FSW-31A and FSW-32A
Industrial Flow Switches

FEATURES

• Model FSW-31A Supplied With 3 Drag Disks To Provide 3 Overlapping Ranges From 6 to 70 GPM for Water
• Responds to Flow, Independent of a Broad Range of Environmental Conditions
• Rugged Industrial/Design
• Switch Point Adjustable Without Removing Unit From Line
• Mount in Any Position
• Maintains Calibration Limits When Subjected to Reasonable Line Hydraulic Hammer or Surge Pulses
• Line Pressure to 400 PSIG
• Temperature to 180° F Continuous
• 15AT Spot Switch Directly Controls Pump
• Easy Screw Terminal Wiring-No Soldering
• NPT Threaded to Pipe Directly In-Line
• Working Fluids: Pure Water, Tap Water, Filtered Sewage Water, Alcohols, Oils, Gasolene, Glycols, Soap Solutions

INSTALLATION DIMENSIONS
INSTALLATION AND OPERATION INSTRUCTIONS

INSTALLATION

1. THESE UNITS ARE NOT COMPATIBLE WITH GASOLINE; NOR ARE THEY INTENDED FOR USE WITH FLAMMABLE LIQUIDS WITHOUT PROPER SAFETY PRECAUTIONS, SUCH AS THE USE OF INTRINSIC SAFETY RELAYS.

2. 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 GASKETS MAY COMPRESS ALLOWING THE BODY-LID CLAMPS TO BECOME SLIGHTLY LOOSE. TIGHTEN THESE BOLTS BEFORE ASSEMBLING THE FLOW SWITCH IN THE SYSTEM. NO FURTHER CREEP OF THE GASKET WILL OCCUR AFTER THE SECOND TIGHTENING.

The FSW-31A and FSW-32A Fluid Flow Switches are supplied with tapped holes for standard 1” pipe. Insert the FSW-31/32 Switch in line with the arrow on the side of the casting pointed in the direction of the flow. (Refer to FLOW TURBULENCE EFFECTS for additional installation considerations.)

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 (Model FSW-31 only).

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 in the terminal barrel and crimp. Place the terminal on the strip in the SAME orientation as received. This is important since the terminals and wires may interfere with the cover if orientation is changed.

NOTE

SENSITIVITY 1% FLOW CHANGE TO ACTIVATE SWITCH:
5% at upper end if flow range; 25% at lower end of flow range

DIFFERENTIAL PRESSURE DRIP ACROSS UNIT:
(Under normal operating conditions) Model FSW-32A: 2 PSI at the lower end of flow range; 15 PSI at the upper end of flow range;
Model FSW-31A: less than 2 PSI

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 FITTINGS:
Water resistant for cable diameter .250” ±.025”

MATERIALS:
Wetted Parts: red brass, 302-304 stainless steel, phosphor bronze, PVC, Buna-N; Other materials of construction: brass body, aluminum cover, stainless steel and plastic hardware

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

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

FLOW TURBULENCE EFFECTS

The FSW-31A and FSW-32A Flow Switches are sensitive and fast acting. They respond to pipe system steady state 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., 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 action 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 size larger drag disk (drag disk number 3 is larger than drag disk number 4, etc.) will have to be used (for the Model FSW-31A only).
GENERAL SWITCH POINT ADJUSTMENT

1. Remove the anodized aluminum cover.
2. Adjust the fluid flow in the system to the desired rate without regard to the switch point setting.
3. The switch point adjusting mechanism consists of an adjusting screw (leadscrew), 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 toward LOWER flow rates).

MODEL FSW-32A ADJUSTMENT:

If the procedure in Step 4 has been followed and the microswitch has not been actuated even though the spring is completely relaxed, then the flow rate is too low, and another type flow switch with a lower range must be used. If the adjustment screw has been turned clockwise until the lead screw nut is at the extreme right-hand end of the bracket with the spring fully extended and the microswitch still has not been actuated, then the flow rate is greater than 8 GPM and the Model FSW-32A can not be used. A flow switch with a higher flow range, such as the FSW-31A, should be used. The FSW-32A can be converted into a Model FSW-31A.

To convert a Model FSW-32A into a Model FSW-31A:

a. Remove the cover.

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

b. Remove the lid casting from the main body casting.
c. Remove the orifice pin.
d. Insert a small screwdriver blade in the groove located in the exposed end of the orifice and pry the orifice toward the body cavity. Remove the orifice and attach Drag Disk #2.
e. Reassemble without the orifice and orifice pin and proceed as outline below.

MODEL FSW-31A ADJUSTMENT:

Proceed as in Steps 4 through 6 above. If microswitch action is not obtainable even though the adjusting spring is fully extended, then the flow is too great for the drag disk size and the next smallest drag disk (#3) must be used. If there is still no switch action, then next smallest drag disk (#4) must be used.

It is possible to convert the Model FSW-31A into a Model FSW-32A as follows:

a. Remove the cover.
b. Remove the lid casting from the main body casting.
c. Remove the drag disk from the end of the feedthrough shaft and replace it with Drag Disk #1(11/4" dia.).
d. Insert the orifice into the body casting with the 0-ring toward the upstream hole and press into place.
e. Insert the orifice retaining pin. Ensure that the pin is properly inserted in the groove in the orifice.
f. Re-assemble and follow the procedure in Step 4.

FLOW SWITCH OPERATIONAL ADJUSTMENT

NOTE

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All units 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 "U" shaped 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 flow switch is now set for maximum sensitivity for detecting small flow changes.

5. When set for maximum sensitivity (100% point) as described in step 4 above, flow turbulence may cause rapid on/off switching (dithering) of the microswitch contacts, resulting in reduced switch contact life and "noise" in the electrical circuit. This is eliminated by turning the adjusting screw in a counterclockwise direction.

6. 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.

7. If the system flow rate is changed to a rate that is within the orifice or drag disk range presently installed in the unit, the unit may be adjusted to monitor the new flow rate by turning the adjustment screw in a counterclockwise direction until the spring is fully relaxed to the minimum flow position. Then proceed as in Step 4 above.