1. General Information

Description

This document describes the procedures required to install, operate, maintain, and troubleshoot the Model GF90 and GF92 Flowmeters. There are a wide range of possible configurations and information related to the optional features. The flowmeter is composed of a remote thermal dispersion sensing device (flow element) interconnected to a microprocessor-based electronics control and display package (flow transmitter). The flow element can be attached directly to the flow transmitter (local instrument) or it can be connected to the flow transmitter with a cable of up to 1000 feet or 300 meters (remote instrument).

The instrument is designed to operate in gaseous mass flow metering environments. The flowmeter is factory calibrated to handle a range of flows.

Flow Element

The flow element consists of 4 thermowells. The thermowells are hollow metal tubes that are braised together to make 2 pairs of thermowells. One thermowell pair contains the active Resistance Temperature Detector (RTD) and a heater. The other thermowell pair contains the reference RTD and an empty thermowell for thermal mass equalization. Figure 1-1 shows the flow element.

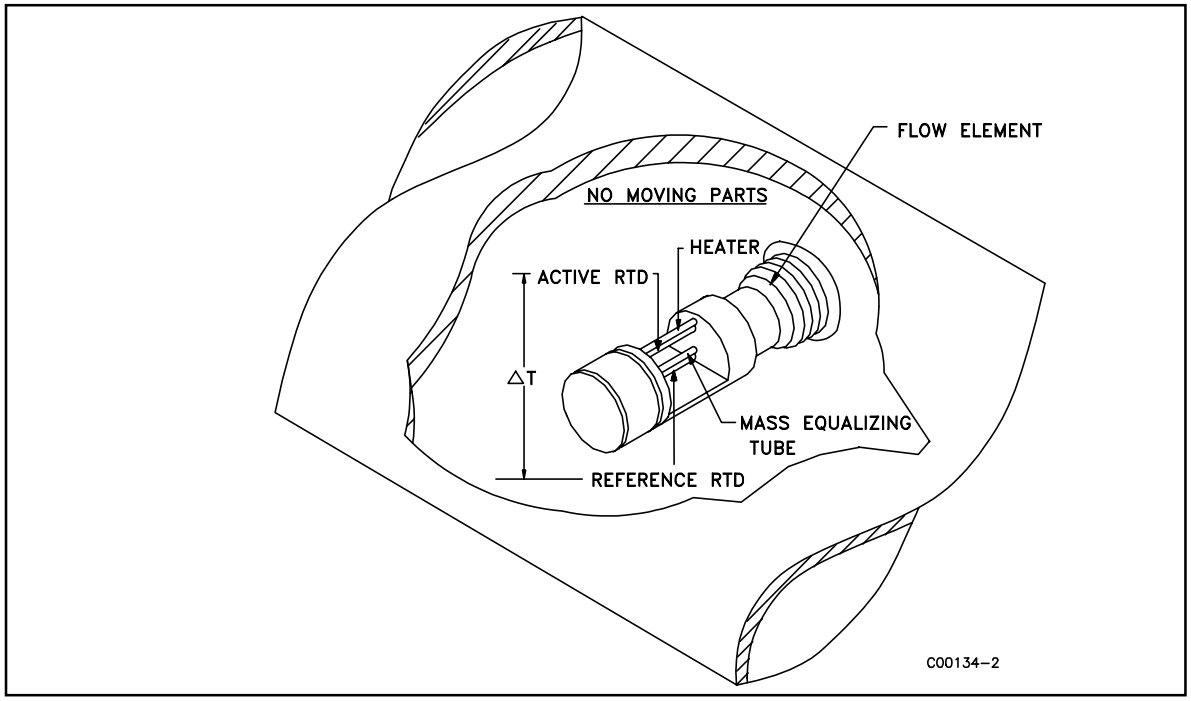

Figure 1-1. Flow Element Cut-Away View

Flow Transmitter

The other component of the flowmeter is the flow transmitter. The basic functions of the flow transmitter are to provide power to the flow element, measure the Differential Temperature (DT) between the two RTDs as a function of resistance, amplify and linearize the Differential Resistance (DR) measurement of the flow element input signal and to provide an output signal.

This output signal is calibrated to the flow rate as a function of velocity, standard volume or mass flow. To perform these functions, microprocessor-based electronic circuitry is employed to acquire the analog voltage signals from the RTDs, digitize and interpret the information.

The microprocessor-based electronics provides maximum flexibility and ease of operation with a menu-driven selection of control, monitoring, display and driver options.

Theory of Operation

The flow element consists of two pairs of thermowells of the same size, shape and mass. One pair contains a platinum RTD and a heater element. The other pair contains one RTD. The RTD located next to the heater element is called the active RTD. The other RTD is referred to as the reference RTD. Since the active RTD is adjacent to the heater, the temperature at the walls of the thermowell are always above the temperature of the process media. The temperature at the reference RTD is the temperature of the process media. When the process media is flowing past the active RTD a quantity of heat is carried off into the flow stream. The amount of heat taken from the active RTD is a function of the process media mass flow rate. A DT exists between the two pairs of thermowells and a proportional DR exists between the active and the reference RTDs. The DR is measured by the flow transmitter. The relationship of DT to the mass flow rate is calculated by the flow transmitter and is converted into a signal or is sent to theflow transmitter's display.

Technical Specifications

Flow Transmitter

Power Input

115 VAC, ± 15 V; 230 VAC, ± 30V; 50/60 Hz.; 16 watts maximum; 24 Vdc -2/+6 Vdc, 16 watts maximum

Internal Fuse Protection

All fuses are "slo-blo" type - 1/4 amp on AC source and 1 amp on DC source

Operating Temperature Range

0°F to +150°F (-18° to 65°C)

Electrical Enclosure Rating

- Local flow element and flow transmitter:

  NEMA 4X (designed to meet IP65) enclosure.
  CE marking EMC directive 89/336/EEC

- Flow element:

  Available with aluminum or steel Class 1, Division 1, Groups B, C, D (CENELEC EEx d IIc T4) explosion-proof enclosure. Other approval certifications are available.

- Remote flow transmitter:

  Available with fiberglass NEMA 4X (designed to meet IP65) or optionally with aluminum Class 1, Division 1, Groups C, D (CENELEC EEx d IIc T4) explosion-proof enclosure. Other approval certifications are available.

Electrical Connections

1 inch (25.4 mm) female NPT

Signal Output

Two independent, AC power isolated, independent analog outputs which can be set as follows:

- 4-20 mA, 600 ohm max load
- 0-10 Vdc, 5000 ohm min load
- 0-5 Vdc, 2500 ohm min load
- 1-5 Vdc, 2500 ohm min load

Ports

- RS-232C serial input/output
- RS-485 serial input/output (contact factory)

Turndown Ratio

- Field set from 2:1 to 100:1
- Signal output zero or non-zero based

Switch Points

May be field set by programming to alarm at high, low or windowed flow (or temperature)

Relays

Two, independently adjustable 10 amp (115 Vac or 24 Vdc) or 2 amp (230 Vac)

Slave Relay Energization Terminals

Customer provided relays may be energized at programmable values by connecting to points on the output connector jack/plug.

Operating Characteristics - Flow Element Assembly

Material

All wetted parts are 316 stainless steel with nickel braze per AMS 4777

Electrical Connections

1 inch (25.4mm) female NPT

Operating Temperature Range

-50°F to + 350°F (-45° to 178°C)

Operating Temperature Range Using High Temperature Flow Element (Customer Option)

-100°F to + 850°F (-73° to 454°C)

GF90 Flow Operating Range

0.25 to 1600 SFPS (0.08 to 487.7 NMPS)

Actual velocity limited to 200 ft/sec (61 m/sec)

GF92 Flow Operating Range

0.006 to 2000 SCFM (0.01 to 3398 NCMH)

Operating Pressure

Up to 1000 psig [68 bar(g)]

Flow Accuracy

±1% full scale for turndowns above 10:1. ±0.3% full scale for turndowns below 10:1.

Electronic Hardware

Physically the flow transmitter employs two printed wiring boards stacked on standoffs in the enclosure. The upper board is the control board and the lower board is the input/output/power supply (I/O/P).

Input/Output/Power Supply Board Functions

All input, output and power supply functions are provided on the lower board. The terminal connections for customer interface are located on this board.

Control Board Functions

The control board receives input signals from the I/O/P board with an interconnect cable. Then the control board processes the signals and delivers usable information to the operator.

Other functions include:

- display
- keyboard
- RS-232 (EIA-232) Serial Communication Port