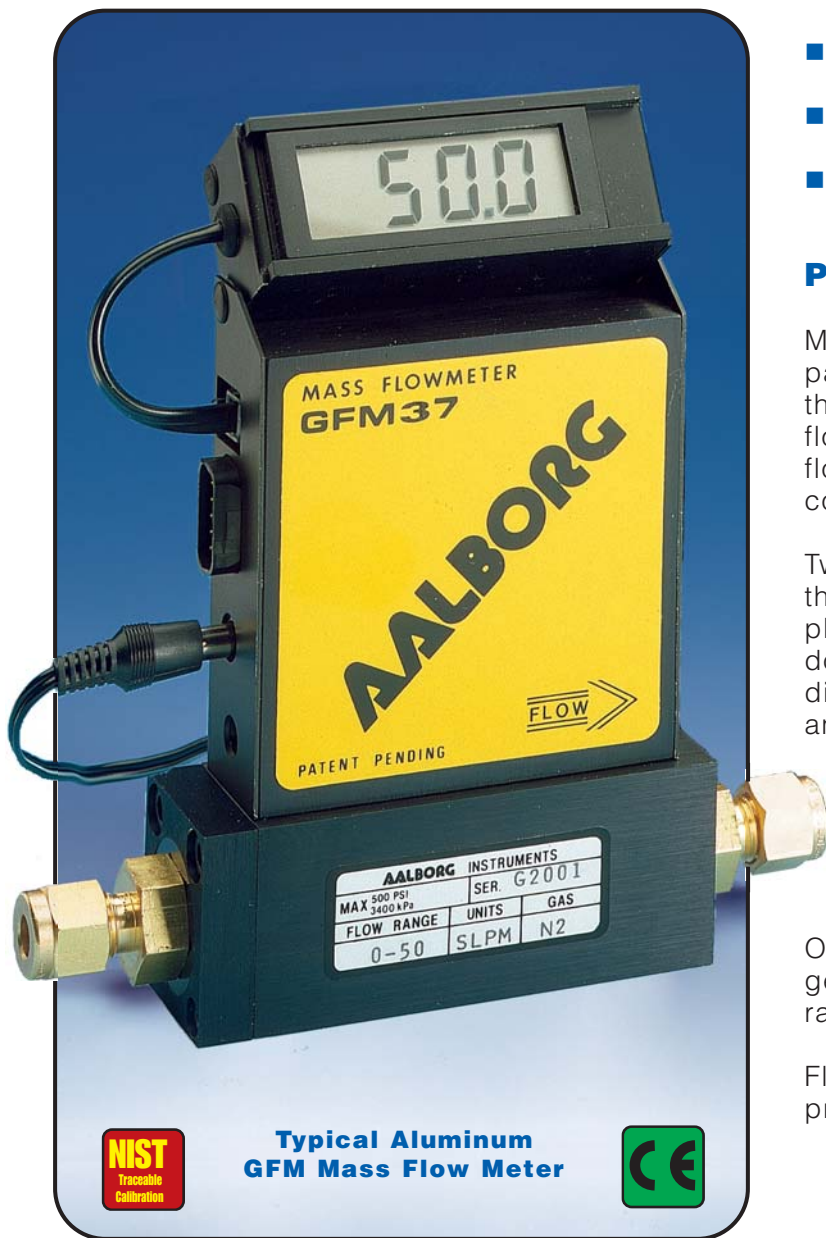


A low cost solution to thermal mass flow metering for gases is presented by Aalborg in introducing the model GFM mass flow meter line.

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.



**Typical Aluminum
GFM Mass Flow Meter**

Design Features

- Rigid metallic construction.
- Maximum pressure of 500 psig(34.5 bars).
- Leak integrity 1×10^{-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.

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 N₂. 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 10⁻⁷ 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 H₂O; 15 std. l/min. [cm H₂O] - 10 cm of H₂O

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

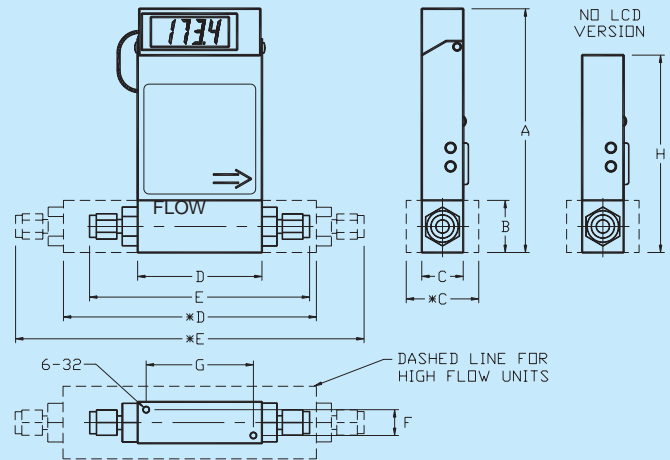
Low Cost Mass Flow Meters

GFM

Dimensions* GFM Mass Flow Meters

<http://aalborg.com>

MODEL	CONNECTION: SWAGelok COMPRESSION FITTING EXCEPT MODEL GFM77	DIMENSIONS [INCH]							
		LCD VERSION							NO LCD
		A	B	C/*C	D/*D	E/*E	F	G	H
GFM17	1/4 TUBE ODIA	5.60	1.00	1.00	3.00	5.02	0.69	2.68	4.50
GFM37	1/4 TUBE ODIA	5.98	1.37	1.25	4.00	6.02	0.69	2.68	4.88
GFM47	3/8 TUBE ODIA	5.98	1.37	1.25	4.00	6.14	0.69	2.68	4.88
GFM57	3/8 TUBE ODIA	6.60	2.00	1.75	6.69	8.83	0.99	4.68	5.50
GFM67	1/2 TUBE ODIA	7.35	2.75	2.50	7.25	9.67	1.69	4.68	6.25
GFM77	3/4 NPT FEMALE	8.23	3.63	3.38	7.31	-----	1.69	4.68	7.13



ORDERING INFORMATION FOR GFM

SERIES		MAX. FLOW (N ₂)		MATERIAL		SEALS		FITTINGS		CONNECTOR		DISPLAY		POWER		INPUT/OUTPUT SIGNAL		DIGITAL INTERFACE	
MODEL		17	10 L/min	A	Aluminum	V	Viton	A	1/4" Compression	D	D Connector	N	No display	2	12 Vdc	A	*n.a./0-5 Vdc	0	None
		37	50 L/min	S	Stainless	B	Buna	B	1/8" Compression			L	LCD readout	4	24 Vdc	B	*n.a./4-20mA		
		47	100 L/min			E	EPR	C	VCR										
		57	200 L/min			T	PTFE/Kalrez	D	3/8" Compression										
		67	500 L/min					E	1/2" Compression										
		77	1000 L/min					F	3/4" FNPT										
								G	3/4" Compression										
								X	Special										

EXAMPLE: GFM17S-VADL2-A0 5 L/min [N₂] 20 psig **PLEASE SPECIFY: Gas, Flow Range and Pressure.**

GFM17 stainless, Viton seals, 1/4" compression fittings, D connector with display, 12Vdc, 0-5 Vdc, Output Signal, No Digital Interface.

For Specific Flow Ranges Contact Aalborg Customer Service Department

Table 7 - Totalizer

TOT-10-0C	Totalizer (5Vdc - 10Vdc signals), calibrated.
TOT-10-0N	Totalizer (5Vdc - 10Vdc signals), uncalibrated.
CBL-TOT-10	Cable & splitter, used in conjunction w/ display.

Table 8 - IO Input/Output

IO-232-C	Input/output to RS232, 0-5Vdc.
IO-232-E	Input/output to RS232, 4-20mA.
IO-485-C	Input/output to RS485, 0-4Vdc.
IO-485-E	Input/output to RS485, 4-20mA.

Table 9 - Accessories for GFM Mass Flow Meters

PS-GFM-110NA-2	Power Supply, 110 V / 12 Vdc /North America
PS-GFM-230EU-2	Power Supply, 220 V / 12 Vdc /Europe
PS-GFM-240UK-2	Power Supply 240 V / 12 Vdc /United Kingdom
PS-GFM-240AU-2	Power Supply 240 V / 12 Vdc /Australia
BP110	Battery Pack, 110 V (includes case)
BP220	Battery Pack, 220 V (includes case)
CBL-D4	Cable with 9-pin D-connector, (4 - 20 mA)
CBL-D5	Cable with 9-pin D-connector, (0 to 5 Vdc)
17/3RC	17/3RC Remote cable, 3 ft long
17/R	17/R Remote LCD readout with 3 ft long cable

FLOW RANGES

Code	Units [Nitrogen]	Code	Units [Nitrogen]
GFM17			
-01	0 to 10 mL/min	-06	0 to 500 mL/min
-02	0 to 20 mL/min	-07	0 to 1 L/min
-03	0 to 50 mL/min	-08	0 to 2 L/min
-04	0 to 100 mL/min	-09	0 to 5 L/min
-05	0 to 200 mL/min	-10	0 to 10 L/min
GFM37			
-11	0 to 15 sL/min	-32	0 to 40 sL/min
-30	0 to 20 sL/min	-33	0 to 50 sL/min
-31	0 to 30 sL/min		
GFM47			
-40	0 to 60 sL/min	-42	0 to 100 sL/min
-41	0 to 80 sL/min		
GFM57			
-50	0 to 200 sL/min		
GFM67			
-60	0 to 500 sL/min		
GFM77			
-70	0 to 1000 sL/min		

call toll free in USA or Canada at 1.800.866.3837 4