

# UNIVERSAL® Flow Monitors

## FlowStream® Mass Flowmeters for Gases

### TYPICAL APPLICATIONS

- Blanketing
- Sparging/Purging Gases
- Burner Management
- Assist Gases
- Leak Tests
- Injectable Gases
- Shielding Gas
- Gas Consumption
- Gas Blending
- Gas Chromatography

## Features

### Meter types

- Output options: current, voltage, frequency, and scaled pulse
- Battery operated
- Bi-directional
- Programmable set points
- Open collector outputs
- Intrinsically safe for hazardous location use - CSA

### Selectable options for installed units

- Gas measured (for Multigas units)
- Response time (5 or 50 ms)
- Open collector set point flow rates
- Range of electrical output
- Visual readout of flow rate or total, pressure and temperature

# FlowStream®



## General Description

Laminar Flow Element differential pressure flowmeters are good for clean, dry, non-corrosive, non-condensing gasses. Corrected for temperature and pressure, it has a mass flow output. The EMI immunity and fast response (5 ms available) make the meters suitable for robotics' applications (painting or welding). A variety of outputs are available (4-20 mA, 0-5 V, and pulse). CE rated for 4-20 mA output, non-hazardous use only. NIST traceable and CSA units are Type 4 weatherproof. The accuracy is a uniform 1% of full scale subject to limitations described in the Specifications section.

Units with a display can indicate flow rate or total as well as gas temperature and pressure.

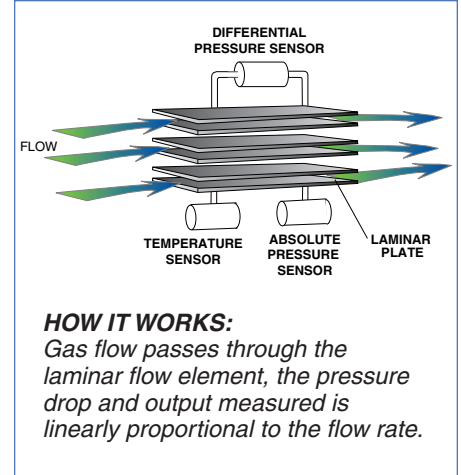
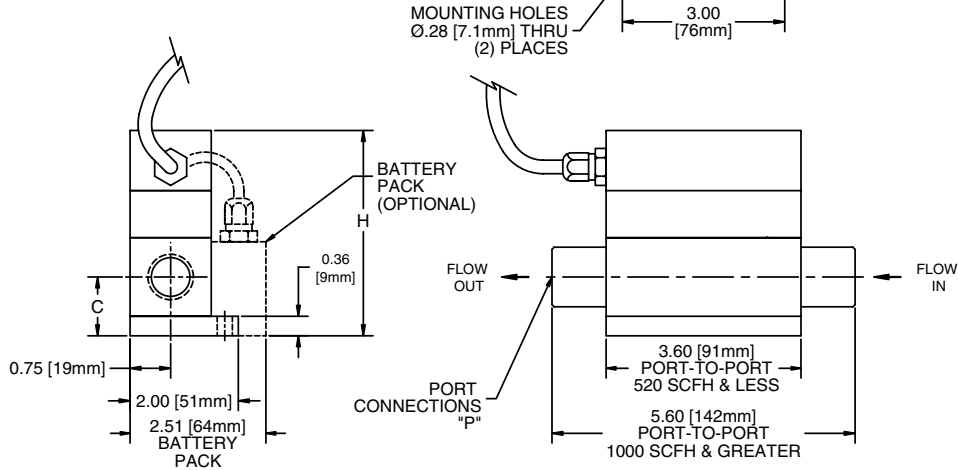
Multi-gas calibration is an option wherein the commonly used gasses like Air, Argon, Helium, Methane (natural gas), Carbon Dioxide, Nitrogen, Oxygen and Hydrogen are all selectable from a menu on the flowmeter. Battery operated units are offered. Calibration for specific pressures to maximize accuracy is available up to 100 PSIA. Calibration is done on air with empirically derived conversion factors although calibration on actual gasses is available for certification requiring it. Oxygen cleaning optional.

Sizes range from 1/4 to 3/4 inch NPT. Anodized aluminum is the standard material for the meter body and 316 Stainless Steel is available for use where external corrosion is a factor.

# Dimensions of OFS/OFM Series

Approximate in inches (mm)

Flow Rate Maximum	"H" Height Overall	"C" Height to Port	"P" Port Connections
120 SCFH	2.34" [59mm]	0.68" [17mm]	1/4-18 NPT
280 SCFH	2.59" [66mm]	0.93" [24mm]	1/4-18 NPT
520 SCFH	2.98" [76mm]	0.55" [14mm]	3/8-18 NPT
1000 SCFH	3.79" [96mm]	1.09" [28mm]	1/2-14 NPT
1000 SLPM	4.63" [118mm]	1.51" [38mm]	3/4-14 NPT



## General Instrument Specifications

<b>Flow Ranges:</b>	500 SCCM full scale to 1,000 SLPM full scale, 1 SCFH full scale to 2,100 SCFH full scale
<b>Turndown Ratio:</b>	100:1
<b>Maximum Operating Pressure:</b>	100 PSIG
<b>Burst Pressure:</b>	200 PSIG
<b>Pressure Effect on Accuracy:</b>	Less than 0.03% full scale / PSI (See <b>Note 1</b> )
<b>Maximum Operating Temperature:</b>	176 °F (80 °C)
<b>Minimum Operating Temperature:</b>	-13 °F (-25 °C)
<b>Temperature Effect on Accuracy:</b>	Less than 0.03% full scale / °F
<b>Maximum Pressure Drop:</b>	<b>Normal 2 PSI, Max 3.5 PSI</b> (Individually listed under Multigas Flow Selection chart by port size and flow rate)
<b>Process Connections:</b>	1/4"-3/8"-1/2"-3/4" Available in NPT, BSPT, BSPP and SAE
<b>Wetted Parts</b>	
<b>Sensors:</b>	Glass-filled nylon, alumina-based ceramic, silicon, gold, epoxy
<b>Flow Body Internals:</b>	Anodized aluminum or 300 series stainless steel, viton or buna n seals
<b>Enclosure Rating:</b>	Type 4
<b>Display:</b>	4-digit LCD digital display, 0.35" high
<b>Approvals:</b>	CE, CSA, Intrinsic Safety (all classes and divisions) with proper zener barrier. (CE rated for 4-20 mA output, non-hazardous use only)

**Note 1:** Most of the error at high pressures is due to sensor offset shifts. Accuracy can be improved by re-zeroing the meter at operating pressure or calibrating at the specific pressure.

## Electrical Specifications

<b>Accuracy (Including Linearity and Repeatability)</b>	
<b>Flow:</b>	± 1% of full-scale for flowmeters sized from 15-566 SLPM (31-1200 SCFH) of Air ± 2% of full-scale for flowmeters sized for lower than 15 SLPM (30 SCFH) of Air ± 2% of full-scale for flowmeters sized for higher than 566 SLPM (1201 SCFH) of Air
<b>Pressure:</b>	± 1 PSI (See <b>Note 2</b> )
<b>Temperature:</b>	± 3 °F
<b>Totalizer:</b>	± 0.25% of full-scale (in addition to flow accuracy)
<b>Output Signal</b>	
<b>Analog:</b>	4-20 mA (2-wire loop powered) 0-5 V, 0-10 V, 1-5 V, 2-10 V 0-5 V Bi-directional (2.5 V = 0 flow)
<b>Frequency:</b>	0-1000 Hz, 200-1200 Hz 0-3V signal amplitude
<b>Pulse:</b>	1,250-5,000 pulses/minute, user selectable 0-3V pulse amplitude 2 msec pulse width
<b>Response Time:</b>	user selectable 5 msec or 50 msec (to 63% of step change) for analog outputs, 50 msec (to 63% of step change) for frequency and pulse outputs
<b>Alarms:</b>	2 independent open-collector outputs (high/low flow rate) with corresponding LEDs Open-Collector Rating 30VDC at 50 mA
<b>Electrical Connection:</b>	4- or 7-conductor shielded cable with pigtail
<b>Supply Voltage:</b>	10-30 VDC is standard 12-24 VDC for Intrinsically Safe 7.2-9 VDC for battery-operated units (See <b>Note 3</b> )
<b>Supply Current:</b>	22 mA @ F.S. flow (includes over-range) for 4-20 mA loop-powered transmitters 5 mA for voltage, frequency, and pulse outputs 3.5 mA for battery-operated units (See <b>Note 3</b> )

**Note 2:** Pressure, temperature, and totalizer are only displayed on the LCD. No output signal is available for these parameters.

**Note 3:** Battery-operated units require a standard 9V alkaline battery and will operate for over 100 hours continuously. An On/Off switch allows the user to turn the power off, thus conserving the battery life. These flowmeters have no output signal.

# How To Order Flowstream for a Single Gas

Select the appropriate symbols to build a model code:

**Example:** OFS - E F - 3 A 200 SLPM - T - X 1B - D10 - R

**SERIES** = OFS

**MATERIAL FOR METER BODY**

Anodized Aluminum = E  
316 Stainless Steel = I

**SEALS**

Viton = F  
Buna N = B

**THREAD TYPE FOR THREADED PORT**

N = NPT  
T = SAE  
B = BSPT  
P = BSPP

GAS												
Air	Acetylene	Argon	CO	CO2	Helium	Hydrogen	MAPP GAS	Methane	Nitrogen	Nitrous Oxide	Oxygen	
= A	= AC	= R	= CO	= CO2	= HE	= H	= MG	= M	= N	= NO	= O2	

**PIPE SIZE in Inches**

1/4 = 2	
3/8 = 3	
1/2 = 4	
3/4 = 6	

**MAXIMUM FLOW IN SLPM**

	128	256	107	128	64	116	256	256	107	128	160	116
	*228	457	190	228	114	208	457	457	190	228	286	208
	548	1096	457	548	274	498	1096	1096	457	548	685	498
	1000	1999	833	1000	500	909	1999	1999	833	1000	1250	909

**MAXIMUM FLOW IN SCFH**

	280	560	233	280	140	255	560	560	233	280	350	255
	500	1000	417	500	250	455	1000	1000	417	500	625	455
	1200	2400	1000	1200	600	1091	2400	2400	1000	1200	1500	1091
	2188	4377	1824	2188	1094	1989	4377	4377	1824	2188	2736	1989

NOTE: Lowest maximum flow rates are 50 SCCM and 1 SCFH respectively.

\* NOTE: The flows selected in each size must be less than or equal to the maximum.

**OUTPUT**

**Digital Visual Display with Output**

- X 1A = 4-20mA
- X 1B = 4-20mA with 2 alarms
- X 2A = 4-20mA Intrinsically Safe
- X 4A = 0-5 VDC
- X 4B = 0-5 VDC with 2 alarms
- X 5A = 0-10 VDC
- X 5B = 0-10 VDC with 2 alarms
- X 12A = 1-5 VDC
- X 12B = 1-5 VDC with 2 alarms
- X 14A = 2-10 VDC
- X 14B = 2-10 VDC with 2 alarms
- X 19A = 0-1000 HZ
- X 20A = 200-1200 HZ
- X 22A = pulse out (rate varies with size)
- X 30A = 0-5 VDC (bi-directional flow)
- X 40A = visual readout only (battery powered)

**No Visual Display with Output**

- Z 1A = 4-20mA
- Z 2A = 4-20mA Intrinsically Safe
- Z 4A = 0-5 VDC
- Z 5A = 0-10 VDC
- Z 12A = 1-5 VDC
- Z 14A = 2-10 VDC
- Z 19A = 0-1000 HZ
- Z 20A = 200-1200 HZ
- Z 22A = pulse out (rate varies with size)
- Z 30A = 0-5 VDC (bi-directional flow)

**CABLE LENGTH**

- 3 feet standard = D3
- Specify required cable length in feet = D
- No cable (battery powered) = B

**SPECIAL OPTIONS**

**CLEAN FOR OXYGEN SERVICE** = C1

**CALIBRATE ON ACTUAL GAS**

- Argon = R
- Nitrogen = N
- Helium = HE
- Carbon Dioxide = CO2

NOTE: Consult factory for other gasses and mixes

**CALIBRATE AT SPECIFIC PRESSURE IN PSIA**

NOTE: Select any specific pressure between 10 and 100 PSIA

- EX: Optimize for 10 PSIA pressure = P10
- Optimize for 45 PSIA pressure = P45

**VACUUM USE (7.35 to 14.7PSIA)** = ZVAC

NOTE: Also good for use at normal pressures

# How To Order Flowstream Multigas Series

Select the appropriate symbols to build a model code:

Example: **OFM - E F - 3 H 51 - T - X 1B - D10 - R**

**SERIES** = **OFM**

**MATERIAL FOR METER BODY**  
 Anodized Aluminum = **E**  
 316 Stainless Steel = **I**

**SEALS**  
 Viton = **F**  
 Buna N = **B**

## MULTIGAS FLOW SELECTION CHART

SCFH (Air)						
Line Size In Inches	Pipe Size Symbol	Nominal Size	SCFH	Max Pressure Drop PSI		
1/4	2	H 20	1	2		
	2	H 40	4	2		
	2	H 41	25	2		
	2	H 42	50	2		
	2	H 43	75	2		
	2	H 44	100	2		
	2	H 45	175	2		
3/8	3	H 49	300	2		
	3	H 50	400	2		
	3	H 51	450	2		
1/2	3	H 52	500	2		
	4	H 55	500	2		
	4	H 56	600	2		
	4	H 57	700	2		
	4	H 58	800	2		
	4	H 59	900	2		
	4	H 60	325	2		
	4	H 61	350	2		
	4	H 63	375	2		
	4	H 64	1000	2		
	4	H 65	1100	2		
	4	H 66	1200	2		
	3/4	6	H 67	1000	1.4	
		6	H 68	1300	1.8	
6		H 69	1350	1.7		
6		H 70	1400	2.1		
6		H 71	1500	2.4		
6		H 72	1550	3		
6		H 73	1600	2.5		
6		H 75	1650	3		
6		H 76	1700	2.7		
6		H 78	1800	2.9		
6		H 79	1900	3.1		
6		H 80	2000	3.3		

SLPM (Air)						
Line Size In Inches	Pipe Size Symbol	Nominal Size	SCCM	Max Pressure Drop PSI		
1/4	2	C 30	500	2		
			SLPM			
	2	P 50	2	2		
	2	P 51	10	2		
	2	P 52	25	2		
	2	P 53	50	2		
	2	P 54	75	2		
	2	P 56	100	2		
	3/8	3	P 59	150	2	
		3	P 60	200	2	
4		P 67	200	2		
1/2	4	P 68	250	2		
	4	P 69	300	2		
	4	P 70	350	2		
	4	P 71	400	2		
	4	P 72	450	2		
	4	P 74	500	2		
	4	P 75	550	2		
	3/4	6	P 76	500	1.4	
6		P 77	600	1.8		
6		P 79	700	2.4		
6		P 80	800	2.7		
6		P 81	900	3.1		
6		P 82	1000	3.5		

**THREAD TYPE FOR THREADED PORT**

**N** = NPT  
**T** = SAE  
**B** = BSPT  
**P** = BSPP

**DIGITAL VISUAL DISPLAY WITH OUTPUT**

**X1A** = 4-20mA  
**X1B** = 4-20mA with 2 alarms  
**X2A** = 4-20mA IS  
**X4A** = 0-5 VDC  
**X4B** = 0-5 VDC with 2 alarms  
**X5A** = 0-10 VDC  
**X5B** = 0-10 VDC with 2 alarms  
**X12A** = 1-5 VDC  
**X12B** = 1-5 VDC with 2 alarms  
**X14A** = 2-10 VDC  
**X14B** = 2-10 VDC with 2 alarms  
**X19A** = 0-1000 HZ  
**X20A** = 200-1200 HZ  
**X22A** = pulse out (rate varies with size)  
**X30A** = 0-5 VDC (bi-directional flow)  
**X40A** = visual readout only battery powered

**CABLE LENGTH**

3 feet standard = **D3**  
 Specify required cable length in feet = **D**  
 No cable (battery powered) = **B**

**SPECIAL OPTIONS**

**CLEAN FOR OXYGEN SERVICE** = **C1**  
**CALIBRATE ON ACTUAL GAS**  
 Argon = **R**  
 Nitrogen = **N**  
 Helium = **HE**  
 Carbon Dioxide = **CO2**  
*NOTE: Consult foactory for other gasses and mixes*  
**CALIBRATE AT SPECIFIC PRESSURE IN PSIA**  
*NOTE: Select any specific pressure between 10 and 100 PSIA*  
 EX: Optimize for 10 PSIA pressure = **P10**  
 Optimize for 45 PSIA pressure = **P45**  
**VACUUM USE (7.35 to 14.7PSIA)** = **ZVAC**  
*NOTE: Also good for use at normal pressures*

**GAS SIZING FACTORS**

Gas Number	Gas	Multiplier	Accuracy Degredation (+/-)
1	Air	1.00	0.0%
2	Argon	0.82	0.2%
3	CO2	0.61	1.0%
4	Helium	0.92	1.0%
5	Hydrogen	2.05	0.0%
6	Methane	1.65	0.5%
7	Nitrogen	1.03	0.0%
8	Oxygen	0.90	0.5%

*For example, selection of a nominal flow size 3M15 would read to a maximum of 300 SCFH of air and would also read to 247 SCFH Argon with additional inaccuracy or .2%*  
*NOTE: These multipliers are to help size and choose the appropriate flow meter. Each gas is displayed directly on the flow meter.*