



# Shuttle-Type Flow Switches

## Series FS-200/400

Instruction Bulletin No. 45523

### Installation

Install FS-200 or FS-400 Series units in piping system using standard pipe fitting procedures. **Be careful to keep sealing compound out of the unit.** Be sure to observe direction of flow - marked "IN" and "OUT" on housing. **See chart below for port and wrench hex. sizes.**

Unless otherwise specified, standard FS-200 and FS-400 units are factory-calibrated with water. FS-200 and FS-200 Adjustable units are installed horizontally, in line, with lead wires up. FS-400 and FS-400 Adjustable units are installed vertically; lead wires up, as shown. **150 micron filtration is suggested for use with all units.**

### Specifications (FS-200 Series)

#### Wetted Materials

##### Housing

|                    |                               |
|--------------------|-------------------------------|
| FS-200             | Bronze or 316 Stainless Steel |
| FS-200 Adj.        | Bronze                        |
| Shuttle            | Teflon <sup>®</sup>           |
| Bonnet             | Bronze or Stainless Steel     |
| Spring             | 316 Stainless Steel           |
| Other Wetted Parts | Viton <sup>®</sup> , Ceramic  |

**Note: Bonnet and shuttle assembly should be removed from unit during welding or brazing.**

**(See bonnet assembly removal under "Maintenance" on back of sheet.)**

#### Pressure Rating

|           |                           |
|-----------|---------------------------|
| Operating | 400 PSIG @ 100°F (37.8°C) |
| Proof     | 800 PSIG @ 100°F (37.8°C) |

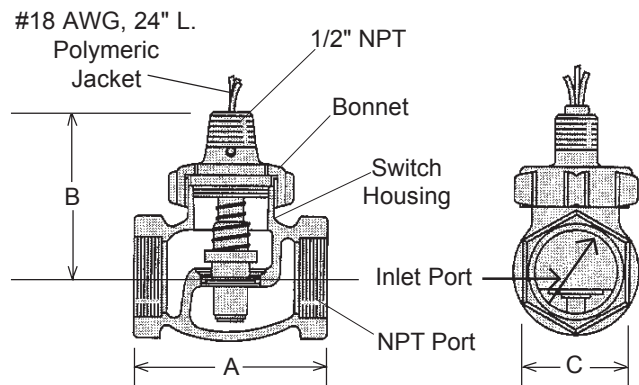
#### Operating Temperature

|             |                                     |
|-------------|-------------------------------------|
| FS-200      | -20°F to +300°F (-29°C to +148.9°C) |
| FS-200 Adj. | -20°F to +200°F (-29°C to +93.3°C)  |

|                        |  |
|------------------------|--|
| Repeatability          | 1% Maximum Deviation                     |
| Set Point Accuracy     | ±10%                                     |
| Set Point Differential | 15% Maximum                              |
| Switch*                | SPDT, 20 VA                              |
| Electrical Termination | No. 18 AWG, 24" L., Polymeric Lead Wires |

**\*See "Electrical Data" on inside pages**

### Dimensions (FS-200 Series)



| Model                        | Port Size NPT | "A" Dim. | "B" Dim. | "C" Dim. (HEX) |
|------------------------------|---------------|----------|----------|----------------|
| FS-200 and FS-200 Adjustable | 1"            | 3-1/4"   | 3"       | 1-25/32"       |
|                              | 1-1/4"        | 4"       | 3-3/16"  | 2-3/16"        |
|                              | 1-1/4" SS     | 4-1/2"   | 3-3/16"  | 2-3/16"        |
|                              | 1-1/2"        | 4-1/2"   | 3-1/2"   | 2-1/2"         |
|                              | 2"            | 5-3/8"   | 4"       | 3-3/32"        |
|                              | 2-1/2"        | 6-5/16"  | 4-1/2"   | 3-5/8"         |
|                              | 3"            | 7-3/8"   | 5-5/32"  | 4-3/8"         |

Adjustable versions available in 1" port sizes only.

## Specifications (FS-400 Series) . . .

### Wetted Materials

|                              |   |
|------------------------------|---|
| Housing                      | Bronze                                      |
| Shuttle                      | Delrin®                                     |
| Spring                       | 316 Stainless Steel                         |
| O-Ring                       | Viton®                                      |
| Other Wetted Parts           | Ceramic                                     |
| <u>Pressure Rating, Max.</u> |   |
| Operating                    | 400 PSI @ 100°F (+37.8°C)                   |
| Proof                        | 800 PSI @ 100°F (+37.8°C)                   |
| Operating Temperature        | -20°F to +180°F (-29°C to +82.2°C)          |
| Repeatability                | 1% Maximum Deviation                        |
| Set Point Accuracy           | ±10%  |
| Set Point Differential       | 15% Maximum                                 |
| Switch*                      | SPDT, 20 VA                                 |
| Inlet/Outlet Ports           | 3/4" NPT                                    |
| Electrical Termination       | No. 18 AWG, 24" L.,<br>Polymeric Lead Wires |

\*See "Electrical Data" below.



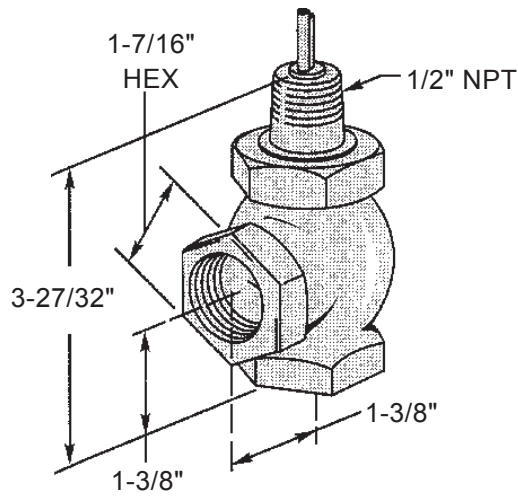
This product is suitable for Class I and Class II applications only, per the requirements of standard EN60730 and any additional specific requirements for a particular application or medium being sensed. Class I compliance of metal bodied units requires a ground connection between the metal body and the earthing system of the installation. Class I compliance of plastic bodied units in contact with a conductive medium requires that the medium be effectively earthed so as to provide an earthed barrier between the unit and accessible areas. For Class III compliance, a supply at safety extra-low voltage (SELV) must be provided. Please consult the Factory for compliance information on specific part numbers.

## Electrical Data

### Switch Ratings - Maximum Resistive Load

| VA                | Volts | Amps AC | Amps DC |
|-------------------|-------|---------|---------|
| 10<br>General Use | 0-50  | .2      | .13     |
|                   | 120   | .08     | N.A.    |
|                   | 100   | N.A.    | .3      |
| 20<br>Pilot Duty  | 0-30  | .4      | .3      |
|                   | 120   | .17     | .13     |
|                   | 240   | .08     | .06     |
| 50<br>General Use | 0-50  | 0.5     | 0.5     |
|                   | 120   | .4      | .4      |
|                   | 240   | .2      | .2      |

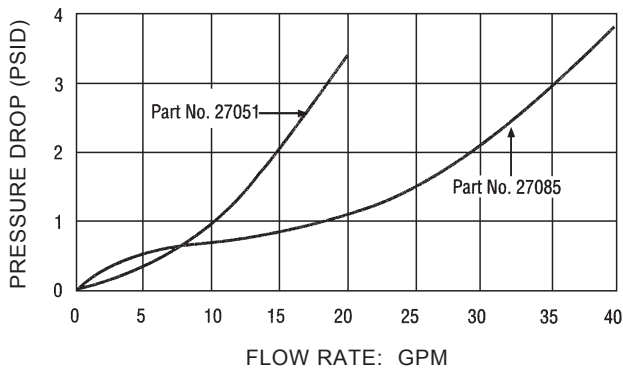
## Dimensions (FS-400 Series)



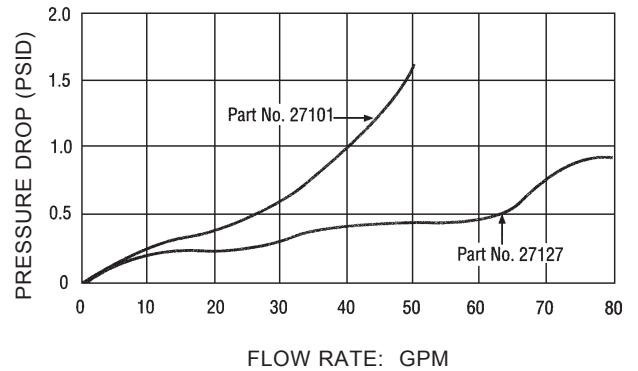
## Pressure Drop Charts - Typical

### FS-200 Series

#### 1" NPT and 1-1/2" NPT Ports

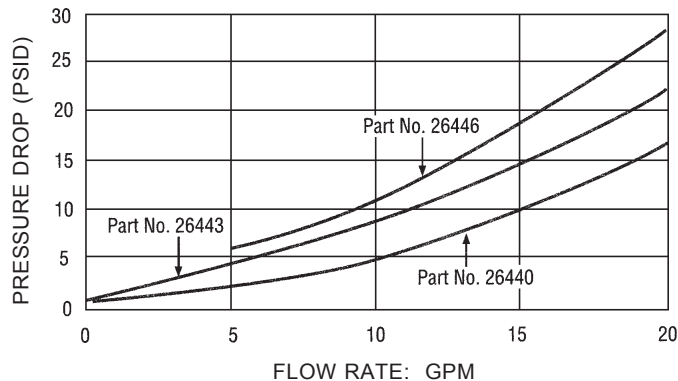


#### 2" NPT and 3" NPT Ports



**Note:** Tests conducted with units in horizontal position (lead wires up) with water at +70°F (21°C).

### FS-400 Series



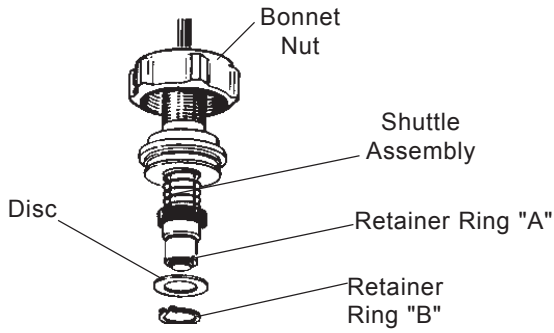
**Note:** Tests conducted with units in vertical position (lead wires up) with water at +70°F (21°C).

## Electrical Connection . . .

Lead wires and 1/2" NPT or junction box with 1/2" NPT.

## Maintenance . . .

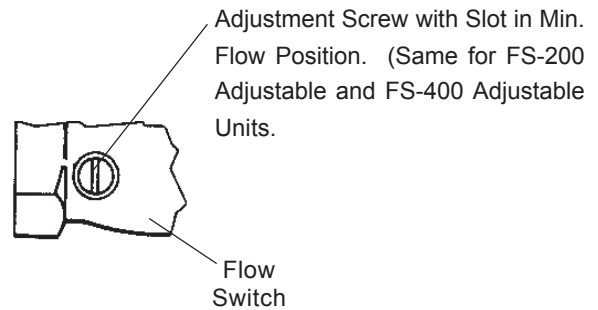
Occasional cleaning when excessive contamination is present in the liquid is the only maintenance normally required. With system shut-down and no liquid in piping, remove bonnet nut to disassemble unit for cleaning. **It is not necessary to remove unit body from the system.** Remove retainer ring "A" for complete shuttle disassembly. Remove ring "B" to disassemble disc only.



## Flow Setting Adjustment . . .

**(FS-200/400 Adjustable and FS-400 Units.)**

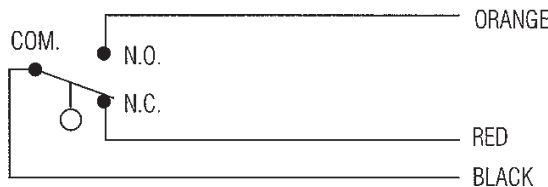
Standard units are normally supplied with adjustment set at "minimum flow" - adjustment screw slot (and vane within unit) in vertical position, as shown below. Adjustment may be made with unit on test stand or installed in system. With liquid flowing at desired rate, adjust screw in side of housing until unit just actuates. (Switch closes or opens, as desired.)



## Typical Wiring Diagram . . .

**FS-200/400 Series  
(Fixed & Adjustable)**

SPDT, Shown Dry



## Important Points!

Product must be maintained and installed in strict accordance with the National Electrical Code and GEMS technical brochure and instruction bulletin. Failure to observe this warning could result in serious injuries or damages.

An appropriate explosion-proof enclosure or intrinsically safe interface device must be used for hazardous area applications involving such things as (*but not limited to*) ignitable mixtures, combustible dust and flammable materials.

\*\*\* Warning: To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Pressure and temperature limitations shown on individual catalog pages and drawings for the specified flow switches must not be exceeded. These pressures and temperatures take into consideration possible system surge pressures/temperatures and their frequencies.

Selection of materials for compatibility with the media is critical to the life and operation of GEMS flow switches. Take care in the proper selection of materials of construction; particularly wetted materials.

Life expectancy of switch contacts varies with applications. Contact GEMS if life cycle testing is required.

Ambient temperature changes do affect switch set points, since the specific gravity of a liquid can vary with temperature.

Flow switches have been designed to resist shock and vibration; however, shock and vibration should be minimized.

Liquid media containing particulate and/or debris should be filtered to ensure proper operation of GEMS products.

Electrical entries and mounting points may require liquid/vapor sealing if located in an enclosed tank.

Flow switches must not be field repaired.

Physical damage sustained by the product may render it unserviceable.



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