FMA Series
Mass flow sensors for gases

FEATURES

- **Ranges 0...1000 sccm[1] and 0...6 slpm[2]**
- **Actual mass flow sensing**
- **1...5 V output**
- **Manifold mount/O-ring sealed**
- **Sensortechnics PRO services**

MEDIA COMPATIBILITY

To be used with dry gases only

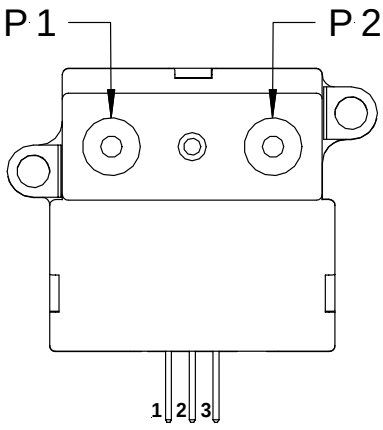
The FMA series is NOT designed for liquid flow and will be damaged by liquid flow through the sensor

SPECIFICATIONS

Maximum ratings

Supply voltage[3]	8 to 15 V typ. 10 ±0.01 V
Power consumption	
FMAL001DU	60 mW
FMAL006DU	75 mW
Output load	
NPN (Sinking)	10 mA
PNP (Sourcing)	20 mA
Temperature limits	
Operating	-25 to 85°C
Storage	-40 to 90°C
Mechanical shock	100 g (5 drops, 6 axes)

ELECTRICAL CONNECTION



Pin 1: V_{out}
Pin 2: $+V_S$
Pin 3: GND

Note:
[1] sccm denotes standard cubic centimeters per minute, 1000 sccm = 1 slpm
[2] slpm denotes standard liters per minute, which is a flow measurement referenced to standard conditions of 0°C, 1 bar, 50% RH.
[3] Output voltage is ratiometric to supply voltage

FLOW SENSOR CHARACTERISTICS[4]

(V_S = 10 ±0.01 V, T_A = 25°C)

Part no.	Flow range (full scale)	Max. flow change[5]	Output voltage @ trim point
FMAL001DU	1000 sccm[1]	5.0 l/sec	5 ±0.15 V @ 1000 sccm[1]
FMAL006DU	6 SLPM[2]	5.0 l/sec	5 ±0.15 V @ 6 SLPM[2]

PERFORMANCE CHARACTERISTICS

(V_S = 10 ±0.01 V, T_A = 25°C)

Characteristics				Min.	Typ.	Max.	Unit
Zero offset				0.95	1.0	1.05	V
Repeatability and hysteresis (combined)			FMAL001DU			±0.5	% reading
			FMAL006DU			±1.0	
Ratiometricity error[3]						±0.3	
Temperature effects[6]	Offset	-25 to 85 °C			±0.025		V
	Span	-25 to 25 °C	FMAL001DU			-5.0	% reading
			FMAL006DU			-6.0	
		25 to 85 °C	FMAL001DU			6.0	
			FMAL006DU			6.0	
Response time					1.0	3.0	ms
Common mode pressure			FMAL001DU			150	psi
			FMAL006DU			25	

Notes:
[1] sccm denotes standard cubic centimeters per minute, 1000 sccm = 1 slpm
[2] SLPM denotes standard liters per minute, which is a flow measurement referenced to standard conditions of 0°C, 1 bar, 50% RH.
[3] Output voltage is ratiometric to supply voltage
[4] A 5 micron filter is recommended for all devices.
[5] Maximum allowable rate of flow change to prevent damage.
[6] Shift is relative to 25 °C.

FLOW SPECIFICATIONS

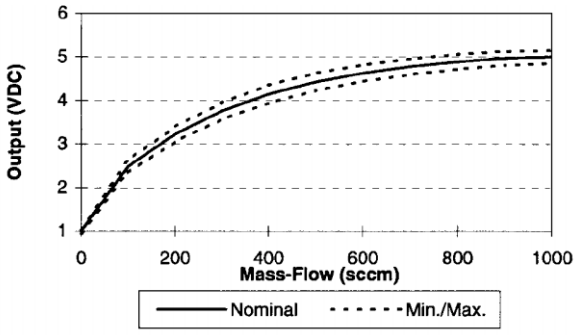
(V_S = 10 ±0.01 V, T_A = 25°C)

FMAL001DU				FMAL006DU			
Press. (mbar)	**Flow (sccm)**[7]	Nom. (V_{DC})	Tol. (± V_{DC})	Press. (mbar)	**Flow (slpm)**[7]	Nom. (V_{DC})	Tol. (± V_{DC})
2.23	**1000**	5.00	0.15	20.0	**6**	5.00	0.15
1.87	**900**	4.97	0.16	14.7	**5**	4.89	0.20
1.52	**800**	4.89	0.17	9.07	**4**	4.70	0.25
1.16	**700**	4.78	0.18	6.40	**3**	4.40	0.35
0.94	**600**	4.63	0.19	3.35	**2**	3.80	0.30
0.71	**500**	4.43	0.20	1.17	**1**	3.10	0.30
0.50	**400**	4.15	0.21	0.00	**0**	1.00	0.05
0.33	**300**	3.76	0.19				
0.19	**200**	3.23	0.17				
0.08	**100**	2.49	0.14				
0.00	**0**	1.00	0.05				

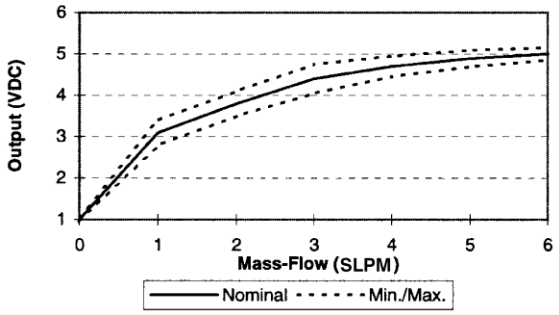
Note:
[7] Devices are calibrated in mass flow. Tolerance values apply to calibration type only.

OUTPUT VS. FLOW CURVES

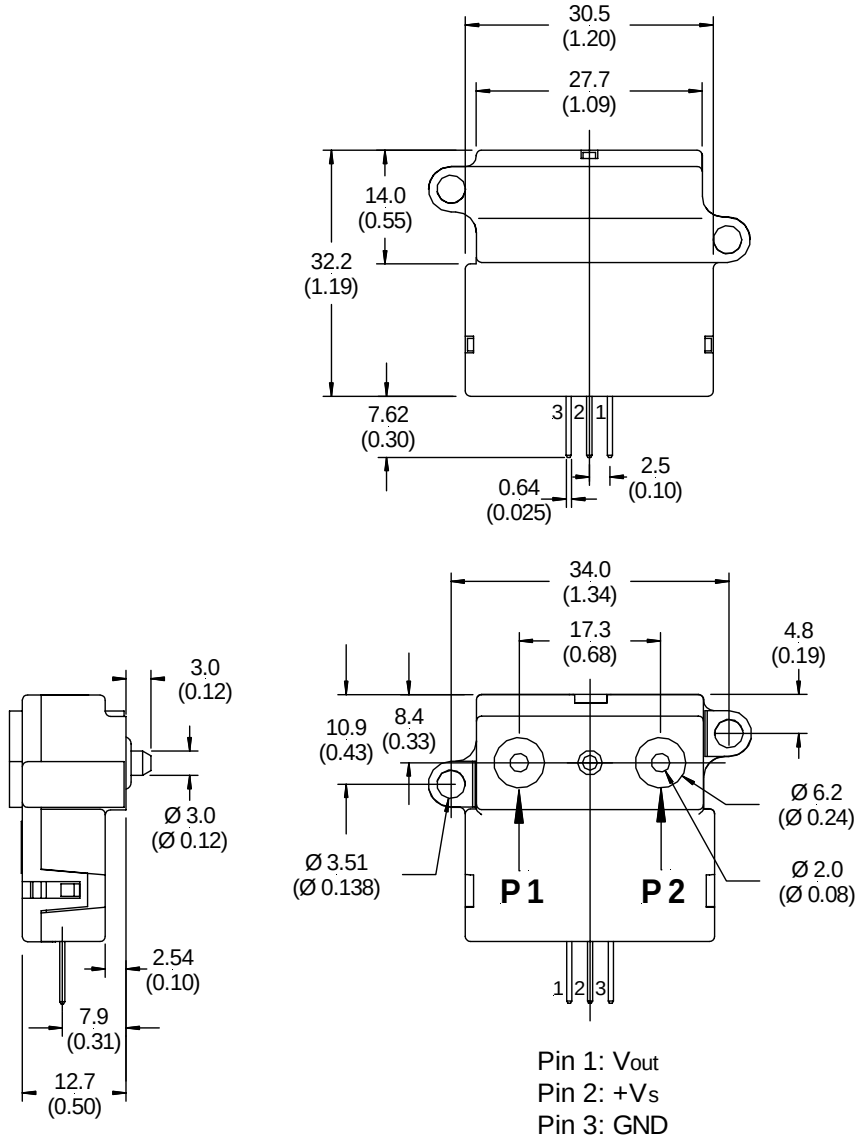
FMAL001DU



FMAL006DU



OUTLINE DRAWING



Pin 1: V_{out}
Pin 2: $+V_S$
Pin 3: GND

third angle projection

mass: approx. 11 g

dimensions in mm (inches)

Note: **Positiv flow direction is defined as proceeding from port 1 (P1) to port 2 (P2) and results in positive output.**

GAS CORRECTION FACTORS[8]

Gas type	Correction factor (approx.)
Helium (He)	0.5[9]
Hydrogen (H_2)	0.7[9,10]
Argon (Ar)	0.95
Nitrogen (N_2)	1.0
Oxygen (O_2)	1.0
Air	1.0
Nitric oxide (NO)	1.0
Carbon monoxide (CO)	1.0
Methane (CH_4)	1.1
Ammonia (NH_3)	1.1
Nitrous oxide (N_2O)	1.35
Nitrogen dioxide (NO_2)	1.35
Carbon dioxide (CO_2)	1.35

Notes:
[8] Gas correction factors are referenced to nitrogen (N_2) as calibration gas type. Approximate gas correction factors are provided as guidelines only. Individual gas types may perform differently at temperature extremes and varying flow rates.
[9] When sensing Hydrogen (H_2) or Helium (He) it may be necessary to power the mass flow sensor using increased supply voltage: Hydrogen typ. 12 V, Helium typ. 15 V
[10] Hydrogen (H_2) flow measurement requires the use of a special sensor. These devices provide normal operation when sensing hydrogen flow and are designated with an "H" at the end of the order number.

ORDERING INFORMATION - AVAILABLE LISTINGS

Note: Preferred listings are highlighted in grey

Flow range	Dry gas	Hydrogen gas[10]
1000 sccm	FMAL001DU	FMAL001HU
6 SLPM	FMAL006DU	---

Sensortechnics PRO services:

- Extended guarantee period of 2 years
- Improved performance characteristics
- Custom product modifications and adaptations even for small quantities
- Advanced logistics models for supply inventory and short delivery times
- Technical support through application engineers on the phone or at your site
- Fastest possible technical response for design and QA engineers

... plus other services on request