MASS AND VOLUMETRIC GAS FLOW METERS

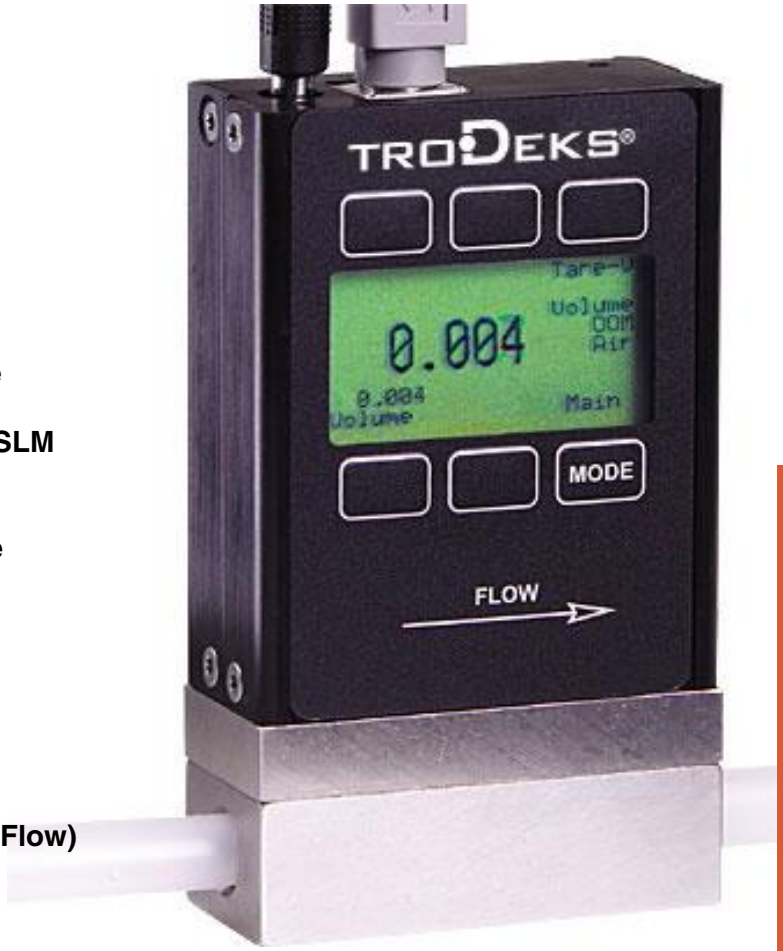
For Clean Gases

TRODEKS®

FMA-1600A Series

1 YEAR WARRANTY · NIST · CE · RoHS

- Up to 18 Hour Battery Charge on Portable "-B" Models
- Ranges of 0 to 0.5 SCCM Up to 0 to 3000 SLM
- Reports Mass Flow, Volumetric Flow, Temperature, and Pressure
- <10 ms Response Time—Field Adjustable
- 130+ Gas Calibrations Including Pure and Mixed Gases
- Pressure, Temperature and Volumetric or Mass Flow Simultaneously Displayed
- NIST 5-Point Certificate Included
- No Straight Runs of Pipe Required
- No Warm-Up Time
- Turndown Ratio of 200:1 (0.5% Maximum Flow)
- RS232 Standard
- Custom Live Gas Blend Programming
- Store Up to 20 User Defined Gas Blends



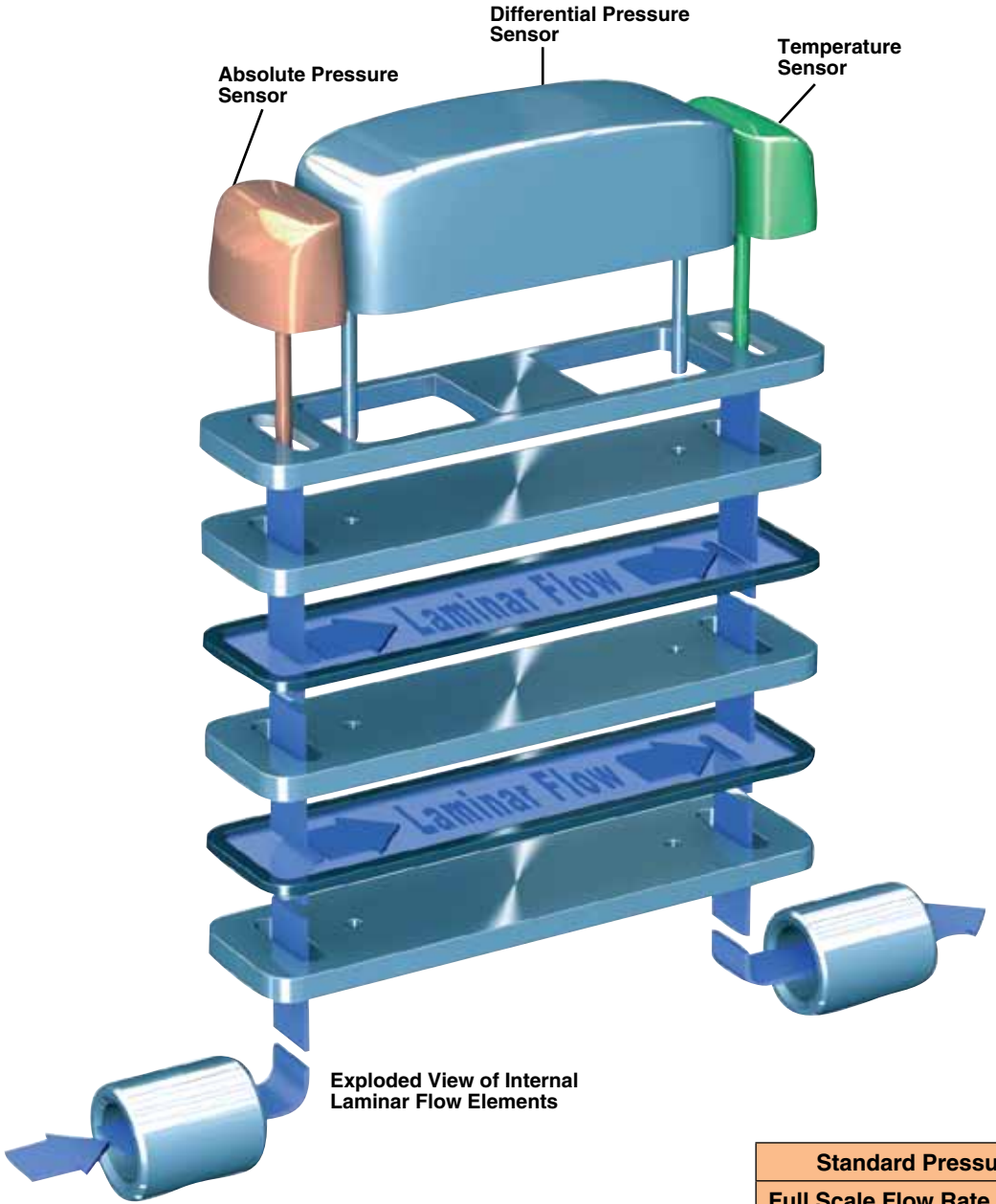
FMA-1603A includes 110 Vac power supply and a 1.8 m (6') cable 8-pin mini DIN connector, shown actual size.

The FMA-1600A Series mass and volumetric flow meters use the principle of differential pressure within a laminar flow field to determine the 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). Standard units include a 0 to 5V output (4 to 20 mA optional) and RS232 communications. The gas select feature 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 38 m (125'). These flow meters are available in a portable version ("-B" option), the battery charge will last up to 18 hours.

SPECIFICATIONS

Accuracy: ±(0.8% of rdg + 0.2% FS)
Repeatability: ±0.2%
Turndown Ratio: 200:1
Response Time: 10 ms typical default response time for 63.2% of a step change. A variable register allows response time to be field adjustable to a certain extent via RS232 communications. The primary trade-off for response time is signal noise
Output: 0 to 5 Vdc standard
Operating Temperature: -10 to 50°C (14 to 122°F)
Zero Shift: 0.02% FS/°C/atm
Span Shift: 0.02% FS/°C/atm
Humidity Range: 0 to 100% non-condensing
Pressure (Maximum): 145 psig
Measurable Flow Rate: 125% FS
Supply Voltage: 7 to 30 Vdc (15 to 30 Vdc for 4 to 20 mA output)
Supply Current: 35 mA typical current draw; 100 mA available supply recommended
Cable Connection: 8-pin mini DIN
Wetted Parts: 302 and 303 SS, FKM, heat cured silicone RTV, glass reinforced PPS, heat cured epoxy, aluminum, gold, brass, 430 FR stainless (416 stainless steel on large sizes), silicon, glass

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



Exploded View of Internal Laminar Flow Elements

Flow Range	Height	Length	Depth	Port Size
0.5 to 50 SCCM	98.98 (3.897)	60.33 (2.375)	26.67 (1.05)	10-32 UNF
100 to 500 SCCM and 1 to 20 SLM	103.30 (4.067)	60.33 (2.375)	26.67 (1.05)	⅛ FNPT
50 and 100 SLM	110.92 (4.367)	101.60 (4.0)	40.64 (1.6)	¼ FNPT
250 SLM	126.16 (4.967)	101.60 (4.0)	40.64 (1.6)	½ FNPT
500 to 1500 SLM	126.16 (4.967)	101.60 (4.0)	40.64 (1.6)	¾ FNPT

Standard Pressure Drops†	
Full Scale Flow Rate	**psid**
0.5 to 50 SCCM	1
100 SCCM to 10 SLM	1
20 SLM	1
50 SLM	2
100 SLM	2.5
250 SLM	4.0
500 SLM	5.5
1000 SLM	6.0
1500 SLM	9.0

† Venting to atmosphere.

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-1601A	**FMA-1601A-I**	**FMA-1601A-I2**	**FMA-1601A-V2**	10 to 32 thread	0.5 SCCM
FMA-1602A	**FMA-1602A-I**	**FMA-1602A-I2**	**FMA-1602A-V2**	10 to 32 thread	1 SCCM
FMA-1614A	**FMA-1614A-I**	**FMA-1614A-I2**	**FMA-1614A-V2**	10 to 32 thread	2 SCCM
FMA-1615A	**FMA-1615A-I**	**FMA-1615A-I2**	**FMA-1615A-V2**	10 to 32 thread	5 SCCM
FMA-1603A	**FMA-1603A-I**	**FMA-1603A-I2**	**FMA-1603A-V2**	10 to 32 thread	10 SCCM
FMA-1616A	**FMA-1616A-I**	**FMA-1616A-I2**	**FMA-1616A-V2**	10 to 32 thread	20 SCCM
FMA-1604A	**FMA-1604A-I**	**FMA-1604A-I2**	**FMA-1604A-V2**	10 to 32 thread	50 SCCM
FMA-1617A	**FMA-1617A-I**	**FMA-1617A-I2**	**FMA-1617A-V2**	⅛ FNPT	100 SCCM
FMA-1618A	**FMA-1618A-I**	**FMA-1618A-I2**	**FMA-1618A-V2**	⅛ FNPT	200 SCCM
FMA-1619A	**FMA-1619A-I**	**FMA-1619A-I2**	**FMA-1619A-V2**	⅛ FNPT	500 SCCM
FMA-1620A	**FMA-1620A-I**	**FMA-1620A-I2**	**FMA-1620A-V2**	⅛ FNPT	1 SLM
FMA-1605A	**FMA-1605A-I**	**FMA-1605A-I2**	**FMA-1605A-V2**	⅛ FNPT	2 SLM
FMA-1606A	**FMA-1606A-I**	**FMA-1606A-I2**	**FMA-1606A-V2**	⅛ FNPT	5 SLM
FMA-1607A	**FMA-1607A-I**	**FMA-1607A-I2**	**FMA-1607A-V2**	⅛ FNPT	10 SLM
FMA-1608A	**FMA-1608A-I**	**FMA-1608A-I2**	**FMA-1608A-V2**	⅛ FNPT	20 SLM
FMA-1609A	**FMA-1609A-I**	**FMA-1609A-I2**	**FMA-1609A-V2**	¼ FNPT	50 SLM
FMA-1610A	**FMA-1610A-I**	**FMA-1610A-I2**	**FMA-1610A-V2**	¼ FNPT	100 SLM
FMA-1611A	**FMA-1611A-I**	**FMA-1611A-I2**	**FMA-1611A-V2**	½ FNPT	250 SLM
FMA-1612A	**FMA-1612A-I**	**FMA-1612A-I2**	**FMA-1612A-V2**	¾ FNPT	500 SLM
FMA-1613A	**FMA-1613A-I**	**FMA-1613A-I2**	**FMA-1613A-V2**	¾ FNPT	1000 SLM
FMA-1621A	**FMA-1621A-I**	**FMA-1621A-I2**	**FMA-1621A-V2**	¾ FNPT	1500 SLM
FMA-1622A	**FMA-1622A-I**	**FMA-1622A-I2**	**FMA-1622A-V2**	¾ FNPT	2000 SLM
FMA-1623A	**FMA-1623A-I**	**FMA-1623A-I2**	**FMA-1623A-V2**	1¼ FNPT	3000 SLM

D

Accessories

Model No.	Description
FMA1600-C1	Replacement 8-pin male mini DIN connector cable, single ended, 1.8 m (6')
FMA1600-C1-25 FT	8-pin male mini DIN connector cable, single ended, 7.6 m (25')
FMA1600-C2	8-pin male mini DIN connector cable, double ended, 1.8 m (6')
FMA1600-C2-25FT	8-pin male mini DIN connector cable, double ended, 7.6 m (25')
FMA1600-C3	8-pin male mini DIN to DB9 female adaptor, 1.8 m (6')
FMA1600-CRA	8-pin male right-angle mini DIN cable, single ended, 1.8 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, 1.8 m (6') cable, 8-pin male Mini-DIN connector, operator's manual, and NIST certificate.

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.

Calibrations done at ambient 25ºC (77ºF) 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 5V, 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.

*Standard output is 0 to 5V, 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 5V 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 a portable version of the meter add suffix **"-B"** to the model number; for additional cost. Portable versions have an integral battery on the meter and come with one 9V battery installed. Option not available on "-I" or "I2" models where 4 to 20 mA is the chosen output.*

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

*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.

***Ordering Examples: FMA-1601A,** 0.5 SCCM mass flow meter.*

***FVL-1619A-VOL,** 500 SCCM volumetric flow meter.*