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A low cost solution to thermal mass flow metering for gases is presented by Aalborg in introducing the model GFM mass flow meter line.

The GFM design combines the convenience and accuracy of conventional mass flow devices with low costs previously unattainable.

Each of these meters incorporate an advanced straight tube sensor in conjunction with flow passage elements constructed of aluminum and brass for non-corrosive gases or 316 stainless steel for corrosive applications.

## Design Features

- Rigid metallic construction.
- Maximum pressure of 500 psig(34.5 bars).
- Leak integrity  $1 \times 10^{-7}$  of helium.
- NIST traceable certification.
- Built-in tiltable LCD readout.
- 0-5 Vdc and 4-20 mA signals.
- Circuit protection.
- Can be used as a portable device.
- Engineering units or 0 to 100% displays.
- Totalizer option.

## Principles of Operation

Metered gases are divided into two laminar flow paths, one through the primary flow conduit, and the other through a capillary sensor tube. Both flow conduits are designed to ensure laminar flows and therefore the ratio of their flow rates is constant.

Two precision temperature sensing windings on the sensor tube are heated, and when flow takes place, gas carries heat from the upstream to the downstream windings. The resultant temperature differential is proportional to the change in resistance of the sensor windings.

A Wheatstone bridge design is used to monitor the temperature dependent resistance gradient on the sensor windings which is linearly proportional to the instantaneous rate of flow.

Output signals of 0 to 5Vdc and 4 to 20mA are generated indicating mass molecular based flow rates of the metered gas.

Flow rates are unaffected by temperature and pressure variations within stated limitations.



**Typical Aluminum  
GFM Mass Flow Meter**



## GFM 77 Aluminum Mass Flow Meter



### General Description

Compact, self contained GFM mass flow meters are designed to read flow rates of gases. The rugged design coupled with instrumentation grade accuracy provides versatile and economical means of flow control.

Aluminum or stainless steel models with readout options of either engineering units (standard) or 0 to 100 percent displays are available.

The mechanical layout of the design includes an LCD readout built into the top of the transducer. This readout module is tiltable over 90 degrees to provide optimal reading comfort. It is connected to the transducer by a standard modular plug, and is also readily removable for remote reading installations. Transducers without LCD readout are offered for OEM applications.

GFM mass flow meters are available with flow ranges from 10 sccm to 1000 sL/min N<sub>2</sub>. Gases are connected by means of 1/4" 3/8" 1/2" compression fittings and 3/4" FNPT fittings. Optional fittings are available. These controllers may be used as benchtop units or mounted by means of screws in the base.

Transducer power supply ports are fuse and polarity protected.

### Leak Integrity

1 x 10<sup>-7</sup> smL/sec of helium max to outside environment.

### Specifications

**Accuracy :** ±1.5% of full scale, including linearity for gas temperatures of 59°F to 77°F (15°C to 25°C) and pressures of 5 to 60 psia (0.4 to 4.1 bars); optional ±1% of full scale (certified calibration accuracy) associated with a given set of temperature and pressure values. ±3% of full scale including linearity for gas temperatures of 32°F to 122°F (0 to 50°C) and 1 to 500 psia (0.07 to 34 bars).

**Repeatability :** ±0.5% of full scale.

**Response Time :** Generally 2 seconds to within ±2% of actual flowrate over 25 to 100% of full scale.

**Temp. Coefficient :** 0.15% of full scale / °C.

**Pressure Coefficient :** 0.01% of full scale / psi (0.07 bar)

**Max Pressure Drop :** up to 10 std. sL/min. - 2.5cm of H<sub>2</sub>O; 15 std. l/min. [cm H<sub>2</sub>O] -10 cm of H<sub>2</sub>O

**Gas & Ambient Temp :** 41°F to 122°F (0 to 50°C)

**Output Signals :** Linear 0-5 Vdc. 1000 ohms min. load impedance and 4 - 20 mA 0 - 250 ohms loop resistance

**Transducer Input Power :** +12 Vdc; 200 mA of maximum. +24 Vdc optional.

**Time Constant :** 800 ms.

**Gas Pressure :** 500 psig ( 34.5 bars ) maximum. 20 psig ( 1.4 bars ) optimum.

**Materials In Fluid** a. Aluminum models GFM Series:

**Contact :** anodized aluminum, 316 stainless steel, brass and Viton® O-rings.

b. Stainless Steel models GFM17S, 37S, 47S, 57S, 67S and 77S: 316 stainless steel and Viton® O-rings. Optional O-rings Neoprene® and Kalrez®.

**Connections :** GFM 17 and 37 -1/4" compression fittings.

GFM 47 -3/8" compression fittings.

Optional VCR®s or 1/8", 3/8"compression fittings.

GFM 57 - 3/8" compression fittings.

GFM 67 - 1/2" compression fittings.

GFM 77 - 3/4" FNPT fittings.

Optional VCR®s 3/4" compression fittings (GFM77).

**CE Compliant :** EN 55011 class 1, class B; EN50082-1

