

# MASS AND VOLUMETRIC GAS FLOW CONTROLLERS

For Clean Gases



FMA-2613A  
shown smaller  
than actual size.



FMA-2601A shown  
smaller than actual size.



## FMA-2600A Series



- ✓ 130+ Gas Calibrations Including Pure and Mixed Gases
- ✓ Pressure, Temperature, and Volumetric and Mass Flow Simultaneously Displayed
- ✓ Easy-to-Use Pushbutton Interface
- ✓ NIST Traceability Standard
- ✓ Full Scale Ranges from 0.5 SCCM to 3000 SLM
- ✓ Response Time of 50 to 100 ms Typical
- ✓ Turndown Ratio of 200:1
- ✓ Position Insensitive
- ✓ ±0.8% Reading Accuracy
- ✓ RS232 Standard
- ✓ Custom Live Gas Blend Programming
- ✓ Store Up to 20 User Defined Gas Blends

The FMA-2600A Series mass and volumetric flow controllers use the principle of differential pressure within a laminar flow field to determine and control mass flow rate. A laminar flow element (LFE) inside the meter forces the gas into laminar (streamlined) flow. Inside this region, the Poiseuille equation dictates that the volumetric flow rate be linearly related to the pressure drop. A differential pressure sensor is used to measure the pressure drop along a fixed distance of the LFE. This, along with the viscosity of the gas, is used to accurately determine the volumetric flow rate. Separate absolute temperature and pressure sensors are incorporated and correct the volumetric

flow rate to a set of standard conditions. This standardized flow rate is commonly called the mass flow rate and is reported in units such as standard cubic feet per minute (SCFM) or standard liters per minute (SLM).

The controller uses a true proportional valve coupled to the flow body to control flow using the integral PID loop controller. Standard units include a 0 to 5 V output (4 to 20 mA optional) and RS232 communications. The gas-select feature and the setpoints can be adjusted from the front keypad or via RS232 communications. Volumetric flow, mass flow, absolute pressure, and temperature can all be viewed or recorded through the RS232 connection. It is also possible to multi-drop up to 26 units on the same serial connection to a distance of 46 m (150').

### SPECIFICATIONS

**Accuracy:** ±(0.8% of reading + 0.2%FS)

**Repeatability:** ±0.2% FS

**Turndown Ratio:** 200:1

**Control Response Time:** 100 ms

**Input Control Signal:** 0 to 5 Vdc, RS232

**Output Signal:** 0 to 5 Vdc, RS232

**Optional Input/Outputs:** 4 to 20 mA, 0 to 10 Vdc

**Operating Temperature:** -10 to 50°C (14 to 122°F)

**Zero Shift:** 0.02%/ATM FS/°C

**Span Shift:** 0.02%/ATM FS/°C

**Humidity Range:** 0 to 100% RH, non-condensing

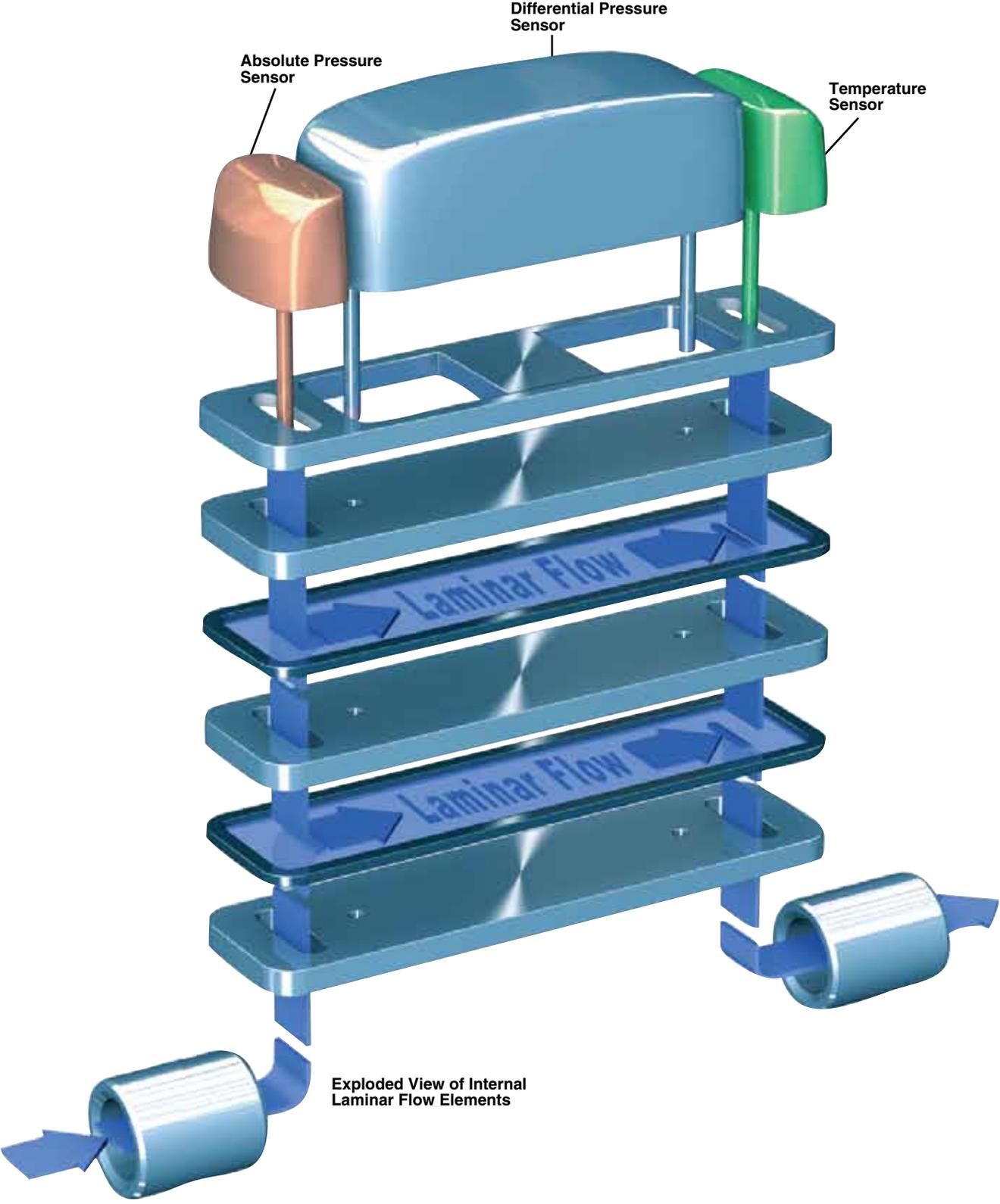
**Excess Flow Rate:** 2.4% FS

**Wetted Materials:** 303 and 302 SS, FKM, heat cured silicone RTV (rubber), glass-reinforced PPS, heat cured epoxy, aluminum, gold, silicone, glass; >250 SLM: 416 SS and nickel replace brass

**Maximum Pressure:** 145 psig

**To Use in Volumetric Mode:** Near atmosphere, 15 psig recommended maximum. Volumetric flow meters and controllers not certified for accuracy at mass flow rates above the rated flow range of the meter. They are designed for near atmospheric pressure conditions only. The recommended maximum operating pressure is 15 psig

# ***Program Custom Mixed Calibrations for Bioreactors, Chromatography, Welding, Lasers, Stack/Flue, Fuel Gases and More***



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**Minimum Differential Pressure Required:**  
 5 SLM and under: 5 psid; 10 to 250 SLM:  
 15 psid; 500 SLM: 5 psid; 1500 SLM: 10 psid  
**Supply Current:** 0.250 A for 20 SLM and  
 under; 0.75 A for 50 SLM and above (typical)  
**Supply Voltage:** 12 to 30 Vdc for units  
 20 SLM and smaller; 24 to 30 Vdc for units  
 50 SLM and larger  
**Electrical Connections:** 8-pin circular  
 mini DIN

**Dimensions: mm (inch)**

Flow Range	Height	Length	Depth
0.5 to 50 SCCM	99 (3.9)	86 (3.4)	27.9 (1.1)
100 SCCM to 20 SLM	104 (4.1)	89 (3.6)	27.9 (1.1)
50 to 100 SLM	112 (4.4)	163 (6.4)	58.4 (2.3)
250 SLM	140 (5.5)	196 (7.7)	58.4 (2.3)
500 to 1500 SLM	140 (5.5)	188 (7.4)	58.4 (2.3)

Please allow approximately 44.5 mm (1.75") on top of the unit for electrical cable connection.

To Order					
Mass Flow meter Model No.	4 to 20 mA Output Model No.	Two 4 to 20 mA Output Model No.	Two 0 to 5V Output Model No.	Connection	Maximum Flow
FMA-2601A	FMA-2601A-I	FMA-2601A-I2	FMA-2601A-V2	10 - 32 thread	0.5 SCCM
FMA-2602A	FMA-2602A-I	FMA-2602A-I2	FMA-2602A-V2	10 - 32 thread	1 SCCM
FMA-2614A	FMA-2614A-I	FMA-2614A-I2	FMA-2614A-V2	10 - 32 thread	2 SCCM
FMA-2615A	FMA-2615A-I	FMA-2615A-I2	FMA-2615A-V2	10 - 32 thread	5 SCCM
FMA-2603A	FMA-2603A-I	FMA-2603A-I2	FMA-2603A-V2	10 - 32 thread	10 SCCM
FMA-2616A	FMA-2616A-I	FMA-2616A-I2	FMA-2616A-V2	10 - 32 thread	20 SCCM
FMA-2604A	FMA-2604A-I	FMA-2604A-I2	FMA-2604A-V2	10 - 32 thread	50 SCCM
FMA-2617A	FMA-2617A-I	FMA-2617A-I2	FMA-2617A-V2	1/8 FNPT	100 SCCM
FMA-2618A	FMA-2618A-I	FMA-2618A-I2	FMA-2618A-V2	1/8 FNPT	200 SCCM
FMA-2619A	FMA-2619A-I	FMA-2619A-I2	FMA-2619A-V2	1/8 FNPT	500 SCCM
FMA-2620A	FMA-2620A-I	FMA-2620A-I2	FMA-2620A-V2	1/8 FNPT	1 SLM
FMA-2605A	FMA-2605A-I	FMA-2605A-I2	FMA-2605A-V2	1/8 FNPT	2 SLM
FMA-2606A	FMA-2606A-I	FMA-2606A-I2	FMA-2606A-V2	1/8 FNPT	5 SLM
FMA-2607A	FMA-2607A-I	FMA-2607A-I2	FMA-2607A-V2	1/8 FNPT	10 SLM
FMA-2608A	FMA-2608A-I	FMA-2608A-I2	FMA-2608A-V2	1/8 FNPT	20 SLM
FMA-2609A	FMA-2609A-I	FMA-2609A-I2	FMA-2609A-V2	1/4 FNPT	50 SLM
FMA-2610A	FMA-2610A-I	FMA-2610A-I2	FMA-2610A-V2	1/4 FNPT	100 SLM
FMA-2611A	FMA-2611A-I	FMA-2611A-I2	FMA-2611A-V2	1/2 FNPT	250 SLM
FMA-2612A	FMA-2612A-I	FMA-2612A-I2	FMA-2612A-V2	3/4 FNPT	500 SLM
FMA-2613A	FMA-2613A-I	FMA-2613A-I2	FMA-2613A-V2	3/4 FNPT	1000 SLM
FMA-2621A	FMA-2621A-I	FMA-2621A-I2	FMA-2621A-V2	3/4 FNPT	1500 SLM
FMA-2622A	FMA-2622A-I	FMA-2622A-I2	FMA-2622A-V2	3/4 FNPT	2000 SLM
FMA-2623A	FMA-2623A-I	FMA-2623A-I2	FMA-2623-V2	1 1/4 FNPT	3000 SLM

### Accessories for FMA-2600A Series

Model No.	Description
FMA1600-C1	Replacement 8-pin male mini DIN connector cable, single ended, 1.83 m (6')
FMA1600-C1-25FT	8-pin male mini DIN connector cable, single ended, 7.62 m (25')
FMA1600-C2	8-pin male mini DIN connector cable, double ended, 1.83 m (6')
FMA1600-C2-25FT	8-pin male mini DIN connector cable, double ended, 7.62 m (25')
FMA1600-C3	8-pin male mini DIN to DB9 female adaptor, 1.83 m (6')
FMA1600-CRA	8-pin male right-angle mini DIN cable, single ended, 1.83 m (6')
FMA1600-MDB	Multi-drop box
FMA1600-PSU	Universal 100 to 240 Vac to 24 Vdc power supply adaptor

Comes complete with 24 Vdc universal power supply, 1.8m (6') cable, 8-pin male mini-DIN connector, operator's manual, and NIST certificate  
 Standard units are calibrated to air @ 5 psig for 0 to 1 LPM, 15 psig for 2 to 10 LPM, 30 psig for 20 to 100 LPM, and 50 psig for 200 LPM  
 and greater.

For custom calibrations, add "-(\*)" to the model number, no additional cost. \* Specify gas, and inlet/outlet or backpressure for custom calibrations  
 Calibrations done at ambient 25°C (77°F) temperature only.

To replace the standard RS232 communications with RS485, add suffix "-RS485" to the model number, for additional cost.

Standard input is 0 to 5 V, for optional 4 to 20 mA input add suffix "-IN" to the model number, no additional cost.

Standard output is scaled to the mass flow rate. For volumetric flow rate as standard output add suffix "-VOL" to the model number, no additional  
 cost. For "-VOL" controllers the control loop is set to volumetric as standard.

Standard output is 0 to 5 V, for optional 4 to 20 mA output, add suffix, "-I" to model number, for additional cost.

For two 4 to 20 mA output, add suffix "-I2" to model number, for additional cost.

For two 0 to 5 V output, add suffix "V2" to model number, for additional cost.

\*\* Optional secondary output are scaled the same as the primary output scale. For an alternate output scale add suffix "-T" to the model number for  
 temperature or "-P" for pressure, no additional cost.

For an integrated positive shut-off valve, add suffix "-P" to the model number, for additional cost. Models with the positive shut off valve have 1/4"  
 welded male VCR fittings. Available on models up to 20 SLM.

For units scaled in SCFH, add suffix "-SCFH" to model number. Please specify the desired range in SCFH, no additional cost.

For totalizer option, add suffix "-TOT" to the model number, for additional cost. Please specify resolution.

This is a 6-digit counter. Examples: For totalizing in liters with 1/100 liter resolution, the max count would be 9999.99. For totalizing in liters with  
 1 liter resolution, the max count would be 999999.