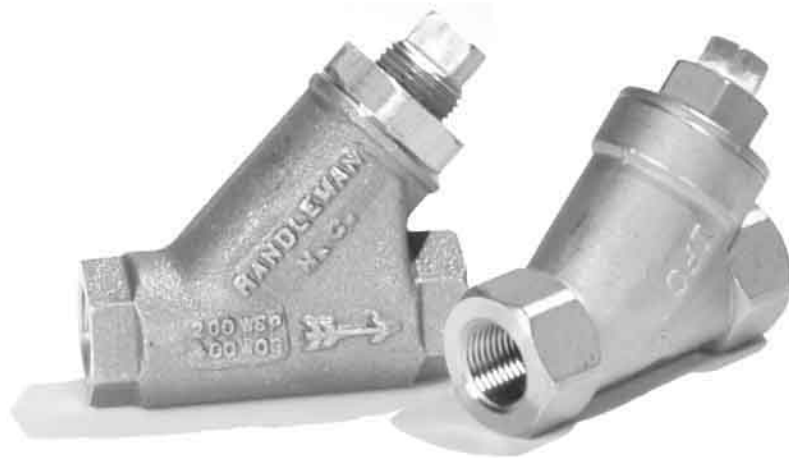
SCHEMATIC SYMBOL



The Model 141-3 Flow Control Valve is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 125 Pump Control Valve as separate opening and closing speeds.



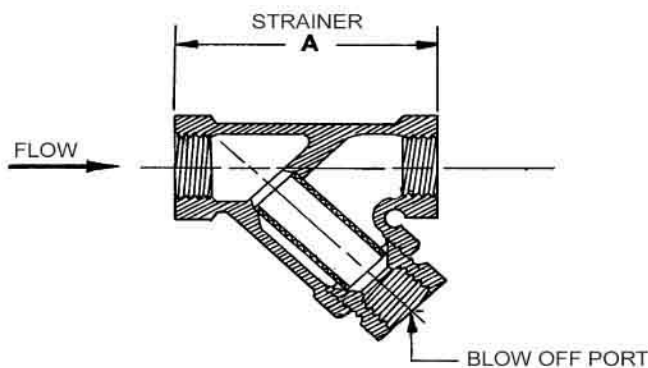
DESCRIPTION

MODEL 159 Y-STRAINER

The 159 Y-Strainer installs in the inlet piping of the pilot system and protects the pilot system from solid contaminants in the line fluid. It is the standard strainer for water service valves.

MODEL 159 Y-STRAINER MATRIX

MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	BLOW OFF PORT (NP)	A	STD. MESH	USED ON VALVE SIZE
Bronze	660100	3/8	3/8	2 11/16	24	1 1/4"-6"
Bronze	660101	1/2	3/8	2 5/8	24	8"-10"
Bronze	660102	3/4	3/8	3 5/16	24	12"-16"
Stn. Steel	660700	3/8	1/4	2 1/2	20	1 1/4"-6"
Stn. Steel	660701	1/2	1/4	2 1/2	20	8"-10"
Stn. Steel	660702	3/4	1/4	3 1/8	20	12"-16"



MATERIALS

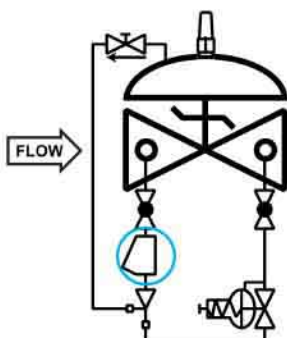
Bronze, ASTM B62
Optional mesh sizes: 50, 100

Stainless Steel, CF8-M (316)
Optional mesh sizes: 60, 80, 100

Screens are stainless steel

SCHEMATIC SYMBOL

The Model 159 Y-Strainer is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 127-3 Pressure Reducing Valve

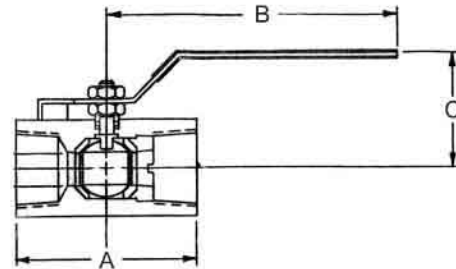
MAINTENANCE

Routine cleaning and checking of the Y-Strainer will aid in keeping the control valve functioning properly. Pilot system isolation ball valves are supplied on valves equipped with the Model 159 Y-Strainer. These allow flushing of the screen through the blow off port, or removal of the screen itself for manual cleaning.

DESCRIPTION

The Model 141-4 Ball Valve is a 1/4-turn shutoff device used for isolating the pilot system from the main valve. They are extremely useful for performing routine maintenance and troubleshooting.

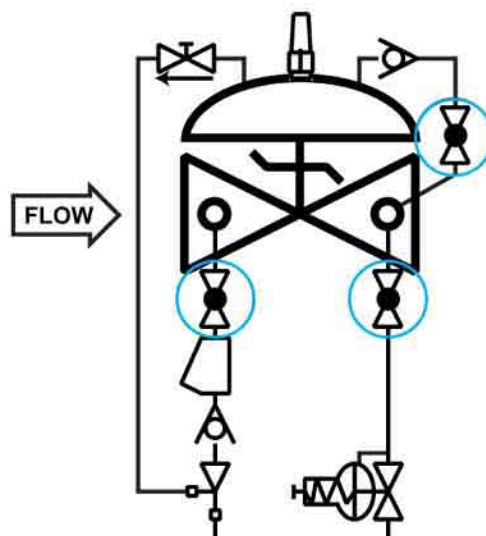
Ball valves are standard on water service valves; optional on fuel service valves.



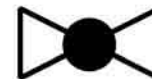
MODEL 141-4 MATRIX

MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	A	B	C	USED ON VALVE SIZE*
Bronze	680100	3/8	1 3/4	3 1/2	1 7/8	1 1/4"-6"
Bronze	680101	1/2	2	3 1/2	2 1/4	8"-10"
Bronze	680102	3/4	3	4 3/4	2 1/4	12"-16"
Stn. Steel	680700	3/8	2	3 3/4	2 1/8	1 1/4"-6"
Stn. Steel	680701	1/2	2 1/4	3 3/4	2 1/2	8"-10"
Stn. Steel	680702	3/4	3	4 3/4	2 1/4	12"-16"

SCHEMATIC SYMBOL



The Model 141-4 Ball Valve is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 127-4 Pressure Reducing / Check Valve.