

Mass Flowmeters

Model GFM

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

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 resulting 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 5 VDC 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.

Model GFM Mass Flowmeters are available with flow ranges from 10 mL/min to 1000 L/min N₂. Gases are connected by means of 1/4", 3/8" and 1/2" compression fittings, and 3/4" NPT Female fittings. Optional fittings are available. These meters may be used as bench top units or mounted by means of screws in the base. Transducer power supply ports are fuse and polarity protected.



Typical Aluminum GFM Mass Flowmeter



Benefits/Features

- Rigid metallic construction
- Maximum pressure of 1000 psig (70 bar)
- Leak integrity 1 x 10⁻⁹ mL/sec of helium
- NIST-traceable certification
- Built-in tiltable LCD readout
- 0–5 VDC and 4–20mA signals
- Circuit protection
- Can be used as a portable device
- Engineering units or 0–100% displays
- TIO Totalizer option

Models GFM 57, 67 and 77 Mass Flowmeters





Mass Flowmeters (cont'd.)

Model GFM

Specifications

Accuracy:

17, 37, 47: ±1% of full scale
 57, 67, 77: ±1.5% of full scale. Optional enhanced accuracy is available: ±1% of full scale

Calibration: Performed at standard conditions [14.7 psia (101.4 kPa) and 70°F (21.1°C)] unless otherwise requested

Repeatability: ±0.25% of full scale

Response Time: Generally 2 seconds to within ±2% of actual flow rate over 25 to 100% of full scale

Temperature Coefficient: 0.15% of full scale/°C

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

Pressure Drop (maximum): See Table 2

Gas and Ambient Temperature:

32°F to 122°F (0°C to 50°C)
 Dry gases: 14°F to 122°F (-10°C to 50°C)

Output Signals: Linear 0-5 VDC (1000 ohms min. load impedance) and 4-20mA (0-500 ohms loop resistance)

Transducer Input Power: Universal +12 VDC to +26 VDC, 200mA maximum

Time Constant: 800 ms.

Gas Pressure:

17, 37, 47: 1000 psig (70 bar) maximum; 20 psig (1.4 bar) optimum
 57, 67, 77: 500 psig (34.5 bar) maximum; 20 psig (1.4 bar) optimum

Materials in Fluid Contact:

Aluminum Models: Anodized aluminum, 316 Stainless Steel, brass and Viton® O-rings

Stainless Steel Models: 316 Stainless Steel and Viton® O-rings (optional O-rings available: Buna®, EPR and Kalrez®)

Attitude Sensitivity: No greater than ±15° rotation from horizontal to vertical; standard calibration is in horizontal position

Connections:

17: 1/4" compression fittings (optional: 6mm, 3/8" and 1/8" compression fittings or 1/4" VCR)
 37: 1/4" compression fittings (optional 6mm and 3/8" compression fittings or 1/4" VCR)
 47, 57: 3/8" compression fittings
 67: 1/2" compression fittings
 77: 3/4" NPT Female fittings or 3/4" compression fittings

Leak Integrity: 1 x 10⁻⁹ smL/sec of helium maximum to the outside environment

Display: 3-1/2 digit LCD, 0.5" (H) characters

CE Compliant: EN 55011 Class 1, Class B; EN50082-1

Table 1 Flow Ranges

GFM Model	Code	Flow Range	
		mL/min (N2)	L/min (N2)
17 Low-Flow	01	0 – 10	—
	02	0 – 20	—
	03	0 – 50	—
	04	0 – 100	—
	05	0 – 200	—
	06	0 – 500	—
	07	—	0 – 1
	08	—	0 – 2
	09	—	0 – 5
	10	—	0 – 10
37 Medium-Flow	11	—	0 – 15
	30	—	0 – 20
	31	—	0 – 30
	32	—	0 – 40
	33	—	0 – 50
47 High-Flow	40	—	0 – 60
	41	—	0 – 80
	42	—	0 – 100
57 High-Flow	50	—	0 – 200
67 High-Flow	60	—	0 – 500
77 High-Flow	70	—	0 – 1000

Table 2 Pressure Drop

GFM Model	Flow Rate	Maximum Pressure Drop		
		L/min	mm H2O	psid
17	up to 10	25	0.04	2.5
		30	0.44	30
37	30	800	1.18	81
		1480	2.18	150
		2200	3.23	223
		3100	4.56	314
		4422	6.50	448
47	100	5500	8.08	557
		2720	4.00	280
		3400	5.00	340
57	200	2720	4.00	280
67	500	3400	5.00	340
77	1000	6120	9.00	620

Please note: For more information regarding specific flow ranges, please contact Air Liquide.

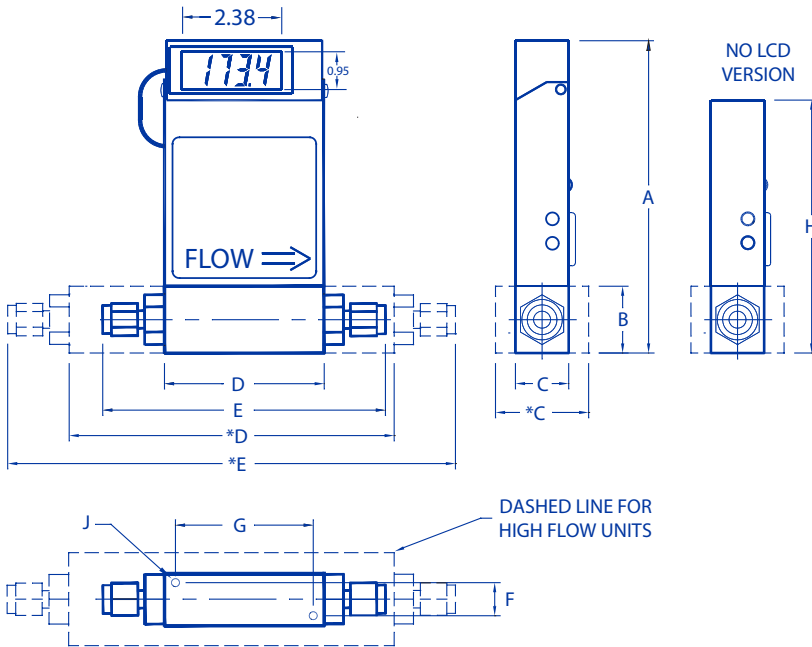
Mass Flowmeters (cont'd.)

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Table 3 Dimensions

GFM Model	Inlet and Outlet Connections	Dimension (inches)								Size
		LCD Version							No LCD	Mounting Hole
		A	B	C/C	D/D	E/E	F	G	H	J
17	1/4" Compression	5.60	1.00	1.00	3.00	5.02	0.69	2.69	4.50	6-32
37	1/4" Compression	5.98	1.37	1.25	4.13	6.15	0.69	2.69	4.88	6-32
47	3/8" Compression	5.98	1.37	1.25	4.13	6.27	0.69	2.69	4.88	6-32
57	3/8" Compression	6.60	2.00	1.75	6.69	8.83	0.99	4.69	5.50	10-24
67	1/2" Compression	7.60	3.00	3.00	7.25	9.67	2.25	6.75	6.50	1/4-20
77	3/4" NPT Female	8.60	4.00	4.00	7.30	—	3.00	6.80	7.50	1/4-20

Table 4 Accessories: Power Supply, Battery Packs and Cables



Part Number	Description
PS-GFM-110NA-2	Power supply, 110 V/12 VDC North America
PS-GFM-110NA-4	Power supply, 110 V/24 VDC North America
PS-GFM-230EU-2	Power supply, 220 V/12 VDC Europe
PS-GFM-230EU-4	Power supply, 220 V/24 VDC Europe
PS-GFM-240UK-2	Power supply 240 V/12 VDC United Kingdom
PS-GFM-240UK-4	Power supply 240 V/24 VDC United Kingdom
PS-GFM-240AU-2	Power supply 240 V/12 VDC Australia
PS-GFM-240AU-4	Power supply 240 V/24 VDC Australia
BP110	Battery pack, 110V (includes case)
BP220	Battery pack, 220V (includes case)
CBL-D4	Cable with 9-pin D-conn. (4-20mA)
CBL-D5	Cable with 9-pin D-conn. (0-5 VDC)
17/3RC	Remote cable, 3 ft. long
17/R	Remote LCD readout with 3 ft. cable
TIO-LAA2	Totalizer I/O monitor and RS-232 digital interface
TIO-LAA5	Totalizer I/O monitor and RS-485 digital interface
KIT-TM-DD	GFM flowmeter mounting kit with two 9-pin D-conn.

For more information regarding Totalizer input/output flow monitor and controller options — please inquire.

Mass Flowmeters (cont'd.)

Model GFM Ordering Information

GFM	Maximum Flow N2	
17	10 L/min	
37	50 L/min	
47	100 L/min	
57	200 L/min	
67	500 L/min	
77	1000 L/min	
Material		
A	Aluminum	
S	Stainless steel	
Seals		
V	Viton®	
B	Buna®	
E	EPR	
T	PTFE/Kalrez®	
Fittings		GFM Model
A	1/4" Compression	17, 37
B	1/8" Compression	17
C	1/4" VCR®	17, 37
D	3/8" Compression	17, 37, 47, 57
E	1/2" Compression	67
F	3/4" NPT Female	77
G	3/4" Compression	77
H	6mm Compression	17, 37
Display		
N	No display	
L	LCD readout	
Power		
6	Universal +12 VDC to +26 VDC	
Output Signal		
A	0-5 VDC	
B	4-20mA	
Digital Interface		
0	None	

Example: GFM17S-VAL6-A0
5 L/min (N₂) 20 psig

Specify flow range, gas and pressure
GFM17 with stainless steel, Viton® seals,
1/4" compression fittings, display, 12-26
VDC power, 0-5 VDC output signal, no
digital interface

GFM	17	S	V	A	L	6	A	0
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