

HOW THEY WORK:

1. First, the turbulent gas flow enters a unique internal restriction known as a Laminar Flow Element (LFE). The LFE forces the gas molecules to move in parallel paths along the entire length of the passage. This creates streamline flow, or laminar flow, for the entire range of operation of the device.
2. Now we measure the differential pressure drop within the laminar region and apply the Poiseuille Equation, which quantifies the linear relationship between pressure drop and flow. This provides us with a volumetric flow rate.
3. Then we measure gas temperature and pressure to determine density effects per Ideal Gas Laws.
4. Finally, the microprocessor corrects the volumetric flow rate to a standard pressure and temperature (STP) with density change compensations to provide a mass flow rate. This technique creates a unique **Internally Compensated Laminar** flow device.

ICL Technology means no Warm-up Delays!

COMMON APPLICATIONS

Leak Testing

Bioreactor Outgassing

Nitrogen Blanketing

Quality Control Testing

Environmental Analysis

Membrane Filter Testing

Air Sampling

Sputtering

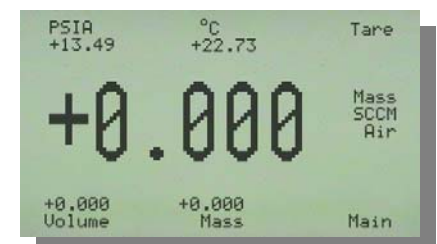
Purge and Trap

Standard Features Add Versatility and Value

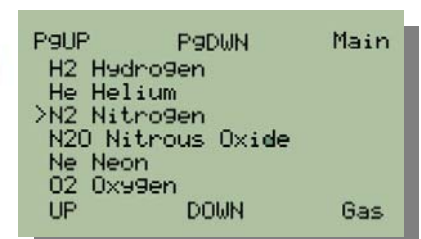
- ◆ Display of Mass Flow, Volumetric Flow, Pressure & Temperature
- ◆ Local LCD
- ◆ RS-232 Input/Output & Analog Input/Output
- ◆ Multiple drop capable RS-232
- ◆ Field Tunable for Application Specific Response
- ◆ Field Selectable to Control Pressure while Measuring Flow (MC, MCR series only)
- ◆ **16 Gas Select Calibration:**
Air, Argon, Methane (CH₄), Carbon Monoxide, Carbon Dioxide, Ethane, Hydrogen, Helium, Nitrogen, Nitrous Oxide, Neon, Oxygen, Propane, Butane, Acetylene, Ethylene.



20SLPM FS Mass Flow Meter (shown with opt. fittings)



M Series Main Mode Display



M, MC & MCR Gas Select (Scroll display for all gases)

NO STRAIGHT RUNS OF PIPE REQUIRED!

Alicat Meters are not affected by changes in process temperature or pressure, and can measure as low as 0.5SCCM full scale.

Communication for Gas Meters and Gas Controllers

All units are provided with a local display, RS-232 serial Input/Output and an analog signal. No special software is required for the RS-232 serial, only a device utilizing a terminal program such Hyper-Terminal® found in all Windows® operating systems. Our optional FlowVision™ software offers a simple Graphical User Interface option. All communication options are through the 8-pin electrical connector on top of the unit.

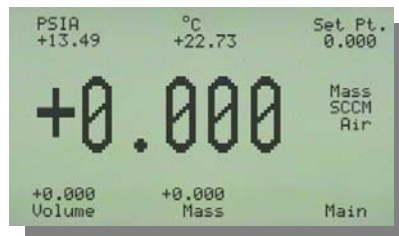
Multi-Drop Capable
Up to 26 units addressable,
mix & match meters, controllers
and pressure units!



100SLPM FS Mass Flow Controller

Stand Alone Control

Provide a Setpoint via
Local Display or RS-232,
unplug communication &
walk away!



MC & MCR Main Mode Display

Alicat Mass Gas Flow Controllers utilize a proportional control valve coupled to an Alicat flow meter. Integrated PID controller software positions the valve to match the flow to the setpoint. The PID algorithms may be field tuned for application specific response. Standard configuration places the valve upstream but downstream configuration is available for vacuum applications at no charge.

Valves are normally closed, alternate settings available.

Controllers feature an independent 5.12Vdc output pin that can be used in conjunction with a potentiometer to provide the control setpoint. (If an optional secondary output is ordered it will utilize this pin.)

Controllers and Meters:

Read mass flow, volumetric flow, pressure, temperature and gas selection via the Main Mode Display or RS-232 serial.

Standard 0-5Vdc output is mass flow rate. 0-10Vdc or 4-20mA is available. Also secondary analog outputs of pressure, temperature volumetric or mass flow.

All meters have a remote tare (ground to tare) and push button tare.

Controllers:

Provide and read
setpoint and auto-tare
via RS-232, Analog
Input or Local Display
Screen.

Select	LOOP	Input
>P 400	>Mass	Analog
D 5000	Volume	Serial
AUTOoff	Press	>Local
Set 0.000		
	UP	DOWN
		Control Setup

MC & MCR Control Setup

Customization Options Reduce Engineering Time

- ◆ Alternate STPs
- ◆ Lower pressure drops
- ◆ Multiple 0-10Vdc or 4-20mA outputs
- ◆ Gas blend calibrations
- ◆ Integrated Totalizer
- ◆ Alternate Units (SCFM, nm³/h)
- ◆ Locking electrical connection
- ◆ No display units for OEM
- ◆ Downstream valve for vacuum applications (MC & MCR only)
- ◆ Battery pack for portable operation (M series only)
- ◆ High Accuracy Calibration
- ◆ VCR, Swagelok®, SAE, BSPP etc.

The following specifications are for the standard configuration of Alicat M Series flow meters and MC and MCR Series flow controllers as shipped from the factory. Please contact us or visit www.alicatscientific.com for customization details, mechanical drawings, application notes, etc.

Basic Specification	Meters	Controllers	Description
Accuracy	± 0.8% of Reading	±0.2% of Full Scale	At calibration conditions after tare
High Accuracy Option	± 0.4% of Reading	±0.2% of Full Scale	At calibration conditions after tare
Repeatability	± 0.2%		Full Scale
Operating Range	1% to 100% Full Scale		Measure and Control
Typical Response Time	10	100	Milliseconds (Adjustable)
Standard Conditions (STP)	25° C & 14.696PSIA		Mass Reference Conditions
Operating Temperature	-10 to + 50		° Celsius
Zero Shift	0.02%		Full Scale / ° Celsius / Atm
Span Shift	0.02%		Full Scale / ° Celsius / Atm
Humidity Range	0 to 100%		Non – Condensing
Excess Measurable Flow Rate	28 %		Full Scale
Maximum Pressure	125		PSIG
Input /Output Signal Standard	RS-232 Serial & 0-5Vdc		
Input / Output Secondary	0-5 Vdc; 0-10Vdc;4-20mA		Pressure, Temperature or Flow
Electrical Connections	8 Pin		Mini Din
Sensitivity to Mounting Attitude	0%		Tare after installation required
Warm-up Time	< 1		Second
Wetted Materials	303 & 302 Stainless Steel, Viton®, Silicone RTV (Rubber), Glass Reinforced Nylon, Aluminum. Controllers ≤20SLPM Add: Brass, 410 Stainless Steel. Controllers >20SLPM Add: 410 & 416 Stainless Steel and Nickel		

Mechanical Dimensions	Mechanical Connections ¹	Meters	Controllers
≤50SCCM	10-32 UNF (European M-5)	3.9"H x 2.4"W x 1.1"D	3.9"H x 3.5"W x 1.1"D
50SCCM ≤20SLPM	1/8" NPT Female	4.2"H x 2.4"W x 1.1"D	4.2"H x 3.6"W x 1.1"D
20SLPM ≤ 100SLPM	1/4" NPT Female	4.4"H x 4.0"W x 1.6"D	4.7"H x 6.9"W x 2.3"D
100SLPM ≤ 250SLPM	1/2" NPT Female	5.0"H x 4.0"W x 1.6"D	5.0"H x 6.9"W x 2.3"D
250SLPM ≤ 1500SLPM	3/4" NPT Female	5.0"H x 4.0"W x 1.6"D	5.6"H x 7.4"W x 2.3"D

1) VCR, SAE with O-ring face seals, BSPP, etc. also available

Power Specifications	Meters (unregulated)	Controllers (unregulated)
≤20SLPM	7 ² to 30 Vdc and 0.035 Amp	12 ² to 18 Vdc and 0.250 Amp
20SLPM ≤1500SLPM	7 ² to 30 Vdc and 0.035 Amp	24 to 30 Vdc and 1 Amp

2) 15 Volts minimum required for 4-20mA output

Standard Full Scale Flow Ranges ³		
0.5SCCM	100SCCM	50SLPM
1SCCM	500SCCM	100SLPM
2SCCM	1SLPM	250SLPM
5SCCM	2SLPM	500SLPM
10SCCM	5SLPM	1000SLPM
20SCCM	10SLPM	1500SLPM
50SCCM	20SLPM	

3) No charge alternate full scale ranges to increase accuracy (e.g. 2.5SLPM) or alternate units of measure (e.g. 133SCFH).

3) Full Scale range applies for all 16 gases in the calibration table, another advantage of ICL Technology.

Standard Pressure Drop Across the Device in PSID ⁴		
Full Scale Flow	Meters	Controllers
0.5SCCM, 1SCCM	0.5	0.5
2SCCM, 5SCCM, 10SCCM,	1.0	1.0
20SCCM, 100SCCM, 500SCCM	1.0	1.0
1SLPM	1.0	1.5
5SLPM	1.0	2.0
10SLPM	1.0	5.0
20SLPM	1.0	20.0
50SLPM	1.0	2.5
100SLPM	1.0	5.0
250SLPM	1.5	10.0
500SLPM	2.5	4.1
1000SLPM	6.8	12.3
1500SLPM	12.0	23.3

4) Lower Pressure Drops Available, Please Consult Factory