

1. General Information

Description

This document explains the operating principle of the Model FR78 Basic Low-Flow Switch/Monitor (see Figure 1-1). The following pages also present the recommended procedures for the installation, operation, maintenance, and troubleshooting of the Model FR78B.

The Model FR78B is an instrument that is capable of detecting liquid or gaseous environments. The instrument has field adjustable alarm set points for control of the media.

Flow Element

The operational part of the flow element consists of two Resistance Temperature Detectors (RTD's) and one low power heater. The heater is positioned adjacent to the Active RTD and will raise it's temperature above the process ambient while the other RTD (Reference) will stabilize near the process temperature. This arrangement produces a temperature differential between the two RTDs that is measured and converted into an analog voltage signal. The temperature differential is greatest when the media is not flowing (no flow). As the process media begins to flow, forced convection cools the Active RTD and reduces the temperature differential between the two RTDs.

Control Circuit

The basic functions of the control circuit are to provide power to the flow element, measure the resistance differential (DR) between the two RTDs, condition the sensing point signals, and provide relay alarm contacts for customer uses.

A Double Pole Double Throw (DPDT) relay is available in the instrument for connections to the customer alarm systems. The relay outputs can be set to be either open or closed when the sensing point is at low or no flow and closed or open when the sensing point is at high flow.

The place where the relays change state will vary depending on the type of media, as well as gas or liquid turbulence. Therefore the instrument has field adjustable alarm set points.

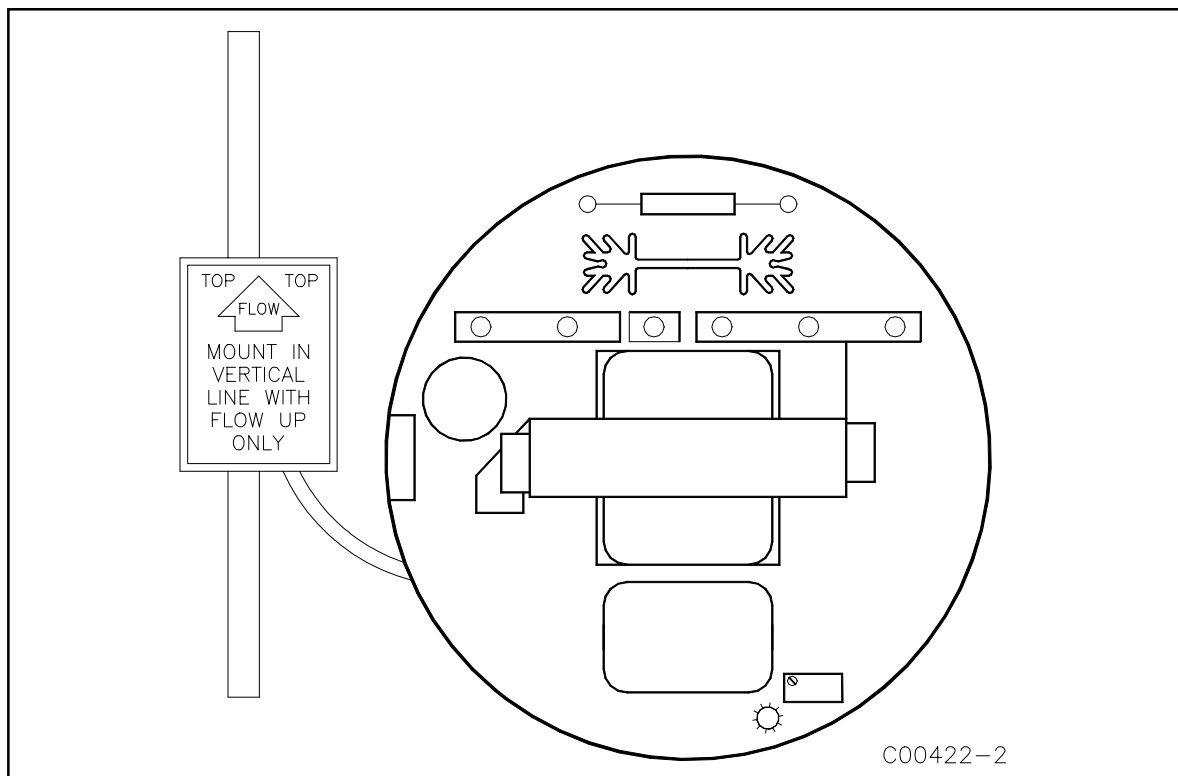


Figure 1-1. FR78B Fast Response Flow Switch/Monitor

Specifications

- **Sensing/Flow Element Ranges**

Water: 0.08 to 2.25 cc/sec

Oil: 0.05 to 25 cc/sec

Air: 4.0 to 1500cc/sec

- **Adjustable Response Time**

1 to 150 seconds

- **Process Connection**

1/4 inch x 2 inch (6.4 x 50mm) long tubing, .0028 (7mm) wall thickness, .53 inches (13.5mm) total length. 3/8 inch (9.5mm) and 1/2 inch (12.7mm) tubing available

- **In-line Sensor Assembly Body Length**

5.3 inches (1.35mm); Customer specified body lengths available

- **Enclosure Classification**

Standard: No enclosure; Optional control circuit enclosure is Feralloy epoxy coated and resists the effects of weather and corrosion. NEMA and CSA Type 4 (meets IP66)

- **Sensing/Flow Element Operating Conditions**

Temperature: -100 to 350°F (-73 to 176°C)

Pressure: To 1000 psig [69 bar (g)]

Repeatability: 1% of full scale range at constant process conditions

- **Input Power**

115 ±15 or 230 ±30 Vac 50/60 Hz; or 22 to 30 Vdc, 6 Watts

- **Relay Contacts**

DPTD, rating is 2 amps at 115 Vac and 24 Vdc or 1 amp at 230 Vac. Coil de-energized at no-flow (default) or de-energized at flow (field selectable)

- **Material of Construction**

All wetted surfaces are 316 series stainless steel with nickel braze per process specifications AMS 4777. Optional wetted surface material customer specified