


**Submittal Package**

**Engineering Specification, Installation, Operation and Maintenance  
Series LF982GD / LF682GD**

**Pump Control Valve with Backpressure Feature**

Sizes: 2" to 24"

**⚠ WARNING**



**Read this Manual BEFORE using this equipment. Failure to read and follow all safety and use information can result in death, serious personal injury, property damage, or damage to the equipment. Keep this Manual for future reference.**

**THINK SAFETY FIRST**

**⚠ WARNING**

Local building or plumbing codes may require modifications to the information provided. You are required to consult the local building and plumbing codes prior to installation. If the information provided here is not consistent with local building or plumbing codes, the local codes should be followed. This product must be installed by a licensed contractor in accordance with local codes and ordinances.

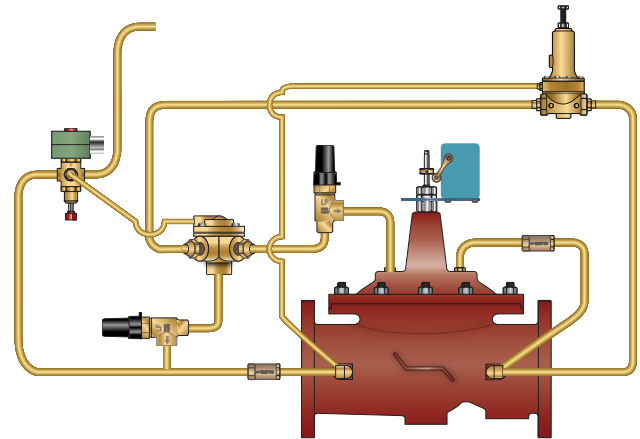
**⚠ WARNING**

**Need for Periodic Inspection/Maintenance:** This product must be tested periodically in compliance with local codes, but at least once per year or more as service conditions warrant. All products must be retested once maintenance has been performed. Corrosive water conditions and/or unauthorized adjustments or repair could render the product ineffective for the service intended. Regular checking and cleaning of the product's internal and external components helps assure maximum life and proper product function.

**NOTICE**

For Australia and New Zealand: Pipeline strainers should be installed between the upstream shutoff valve and the inlet of the backflow preventer.

It's important that this device be tested periodically in compliance with local codes, but at least once per year or more as service conditions warrant. If installed on a fire sprinkler system, all mechanical checks, such as alarm checks and backflow preventers, should be flow tested and inspected internally in accordance with NFPA 13 and NFPA 25.



LF982GD

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Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold.



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# Series LF982GD

## Pump Control Valve with Backpressure Feature

### Full Port Ductile Iron Single Chamber Valve

#### Features

- Opens at adjustable rate on pump start-up
- Closes at adjustable rate on pump shut-off
- Limit Switch turns pump off when valve closes
- Throttles to maintain constant back pressure against pump
- Hydraulic Check Feature prevents flow reversal
- Solenoid equipped with Manual Operator
- Backpressure setpoint is adjustable

#### Standard Components

- 1 – Main Valve (905GD - Single Chamber)
- 2 – Pressure Sustaining Control
- 3 – Model 22 Accelerator Control
- 4 – Limit Switch
- 5 – 3-Way Solenoid
- 6 – Check Valve
- 7 – Adjustable Opening Speed
- 8 – Adjustable Closing Speed
- X – Isolation Cocks
- Y – Y-Strainer

#### Options and Accessories

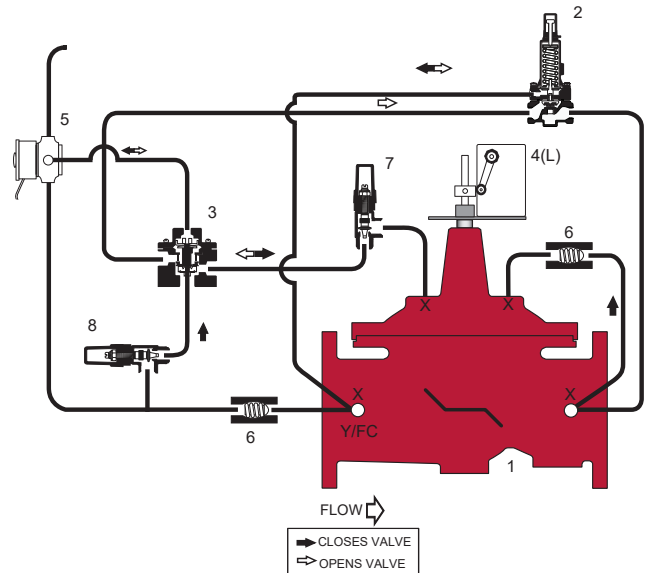
- FC – Flo-Clean Strainer
- L – Dual Limit Switch

#### Operation

The Pump Control Valve with Backpressure Feature is designed to minimize the surges associated with the starting and stopping of pumps. The valve slowly opens and closes as required to control pumping related surges, and throttles to maintain a minimum backpressure against the pump during the pumping cycle. The pump starts and stops against a closed valve.

**Pump Start Up:** When the pump is signaled to start, the 3-Way Solenoid is energized, directing pressure into the cover chamber of the 3-way Accelerator Pilot. The Accelerator Pilot allows the main valve cover chamber to be vented downstream, causing the valve to open at a controlled rate, gradually admitting pumping pressure into the distribution system. The rate of opening is controlled by the adjustable opening speed control, which restricts the speed of fluid and pressure evacuating the main valve cover chamber. The valve remains open during the pumping cycle.

**Backpressure Feature:** During the pumping cycle, the valve acts as a Backpressure Control Valve. When pump discharge pressure falls below an adjustable minimum, the valve modulates toward a closed position, increasing backpressure against the pump. Throttling (Backpressure) action is controlled by a normally closed control pilot designed to: 1) Open (allowing fluid out of the main valve cover chamber) when pump discharge pressure is above the adjustable setpoint, and, 2) Close (allowing fluid to fill the main valve cover chamber through the integral orifice of the Accelerator Pilot) when pump discharge pressure is below the adjustable setpoint. An increase in pump discharge pressure causes the valve to modulate toward an open position. A decrease in pump discharge pressure causes the valve to modulate toward a closed position.



**Pump Shutdown:** When the pump is signaled to turn off, the 3-Way Solenoid is de-energized, venting the cover chamber of the 3-way Accelerator Pilot. The Accelerator Pilot allows the main valve cover chamber to be connected to upstream pressure, causing the valve to close at a controlled rate. The valve slowly begins to close while the pump continues to operate. The closing rate of the valve is controlled by the adjustable closing speed control, which restricts the speed of fluid and pressure entering the main valve cover chamber. When the valve reaches the closed position, the limit switch is actuated, turning the pump off.

**Hydraulic Check Feature:** When the pump is turned off and downstream pressure is greater than upstream pressure, downstream pressure is admitted to the main valve cover chamber through a check valve in the pilot control system, closing the valve, preventing reversal of flow.

**Manual Operation:** Engaging the Solenoid Manual operator simulates power to the solenoid, manually opening the main valve. Disengaging the Solenoid Manual operator returns the valve to the closed position.

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

#### NOTICE

The information contained herein is not intended to replace the full product installation and safety information available or the experience of a trained product installer. You are required to thoroughly read all installation instructions and product safety information before beginning the installation of this product.

# M Series Basic Valves

## Pump Control Valve with Backpressure Feature

### Full Port Ductile Iron Single Chamber Basic Valve

This Ames Automatic Control Valve (ACV) is a full port, single chamber basic valve that incorporates a one-piece disc and diaphragm assembly. This assembly is the only moving part within the valve allowing it to open, close, or modulate as commanded by the pilot control system.

Ames ACV Main Valves are Lead Free. The Ames ACV piloting system contains Lead Free\* components, ensuring all of our configurations are Lead Free compliant.

Globe Pattern Single Chamber Basic Valve (905GD)

Angle Pattern Single Chamber Basic Valve (905AD)

### Standard Materials

|                        |   |
|------------------------|---|
| Body and Cover:        | Ductile Iron ASTM A536                                    |
| Coating:               | NSF Listed Fusion Bonded Epoxy Lined and Coated           |
| Trim:                  | 316 Stainless Steel                                       |
| Elastomers:            | Buna-N (standard)<br>EPDM (optional)<br>Viton™ (optional) |
| Nut, Spring and Stem:  | Stainless Steel   |
| Anti-Scale (Optional): | Xylan Coated Stem and Seat                                |



Viton™ is a trademark of The Chemours Company FC, LLC

### Operating Pressure

- Threaded = 400psi (27.6 bar)
- 150# Flanged = 250psi (17.2 bar)
- 300# Flanged = 400psi (27.6 bar)
- Grooved End = 400psi (27.6 bar)

### Operating Temperature

- Buna-N: 160°F (71°C) Maximum
- EPDM: 300°F (140°C) Maximum
- Viton™: 250°F (121°C) Maximum
- Epoxy Coating\*\*: 225°F (107°C) Maximum

\*\* Valves can be provided without internal epoxy coating consult factory

### Basic Valve Body Options



Globe Flanged



Angle Flanged



Globe Grooved End



Angle Grooved End



Globe Threaded



Angle Threaded

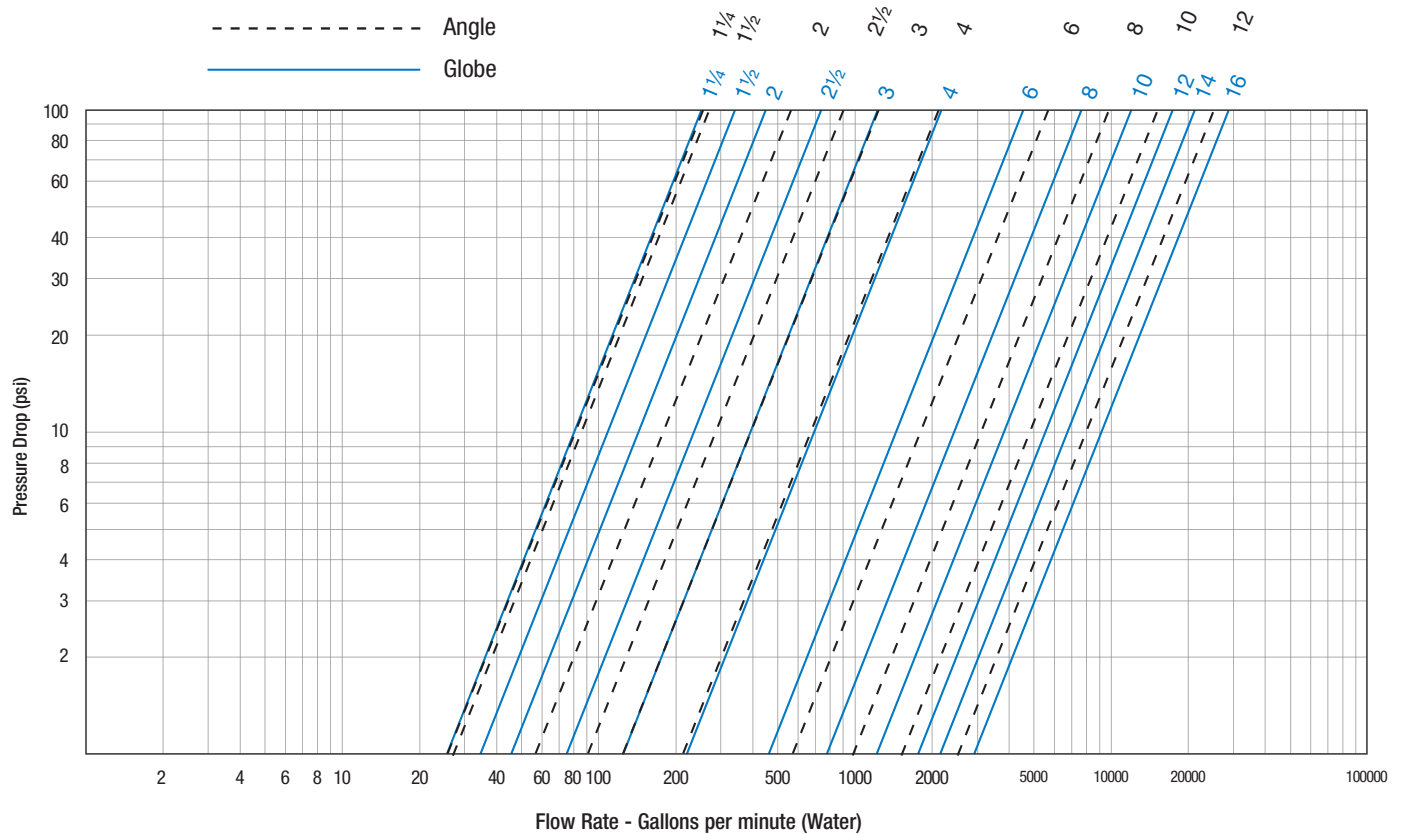
# ACV Schematic - Series LF982GD

## Flow Data

| Valve Size - Inches |  | 1/4 | 1/2 | 2   | 2 1/2 | 3   | 4    | 6    | 8    | 10   | 12   | 14    | 16    |
|---------------------|--|-----|-----|-----|-------|-----|------|------|------|------|------|-------|-------|
| <b>Suggested</b>    | Maximum Continuous Flow Rate Gpm (Water)   | 95  | 130 | 210 | 300   | 485 | 800  | 1850 | 3100 | 5000 | 7000 | 8500  | 11100 |
|                     | Maximum Intermittent Flow Rate Gpm (Water) | 119 | 161 | 265 | 390   | 590 | 1000 | 2300 | 4000 | 6250 | 8900 | 10800 | 14100 |
|                     | Minimum Flow Rate Gpm (Water)              | 3   | 5   | 6   | 9     | 15  | 16   | 17   | 25   | 55   | 70   | 190   | 400   |
| <b>Cv</b>           | Cv Factor GPM (Globe)                      | 26  | 26  | 48  | 75    | 112 | 188  | 387  | 764  | 1215 | 1734 | 2234  | 3131  |
|                     | Cv Factor GPM (Angle)                      | 26  | 27  | 57  | 91    | 125 | 207  | 571  | 889  | 1530 | 1945 |       |       |

- Maximum continuous flow based on velocity of 20 ft. per second.
- Maximum intermittent flow based on velocity of 25 ft. per second.
- Minimum flow rates based on a 20-40 psi pressure drop.
- The C<sub>v</sub> Factor of a valve is the flow rate in US GPM at 60°F that will cause a 1psi drop in pressure.
- C<sub>v</sub> factor can be used in the following equations to determine Flow (Q) and Pressure Drop (ΔP):

$$Q \text{ (Flow)} = C_v \sqrt{\Delta P} \quad \Delta P \text{ (Pressure Drop)} = (Q/C_v)^2$$



## Valve Cover Chamber Capacity

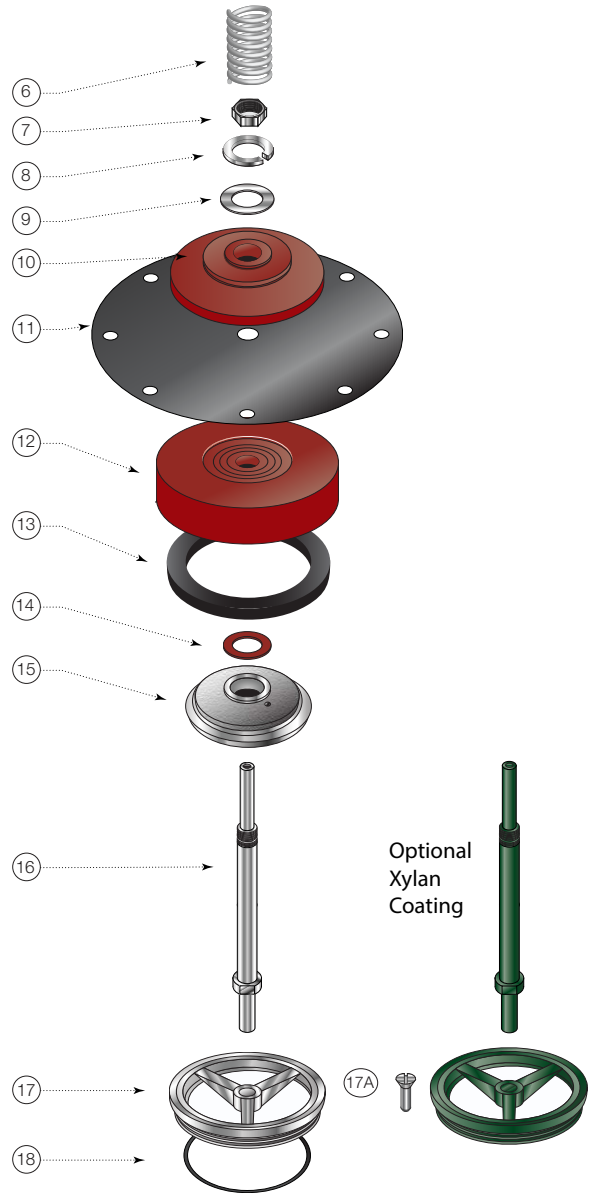
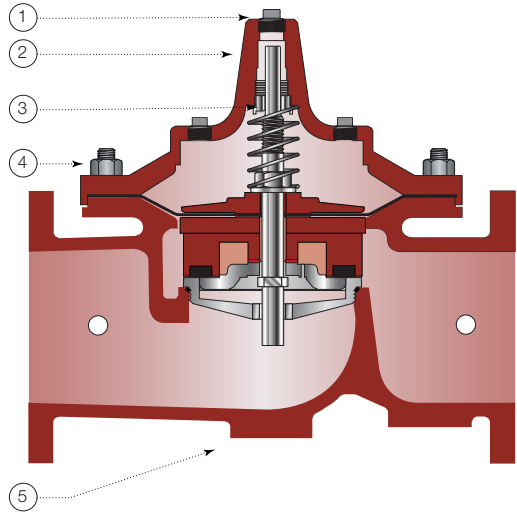
| Valve Size - Inches | 1/4 | 1/2 | 2 | 2 1/2 | 3  | 4  | 6  | 8   | 10    | 12 | 14    | 16    |
|---------------------|-----|-----|---|-------|----|----|----|-----|-------|----|-------|-------|
| fl.oz.              | 4   | 4   | 4 | 10    | 16 | 22 | 70 |     |       |    |       |       |
| U.S. Gal            |     |     |   |       |    |    |    | 1/4 | 2 1/2 | 4  | 6 1/2 | 9 1/2 |

## Valve Travel

| Valve Size - Inches | 1/4 | 1/2 | 2   | 2 1/2 | 3   | 4 | 6     | 8 | 10    | 12 | 14    | 16 |
|---------------------|-----|-----|-----|-------|-----|---|-------|---|-------|----|-------|----|
| Travel - Inches     | 3/8 | 3/8 | 1/2 | 5/8   | 3/4 | 1 | 1 1/2 | 2 | 2 1/2 | 3  | 3 1/2 | 4  |

# ACV Schematic - Series LF982GD

## Basic Valve



| Item | Description                    | Material                                     |
|------|--------------------------------|--|
| 1    | Pipe Plug                      | Lead Free Brass                              |
| 2    | Cover                          | ASTM A536 65-45-12 Epoxy Coated Ductile Iron |
| 3    | Cover Bearing                  | ASTM A276 304 Stainless Steel                |
| 4    | Stud with Cover Nut and Washer | ASTM A570 Gr.33 Zinc Plated Steel            |
| 5    | Body                           | ASTM A536 65-45-12 Epoxy Coated Ductile Iron |
| 6    | Spring                         | ASTM A276 302 Stainless Steel                |
| 7    | Stem Nut                       | ASTM A276 304 Stainless Steel                |
| 8    | Lock Washer                    | ASTM A276 304 Stainless Steel                |
| 9    | Stem Washer                    | ASTM A276 304 Stainless Steel                |
| 10   | Diaphragm Washer               | ASTM A536 65-45-12 Epoxy Coated Ductile Iron |
| 11   | Diaphragm*                     | Buna-N (Nitrile)                             |
| 12   | Disc Retainer                  | ASTM A536 65-45-12 Epoxy Coated Ductile Iron |
| 13   | Seat Disc*                     | Buna-N (Nitrile)                             |
| 14   | Spacer Washer* x5              | NY300 Fiber*                                 |
| 15   | Disc Guide                     | ASTM A743 CF8M (316) Stainless Steel         |
| 16   | Shaft                          | ASTM A276 304 Stainless Steel                |
| 17   | Seat Ring**                    | ASTM A743 CF8M (316) Stainless Steel         |
| 17A  | Seat Screw** (8" and Larger)   | ASTM A276 304 Stainless Steel                |
| 18   | Seat Gasket*                   | Buna-N (Nitrile)                             |

\* Contained in Main Valve Repair Kit

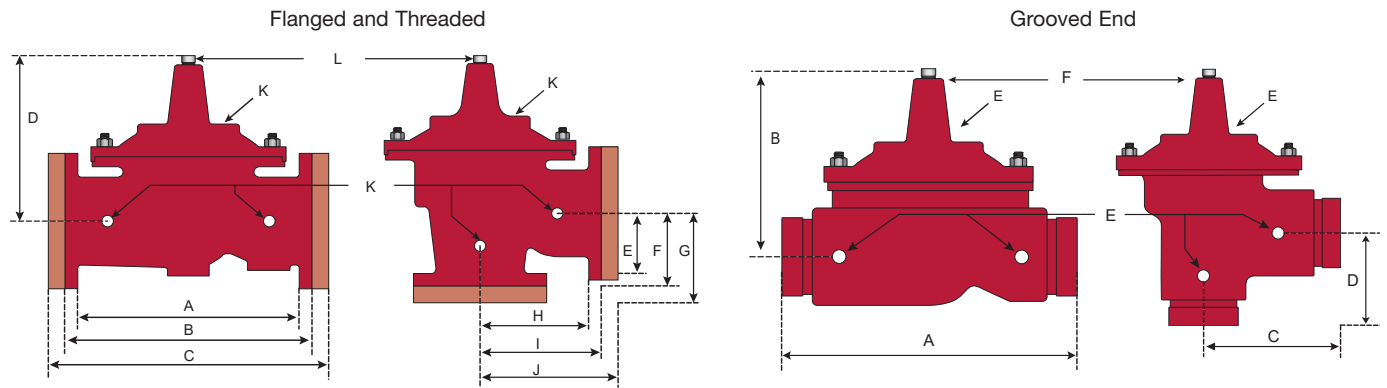
\*\*Note: 6 inch and Smaller Valves, Seat Ring is threaded

### NOTICE

Installation: If unit is installed in any orientation other than horizontal (cover up) OR extreme space constraints exist, consult customer service prior to or at the time of order.

# ACV Schematic - Series LF982GD

## Dimensions



### Flanged and Threaded Dimensions

| Valve Size                    | Globe Thread                   |     | Globe 150#                     |      | Globe 300#                     |      | Cover To Center                |     | Angle Thread                  |     | Angle 150#                     |     | Angle 300#                      |     | Angle Thread                  |     | Angle 150#                     |     | Angle 300#                     |     | Port Size NPT                  | Port Size NPT                 | Shipping Weights* |      |
|-------------------------------|--------------------------------|-----|--------------------------------|------|--------------------------------|------|--------------------------------|-----|-------------------------------|-----|--------------------------------|-----|---------------------------------|-----|-------------------------------|-----|--------------------------------|-----|--------------------------------|-----|--------------------------------|-------------------------------|-------------------|------|
|                               | A                              | B   | C                              | D    | E                              | F    | G                              | H   | I                             | J   | K                              | L   |                                 |     |                               |     |                                |     |                                |     |                                |                               |                   |      |
| in.                           | in.                            | mm  | in.                            | mm   | in.                            | mm   | in.                            | mm  | in.                           | mm  | in.                            | mm  | in.                             | mm  | in.                           | mm  | in.                            | mm  | in.                            | mm  | in.                            | in.                           | lbs.              | kgs. |
| 2                             | 9 <sup>3</sup> / <sub>8</sub>  | 238 | 9 <sup>3</sup> / <sub>8</sub>  | 238  | 10                             | 254  | 6 <sup>3</sup> / <sub>4</sub>  | 171 | 4 <sup>3</sup> / <sub>4</sub> | 120 | 4 <sup>3</sup> / <sub>4</sub>  | 121 | 5                               | 127 | 3 <sup>1</sup> / <sub>4</sub> | 83  | 3 <sup>1</sup> / <sub>4</sub>  | 83  | 3 <sup>1</sup> / <sub>2</sub>  | 89  | 3 <sup>8</sup> / <sub>16</sub> | 1/2                           | 40                | 18   |
| 2 <sup>1</sup> / <sub>2</sub> | 11                             | 279 | 11                             | 279  | 11 <sup>5</sup> / <sub>8</sub> | 295  | 7 <sup>1</sup> / <sub>2</sub>  | 191 | 5 <sup>1</sup> / <sub>2</sub> | 140 | 5 <sup>1</sup> / <sub>2</sub>  | 140 | 5 <sup>7</sup> / <sub>8</sub>   | 149 | 4                             | 102 | 4                              | 102 | 4 <sup>5</sup> / <sub>16</sub> | 110 | 1/2                            | 1/2                           | 65                | 29   |
| 3                             | 12 <sup>1</sup> / <sub>2</sub> | 318 | 12                             | 305  | 13 <sup>1</sup> / <sub>4</sub> | 337  | 8 <sup>1</sup> / <sub>4</sub>  | 210 | 6 <sup>1</sup> / <sub>4</sub> | 159 | 6                              | 152 | 6 <sup>5</sup> / <sub>8</sub>   | 162 | 4 <sup>1</sup> / <sub>2</sub> | 114 | 4                              | 102 | 4 <sup>3</sup> / <sub>8</sub>  | 111 | 1/2                            | 1/2                           | 95                | 43   |
| 4                             |                                |     | 15                             | 381  | 15 <sup>5</sup> / <sub>8</sub> | 397  | 10 <sup>5</sup> / <sub>8</sub> | 270 |                               |     | 7 <sup>1</sup> / <sub>2</sub>  | 191 | 7 <sup>7</sup> / <sub>8</sub>   | 200 |                               |     | 5                              | 127 | 5 <sup>5</sup> / <sub>16</sub> | 135 | 3/4                            | 3/4                           | 190               | 86   |
| 6                             |                                |     | 20                             | 508  | 21                             | 533  | 13                             | 330 |                               |     | 10                             | 254 | 10 <sup>1</sup> / <sub>2</sub>  | 267 |                               |     | 6                              | 152 | 6 <sup>1</sup> / <sub>2</sub>  | 165 | 3/4                            | 3/4                           | 320               | 145  |
| 8                             |                                |     | 25 <sup>3</sup> / <sub>8</sub> | 645  | 26 <sup>3</sup> / <sub>8</sub> | 670  | 16                             | 406 |                               |     | 12 <sup>3</sup> / <sub>4</sub> | 324 | 13 <sup>1</sup> / <sub>4</sub>  | 337 |                               |     | 8                              | 203 | 8 <sup>1</sup> / <sub>2</sub>  | 216 | 1                              | 1                             | 650               | 295  |
| 10                            |                                |     | 29 <sup>3</sup> / <sub>4</sub> | 756  | 31 <sup>1</sup> / <sub>8</sub> | 791  | 17                             | 430 |                               |     | 14 <sup>7</sup> / <sub>8</sub> | 378 | 15 <sup>5</sup> / <sub>16</sub> | 395 |                               |     | 8 <sup>5</sup> / <sub>8</sub>  | 219 | 9 <sup>5</sup> / <sub>16</sub> | 237 | 1                              | 1                             | 940               | 426  |
| 12                            |                                |     | 34                             | 864  | 35 <sup>1</sup> / <sub>2</sub> | 902  | 20 <sup>7</sup> / <sub>8</sub> | 530 |                               |     | 17                             | 432 | 17 <sup>3</sup> / <sub>4</sub>  | 451 |                               |     | 13 <sup>3</sup> / <sub>4</sub> | 349 | 14 <sup>1</sup> / <sub>2</sub> | 368 | 1                              | 1 <sup>1</sup> / <sub>4</sub> | 1500              | 680  |
| 14                            |                                |     | 39                             | 991  | 40 <sup>1</sup> / <sub>2</sub> | 1029 | 24 <sup>1</sup> / <sub>4</sub> | 616 |                               |     |                                |     |                                 |     |                               |     |                                |     |                                |     | 1                              | 1 <sup>1</sup> / <sub>2</sub> | 1675              | 760  |
| 16                            |                                |     | 41 <sup>3</sup> / <sub>8</sub> | 1051 | 43 <sup>1</sup> / <sub>2</sub> | 1105 | 25 <sup>1</sup> / <sub>4</sub> | 640 |                               |     |                                |     |                                 |     |                               |     |                                |     |                                |     | 1                              | 2                             | 3100              | 1406 |

### Grooved End Dimensions

| Valve Size                    | Globe Grooved                  |     | Cover To Center                |     | Angle Grooved                 |     | Angle Grooved                 |     | Port Size (npt) | Port Size (npt) | Shipping Weights* |      |
|-------------------------------|--------------------------------|-----|--------------------------------|-----|-------------------------------|-----|-------------------------------|-----|-----------------|-----------------|-------------------|------|
|                               | A                              | B   | C                              | D   | E                             | F   |                               |     |                 |                 |                   |      |
| in.                           | in.                            | mm  | in.                            | mm  | in.                           | mm  | in.                           | mm  | in.             | in.             | lbs.              | kgs. |
| 2                             | 9                              | 229 | 6 <sup>1</sup> / <sub>2</sub>  | 165 | 4 <sup>3</sup> / <sub>4</sub> | 121 | 3 <sup>1</sup> / <sub>4</sub> | 83  | 3/8             | 1/2             | 40                | 18   |
| 2 <sup>1</sup> / <sub>2</sub> | 11                             | 279 | 7 <sup>1</sup> / <sub>2</sub>  | 191 | 5 <sup>1</sup> / <sub>2</sub> | 140 | 4                             | 102 | 1/2             | 1/2             | 65                | 29   |
| 3                             | 12 <sup>1</sup> / <sub>2</sub> | 318 | 8 <sup>1</sup> / <sub>4</sub>  | 210 | 6                             | 152 | 4 <sup>1</sup> / <sub>4</sub> | 108 | 1/2             | 1/2             | 95                | 43   |
| 4                             | 15                             | 381 | 10 <sup>5</sup> / <sub>8</sub> | 270 | 7 <sup>1</sup> / <sub>2</sub> | 191 | 5                             | 127 | 3/4             | 3/4             | 190               | 86   |
| 6                             | 20                             | 508 | 13 <sup>3</sup> / <sub>8</sub> | 340 |                               |     |                               |     | 3/4             | 3/4             | 320               | 145  |
| 8                             | 25 <sup>3</sup> / <sub>8</sub> | 645 | 16                             | 406 |                               |     |                               |     | 1               | 1               | 650               | 295  |



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# Model LFPV20C

## Pressure Relief, Sustaining or Backpressure Pilot

Size: 1/2" NPT

The Model LFPV20C is a remote sensed direct acting, diaphragm actuated Pilot that is used on various configurations of Automatic Control Valves.

It is normally held closed by the force of the adjustable spring setting above the diaphragm. It modulates toward an open position when control pressure, exerting force below the diaphragm, exceeds the spring setpoint, and modulates toward a closed position when the control pressure falls below the spring setpoint. The LFPV20C senses control pressure through a tapped port below the diaphragm. The large diaphragm-to-seat ratio allows it to open and close within tight pressure tolerances, accurately positioning the Main Valve.

Turning the adjustment screw clockwise raises the control setpoint. Turning the adjustment screw counterclockwise lowers the control setpoint.

The LFPV20C is equipped with one 1/2" NPT inlet and outlet port and a 1/4" NPT side sensing port located on the power chamber. The 1/4" side sensing port is used to monitor upstream or downstream pressure as required by specific valve function.



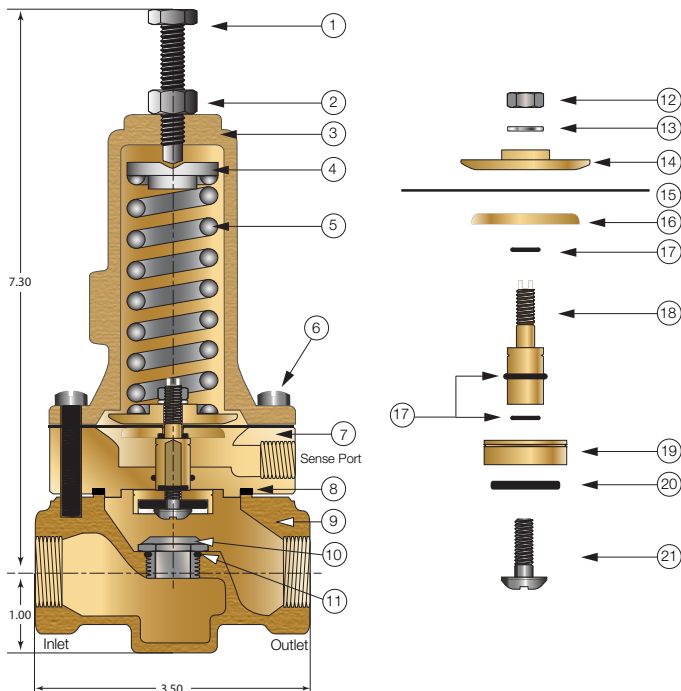
Model LFPV20C

### Specifications

- Body Material:** Lead Free Copper Silicon Alloy
- Seat:** 316 Stainless Steel
- Elastomers:** Buna-N (standard)  
Viton™ (optional)  
EPDM (optional)
- Inlet Pressure Rating:** 400psi (27.6 bar) maximum
- Adjustment Rating:** 20-200psi (1.4 - 13.8 bar) (standard)  
0-30psi (0 - 2.1 bar) (optional)  
100-300psi (6.9 - 20.7 bar) (optional)  
200-450psi (13.8 - 31.0 bar) (optional)

Viton™ is a trademark of The Chemours Company FC, LLC

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.



| Item | Description     |
|------|-----------------|
| 1    | Adjusting Screw |
| 2    | Jam Nut         |
| 3    | Spring Housing  |
| 4    | Spring Guide    |
| 5    | Spring          |
| 6    | Cap Screw       |
| 7    | Power Chamber   |
| 8    | O-Ring*         |
| 9    | Body            |
| 10   | Seat            |
| 11   | O-Ring*         |

| Item | Description      |
|------|------------------|
| 12   | Nut              |
| 13   | Lockwasher       |
| 14   | Diaphragm Washer |
| 15   | Diaphragm*       |
| 16   | Diaphragm Washer |
| 17   | O-Ring*          |
| 18   | Stem             |
| 19   | Retainer         |
| 20   | Rubber Disc*     |
| 21   | Screw            |

\*Included in Repair Kit

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# Model 22

## 3-Way Accelerator Control

Size: 1/2"

The Model 22 3-Way Accelerator Pilot is a diaphragm actuated control with three separate ports: Supply, Common and Exhaust. It is normally installed in the pilot control circuit of an Automatic Control Valve, with the supply port connected to upstream pressure, the common port connected to the Main Valve cover chamber, and the exhaust port vented either downstream or to atmosphere. Its large 1/2" ports offer increased capacity, and allow smaller ported devices, such as a 3-Way Solenoid, Float or Altitude Pilot, to operate the Main Valve open and closed.

When the cover of the Accelerator Pilot is de-pressurized, the main valve cover chamber is connected to upstream pressure, causing the valve to close drip tight.

When the cover of the Accelerator Pilot is pressurized, the main valve cover chamber is vented downstream (dry drain) or to atmosphere (wet drain), causing the valve to open.

The Model 22 is designed with an integral orifice to provide a constant source of pressure for valve regulation, when modulating features are desired in addition to normal On/Off operation.



Model LF22

### Specifications

- Size: 1/2"
- Body Material: C87800 Silicone Bronze (std)  
CF8M Stainless Steel (opt)
- Elastomers: Buna-N (std)  
Viton™ (opt)  
EPDM (opt)
- Inlet Pressure Rating: 400 psi maximum

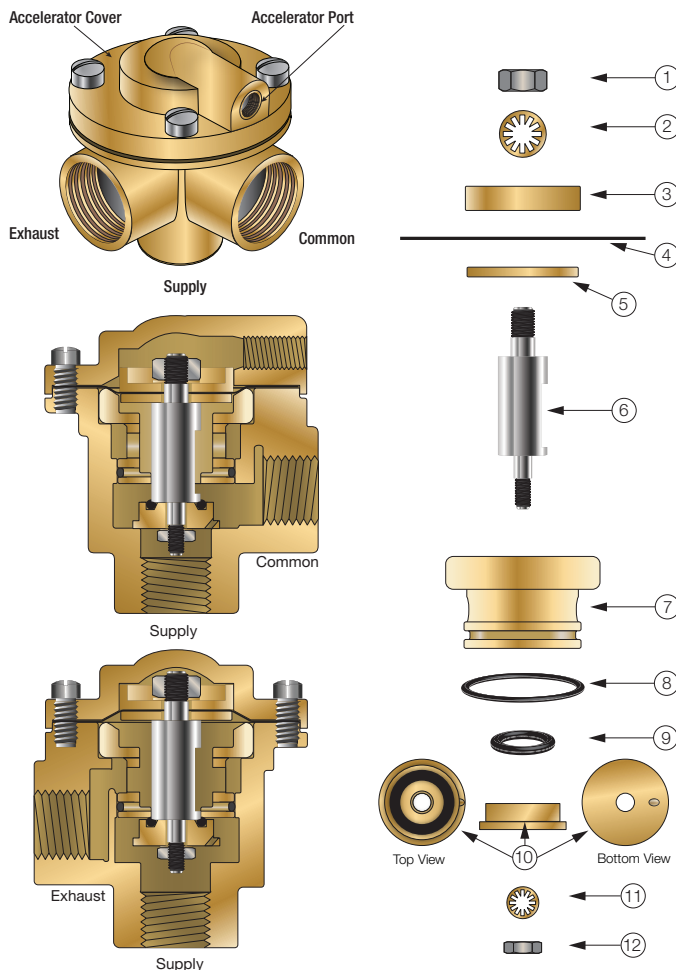
Viton™ is a trademark of The Chemours Company FC, LLC

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

### Parts List

| Item | Description            |
|------|------------------------|
| 1    | Nut                    |
| 2    | Lock Washer            |
| 3    | Upper Diaphragm        |
| 4    | Diaphragm*             |
| 5    | Lower Diaphragm Washer |
| 6    | Stem                   |
| 7    | Spool                  |
| 8    | O-Ring*                |
| 9    | O-Ring*                |
| 10   | Retainer               |
| 11   | Lock Washer            |
| 12   | Nut                    |

\*Included in Repair Kit





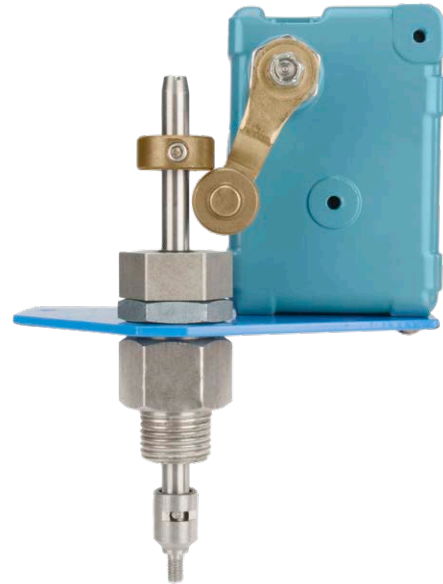
**LEAD FREE\***

# Model 51

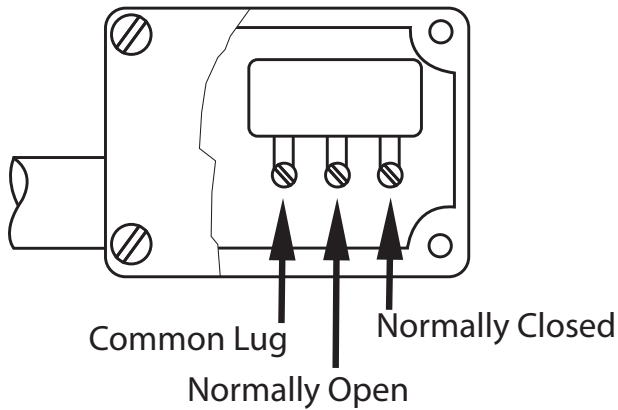
## Single Limit Switch

The Model 51 Single Limit Switch provides visual indication of valve position, as well as remote electrical indication of "valve open" or "valve closed". The single pole double throw Micro-Switch can be connected to open or close an electrical circuit when the valve opens or closes.

The adjustable collar is normally set to contact the trip arm when the main valve is closed. The collar can be positioned on the stem by loosening the set-screw to actuate the switch at the desired point of valve travel.



Model LF51



Single Pole Double Throw Switch

### Specifications

- Body Material: Stainless Steel
- Elastomers: Buna-N (standard)  
EPDM (optional)  
Viton™ (optional)
- Enclosure: NEMA 1, 3, 4 and 13 General Purpose (standard)  
NEMA 1, 7 and 9 Explosion Proof (optional)
- Electrical: Form C SPDT Switch  
15 amp. 125, 250 or 480 VAC  
½ amp. 125 VDC  
¼ amp. 250 VDC  
½" Conduit Connection

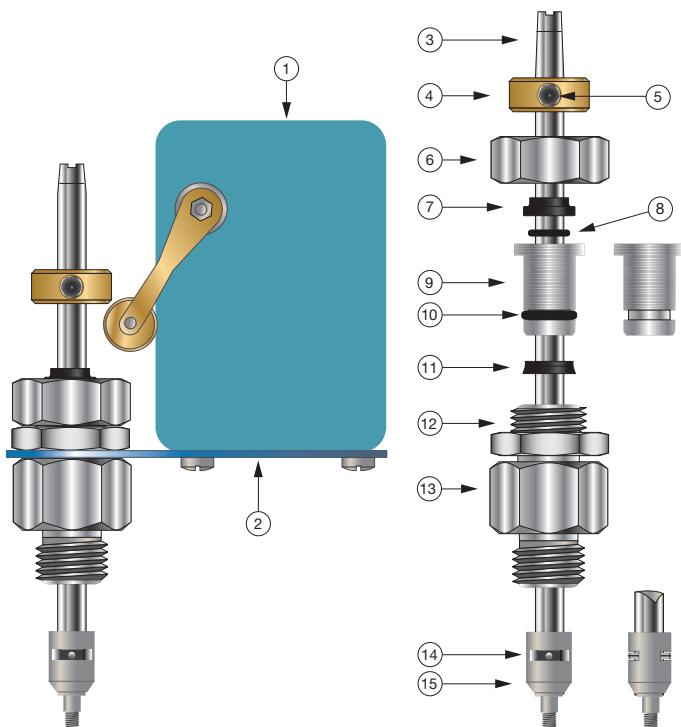
Viton™ is a trademark of The Chemours Company FC, LLC

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

### Parts List

| Item | Description  |
|------|--------------|
| 1    | Limit Switch |
| 2    | Bracket      |
| 3    | Stem         |
| 4    | Trip collar  |
| 5    | Set Screw    |
| 6    | Cap          |
| 7    | Wiper Ring*  |
| 8    | O-Ring*      |
| 9    | Guide        |
| 10   | O-Ring*      |
| 11   | Polypak*     |
| 12   | Locknut      |
| 13   | Body         |
| 14   | Pin          |
| 15   | Coupling     |

\*Included in Repair Kit

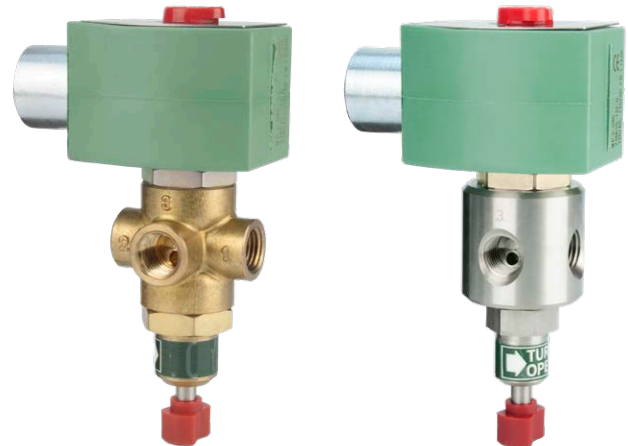


# Model S3W

## 3-Way Solenoid

Size: 1/8" – 1/2" NPT

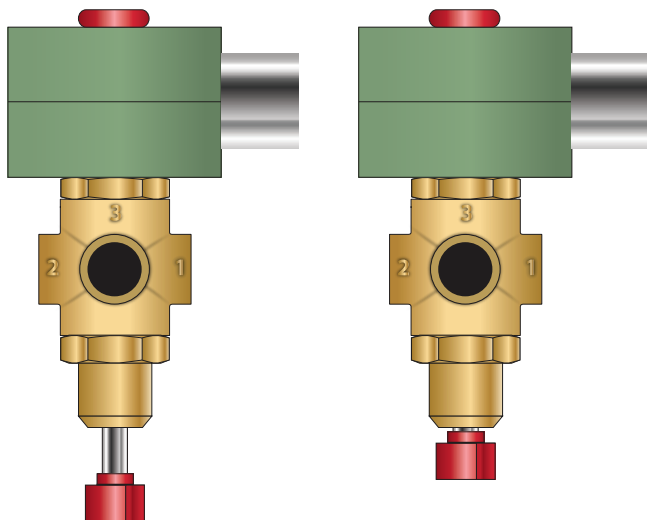
Model S3W are pilot system 3-way solenoids. The solenoids can control valves independently or in combination with other control circuit pilots or accessories. Product is available with a wide range of options including: voltage (24VDC, 24VAC or 120VAC), operation (energize to open or closed) and a range of enclosures (general service to watertight to explosion proof).



Model S3W  
Brass

Model S3W  
Stainless Steel

## Manual Operator



Normal Operating Condition

Manual Override

## Specifications

- Body Material:** Brass (standard)\*\*\*  
Stainless Steel (optional)
- Elastomers:** Nitrile (standard)  
EPDM (optional)  
Viton™ (optional)
- Voltage:** 24VDC, 24VAC or 120VAC
- Enclosure:** General Purpose – NEMA 4 (standard)  
Explosion Proof – NEMA 6, 6P, 7, 9 (optional)
- Action:** Normally Open or Normally Closed\*\*

\*\*Solenoid Action only. Main valve action (energize-to-open or energize-to-close) is dependent on the particulars of the pilot system.

\*\*\*Brass solenoids are not lead free and it is illegal to use them in potable services in the United States such as drinking water, handwashing, food preparation, and dishwashing. However, brass solenoids may be used as a replacement component in a lead free Watts ACV main valve, as the wetted surface of a lead free Watts ACV main valve including installed brass solenoids contains less than 0.25% of lead by weight.

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\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

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## Model CK

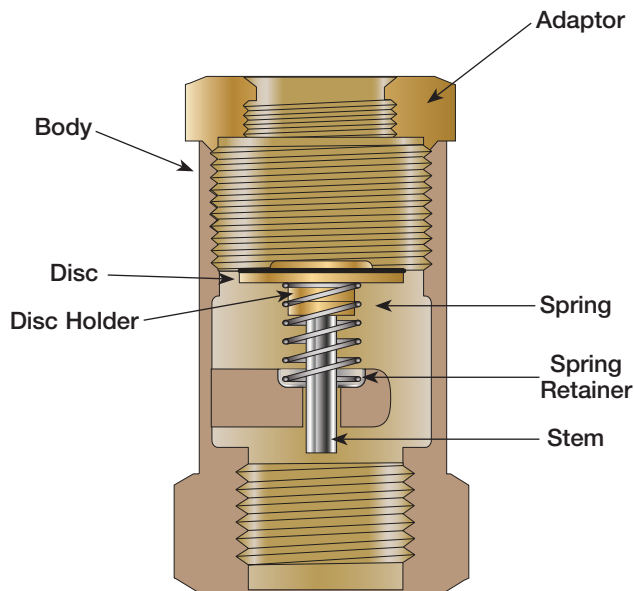
### Check Valve

Size: 1/4" - 1" NPT

Model CK Check Valves are pilot line check valves. In typical applications these low cracking pressure in-line checks provide a hydraulic check feature to a pilot system. When the main valve outlet pressure exceeds inlet pressure, fluid is directed from the outlet to the main valve cover. This causes the main valve to close until inlet pressure is again greater than outlet.



Model LFCK



### Specifications

Standard Material: Brass Housing and Body  
Stainless Steel Indicating Rod

Optional Material: Stainless Steel Housing and Body Disc  
Viton™ (1/4" - 1/2")  
PTFE (1")

Pressure Rating: 400psi (27.6 bar)

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\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

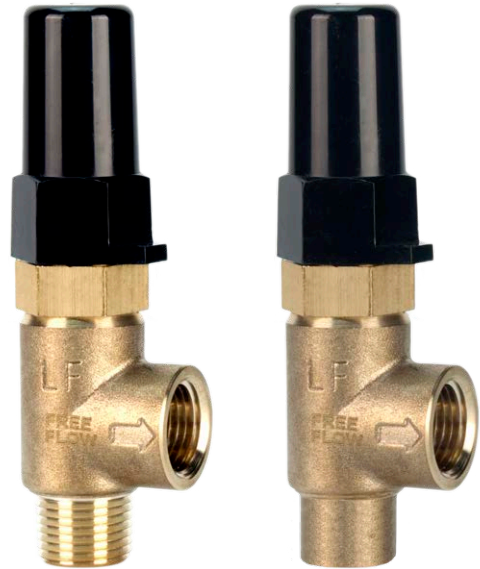
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# Model LFFC

## Flow Control

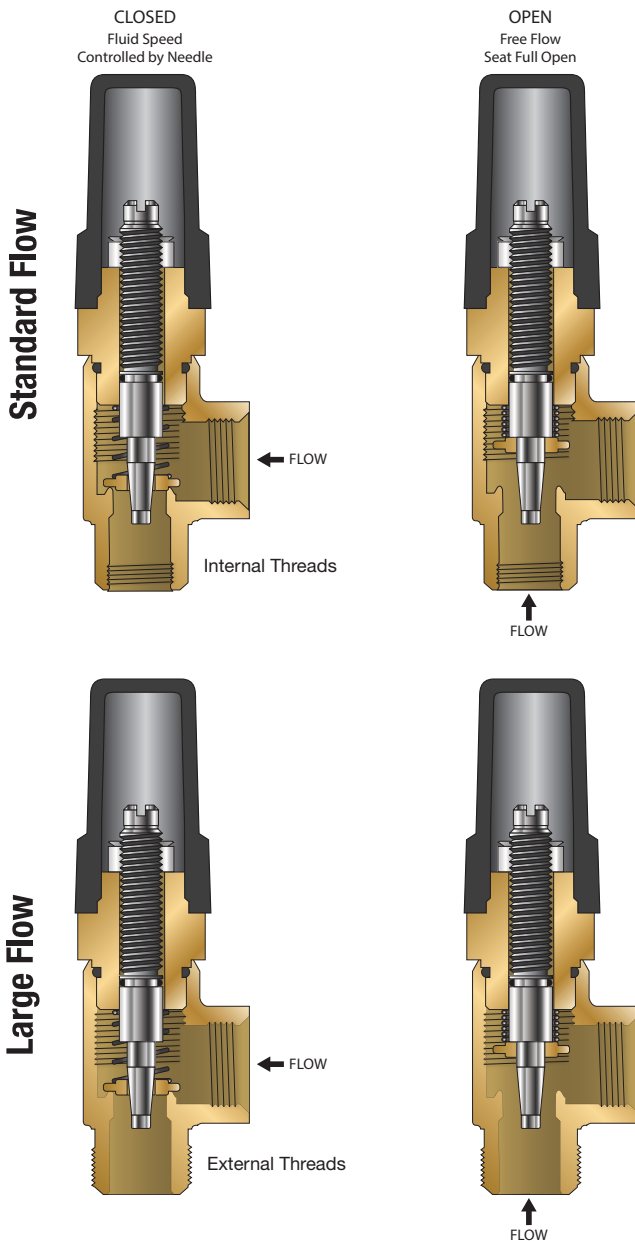
Size: Standard Flow - 1/2" MNPT x 3/8" FNPT  
 High Flow - 1/2" MxF NPT

A Flow Control is an adjustable device used for tuning valve performance. It can be installed to either control the opening or closing the speed of the automatic control main valve. When the flow is in the direction of the needle the flow control is an adjustable restriction. In the free flow direction the seat moves out of the flow path to all unrestricted flow.



Large Flow Control

Standard Flow Control



### Specifications

- Size: Standard Flow - 1/2" MNPT x 3/8" FNPT  
 High Flow - 1/2" MxF NPT
- Body Material: Lead Free Brass  
 Stainless Steel (optional)
- Seat: Lead Free Brass
- Needle: Stainless Steel (304)
- Elastomers: Buna-N (standard)

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

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## Model LF60-1

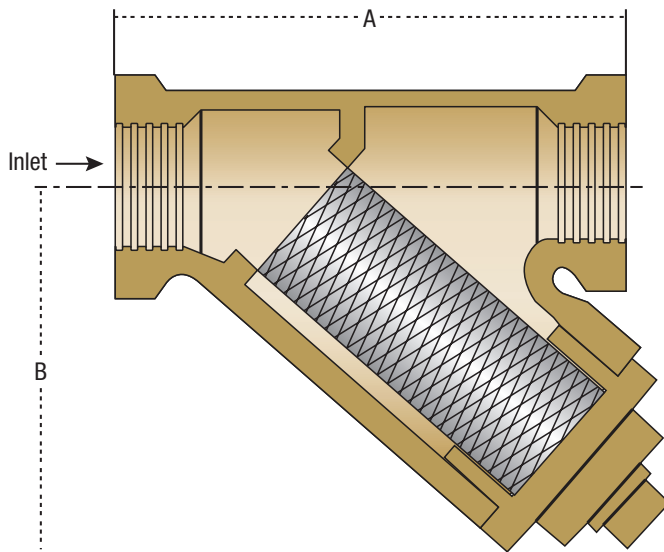
### Y-Pattern Strainer

Size: ¼" – ¾" NPT

Model LF60-1 Y-Pattern Strainers are used to filter the fluid passing through the pilot circuit, and provide protection to pilot circuit speed controls and pilots. The filter element can be accessed for cleaning by removing the clean-out cap, or may be cleaned by installing an optional "blow-down" ball valve.



Model LF60-1



### Specifications

|                  |   |
|------------------|---|
| Body Material:   | Lead Free Copper Silicon Alloy<br>CF8M (316) Stainless Steel (optional) |
| Retainer Cap:    | Lead Free Copper Silicon Alloy  |
| Cap Gasket:      | EPDM  |
| Pressure Rating: | 400psi (27.6 bar)   |
| Filter Element:  | 304 Stainless Steel   |
| Mesh Options:    | 60 Mesh (standard)<br>100 Mesh (optional)                               |

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

### Dimensions

| SIZE | DIMENSIONS                      |    |                                 |    | WEIGHT |      |
|------|---------------------------------|----|---------------------------------|----|--------|------|
|      | A                               |    | B                               |    | lbs.   | kgs. |
| in.  | in                              | mm | in                              | mm |        |      |
| ¼    | 2 <sup>11</sup> / <sub>16</sub> | 68 | 1 <sup>11</sup> / <sub>16</sub> | 43 | 1.7    | 0.77 |
| ⅜    | 2 <sup>11</sup> / <sub>16</sub> | 68 | 1 <sup>11</sup> / <sub>16</sub> | 43 | 1.7    | 0.77 |
| ½    | 3                               | 76 | 2                               | 51 | 1.7    | 0.77 |
| ¾    | 3 <sup>5</sup> / <sub>16</sub>  | 84 | 2 <sup>5</sup> / <sub>16</sub>  | 59 | 1.7    | 0.77 |

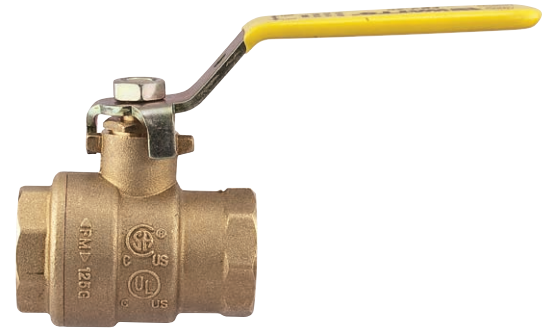
**LEAD FREE\***

# Model BV

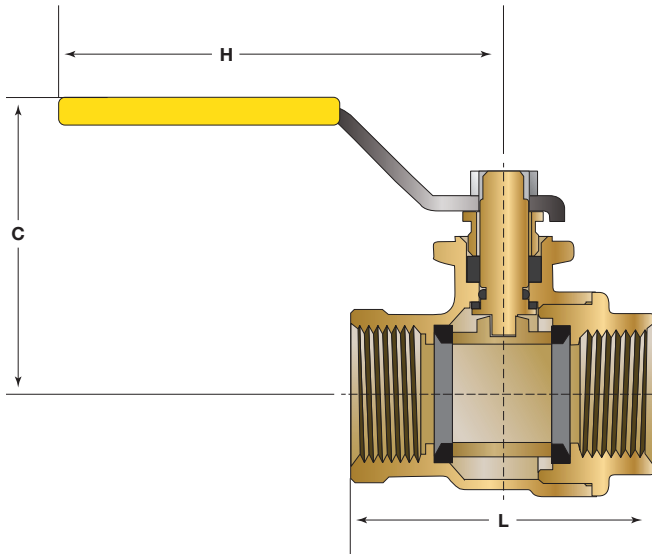
## Ball Valve

Size: ¼" – 1" NPT

Model BV Ball Valves are used in pilot lines to provide a positive shutoff in any override or maintenance situation for simple trouble shooting. This 2-piece, full port valve features: bottom loaded stems, PTFE seats and packing.



Lead Free Ball Valve



### Specifications

Standard Material: Copper Silicon Alloy Body and Adaptor  
Chrome Plated Ball

Optional Material: Stainless Steel Housing, Body and Adaptor  
Stainless Steel Ball

Pressure Rating: 600psi (41 bar) Non Shock

Temp Rating: -40°F - 400°F

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

| Size | Dimensions                      |    |                                |     |                                 |    | Weight |     |
|------|---------------------------------|----|--------------------------------|-----|---------------------------------|----|--------|-----|
|      | C                               |    | H                              |     | L                               |    | lbs.   | kg. |
| in.  | in.                             | mm | in.                            | mm  | in.                             | mm |        |     |
| ¼    | 1 <sup>13</sup> / <sub>16</sub> | 46 | 3 <sup>7</sup> / <sub>16</sub> | 87  | 1 <sup>3</sup> / <sub>4</sub>   | 45 | 0.4    | 0.2 |
| ⅜    | 1 <sup>13</sup> / <sub>16</sub> | 46 | 3 <sup>7</sup> / <sub>16</sub> | 87  | 1 <sup>3</sup> / <sub>4</sub>   | 45 | 0.4    | 0.2 |
| ½    | 1 <sup>13</sup> / <sub>16</sub> | 46 | 3 <sup>7</sup> / <sub>16</sub> | 87  | 1 <sup>15</sup> / <sub>16</sub> | 50 | 0.4    | 0.2 |
| ¾    | 2 <sup>1</sup> / <sub>4</sub>   | 57 | 4                              | 101 | 2 <sup>5</sup> / <sub>16</sub>  | 59 | 0.8    | 0.3 |



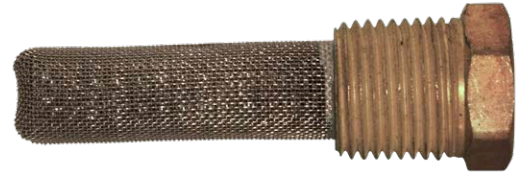
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## Model LF60

### Flo-Clean Strainer

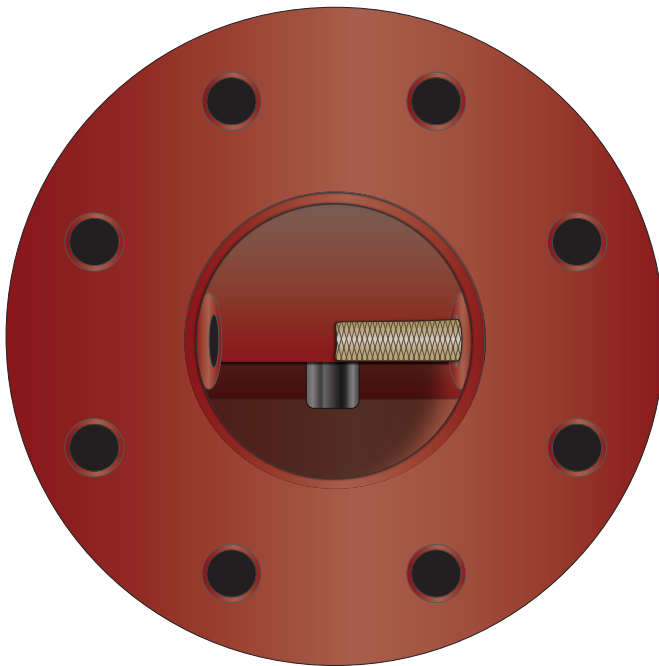
Size: 1/4" - 3/4" NPT

Model LF60 Flo-Clean Strainers are used to filter the fluid passing through the pilot circuit, and provide protection to pilot circuit speed controls and pilots. It is installed in the inlet body port of the Main Valve, exposing the strainer element to main line flow. The currents and flow across the screen create a self-scouring effect, cleaning the filter element.



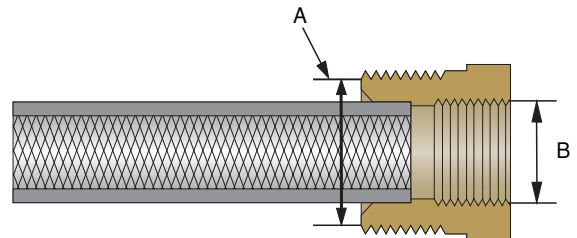
Model LF60

#### Valve inlet with Filter installed



#### Specifications

|                  |  |
|------------------|--|
| Body Material:   | Lead Free Brass (standard)<br>Stainless Steel (optional) |
| Pressure Rating: | 400psi (27.6 bar)  |
| Filter Element:  | Monel  |
| Screen Mesh:     | 40 Mesh (standard)                                       |



| A                | B                  |
|------------------|--------------------|
| Male Pipe Thread | Female Pipe Thread |
| in.              | in.                |
| 1/4              | 1/8                |
| 3/8              | 1/4                |
| 1/2              | 3/8                |

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

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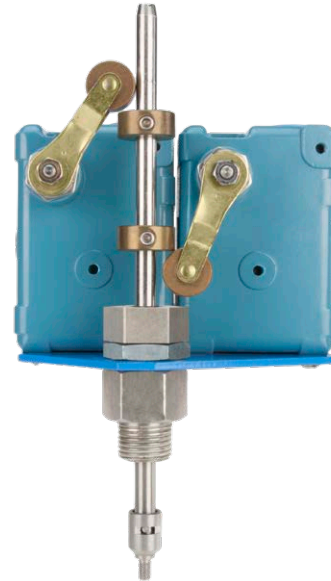
# Model 51-1

## Dual Limit Switch

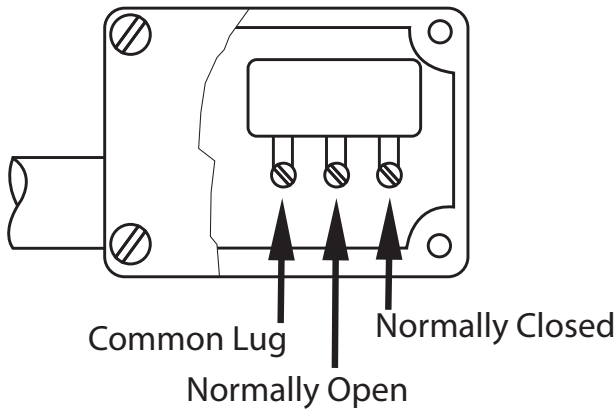
Size: 2" - 8" NPT

The Model 51-1 Dual Limit Switch provides visual indication of valve position, as well as remote electrical indication of "valve open" and "valve closed". The single pole double throw Micro-Switches can be connected to open or close an electrical circuit when the valve opens or closes.

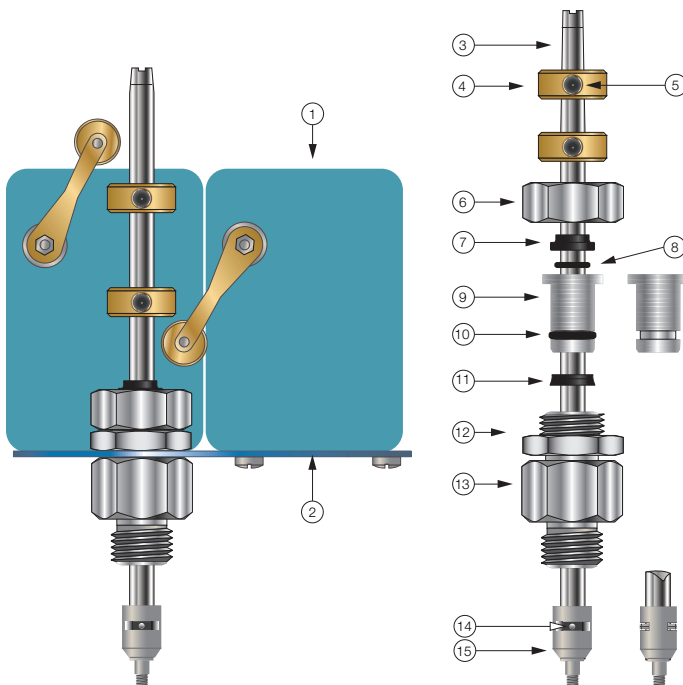
The adjustable collars are normally set to contact the trip arms to indicate "valve open" and "valve closed". The collars can be positioned on the stem by loosening the set-screws to actuate the switches at the desired point of valve travel.



Model LF51-1



Single Pole Double Throw Switch



### Specifications

- Body Material: Stainless Steel
- Elastomers: Buna-N (standard)  
EPDM (optional)  
Viton™ (optional)
- Enclosure: NEMA 1, 3, 4 and 13 General Purpose (standard)  
NEMA 1,7 and 9 Explosion Proof (optional)
- Electrical: Form C SPDT Switch  
15 amp. 125, 250 or 480 VAC  
½ amp. 125 VDC  
¼ amp. 250 VDC  
½" Conduit Connection

Viton™ is a trademark of The Chemours Company FC, LLC

\*The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.

### Parts List

| Item | Description  |
|------|--------------|
| 1    | Limit Switch |
| 2    | Bracket      |
| 3    | Stem         |
| 4    | Trip collar  |
| 5    | Set Screw    |
| 6    | Cap          |
| 7    | Wiper Ring*  |
| 8    | O-Ring*      |
| 9    | Guide        |
| 10   | O-Ring*      |
| 11   | Polypak*     |
| 12   | Locknut      |
| 13   | Body         |
| 14   | Pin          |
| 15   | Coupling     |

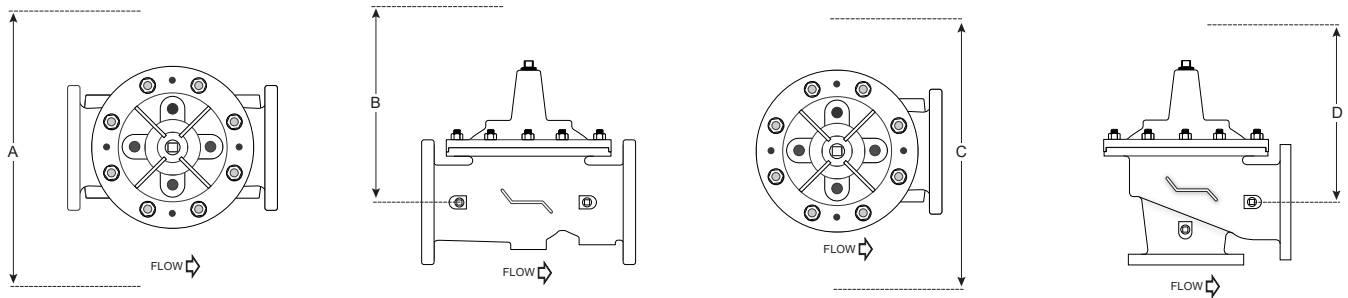
\*Included in Repair Kit

## Installation

Start-up of an automatic control valve requires that proper procedures be followed. Time must be allowed for the valve to react to adjustments and the system to stabilize. The objective is to bring the valve into service in a controlled manner to protect the system from damaging over-pressure.

1. Prior to installation, flush line to remove debris.
2. Install valve so the flow arrow matches flow through the line, and gauges to monitor valve inlet and outlet pressures.
3. Install isolation valves upstream and downstream of the main valve.
4. Provide adequate clearance for valve servicing and maintenance. Refer to valve servicing dimensions on next page. Avoid installing valves 6" and larger in the vertical position (main valve stem horizontal). Automatic Control Valves (ACVs) are designed for horizontal in-line installation, with the cover facing up (main valve stem vertical). Slow operation or premature stem and guide wear may occur if valve is not installed according to factory recommendations. Consult factory for detailed engineering review prior to ordering if valve is to be installed other than horizontally in-line.
5. If valve is equipped with a pilot control system, extra precautions should be made during installation to protect the piping circuit from damage. Only remove the pilot control system from the valve if necessary. Tubing and fittings should be kept clean and replaced exactly as removed. Consult appropriate hydraulic schematic to ensure proper re-assembly.
6. Connect solenoid wiring leads to desired switching device, using safe, standard electrical practices.
7. Install a pressure gauge at a location upstream of the valve.
8. After installation, vent entrapped air from valve cover and pilot system by following instructions in the **Commissioning the Booster Pump Control Valve** section on the following page.

## Valve Servicing Dimensions



The following tables detail the recommended minimum valve servicing dimensions.

### Globe

| Size (in) | 1¼ | 1½ | 2  | 2½ | 3  | 4  | 6  | 8  | 10 | 12 | 14 | 16 | 20 | 24 |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| A (in)    | 16 | 16 | 20 | 22 | 22 | 24 | 32 | 34 | 38 | 44 | 48 | 52 | 56 | 56 |
| B (in)    | 10 | 10 | 12 | 14 | 14 | 16 | 24 | 26 | 28 | 30 | 34 | 40 | 48 | 48 |

### Angle

| Size (in) | 1¼ | 1½ | 2  | 2½ | 3  | 4  | 6  | 8  | 10 | 12 | 14 | 16 |
|-----------|----|----|----|----|----|----|----|----|----|----|----|----|
| C (in)    | 16 | 16 | 20 | 22 | 22 | 24 | 32 | 34 | 38 | 44 | 48 | 52 |
| D (in)    | 10 | 10 | 12 | 14 | 14 | 16 | 24 | 26 | 28 | 30 | 34 | 40 |

## Commissioning the Booster Pump Control Valve

### STEP 1

Pre-set pilots as noted:

**Pressure Sustaining** – Turn Sustaining Control adjustment screw, OUT, counterclockwise, backing pressure off the spring, to allow it to stay open during while adjusting the other controls.

**Opening and Closing Speed** – Turn the adjustment screws on the Closing Speed and Opening Speed Controls, if the main valve is so equipped, OUT, counterclockwise, 1½ to 2½ turns from full closed position.

**3-Way Solenoid** – Confirm that the manual operator is turn counter clockwise to a full OUT position (See Figure 1).

### STEP 2

Energize the solenoid to check actuation and to confirm connection to power source.

### STEP 3

De-energize the solenoid prior to initial pump start.

### STEP 4

Loosen a tube fitting or cover plug at the main valve to allow air to vent during start-up.

### STEP 5

Energize the solenoid at pump start to open the main valve, checking that the main valve opens. Air is vented through the loosened fitting. Tighten the fitting when liquid begins to vent.

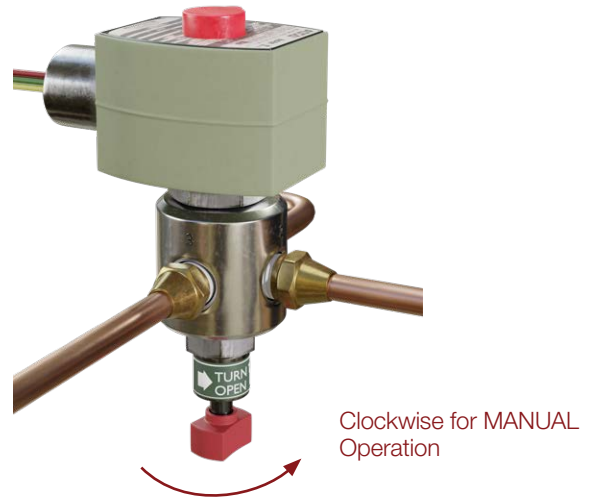


Figure 1  
3-Way Solenoid

### STEP 6

Opening Speed Flow Control Adjustment: The Opening speed needle valve restricts flow out of the cover of the main valve.

If the main valve is opening too slowly turn the adjustment screw OUT, counterclockwise, increasing the rate of opening (See Figure 2B).

If the main valve is opening too quickly, turn the adjustment screw IN, clockwise, decreasing the rate of opening (See Figure 2A).

Clockwise to DECREASE  
rate of opening

Counterclockwise to INCREASE  
the rate of opening

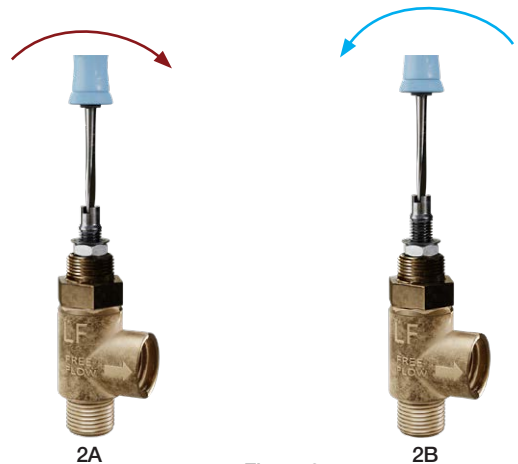


Figure 2  
Flow Control

## Setting the Sustaining Control

### STEP 7

Setting the Sustaining Control requires lowering the upstream pressure to the desired minimum sustained pressure.

### STEP 8

Leave the downstream isolation valve full open and close the upstream isolation valve until the inlet pressure drops to the desired setting.

### STEP 9

Adjust the Sustaining Control screw IN, clockwise, until the inlet pressure begins to increase (See Figure 3A), or OUT, counterclockwise, to decrease (See Figure 3B), stopping at the desired pressure.

### STEP 10

Allow pressure to stabilize.

### STEP 11

Fine-tune the sustaining setting as required as detailed in STEP 8.

### STEP 12

Open upstream isolation valve to return to normal operation.

### STEP 13

De-energize solenoid to check that the main valve closes.

### STEP 14

At valve closure booster pump will stop. Adjust limit switch collar to final position to ensure positive actuation of limit switch electrical contact, if necessary, by sliding up/down to location (See Figure 4).

Clockwise to increase inlet pressure

Counterclockwise to decrease inlet pressure

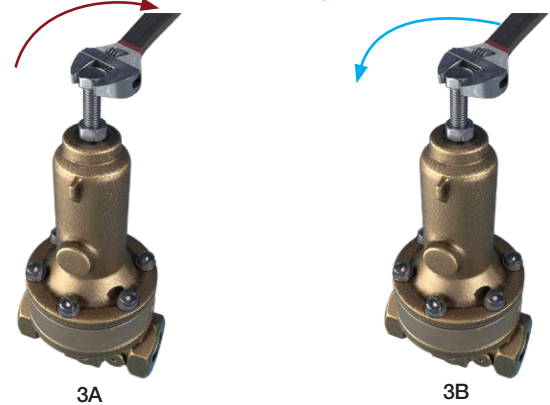


Figure 3  
PV20C — Pressure Sustaining Control



Figure 4  
Limit Switch in Closed Position

## Automatic Control Valve Maintenance Schedule

To ensure peak performance and longevity of your automatic control valve, Watts/Ames recommends following the below standard maintenance schedule.

### • Monthly Maintenance

- Visual inspection of valve(s) for leaks
- Inspect for proper operation(s); exercise valve.

### • Quarterly Maintenance

- Conduct monthly inspection.
- Validate/Re-establish necessary setpoints of controls/pilots.

### • Annual Maintenance

- Conduct monthly & quarterly inspections.
- Inspect & clean all strainers.
- Inspect valve coating, touch up as required.

### • 3-5 Year Maintenance

- Conduct monthly, quarterly, & annual maintenance.
- Inspect & replace valve elastomers (diaphragm, O-rings, valve/pilot seats)
- Re-establish necessary set points of controls/pilots.

## Troubleshooting Guide

### ⚠ WARNING

**Warning:** The valve cannot be serviced under pressure. Upstream and downstream Isolation Valves must be installed to protect system piping. Accurate diagnosis and troubleshooting requires the valve to open fully, and may subject downstream piping and equipment to high pressure and/or flow rates. The downstream Isolation Valve should be kept closed while diagnosing the valve.

**Extreme caution should be used while performing the troubleshooting techniques listed below.**

Recommended tools for diagnosis: (3) PRESSURE GAUGES, installed to monitor the inlet pressure, outlet pressure, and cover chamber pressure. If included, a POSITION INDICATOR should be installed to visually assess the position of the disc & diaphragm assembly.

### Test 1: Diaphragm Seal Test

1. Close upstream & downstream isolation valves. Close pilot isolation valves or remove pilot control tubing to isolate valve cover from incoming fluid & pressure. Remove uppermost cover plug, test cock, or limit switch.
2. With the valve cover chamber vented to atmosphere, partially open the upstream isolation valve, allowing incoming pressure to lift the disc & diaphragm assembly. A volume of water will be displaced from the cover chamber as the valve opens; consult valve specification sheets for approximate cover capacity. A continuous flow of water from the open port indicates a damaged diaphragm or loose disc & diaphragm assembly. Disassemble valve and replace diaphragm or tighten disc & diaphragm assembly.

### Test 2: Seat Seal Test

1. Close downstream isolation valve and install pressure gauges on an open inlet and outlet port of main valve.
2. Open upstream isolation valve to allow pressure on to the valve cover. Allow valve to fully close.
3. Monitor downstream pressure gauge; reading should hold steady below incoming pressure. If pressure on downstream side rises to match upstream pressure, leakage is occurring through the seat of the main valve. Disassemble valve, inspect and repair/replace any required parts.
  - a. If gauge pressure rises to match outlet pressure (downstream of closed isolation valve) yet remains below inlet pressure, the isolation valve may be leaking as opposed to main valve seat.

### Test 3: Freedom of Movement/Valve Travel Test

1. Close upstream and downstream isolation valves. Install valve position indicator.
2. Partially open upstream isolation valve and allow cover to fill with fluid & pressure, closing the valve fully. Mark the position indicator's full closed position.
3. Isolate cover chamber from receiving fluid and pressure by closing isolation valves or removing control tubing.
4. Carefully vent cover chamber to atmosphere by opening test cock or removing a cover plug. Observe the valve position indicator as the valve travels to the full-open position. The disc & diaphragm assembly should move freely from fully closed to fully open position without binding or "grabbing" at any point during its movement.
  - a. The disc & diaphragm assembly may momentarily "hesitate" while travelling from fully closed to fully open position – this is a normal characteristic of diaphragm operated control valves, and does not indicate mechanical binding or improper valve operation.
  - b. A continuous discharge of water from the cover chamber after venting to atmosphere indicates leakage past the diaphragm.
5. If necessary, disassemble valve and inspect/repair disc & diaphragm assembly.



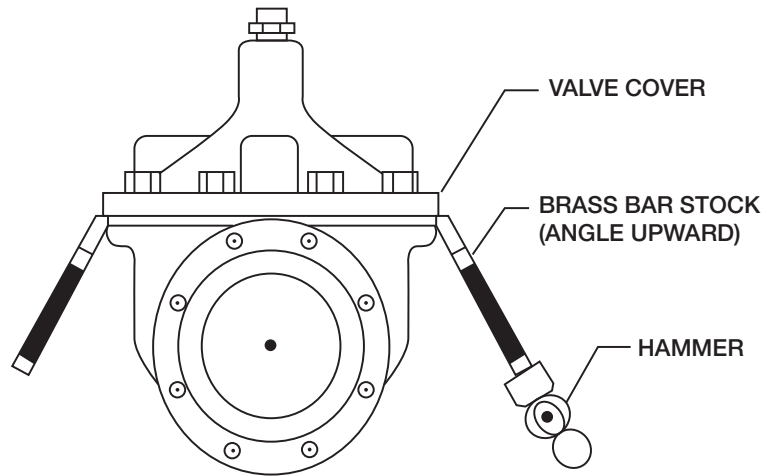
## Troubleshooting Guide

| Issue                            | Possible Cause                               | Corrective Action   | Notes   |
|----------------------------------|--|---|---|
| <b>Main Valve will not open</b>  | Closed isolation valves in pilot system.     | Check isolation valves, ensure open.  |   |
|                                  | Insufficient supply pressure.                | Check upstream pressure.  | Depending on water source, supply pressure may not be controlled by valve operator.                                   |
|                                  | Main valve stem assembly corroded/damaged    | Inspect stem assembly, clean/replace if necessary.  |   |
|                                  | Blockage in pilot system.                    | Inspect & clean any installed pilot system strainers, check orifice/speed controls for blockages.             |   |
|                                  | Improperly configured opening speed control. | Adjust opening speed control to verify functionality, adjust as required.                                     | Standard setting for opening speed control is 1½ - 2½ turns open from full closed position. Can be adjusted in field. |
|                                  | Pressure Sustaining Control not operable     | Rebuild or replace Pressure Sustaining Control  |   |
| <b>Main Valve will not close</b> | Closed isolation valves in pilot system      | Check isolation valves, ensure open.  |   |
|                                  | Diaphragm is damaged                         | Conduct diaphragm seal test, repair and replace if necessary.   |   |
|                                  | Main valve stem assembly corroded/damaged.   | Inspect stem assembly, clean/replace if necessary.  |   |
|                                  | Blockage in main valve.                      | Perform freedom of movement test; if valve does not close, disassemble and remove blockage.                   |   |
|                                  | Worn/damaged valve seat.                     | Perform seat sealing check; disassemble and inspect/repair seat if required.                                  |   |
|                                  | Improperly configured closing speed control. | Adjust closing speed control to verify functionality, adjust as required.                                     | Standard setting for closing speed control is 1½ - 2½ turns open from full closed position. Can be adjusted in field. |
| <b>Solenoid will not actuate</b> | Possible Cause: Low or no voltage            | Check voltage at the solenoid connection, insuring that it has the minimum of 85% of the coils rated voltage. | Should be performed by licensed electrician   |
|                                  | Manual operated is engaged                   | Turn manual operator counter-clockwise to disengage   |   |

## Valve Disassembly Instructions

Before undertaking valve disassembly, it is recommended to gather the following tools to aid you during the process:

- Small & large adjustable wrenches
- Screwdriver set
- Machinist fine metal file
- Fine wire brush
- Bench vise
- Basic valve IO&M manual
- Hammer & dull cold chisel
- Heavy-duty ratchet & socket set
- Hexagonal wrench set
- 320 grit/fine Emery cloth
- Appropriate technical bulletins for valve start-up procedures.



1. Isolate the valve from line pressure and depressurize it to ensure safe working conditions. Disconnect any electrical connections if so equipped.
2. Carefully remove Position Indicator or Limit Switches if equipped. Remove all tubing, fittings, and Control Pilots necessary to easily access and remove the cover. Remove cover nuts and washers.
3. Remove the cover. If cover is not free to be removed, loosen it by tapping upward along its outside edge with a dull cold chisel, pictured above.
  - a. Large valves may require the installation of lifting “eye” bolts in order to facilitate cover removal; installation ports are provided on the cover for this purpose.
4. Remove the Disc and Diaphragm Assembly from the valve body by lifting straight up.
  - a. Large diameter valves may require a lifting “eye” bolt to be installed in the valve stem accessory threads located on the very top of the valve stem.
5. Before removing the Stem Nut, examine stem threads for mineral build-up. Remove deposits with a fine wire brush. Extreme care should be taken not to damage the finish on stem guiding surfaces when disassembling. Avoid applying pipe wrenches to top or bottom stem guide surfaces.
6. After removing the Stem Nut, the remainder of the Disc & Diaphragm Assembly should disassemble easily. Polish stem guide surfaces with fine emery cloth to remove any mineral deposits and inspect for excessive wear. Remove any mineral build-up from other components with wire brush or by using a Mineral Dissolving Solution. Inspect parts for wear and replace if necessary.
7. Inspect valve seat. If seat is not damaged, removal is not necessary. Valve seats 6" and smaller are threaded into the body of the valve and require a seat removal tool (Figure 5) (Table 1 details the tool dimensions for seat removal). Valve seats 8" and larger are held in the valve body with stainless steel cap screws. Remove seat retaining screws and lift seat straight up (Figure 6).

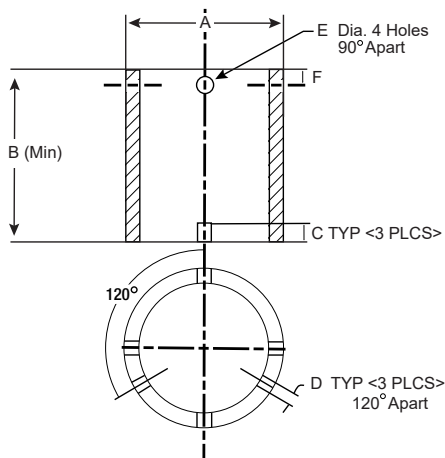


Figure 5

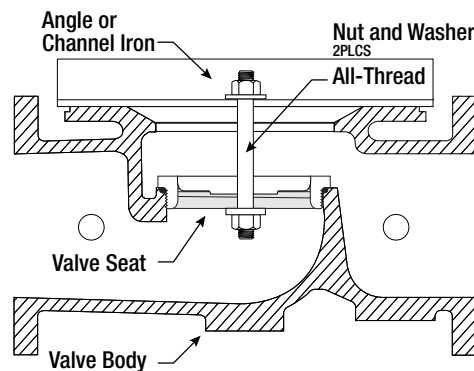


Figure 6

## Installation, Operation and Maintenance - Series LF982GD

**Table 1: Seat Removal Tool Dimension**

| Size      | A                     | B                       | C         | D         | E (Dia.)  | F         |
|-----------|-----------------------|-------------------------|-----------|-----------|-----------|-----------|
| <i>in</i> | <i>Pipe Size (in)</i> | <i>Min. Length (in)</i> | <i>in</i> | <i>in</i> | <i>in</i> | <i>in</i> |
| 1¼        | 1                     | 3.12                    | 0.38      | 0.25      | 0.44      | 0.55      |
| 1½        | 1                     | 3.12                    | 0.38      | 0.25      | 0.44      | 0.50      |
| 2         | 1¼                    | 3.38                    | 0.38      | 0.25      | 0.44      | 0.50      |
| 2½        | 2                     | 4.0                     | 0.38      | 0.38      | 0.56      | 0.62      |
| 3         | 2½                    | 4.5                     | 0.50      | 0.38      | 0.56      | 0.62      |
| 4         | 3                     | 5.0                     | 0.50      | 0.44      | 0.56      | 0.62      |
| 6         | 5                     | 6.50                    | 0.62      | 0.44      | 0.56      | 0.62      |

\*Schedule 40 steel pipe

- Replace Seat Disc, Diaphragm and Spacer Washers provided in Main Valve repair kit (refer to Table 2 or 3 for correct repair kit part number). Re-assemble in the reverse order of disassembly.

**Table 2: Full Port Valve (905GD/905AD) Repair Kits**

| Size (in) | 1¼      | 1½      | 2       | 2½      | 3       | 4       | 6       | 8       | 10      | 12      | 14      | 16      |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| P/N       | 0677-01 | 0677-01 | 0677-02 | 0677-03 | 0677-04 | 0677-05 | 0677-06 | 0677-07 | 0677-08 | 0677-09 | 0677-10 | 0677-11 |

**Table 3: Reduced Port Valve (605GD/605AD) Repair Kits**

| Size (in) | 3       | 4       | 6       | 8       | 10      | 12      | 16      | 20 & 24 |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|
| P/N       | 0677-02 | 0677-04 | 0677-05 | 0677-06 | 0677-07 | 0677-08 | 0677-09 | 0677-11 |

- Re-Install Disc and Diaphragm Assembly in the valve, taking care not to damage the lower guide area in the center of the valve seat.
- Re-install Cover Spring. Replace Valve Cover and tighten Cover Nuts in a crossing pattern to ensure even distribution. Test the Disc and Diaphragm Assembly for smooth travel by following the Freedom of Movement Test procedure in previous section.
- Test the integrity of the Seat Seal by following the Seat Seal Test procedure in previous section.
- Return valve to service by following instructions in the **Commissioning the Booster Pump Control Valve** section matching the valve function.

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