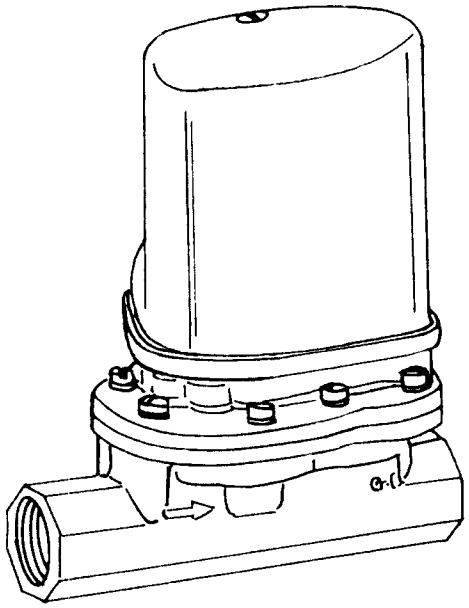
User's Guide



FSW-30A
Industrial Flow Switch

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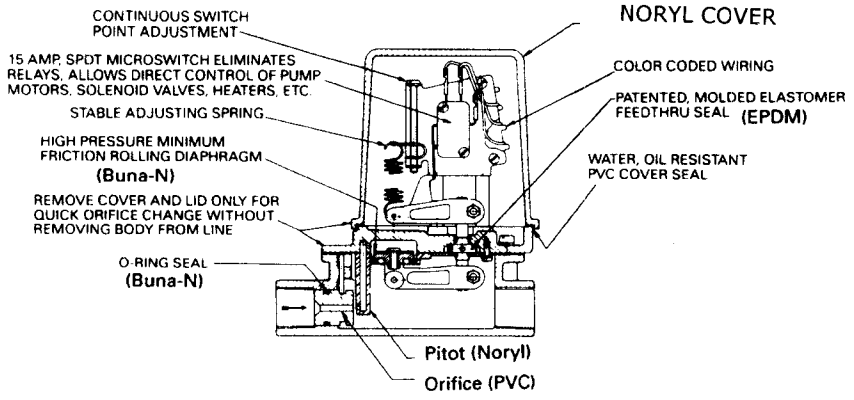
Features

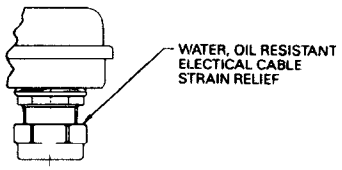
- Supplied With 6 Orifices to Provide 6 Overlapping Flow Ranges From 0.12 to 8.0 GPM for Water
- Responds to Flow Independent of a Broad Range of Environmental Conditions
- Switch Point Adjustable Without Removing Unit From Line
- Mount in Any Position
- 15A SPDT Switch Directly Controls Pump
- Maintains Calibration Limits When Subjected to Reasonable Line Hydraulic Hammer of Surge Pulses
- Easy Screw Terminal Wiring – No Soldering
- Line Pressure to 400 PSIG
- Temperature to 180°F Continuous
- NPT Threaded to Pipe Directly In-Line
- Rugged Industrial Design
- Working Fluids: Pure Water, Tap Water, Filtered Sewage Water, Alcohols, Oils, Glycols, Soap Solutions (check chemical capacity of all wetted materials)

WARNING

These units are not compatible with gasoline; nor are they intended for use with flammable liquids without the proper safety precautions, such as the use of intrinsic safety relays.



FSW-30



PART SIDE VIEW

Specifications

Flow Range (Water Calibrated @ 70°F):

Orifice #	Orifice I.D. (Inches)	GPM
1	0.073 (DRILL No. 49)	0.12 to 0.25
2	0.0935 (DRILL No. 42)	0.25 to 0.50
3	0.1495 (DRILL No. 25)	0.50 to 1.0
4	0.196 (DRILL No. 9)	1.0 to 2.0
5	0.277 (DRILL LETTER J)	2.0 to 4.0
6	0.375 (DRILL SIZE 3/8)	4.0 to 8.0

Sensitivity (% Flow Change To Activate Switch): 5% at upper end of flow range; 25% at lower end of flow range

Differential Pressure Drop Across Unit: (Under Normal Operating Conditions) 1.0 PSI at lower end of flow range; 5.0 PSI at upper end of flow range

Working Line Pressure: 400 PSIG max. @ 180°F max. (proof tested to 1200 PSIG @ 180°F)

Maximum Continuous Temperature: 180°F

Relay Switch: SPDT 15A @ 125 or 250 Vac, 10,000,000 operations median; switch may be overloaded to 20 amps @ 125 or 250 Vac for a minimum of 20,000 operations

Option "D": Dual SPDT relays; nominal difference flow between the two relay actuation points is 5%

Electrical Cable Fitting: Water resistant for cable diameter .250"± .025"

Materials: Wetted Parts: red brass, 302-304 SS, phosphor bronze, Buna-N, EPDM, Noryl (pitot tube), PVC (orifice). Other materials of construction: brass body, Noryl cover, stainless steel and plastic hardware.

Weight: 3.5 lb.

Installation and Operating Instructions

WARNING

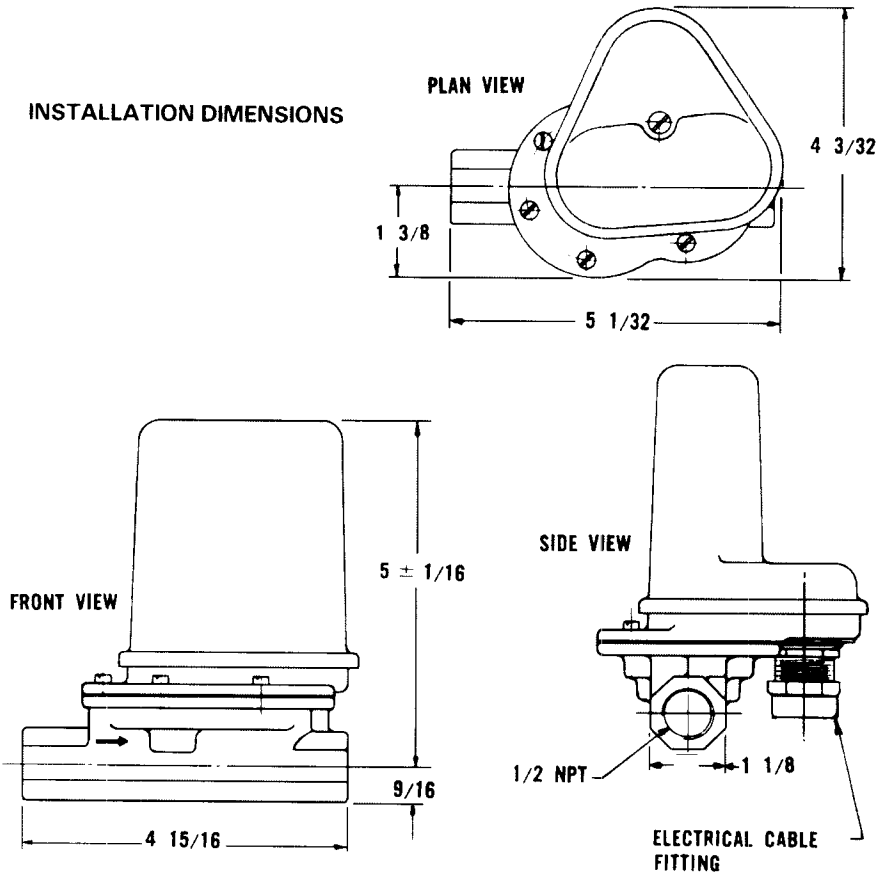
THE GASKET SEAL LOCATED BETWEEN THE MAIN BODY CASTING AND THE LID CASTING IS A CORK-RUBBER COMPOSITION WHICH IS SUBJECT TO A SLIGHT CREEP FOR A SHORT PERIOD AFTER APPLICATION OF INITIAL CLAMPING LOAD. ALL GASKETS ARE PROPERLY CLAMPED BEFORE SHIPMENT, HOWEVER, DURING SHIPPING AND STORAGE, THE GASKET MAY COMPRESS ALLOWING THE BODY-LID CLAMP BOLTS TO BECOME SLIGHTLY LOOSE. TIGHTEN THESE BOLTS BEFORE ASSEMBLING THE FLOW SWITCH IN THE SYSTEM. NO FURTHER CREEP OF GASKET WILL OCCUR AFTER SECOND TIGHTENING.

The FSW-30 Fluid Flow Switch is supplied with tapped holes for standard 1/2" pipe. Insert the FSW-30 in line with the arrow on the side of the casting pointed in the direction of flow. (Refer to FLOW TURBULENCE EFFECTS for additional installation considerations.)

NOTE

Care should be exercised to prevent pipe thread sealant (putty, Teflon tape, etc.) from entering the flow switch and restricting flow through the calibrated orifice.

INSTALLATION DIMENSIONS



Terminal Strip Wiring

1. Loosen the round gland nut located on the strain relief cable connector.
2. Insert the cable through the grommet in the strain relief cable connector and tighten the gland nut sufficiently to seal the cable in place.
3. Strip the conductor ends approximately 3/16".
4. Loosen the appropriate terminal strip screw and remove the empty terminal. Insert the bare wire into the terminal barrel and crimp. Place the terminal on the strip in the SAME orientation as received. This is important since terminals and wires may interfere with the cover if the orientation is changed.

Electrical Wiring Schematics

Figure 1: Wiring Schematic for power applied to load when the flow is GREATER than the set point (power to load is interrupted when flow is LESS than the set point).

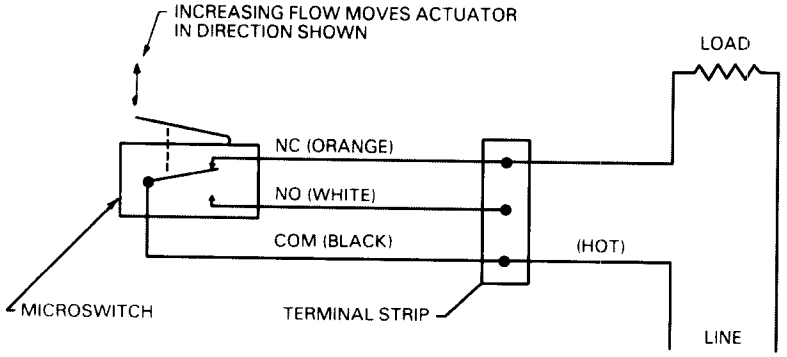
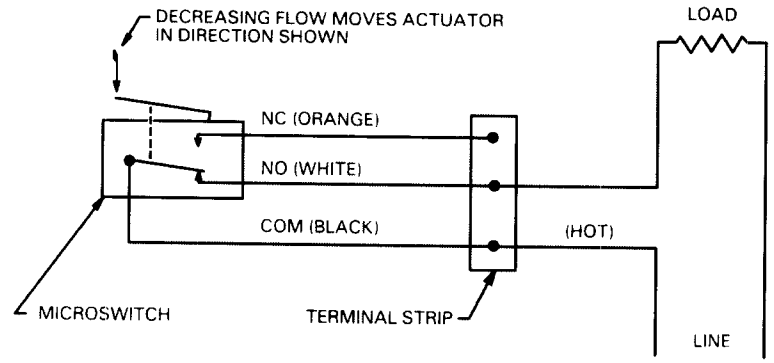


Figure 2: Wiring Schematic for power applied to load when the flow is LESS than the set point (power to load interrupted when flow is GREATER than the set point).



Switch Point Adjustment

1. Remove the cover.
2. Adjust the fluid flow in the system to the desired rate without regard to the FSW-30 switch point setting.
3. The switch point adjusting mechanism consists of an adjusting screw, a "U" shaped leadscrew nut, and a helical spring.

   CLOCKWISE rotation of the adjusting screw changes the microswitch actuation point toward HIGHER flow rates (COUNTERCLOCKWISE rotation towards LOWER flow rates).

NOTE

All the FSW-30 Switches are factory set at the lower end of the flow range, i.e., the adjusting screw is set at the low flow counterclockwise position.

The leadscrew nut locks the adjusting screw in position, maintaining the flow switch set point under all environmental conditions.

4. Turn the adjusting screw in a clockwise direction until the microswitch is actuated while maintaining the desired fluid flow rate in the system. Turn the adjusting screw TWO additional turns in the clockwise direction and then slowly back off in a counterclockwise direction until the microswitch is again actuated. The FSW-30 Switch is now set for maximum sensitivity for detecting small flow changes.
5. The microswitch actuation point may be monitored during the adjustment procedure detailed in Step 4 above by an audible click or with an Ohm meter before connecting line power to the terminal strip or by monitoring the voltage supplied to the load through the microswitch.
6. If the system flow rate is changed, the FSW-30 can be adjusted to monitor the new flow rate by turning the adjustment screw in a counterclockwise direction to the minimum flow position and then proceeding as in Step 4 above.
7. In the event that the system flow is at the desired rate and the adjustment mechanism runs out of travel, i.e. the leadscrew nut is at either end of the support bracket and the microswitch still has not been actuated, then the orifice must be changed to shift the flow switch flow range so that it straddles the system flow rate.

EXAMPLE:
If the FSW-30 is fitted with a No. 3 orifice (range 0.50 to 1.0 GPM), the procedure in Step 4 is followed, the adjusting screw is turned clockwise until the leadscrew nut is at the upper limit of the support bracket and the microswitch still has not been actuated, then the flow is greater than 1.0 GPM and No. 4 orifice will have to be substituted for No. 3 orifice and the procedure in Step 4 is repeated.

General Rules for Selecting a New Orifice

If the system flow is at the proper rate and the procedure in Step 4 has been followed, the leadscrew nut is at the UPPER EXTREME of the support bracket, and the microswitch has not actuated, remove the present orifice, insert the next LARGER size and repeat the procedure in Step 4.

If the system flow is at the proper rate and the procedure in Step 4 has been followed, the leadscrew nut is at the LOWER EXTREME of the support bracket, and the microswitch has not actuated, remove the present orifice, insert the next SMALLER size and repeat the procedure in Step 4.

Changing The Orifice

NOTE

It is not necessary to remove the main body of the switch from the line to change the orifice.

Refer to FSW-30 Parts List Diagram.

1. Remove the cover.
2. Remove the lid casting from the main body casting.
3. Remove the 1/8" diameter orifice retaining pin.
4. Insert a small screw driver blade in the groove located in the exposed end of the orifice and pry the orifice toward the body cavity.
5. Drop the new orifice into the body cavity with the "O" ring toward the upstream hole and press in place.
6. Insert the 1/8" orifice retaining pin. Ensure that the pin is properly located in the groove provided in the orifice.

Flow Turbulence Effects

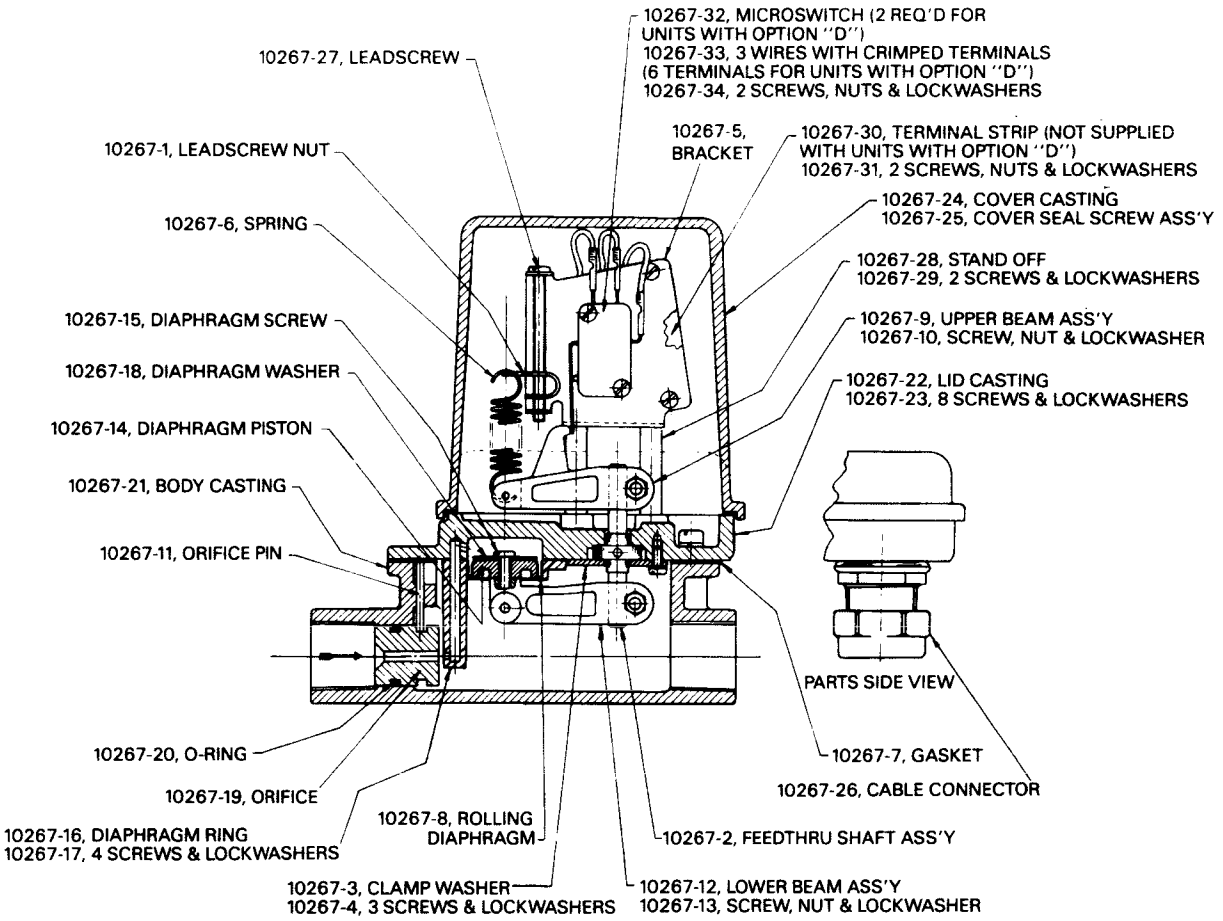
The FSW-30 Flow Switches are sensitive and fast acting. They respond to pipe system steady flow and also to local time variable turbulent flow caused by valves, pumps, elbows, orifices, etc. For instance, the average steady state flow in a 4" line immediately downstream of a gate valve may be 100 GPM, however, the gate valve may produce turbulence which rapidly changes the downstream flow in a random fashion in the range 90 to 110 GPM. A flow switch set at 100 GPM steady state will chatter in the 90 to 110 GPM turbulent environment. Several different procedures can be employed to correct the chatter condition.

1. Locate the flow switch at least 5 (and preferably 10) pipe diameters downstream of the source of turbulence.
2. Place a turbulence reducing section between the turbulent source and the flow switch, e.g., fill the main pipe with a bundle of small diameter thin wall tubes for 1 or 2 pipe diameters, or fill the pipe for 1 or 2 diameters with a metal or plastic gauze similar to a scouring pad.

   Both techniques reduce turbulence effects by breaking large intense flow swirls into a multitude of small less intense flow swirls. A suitable screen will have to be employed to retain the tubes or gauze. Consideration will have to be given to pressure loss effects.
3. Another approach is to "de-tune" the flow switch, i.e., to set it to operate below the lower turbulence induced flow rate. In the 4" example cited above, the adjusting spring could be relaxed so that the switch is activated at 90 GPM or slightly lower. In any given field situation, this is simply accomplished by relaxing the adjusting spring until the chattering ceases.

NOTE

To retain the proper sensitivity, some spring tension is required, i.e., approximately 25% extension minimum (approximately 1/4"). If this 25% spring extension condition is reached and chattering still occurs, then the next smaller size orifice will have to be used.


10267-32, MICROSWITCH (2 REQ'D FOR UNITS WITH OPTION "D")
10267-33, 3 WIRES WITH CRIMPED TERMINALS (6 TERMINALS FOR UNITS WITH OPTION "D")
10267-34, 2 SCREWS, NUTS & LOCKWASHERS
10267-27, LEADSCREW
10267-5, BRACKET
10267-30, TERMINAL STRIP (NOT SUPPLIED WITH UNITS WITH OPTION "D")
10267-31, 2 SCREWS, NUTS & LOCKWASHERS
10267-1, LEADSCREW NUT
10267-24, COVER CASTING
10267-25, COVER SEAL SCREW ASS'Y
10267-6, SPRING
10267-28, STAND OFF
10267-29, 2 SCREWS & LOCKWASHERS
10267-15, DIAPHRAGM SCREW
10267-9, UPPER BEAM ASS'Y
10267-10, SCREW, NUT & LOCKWASHER
10267-18, DIAPHRAGM WASHER
10267-22, LID CASTING
10267-23, 8 SCREWS & LOCKWASHERS
10267-14, DIAPHRAGM PISTON
10267-21, BODY CASTING
10267-11, ORIFICE PIN
PARTS SIDE VIEW
10267-20, O-RING
10267-7, GASKET
10267-26, CABLE CONNECTOR
10267-19, ORIFICE
10267-8, ROLLING DIAPHRAGM
10267-16, DIAPHRAGM RING
10267-17, 4 SCREWS & LOCKWASHERS
10267-2, FEEDTHRU SHAFT ASS'Y
10267-3, CLAMP WASHER
10267-4, 3 SCREWS & LOCKWASHERS
10267-12, LOWER BEAM ASS'Y
10267-13, SCREW, NUT & LOCKWASHER

Notes

MADE IN USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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