

# installation, operating and maintenance instructions

## booster pump control valve

# model 125-27P

### GENERAL DESCRIPTION

The OCV Model 125-27P is designed to effectively eliminate the surges associated with the starting and stopping of booster-type pumps and act as the pump discharge check valve. Electrically interfaced with the pump, the 125-27P performs these functions by:

- (a) Slowly opening after pump start.
- (b) Slowly closing prior to pump shutdown.
- (c) Closing rapidly as a check valve in the event of power failure.

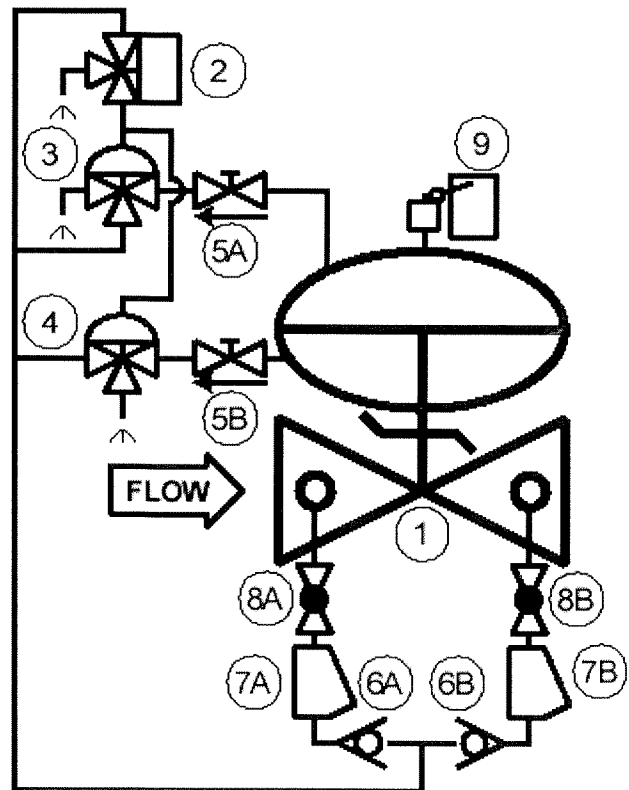
Intended primarily for horizontal, split-case centrifugals, the 125-27P can also be used on vertical turbine pumps with relatively shallow suction lifts.

The 125-27P consists of the following components, arranged as shown on the schematic diagram.

1. **Model 66SC Basic Control Valve**, a hydraulically operated, diaphragm-actuated globe valve that closes with an elastomer-on-metal seal. It contains two isolated diaphragm chambers and a built-in lift check device that allows the valve to close independent of the diaphragm assembly under reverse flow conditions.
2. **Model 452 Three-Way Solenoid Pilot** that allows the valve to open and close under normal operation.
3. **Model 3600 Three-Way Auxiliary Pilot** that, under the control of the solenoid pilot, vents or pressurizes the upper diaphragm chamber of the main valve.
4. **Model 3600S Three-Way Auxiliary Pilot** that, under the control of the solenoid pilot, vents or pressurizes the lower diaphragm chamber of the

main valve.

5. Two **Model 141-3 Flow Control Valves**, needle-type valves that provide adjustable, restricted flow in one direction and free flow in the opposite direction. Flow control valve 5A acts as the opening speed control, 5B as the closing speed control.
6. Two **Model 141-1 Check Valves** that permit the 125-27P to utilize the highest available pressure to actuate the valve.
7. Two **Model 159 Y-strainers** that protect the pilot system from solid contaminants in the line



fluid.

8. Two **Model 141-4 Ball Valves**, useful for isolating the pilot system for maintenance or troubleshooting.
9. **Model 150 Limit Switch Assembly** that electrically interfaces the valve and the pump.

## THEORY OF OPERATION

Before we begin the explanation of how the 125-27P operates, take a few moments to familiarize yourself with the schematic diagram. In particular, note the arrows on the flow control valves 5A and 5B. These arrows match the arrows actually stamped into the bodies of these controls, and point in the direction of **adjustable, restricted** flow. Thus 3A is the Opening Speed Control and 3B is the Closing Speed Control.

Also note that a certain amount of electrical components and circuitry are required to interface the valve and pump. Drawing SK1134 is included in this manual as an example of such a circuit. Its operation will be described in detail later.

In the meantime, let's look at how the valve itself operates:

**NORMAL STARTING CYCLE:** Starting the pump applies power to the solenoid pilot (2), connecting its pressure port to the bonnets of the two auxiliary pilots (3 and 4), and its vent port. Auxiliary pilot (3) shifts to vent the main valve upper chamber to atmosphere. At the same time, auxiliary pilot (4) shifts to pressurize the lower diaphragm chamber. This positively drives the valve to the full open position, but **at the rate** set on opening speed control (5A). What we have succeeded in doing is to start the pump against a **closed** valve, then open the valve **smoothly and slowly** so as to eliminate any startup surge on the line.

As the valve started open, it actuated the limit switch (9), which, as we shall see later, holds the pump "on".

**NORMAL SHUTDOWN CYCLE:** Pump shutdown is initiated by first removing power from the solenoid pilot (2), venting the bonnets of both auxiliary pilots. Auxiliary pilot (3) shifts to pressurize the main valve upper chamber. At the same time, auxiliary pilot (4) shifts to vent the lower chamber to atmosphere. This drives the main valve fully closed, but **at the rate** set on the closing speed control (5B). As the

valve reaches the full closed position, the limit switch (9) is reset, which finally stops the pump. We have virtually eliminated any shutdown surge by:

- (a) Closing the valve slowly, and
- (b) Precluding any possibility of reverse flow by keeping the pump running until the valve is closed.

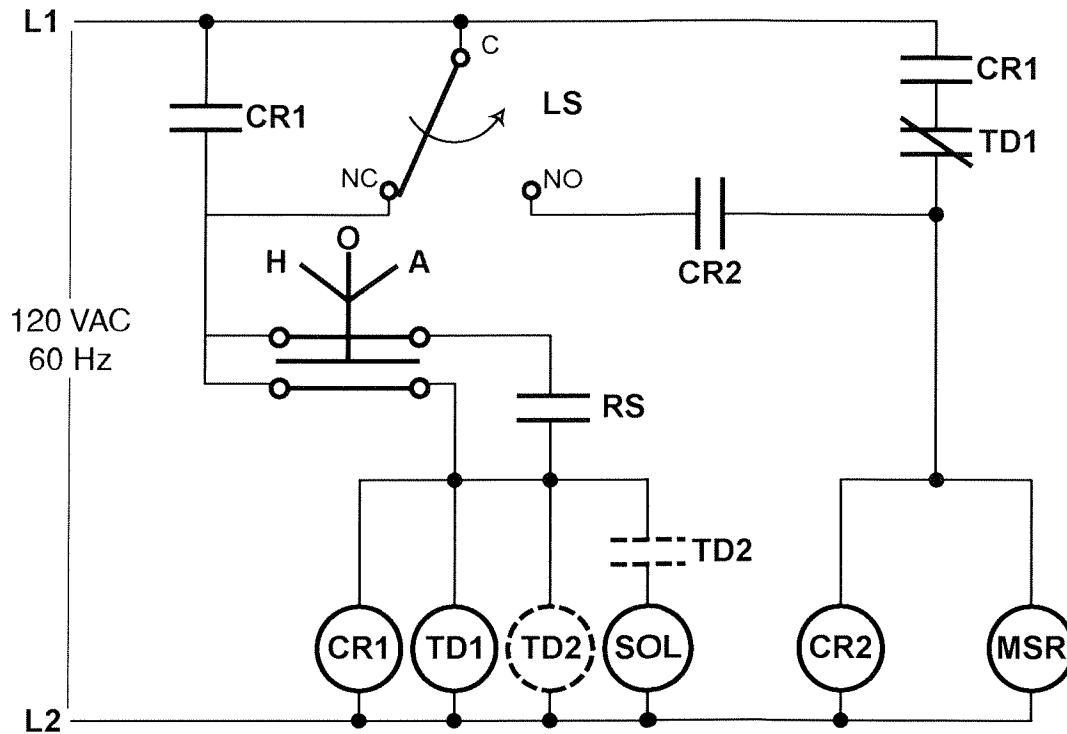
**EMERGENCY SHUTDOWN CYCLE:** Assume the pump is running and the valve is open when we suddenly lose electrical power. Obviously, we can't go through a normal shutdown cycle, as the pump will stop immediately upon loss of power. However, the 125-27P is equipped with the means to close and prevent backflow. First of all, the internal lift check device can only be sustained in the open position by forward flow through the valve. Once this flow ceases, the device immediately closes. Then, check valve (6B) opens to apply the downstream pressure to the main valve upper diaphragm chamber, forcing the diaphragm assembly closed. Meanwhile, check valve (6A) closes to prevent any backflow through the pilot system.

To complete the picture, let's go through the same three sequences again, this time focusing on the wiring diagram, SK1134. For the time being, ignore TD2: it is an optional item as will be explained later.

**NORMAL STARTING CYCLE:** The pump is started either by placing the HOA switch in "HAND," or by placing it in "AUTO" and closing the Remote Start Switch (RS). Either way, power is applied through the NC contact of the Limit Switch (LS) to TD1, CR1 and the Solenoid Pilot (SOL). Both sets of CR1 contacts immediately close. The first set acts as a latch to keep power on the starting circuit. The second set applies power through the still-closed contacts of TD1 to CR2 and the Motor Starter Relay (MSR). The latter starts the pump.

With SOL energized, the valve starts open. After a small degree of opening, the LS switches from "NC" to "NO". This supplies a second "leg" of power to CR2 and MSR, so that when TD1 times out and its contacts open, the pump continues running.

**NORMAL SHUTDOWN CYCLE:** Shutdown is initiated by turning the HOA switch to "OFF" (or, if in "AUTO", by opening RS). This deenergizes TD1, CR1 and SOL. The latter causes the valve to start



SOL = SOLENOID PILOT (ON VALVE)  
 LS = LIMIT SWITCH, SPDT (ON VALVE)

CR1, CR2 = CONTROL RELAY, DPDT  
 TD1 = TIME DELAY RELAY, DPDT, ON-DELAY  
 HOA = HAND-OFF-AUTO-SWITCH  
 RS = REMOTE START SWITCH

TD2 = TIME DELAY RELAY, DPDT, ON-DELAY (OPTIONAL)

### SK1134 WIRING DIAGRAM

closed. However, the pump remains running because power is still available to MSR through the N.O. contacts of LS and the closed contacts of CR2. Finally, as the valve reaches the full closed position, LS switches back to N.C., power is removed from CR2 and MSR, and the pump stops. The valve and pump are ready for the next cycle.

**EMERGENCY SHUTDOWN CYCLE:** There's not much to explain here, as there isn't any electricity flowing through the circuit! However, it is worthwhile to note that even if the power failure is momentary, the pump will not restart until after the valve, includ-

ing the diaphragm assembly, reaches the closed position. This way we are assured of always starting the pump against a closed valve.

As mentioned previously time delay relay TD2 is an optional item that can have utility in certain applications. With its normally open contact wired in series with the coil of the solenoid pilot, TD2 will delay the opening of the valve for a predetermined length of time after the pump starts. This can be particularly useful when the 125-27P is installed on the discharge of a vertical turbine or submersible pump. In these cases it is common to employ an air release valve to

exhaust the air in the pump column when the pump starts. TD2 can then be used to keep the valve closed until all the air is exhausted.

## INSTALLATION

1. The Model 65 Basic Valve section of this manual contains the details of valve installation in general.
2. Following the mechanical installation of the valve, wiring must be completed to properly interface the valve and pump. This can be accomplished one of three ways:
  - (a) With an OCV Pump Commander, a factory-wired control panel that includes all the components necessary for proper interfacing. If a Pump Commander was purchased with the valve, its installation and operation are covered later in this manual.
  - (b) As shown in diagram SK1134, which was explained above.
  - (c) With any other wiring diagram designed so that the pump starts and stops against a closed valve. If in doubt, consult OCV Engineering.

## STARTUP AND ADJUSTMENTS

The following procedures should be followed in the order presented in order to effect an initial startup of the 125-27P.

1. Loosen the adjusting screw jam nuts on speed controls 5A and 5B. Turn the adjusting screws on **both** controls **fully clockwise**, then **counterclockwise one full turn**.
2. Check the limit switch setting. With the valve closed, the top of the collar on the indicator stem should be approximately 1/32" **below** the roller on the limit switch arm. If necessary, loosen the set screw in the side of the collar, reposition the collar and retighten the set screw.
3. Set TD1 to its maximum delay setting.
4. Temporarily close ball valve (6B).
5. Start the pump. The valve should slowly open.
6. Allow the pump to run long enough for TD1 to time out. The pump should continue to run.
7. Initiate a pump shutdown. The valve should close

at a relatively slow rate while the pump continues running. When the valve completes its closure, the pump should stop.

8. If necessary, run the pump through several startup/shutdown cycles to properly adjust the speed controls. The best settings are those that result in the **smoothest** operation with a minimum of surges. Adjustment for both controls is **clockwise to decrease speed; counterclockwise to increase speed**. **CAUTION: Do not adjust either of these controls to the full closed position. To do so can prevent the valve from opening and/or closing.**
11. Reset TD1 to the desired setting.

## MAINTENANCE

Required maintenance of the 125-27P 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. Touch up as required.
2. Check for leaks at fittings and around flanges and connections. Tighten as required.
3. Check that all electrical wiring is secure.
4. Check the screen of the Y-strainer for buildup of solid material. Clean as required. This point is most important, as a clogged strainer can keep the valve from closing. On new installations, it is recommended that the strainer be checked every day or two until experience dictates a greater or lesser interval. Strainer maintenance is covered in detail on a special page later in this manual.

## TROUBLESHOOTING

In the event of malfunction of the 125-27P, the following guide should enable the technician to isolate the specific cause of the problem and take the appropriate corrective action.

### MAIN VALVE FAILS TO OPEN

1. Ball valves (8A and 8B) closed — Open as required.
2. Strainers (7A and 7B) clogged — Clean as required.
3. Opening speed control (5A) adjusted full closed

- Open as required. See Adjustment Instructions.
- 5. Inadequate pump discharge pressure — Check pump.
- 5. Solenoid pilot (2) is not being energized — Check control circuitry.
- 6. Solenoid pilot (2) is stuck in closed position or coil is burned out — See the Solenoid Valve section of this manual.
- 7. Three-way auxiliary pilot (3) not shifting properly — See the 3600 section of this manual.
- 8. Three-way auxiliary pilot (4) not shifting properly — See the 3600S section of this manual.
- 9. Main valve stem binding — Disassemble valve and determine cause. See Model 65 Basic Valve section of this manual.

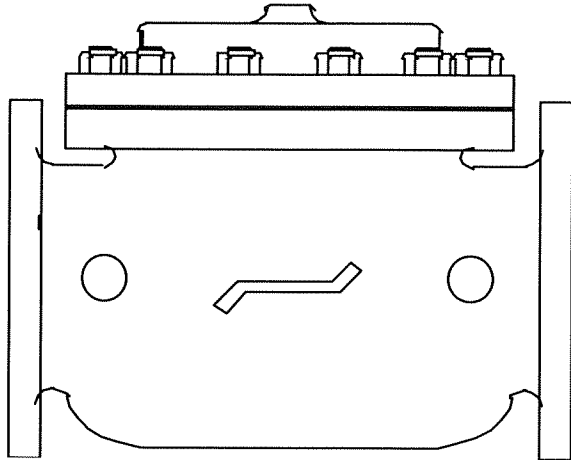
#### **MAIN VALVE OPENS BUT PUMP SHUTS DOWN WHEN TD1 TIMES OUT**

- 1. Defective component or wiring in control circuit — Check control circuitry.
- 2. Limit switch (9) misadjusted — See Adjustment Instructions.
- 3. Limit switch (9) faulty — Replace.

#### **MAIN VALVE FAILS TO CLOSE (NORMAL SHUTDOWN - PUMP RUNNING)**

- 1. Solenoid pilot (2) is not being deenergized — Check control circuitry.
- 2. Ball valves (6A and 6B) closed — Open as required.
- 3. Strainers (7A and 7B) clogged — Clean as required.
- 4. Closing speed control (5B) adjusted full closed — Open as required. See Adjustment Instructions.
- 5. Solenoid pilot (2) is stuck open — Disassemble and determine cause. See the Solenoid Valve section of this manual.
- 6. Three-way auxiliary pilot (3) not shifting properly — See the 3600 section of this manual.
- 7. Three-way auxiliary pilot (4) not shifting properly — See the 3600S section of this manual.





## installation, operating, and maintenance instructions

# series 66

## basic control valve

### GENERAL DESCRIPTION

The OCV Series 66 Power-Actuated Valve is a hydraulically-operated, diaphragm type valve. The diaphragm is a nylon fabric bonded with an elastomer. An elastomeric seat disc forms a tight seal with the valve seat when the valve is closed. The valve contains upper and lower diaphragm chambers, separated and sealed from each other by the diaphragm itself. The lower chamber is sealed from the flow passage by means of a stem seal.

Because of the twin-chamber design, the Series 66 valve requires no line pressure differential to operate. Thus, it is particularly useful where line pressure is extremely low, pressure loss is critical or where line fluid is too dirty or otherwise unsuitable for operating the valve.

The Series 66 valve is designed to operate in a temperature range from -40 degrees F to +180 degrees F, depending upon the type of fluid being transported. It is available in either globe or angle configuration in ductile iron (150 lb. or 300 lb.) or in cast steel (150 lb. or 300 lb.) construction.

### FUNCTIONAL DESCRIPTION

The Series 66 valve may be operated by line pressure or by an independent pressure source (equal to or greater than line pressure). Applying that pressure to the lower diaphragm chamber and simultaneously venting the upper diaphragm chamber causes the valve

to move to its full open position. Conversely, applying pressure to the upper diaphragm chamber and simultaneously venting the lower chamber causes the valve to go fully closed.

### INSTALLATION

In order to insure safe, accurate and efficient operation of the Series 66 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. It is recommended that either gate or block valves be installed on the inlet and discharge sides of the valve to facilitate isolating the valve for preventive or corrective maintenance.
3. It is recommended that pressure gauges be installed at the inlet and discharge ports to provide monitoring of the valve during initial start-up and during operation.
4. Prior to mounting the valve, all interconnecting piping should be thoroughly flushed of chips, scale and foreign matter.
5. Install the valve in the line according to the flow arrow on the inlet flange. The arrow should point downstream.

- 6. It is recommended that for maximum efficiency and serviceability, valves 6" and larger be installed in a horizontal position.
- 7. Allow sufficient room around the valve for ease of adjustment and maintenance service.
- 8. Because of the venting action, a quantity of fluid will be exhausted each time the valve opens or closes. Provisions should be made to drain or dispose of this vented fluid.

<u>Valve Size</u>	<u>Discharge Capacity (gallons)</u>
1.25-1.5"	.02
2"	.05
2.5"	.06
3"	.1
4"	.2
6"	.6
8"	1.3
10"	2.5
12"	4.0
14"	6.5
16"	9.6

**MAINTENANCE**

The OCV control valve requires no lubrication or packing 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, colloidal 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 elastomeric parts, i.e., the diaphragm and seat disc. Any obviously worn parts should be replaced.

**TROUBLESHOOTING**

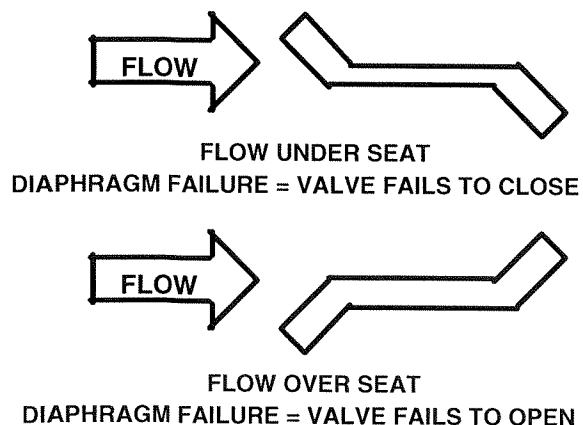
In the event of malfunction of the OCV control valve, troubleshooting should be conducted according to the procedures outlined for the specific model of valve. Then, if those steps indicate a problem with the main

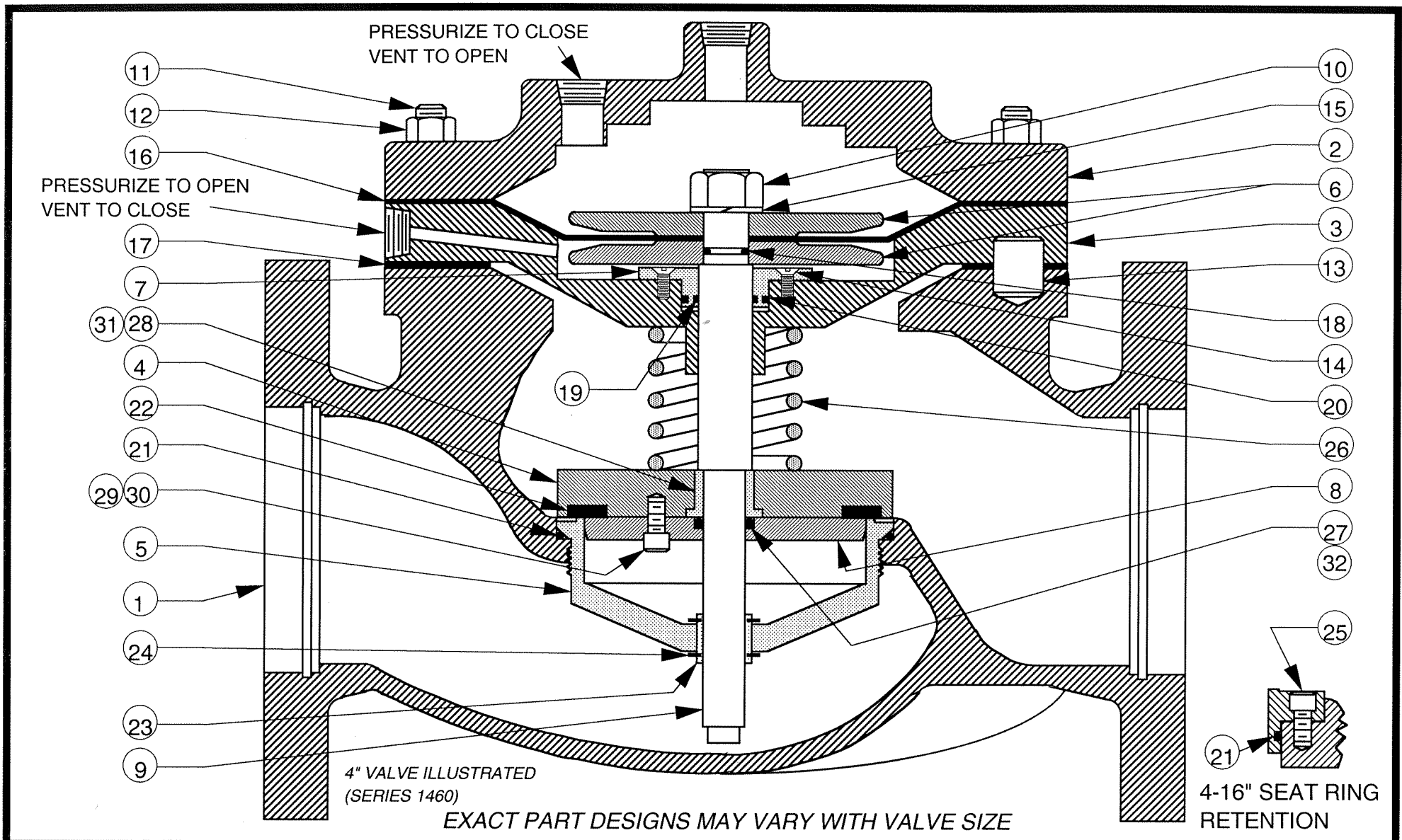
valve, this section will outline the procedures necessary to correct the problem.


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

1. MAIN VALVE FAILS TO OPEN
  - a. Closed isolation valves or cocks in pilot system or in main line—*Open valves or cocks.*
  - b. Insufficient operating pressure—*Check pressure.*
2. MAIN VALVE FAILS TO CLOSE
  - a. Closed cocks in control system or in main line—*Open cocks.*
  - b. Lack of cover chamber pressure—*Check upstream pressure strainer, tubing, cocks, needle valves for restriction.*
  - c. Diaphragm damaged (see note)—*Replace diaphragm.*
  - d. Diaphragm assembly inoperative. Corrosion or excessive scale buildup on valve stem—*Clean and polish stem. Replace any defective, damaged or badly eroded parts.*
  - e. Mechanical obstruction. Object lodged in valve—*Remove obstruction.*
  - f. Worn seat disc—*Replace seat disc.*
  - g. Badly scored seat—*Replace seat.*

**NOTE:** Assuming control system is functioning properly.





				<b>MATERIAL</b>	<b>TOLERANCES</b>	 <b>Control Valves</b> TULSA, OKLAHOMA U.S.A. POWER-ACTUATED VALVE with LIFT CHECK ASSY 2-16" VALVES			
					UNLESS NOTED FRACTIONAL $\pm 1/64$ DECIMAL $\pm .005$ MACH. FINISH 125 $\checkmark$ ANGULAR $\pm 1/2^\circ$				
				NO. REQ'D	DRAWN BY	DATE	SIZE	DRAWING NUMBER	REV.
				SCALE	CHKD. BY	DATE	<b>A</b>	<b>SK-1084</b>	<b>A</b>
<b>REVISIONS</b>				<b>REF DWG NO'S</b>					



# INSTALLATION & MAINTENANCE INSTRUCTIONS

**ASCO.**

BULLETIN

8320

Form No. V5688R2

**3-WAY SOLENOID VALVES — NORMALLY OPEN,  
NORMALLY CLOSED, AND UNIVERSAL OPERATION  
1/4" NPT — BRASS AND STAINLESS STEEL CONSTRUCTION**

## DESCRIPTION

Bulletin 8320 valves are small 3-way solenoid valves with all three connections located in the body. Valve bodies are made of brass or stainless steel.

Standard valves have a Type 1, General Purpose Solenoid Enclosure. Valves may also be provided with an explosion-proof solenoid enclosure designed to meet Enclosure Type 3-Raintight, Type 7 (C & D)-Explosion-Proof Class I, Groups C & D and Type 9 (E, F, & G)-Dust Ignition-Proof Class II, Groups E, F, & G, and have a temperature range code of TC3. Installation and maintenance instructions for the explosion-proof solenoid enclosure are on Form No. V5380.

## OPERATION

### Normally Open (Pressure at 3)

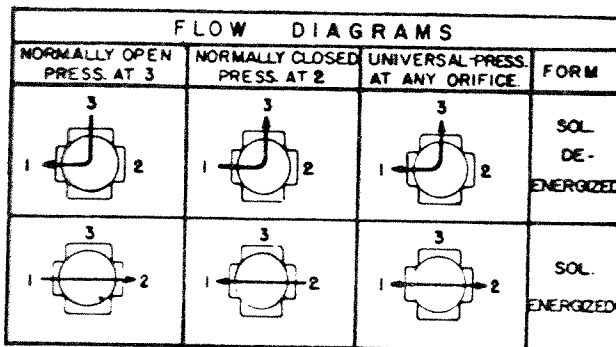
Applies pressure when solenoid is de-energized; exhausts pressure when solenoid is energized. When solenoid is de-energized, flow is from Port "3" to Port "1." Port "2" is closed. When solenoid is energized, flow is from Port "1" to "2." Port "3" is closed.

### Normally Closed (Pressure at 2)

Applies pressure when solenoid is energized; exhausts pressure when solenoid is de-energized. When solenoid is de-energized, flow is from Port "1" to Port "3." Port "2" is closed. When solenoid is energized, flow is from Port "2" to Port "1." Port "3" is closed.

### Universal (Pressure at 1, 2, or 3)

For normally closed or normally open operation, selection or diversion of pressure can be applied to Ports "1," "2," or "3."



### Manual Operator (Optional)

Manual operator allows manual operation when desired or during an electrical power outage. Two types of manual operators are available - push type (Suffix MO) and screw type (Suffix MS). To operate valve manually with push type operator, push stem at base of valve body as far upward as possible. Valve will now be in the same position as when the solenoid is energized. Removing pressure from stem will release manual operator to original position. To operate valve with a screw type manual operator, rotate manual operator stem at base of valve body clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. Rotate manual operator stem fully counterclockwise before operating valve electrically.

## INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service.

## Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to chart below. Check catalog number prefix and watt rating on nameplate to determine the maximum temperatures. See example below chart.

Construction AC or DC	Catalog Number Prefix	Watts	Maximum Ambient Temp. °F	Maximum Fluid Temp. °F
AC	None, DA, or S	10.5	77	200
	DF, FT, or SF	10.5	122	200
	HT	10.5	140	200
	None, DP, or SP	16.7*	77	200
DC	None, FT, or HT	11.2*	77	150

\*Catalog Nos. 8320A 170, 8320A 180, and 8320A 190 are limited to 140°F fluid temperature.

EXAMPLES: For Catalog No. HT 8320A 201, AC construction with a watt rating of 10.5, the maximum ambient temperature is 140°F with a maximum fluid temperature of 200°F. For Catalog No. 8320A 204, AC construction with a watt rating of 10.5, the maximum ambient temperature is 77°F with a maximum fluid temperature of 200°F.

## Positioning

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

## Mounting

For mounting dimensions of body boss (brass) or mounting brackets (optional on brass construction), refer to Figures 1, 2, and 3.

## Piping

Connect piping to valve according to markings on valve body. Refer to flow diagrams provided. Apply pipe compound sparingly to male pipe threads only. If applied to valve threads, the compound may enter the valve and cause operational difficulty. Avoid pipe strain by properly supporting and aligning piping. When tightening the pipe, do not use valve or solenoid as a lever. Locate wrenches applied to valve body or piping as close as possible to connection point. **IMPORTANT:** To protect the solenoid valve, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve as possible. Clean periodically depending on service conditions. See ASCO Bulletins 8600, 8601, and 8602 for strainers.

## Wiring

Wiring must comply with local codes and the National Electrical Code. Solenoid housings are provided with a 7/8" diameter hole to accommodate 1/2" conduit. On some constructions, a green grounding wire is provided. Use rigid metallic conduit to ground all enclosures not provided with a green grounding wire. To facilitate wiring, the enclosure may be rotated 360° by removing the retaining cap or clip. **WARNING:** When metal retaining clip disengages, it will spring upward. Rotate enclosure to desired position. Then replace retaining cap or clip before operating.

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid, including the solenoid base sub-assembly and core assembly.

Form No. V5688R2

Printed in U.S.A.

Automatic Switch Co. 50-60 Hanover Road, Florham Park, New Jersey 07932

**ASCO Valves**

**ASCO**

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### Solenoid Temperature

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

### MAINTENANCE

NOTE: It is not necessary to remove the valve from the pipeline for repairs. **WARNING:** Turn off electrical power supply and depressurize valve before making repairs.

### Cleaning

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

### Preventive Maintenance

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, the valve should be operated at least once a month to insure proper opening and closing.
3. Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace worn or damaged parts. However, for best results, replace all parts as supplied with an ASCO Rebuild Kit.

### Causes Of Improper Operation

1. **Faulty Control Circuits:** Check the electrical system by energizing the solenoid. A metallic "click" signifies that the solenoid is operating. Absence of the "click" indicates loss of power supply. Check for loose or blown fuses, open circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open-circuited coil. Replace coil as necessary. Check supply voltage; it must be the same as specified on nameplate.
3. **Low Voltage:** Check voltage across the coil lead. Voltage must be at least 85% of nameplate rating.
6. **Incorrect Pressure:** Check valve pressure. Pressure to valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve (see Maintenance) and clean all parts. Replace worn or damaged parts. However, for best results, replace all parts as supplied with an ASCO Rebuild Kit.

### Coil Replacement (Refer to Figures 4 and 5)

**WARNING:** Turn off electrical power supply.

1. Disconnect coil lead wires.
2. Remove retaining cap or clip, nameplate and housing. **WARNING:** When metal retaining clip disengages, it will spring upward.
3. Remove spring washer, insulating washer, coil, insulating washer, ground wire terminal (if present) from solenoid base sub-assembly. Insulating washers are omitted when a molded coil is used.
4. Reassemble in reverse order of disassembly. Use exploded view provided for identification and placement of parts.

**CAUTION:** The solenoid must be fully reassembled because the housing and internal parts complete the magnetic circuit. Be sure to replace insulating washer at each end of the non-molded coil.

### Valve Disassembly (Refer to Figures 4 and 5)

**WARNING:** Depressurize valve and turn off electrical power supply.

1. Disassemble valve in an orderly fashion. Use exploded views for identification and placement of parts.
2. If necessary, disconnect coil lead wires, grounding wire (if present), and rigid conduit from solenoid housing.
3. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. **WARNING:** When metal retaining clip disengages, it will spring upward.
4. Unscrew solenoid base sub-assembly from valve body.
5. Remove core assembly, core spring, core guide (AC construction only), and solenoid base gasket.
6. Unscrew end cap (or manual operator assembly) and remove end cap gasket, disc holder spring, and disc holder sub-assembly.
7. All parts are now accessible to clean or replace. Replace worn or damaged parts. However, for best results, replace all parts as supplied with an ASCO Rebuild kit.

### Valve Reassembly

1. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
2. Lubricate all gaskets with DOW CORNING® 111 Compound lubricant or an equivalent high-grade silicone grease. For stainless steel valve constructions, apply a small amount of LOCTITE® PST® pipe sealant (ASCO No. 208-832-11) to male threads of end cap (or manual operator assembly). Pipe sealant supplied in ASCO Rebuild Kits.

3. Replace disc holder sub-assembly, disc holder spring, end cap gasket, and end cap (or manual operator assembly). For brass construction, torque end cap to  $175 \pm 25$  inch-pounds ( $19,8 \pm 2,8$  newton-meters). For stainless steel, torque end cap to  $90 \pm 10$  inch-pounds ( $10,2 \pm 1,1$  newton-meters).
4. Replace solenoid base gasket, core assembly, core spring, core guide (on AC construction only), and solenoid base sub-assembly. Torque solenoid base sub-assembly to  $175 \pm 25$  inch-pounds ( $19,8 \pm 2,8$  newton-meters).
5. Replace solenoid enclosure and retaining cap or clip.
6. Restore line pressure and electrical power supply to valve.
7. After maintenance is completed, operate the valve a few times to be sure of proper operation. A metallic "click" signifies the solenoid is operating.

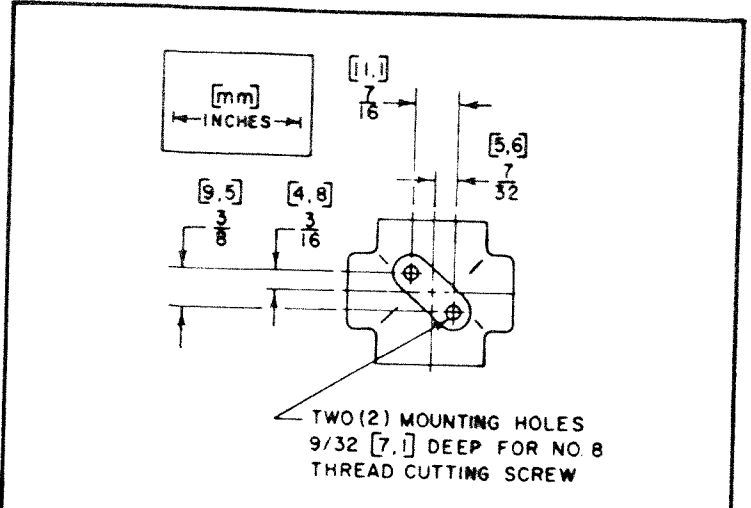


Figure 1. Brass Valve Body Mounting

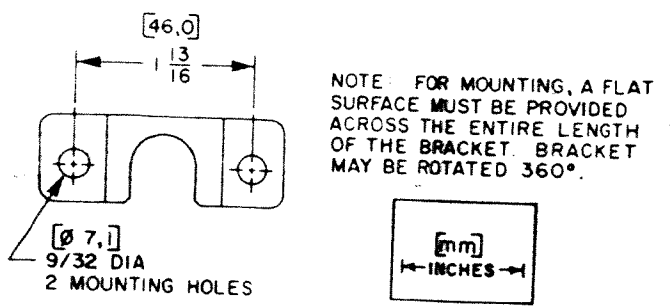


Figure 2. Mounting Bracket for Stainless Steel

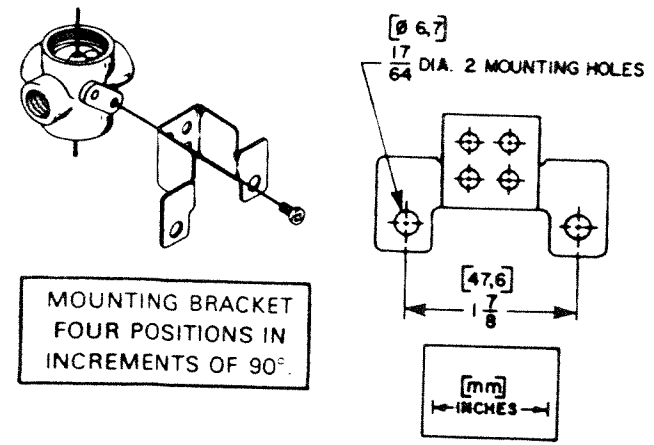


Figure 3. Optional Mounting Bracket for Brass

**ORDERING INFORMATION  
FOR ASCO REBUILD KITS AND COILS**

Parts marked with an asterisk (\*) in the exploded view are supplied in Rebuild Kits.

- When Ordering Rebuild Kits for ASCO valves, order the Rebuild Kit number stamped on the valve nameplate. +
- When Ordering Coils for ASCO valves, order the number stamped on your coil. +

+ If the number of the Rebuild Kit or the Coil is not visible, order them and specify your valve's Catalog Number, Serial Number, Voltage, and Frequency.

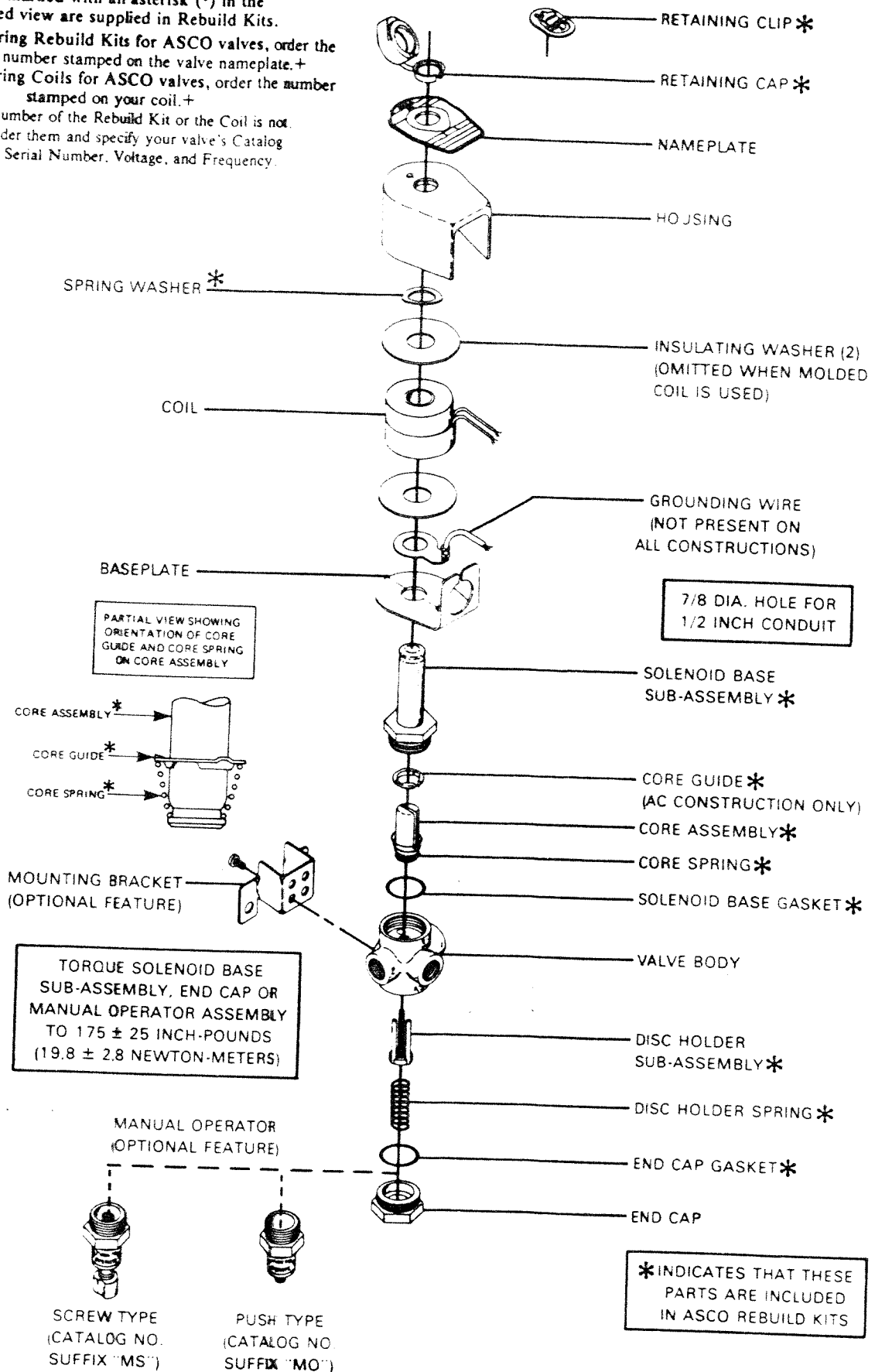


Figure 4. Bulletin 8320, Brass Construction  
With General Purpose Solenoid Enclosure Shown  
For Explosion-Proof Solenoid Enclosure, See Form No.V5380.

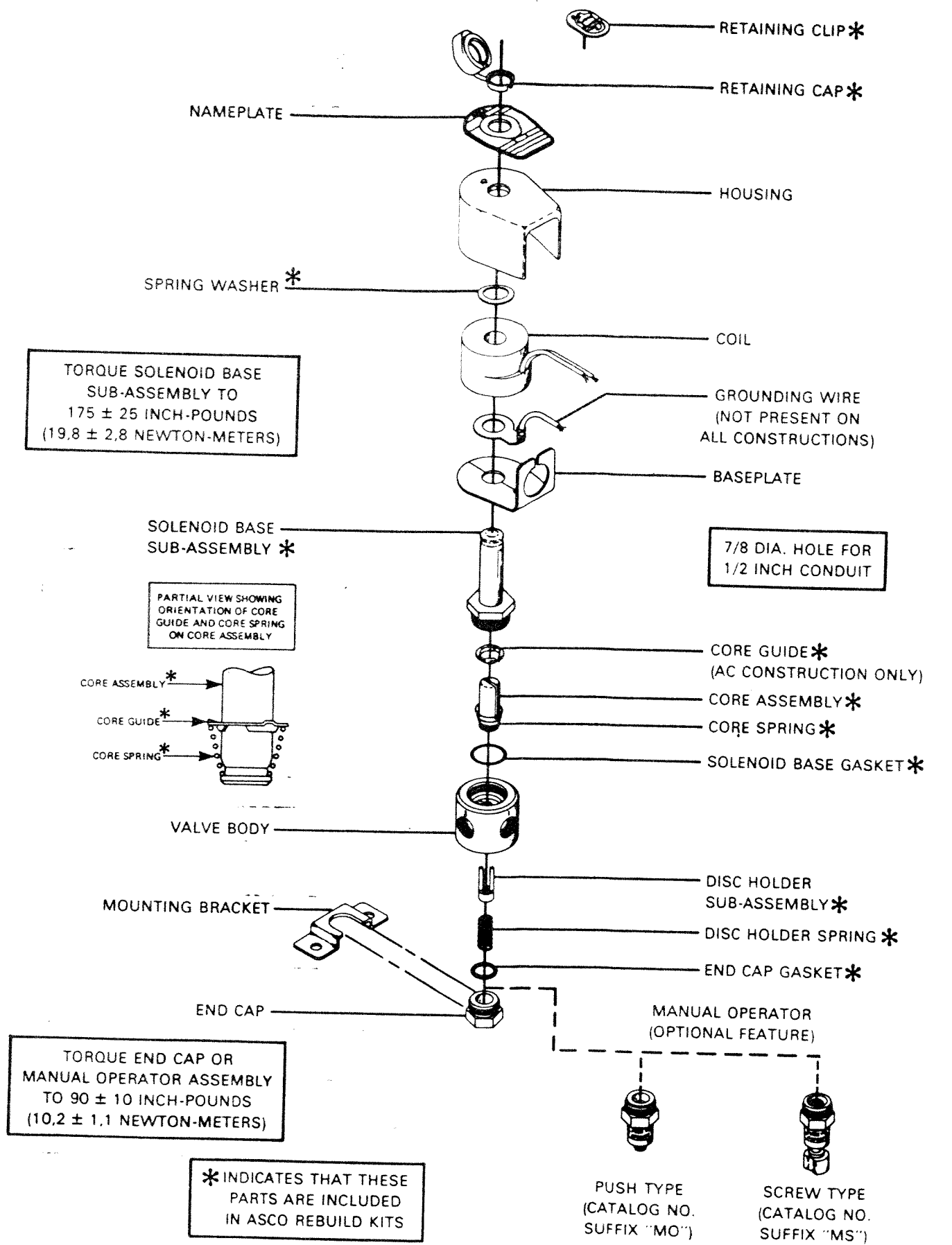


Figure 5. Bulletin 8320, Stainless Steel Construction  
With General Purpose Solenoid Enclosure Shown.  
For Explosion-Proof Solenoid Enclosure, See Form No.V5380.

# three-way pilot

# installation, operating, and maintenance instructions

## model 3600

### GENERAL DESCRIPTION

The OCV Model 3600 is a hydraulically-operated, diaphragm-actuated, three-way valve. It is normally used on a main valve when faster-than-normal closing speed is required or when another pilot (e.g., float pilot or solenoid valve) is used to actuate the main valve.

### FUNCTIONAL DESCRIPTION

Pressurizing the bonnet of the three-way pilot moves its stem to the "down" position connecting Ports 1 and 3. Depressurizing the bonnet of the OCV Model 3600 allows its stem to return to the "up position," connecting Ports 1 and 2.

Pressurize the bonnet of the 3600 to open the main valve on Model 115-4's, 125's and 119's. De-pressurize the bonnet of the 3600 to open the main valve on Model 3333's and 118's.

### TROUBLESHOOTING

A major malfunction in the three-way pilot would generally be evident in a failure of the main valve to open or close. However, keep in mind that such symptoms can also be caused by a malfunction in the main valve itself or in the control pilot(s). If the 3600 is suspected, proceed as follows:

1. FAILURE OF PILOT TO CLOSE MAIN VALVE
  - A. Ruptured diaphragm
    - (1) Detach sense line from the bonnet of the pilot and remove the bonnet. Inspect the

- diaphragm carefully for holes or cracks.
    - (2) If damaged, replace with new diaphragm.

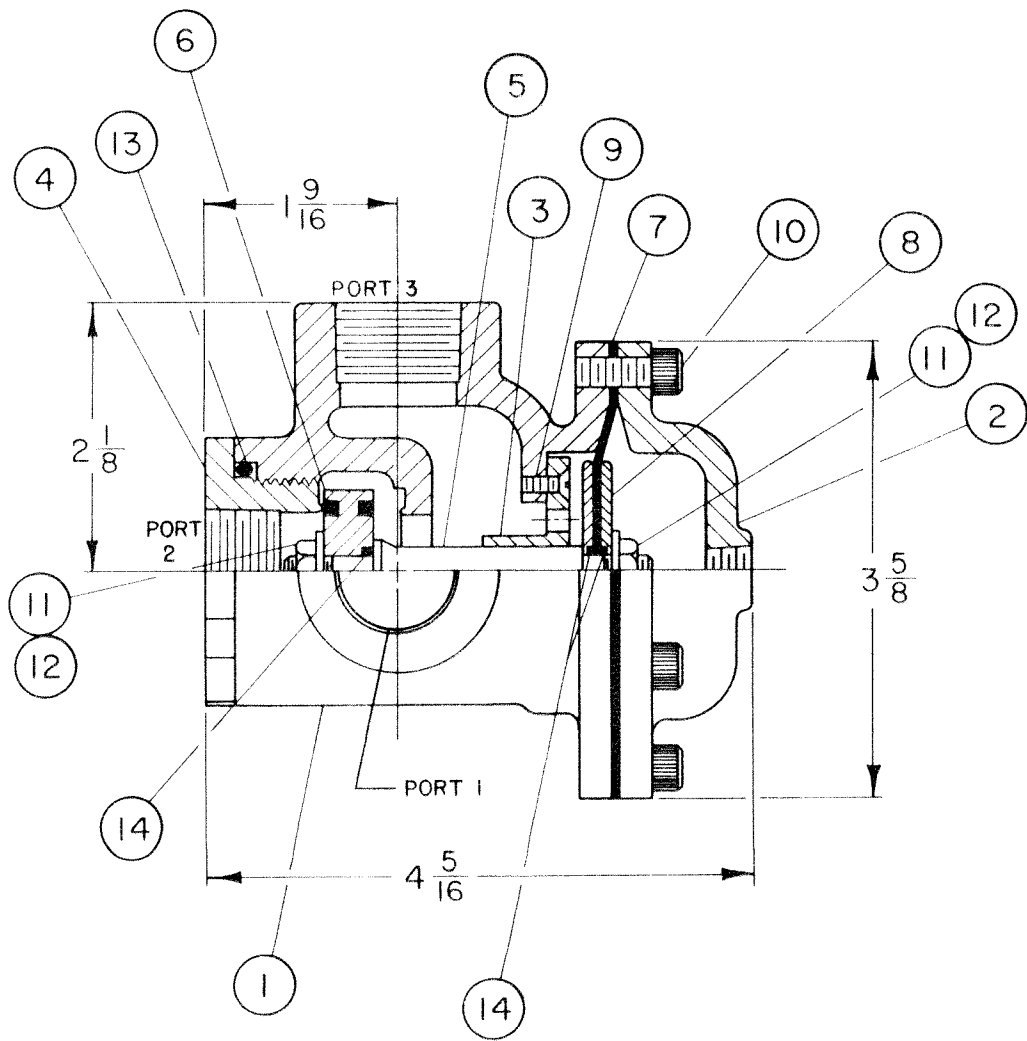
- B. Pilot stem binding
  - (1) With bonnet removed, inspect the stem journal in the bonnet for buildup of foreign material.
  - (2) Clean as necessary and reassemble pilot.
- C. Obstruction in seat area
  - (1) Disassemble pilot and remove obstruction.
- D. Rubber seat damaged
  - (1) Disassemble pilot and examine seats for excessive wear or damage.
  - (2) Replace if necessary and reassemble pilot.

### 2. FAILURE OF PILOT TO OPEN MAIN VALVE

- A. Pilot stem binding
  - (1) Proceed as in 1B above.
- B. Obstruction in seat area
  - (1) Proceed as in 1C above.
- C. Rubber seat damaged
  - (1) Proceed as in 1D above.

### MAINTENANCE

Because of the simplicity of design of the 3600 pilot, required maintenance is minimal. Check fittings and bolts periodically for tightness, and inspect the body for damage or excessive buildup of foreign material.




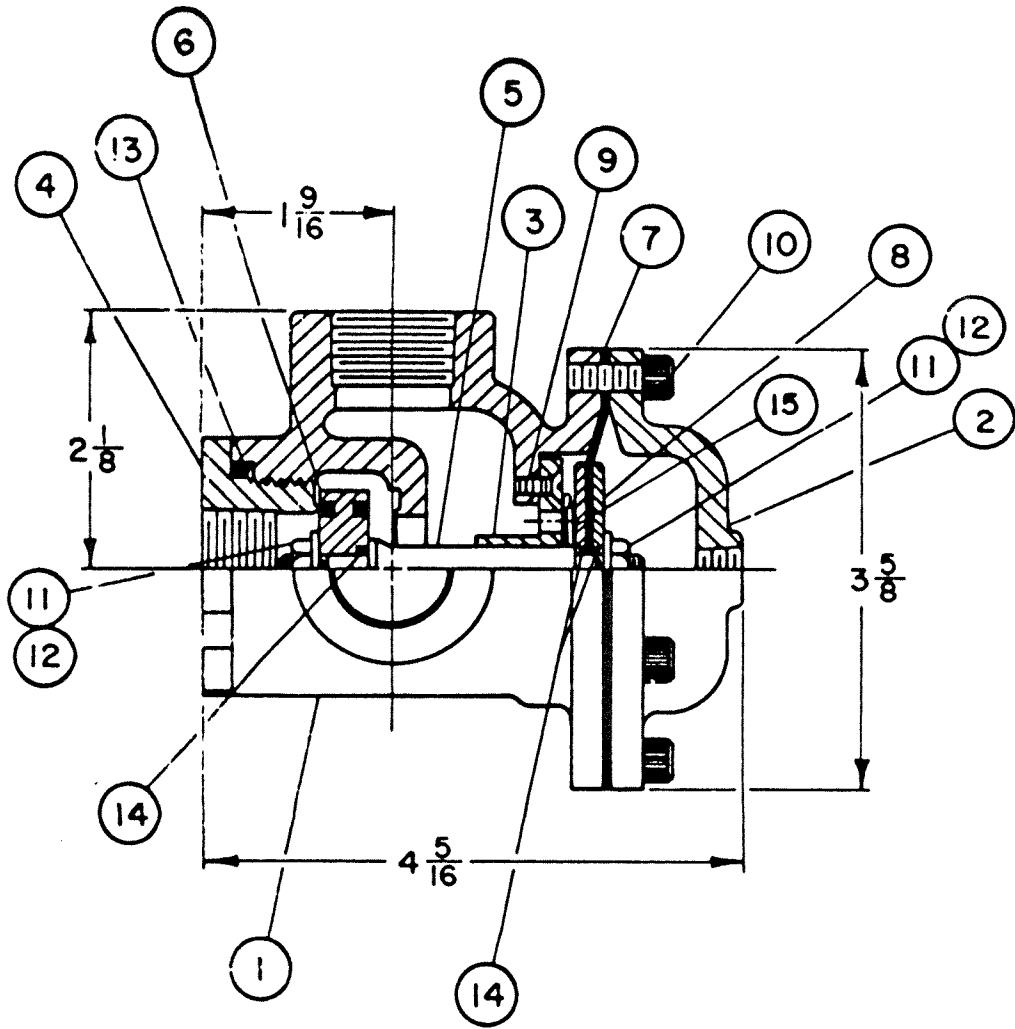
**NOTE:**

1. WHEN ORDERING PARTS, PLEASE SPECIFY; ITEM NO., PART NO. AND MATERIAL.
2. ▲ RECOMMENDED SPARE PARTS.

▲	14	611010	3	O-RING	VITON
▲	13	610222	1	O-RING	BUNA-N
	12	685763	2	LOCKWASHER	STAINLESS STEEL
	11	590712	2	HEX HEAD JAM NUT	STAINLESS STEEL
	10	530701	6	SOCKET HD. CAPSCREW	STAINLESS STEEL
	9	532735	2	FLAT HEAD SCREW	STAINLESS STEEL
	8	308135	2	DIAPHRAGM PLATE	BRASS
		308735	2	DIAPHRAGM PLATE	STAINLESS STEEL
▲	7	694035	1	DIAPHRAGM	BUNA-N
		694135	1	DIAPHRAGM	VITON
▲	6	310736	1	SEAT DISC	STN. STL./BUNA-N
		310737	1	SEAT DISC	STN. STL./VITON
	5	314735	1	STEM	STAINLESS STEEL
	4	300171	1	ADAPTER	BRASS
		300771	1	ADAPTER	STAINLESS STEEL
	3	300164	1	GUIDE PLATE	BRASS
		300764	1	GUIDE PLATE	STAINLESS STEEL
	2	304135	1	BONNET	BRONZE
		304735	1	BONNET	STAINLESS STEEL
	1	302135	1	BODY	BRONZE
		302735	1	BODY	STAINLESS STEEL
	ITEM	PART NO.	QTY.	DESCRIPTION	MATERIAL

**PARTS LIST**

E																					
D																					
C																					
B																					
A																					
CHG	E	C	NO	DATE	BY																
REVISIONS					REF DWG NO'S					MATERIAL		TOLERANCES		 <b>THREE-WAY PILOT</b>							
										UNLESS NOTED		NO REQ'D							DRAWN BY		DATE
										FRACTIONAL ± 1/64		BR.W.		7-28-83		SIZE		DRAWING NUMBER		REV.	
										DECIMAL ± .005						B		3600			
										MACH FINISH 125/											
										ANGULAR ± 1/2											
										SCALE		CHK'D BY		DATE							




**NOTE:**

- 1. WHEN ORDERING PARTS, PLEASE SPECIFY; ITEM NO., PART NO. AND MATERIAL.
- 2. ▲ RECOMMENDED SPARE PARTS.

▲	15	651717	1	SPRING	STAINLESS STEEL
▲	14	61010	3	O-RING	VITON
▲	13	610222	1	O-RING	BUNA-N
	12	685700	2	LOCKWASHER	STAINLESS STEEL
	11	590712	2	HEX HEAD JAM NUT	STAINLESS STEEL
	10	530701	6	SOCKET HD. CAPSCREW	STAINLESS STEEL
	9	532735	2	FLAT HEAD SCREW	STAINLESS STEEL
	8	308135	2	DIAPHRAGM PLATE	BRASS
	8	308735	2	DIAPHRAGM PLATE	STAINLESS STEEL
▲	7	694035	1	DIAPHRAGM	BUNA-N
▲	7	694135	1	DIAPHRAGM	VITON
	6	310736	1	SEAT DISC	STN. STL./BUNA-N
▲	6	310737	1	SEAT DISC	STN. STL./VITON
	5	314735	1	STEM	STAINLESS STEEL
	4	300171	1	ADAPTER	BRASS
	4	300771	1	ADAPTER	STAINLESS STEEL
	3	300164	1	GUIDE PLATE	BRASS
	3	300764	1	GUIDE PLATE	STAINLESS STEEL
	2	304135	1	BONNET	BRONZE
	2	304735	1	BONNET	STAINLESS STEEL
	1	302135	1	BODY	BRONZE
	1	302735	1	BODY	STAINLESS STEEL
ITEM	PART NO.	QTY.	DESCRIPTION	MATERIAL	

**PARTS LIST**

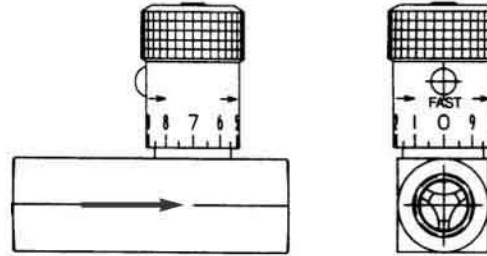
E	D	C	B	A	
CHG	E	C	NO	DATE	BY
REVISIONS					REF DWG NO'S

MATERIAL	TOLERANCES UNLESS NOTED FRACTIONAL ± 1/64 DECIMAL ± .008 MACH FINISH 125/ ANGULAR ± 1/2°	 <b>THREE-WAY PILOT</b>			
NO REQ'D	DRAWN BY B.R.W.				DATE 7-28-83
SCALE	CHK'D BY	DATE	SIZE B	DRAWING NUMBER 3600S	REV A

**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,



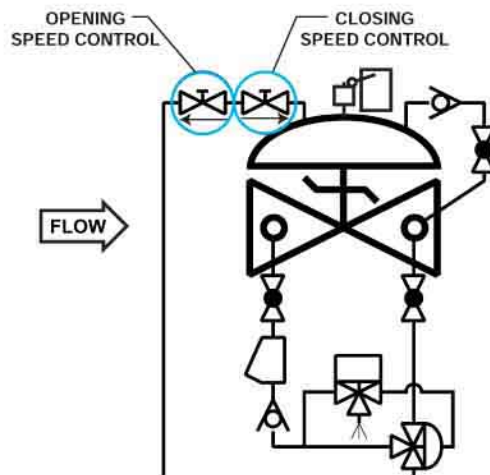
thus controlling either the opening or closing speed of the main valve. These can be installed in series for separate opening and closing speed control. Restricted flow is in the direction of the flow arrow on the body.

**MODEL 141-3 MATRIX**

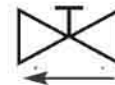
MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	A	USED ON VALVE SIZE*
Brass	682100	1/4	2 3/8	1 1/4"-2"
Brass	682101	3/8	2 3/4	2 1/2"-6"
Brass	682102	1/2	3 1/4	8"-10"
Brass	682103	3/4	3 7/8	12"-16"
Stn. Steel	682700	1/4	2 3/8	1 1/4"-2" Stn.
Stn. Steel	682701	3/8	2 3/4	2 1/2"-6"
Stn. Steel	682702	1/2	3 1/4	8"-10"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

**Flow Control Valves 141-3**



## DESCRIPTION

The Model 141-1 Check Valve uses a spring-loaded poppet that will allow flow in one direction only. It is the primary component used on valves with a reverse flow check function. Flow is in the direction of the arrow on the check valve body.



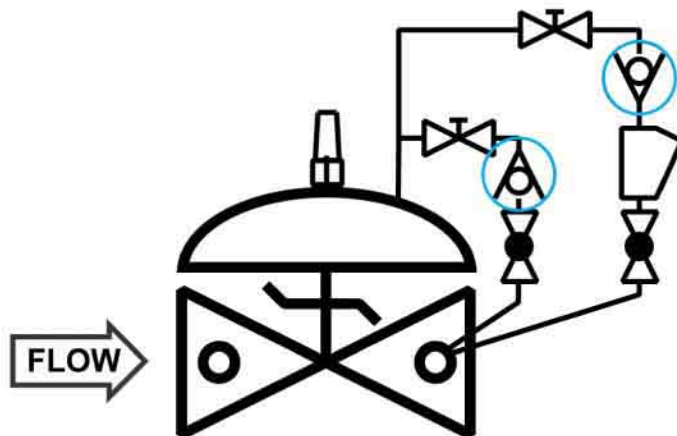
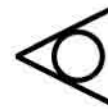
◀ Check Valves shown  
Stainless Steel & Brass

## MODEL 141-1 MATRIX

MATERIAL	PART NUMBER	INLET/OUTLET (NPT)	LENGTH	USED ON VALVE SIZE
Bronze	681100	3/8	2	1 1/4"-6"
Bronze	681101	1/2	2 1/8	8"-10"
Bronze	681102	3/4	2 1/4	12"-16"
Stn. Steel	681700	3/8	2 5/16	1 1/4"-6"
Stn. Steel	681701	1/2	2 5/16	8"-10"
Stn. Steel	681702	3/4	2 7/8	12"-16"

## SCHEMATIC SYMBOL

The Model 141-1 Check Valve is shown on OCV Valve Schematics as:



EXAMPLE: Shown here on a MODEL 94-3 Check Valve.



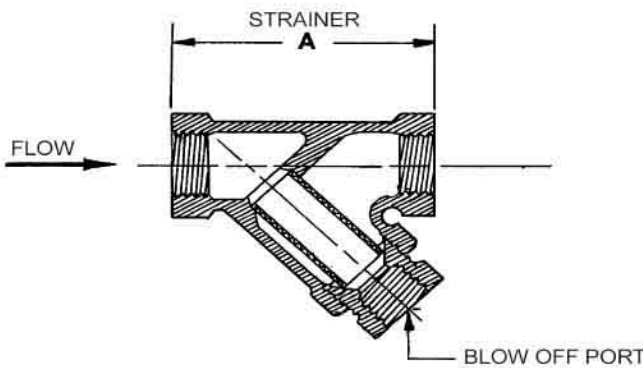
**DESCRIPTION**

**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**

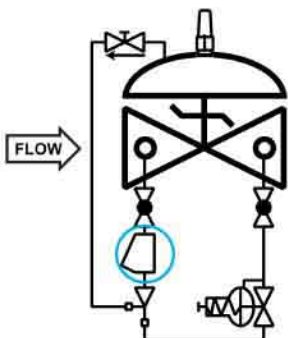
Bronze, ASTM B62  
Optional mesh sizes: 50, 100

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

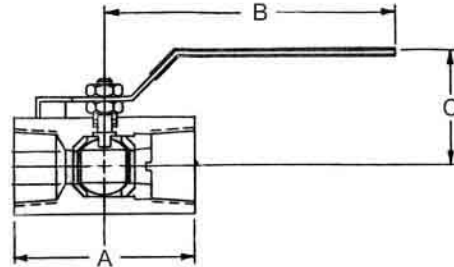
**MAINTENANCE**

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.

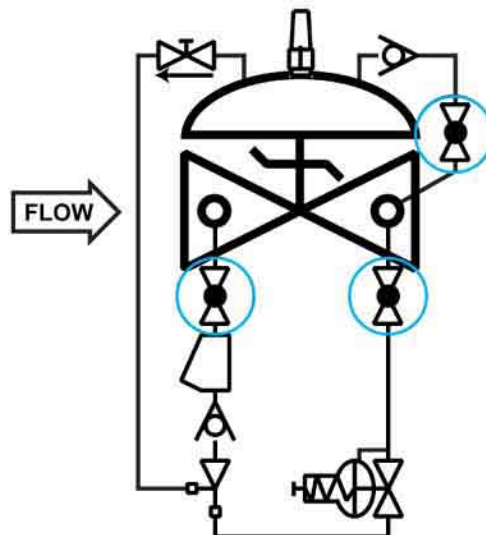
Ball valves are standard on water service valves; optional on fuel service valves.



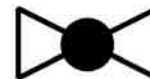
**MODEL 141-4 MATRIX**

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.



**DESCRIPTION**

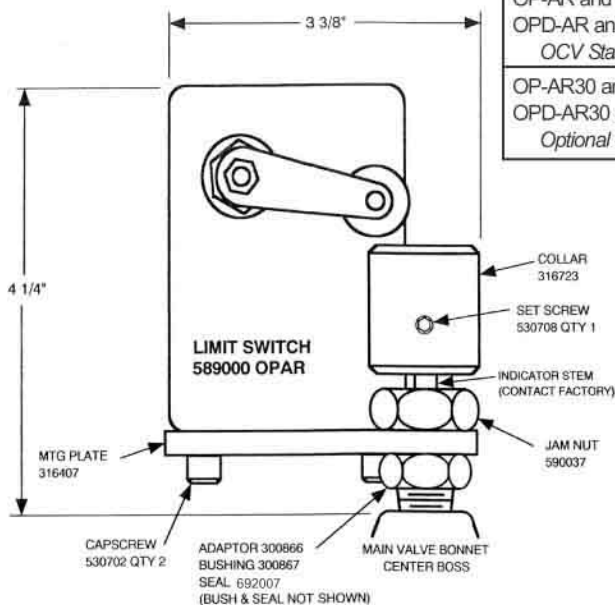
**MODEL 31 LIMIT SWITCH ASSEMBLY**

- Provides electrical indication of valve position.
- Adjustable to any point of valve travel.
- Heavy-duty stem seal.
- Installed without disassembly of valve.
- Available in weatherproof or explosion-proof enclosures.
- SPDT contacts (standard) DPDT (optional)

The Model 31 Limit Switch Assembly is a device that uses movement of the valve stem to make or break electrical contacts at designated points in the valve travel. It consists of an adaptor threaded into the center port of the valve bonnet, a rod threaded into the main valve stem, a heavy-duty stem seal, an actuating collar, and the switch unit. It may be installed on virtually any OCV control valve, and can be done so without any disassembly of the valve itself.

**WHERE USED** - Standard on Series 125/126 Pump Control Valves.  
Optional on all other series control valves.

**MODEL 31 ASSY MATRIX**



SWITCH TYPE	VALVE CLOSED	VALVE OPEN
OP-AR and EX-AR (SPDT) OPD-AR and EXD-AR-3 (DPDT) <i>OCV Standard Configuration</i>	N.C. contact(s) closed N.O. contact(s) open Switch roller OFF collar	N.C. contact(s) open N.O. contact(s) closed Switch roller ON collar
OP-AR30 and EX-AR30 (SPDT) OPD-AR30 and EXD-AR30-3 (DPDT) <i>Optional configuration</i>	N.C. contact(s) open N.O. contact(s) closed Switch roller ON collar	N.C. contact(s) closed N.O. contact(s) open Switch roller OFF collar

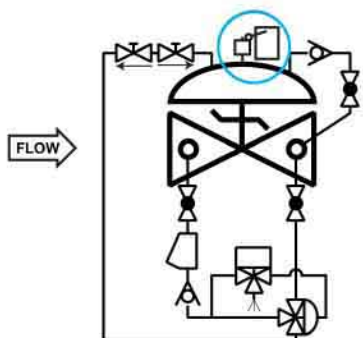
VALVE SIZE	PART NUMBER OP-AR (SPDT) Weatherproof	PART NUMBER EX-AR (SPDT) Explosion proof
1 1/4" - 1 1/2"	Consult factory	Consult factory
2" - 4"	252710	252413
6" - 8"	252720	252423
10 - 12"	252730	Consult factory
14" - 16"	252740	Consult factory

These part numbers include Buna-N stem seal. Consult Factory for part numbers on DPDT, other stem seals, and all model 31 switches shown in the Actuation matrix.

NOTE: Factory recommended valve installation should allow for indicator rod to be in the vertical position.

**SCHEMATIC SYMBOL**

The Model 31 is shown on OCV Valve Schematic as:



EXAMPLE:  
Shown here on a Model 125 Pump Control Valve

**ELECTRICAL RATING**

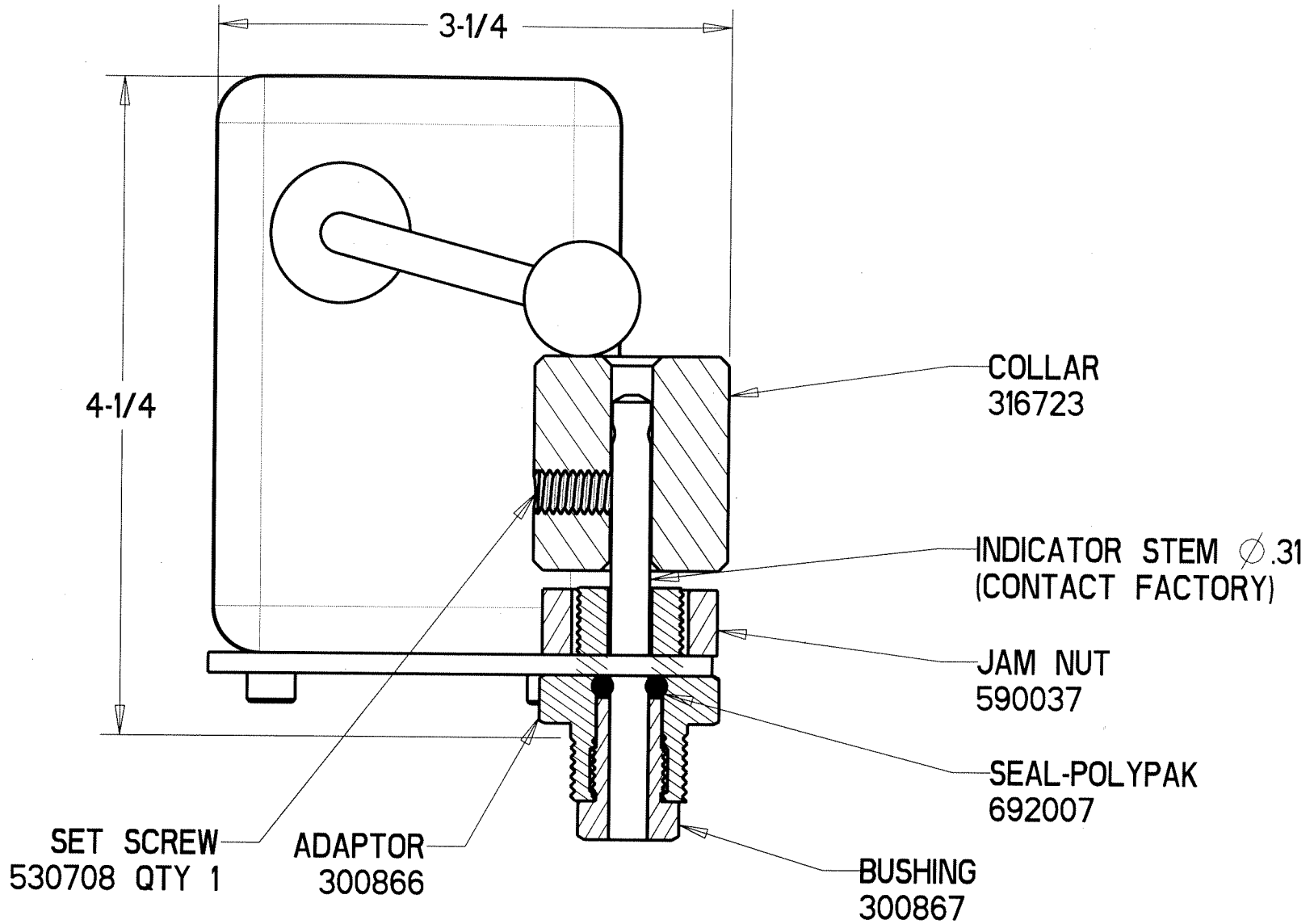
SPDT: 15 amps @ 125-480 VAC  
1/2 amp @ 125 VDC, 1/4 amp @ 250 VDC  
DPDT: 10 amps @ 125-250 VAC  
0.3 amp @ 125 VDC, 0.15 amp @ 250 VDC

**ENCLOSURES**

OP Switches Weatherproof NEMA 4  
EX Switches Explosion Proof NEMA 7, 9

**MATERIALS**

Indicator Rod: Stainless Steel  
Adapter: Stainless Steel  
Collars: Stainless Steel



E					MATERIAL	TOLERANCES	OCV Control Valves TULSA OKLAHOMA USA					
D						UNLESS NOTED .XX $\pm .015$ .XXX $\pm .005$ ANGULAR $\pm 0.5^\circ$ MACH. FINISH 125				LIMIT SWITCH ASSEMBLY		
C							NO. REQ'D	DRAWN BY	DATE	SIZE	DRAWING NUMBER	REV
B								BK.	2-13-08	A	MODEL 31	
A							SCALE	CHKD BY	DATE			
CHG	ECN	DATE	BY		REVISIONS	REF DWG NO'S	FULL					