

M-Series Mass Flow Meters and Controllers

HIGH-ACCURACY, MULTIVARIATE, AND INTUITIVE



*NIST-traceable accuracy
to $\pm 0.5\%$ of reading*

*No warm-up
required*

*98+ pre-loaded gas
calibrations*

*5 millisecond
response times*

M-Series Mass Flow Meters and Controllers

MONITOR OR CONTROL GASES EVEN IN CHANGING PROCESS CONDITIONS



M/MC Meter or Controller

High-accuracy, multivariate flow measurement or control in real time.



MB Portable Meter

Easily verify flow anywhere with an 18 hour rechargeable battery and an intuitive interface.



MW/MCW Low Pressure Drop

Measure flow near atmospheric pressure with pressure drops as low as 0.07 PSID(4.8 mbarD).



MCV Vacuum Control

Protect your vacuum process with a pneumatic shutoff valve on a controller built for flow or pressure control.

Quick Specifications:

Mass Flow Ranges:

0 SCCM–5000 SLPM

Accuracy:

Up to $\pm 0.5\%$ of reading

Measurement Range:

0.01–100% of full scale

Response Time:

10 ms measurement response;
30ms control response

Multi-gas Calibration:

98+ pre-loaded gases

Repeatability:

Greater of $\pm 0.1\%$ of reading or
 $\pm 0.02\%$ of full scale

Analog Outputs:

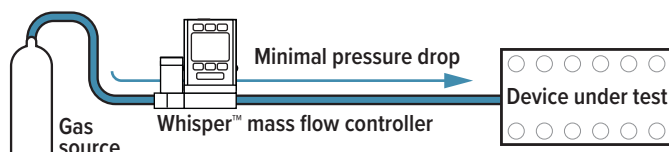
0–5 Vdc, 0–10 Vdc, 4–20 mA

Digital Communications:

RS–232, RS–485, DeviceNet,
EtherCAT, EtherNet/IP, Modbus RTU,
TCP/IP, PROFIBUS

Fast and Accurate Leak Testing

A single Whisper multivariate controller is able to maintain a constant pressure in the device under test (DUT) while providing accurate, real-time mass and volumetric flow readings. When the DUT is subjected to a constant pressure within the closed system, any resulting flow is a direct measure of the DUT's leakage.



Easy Verification and Calibration

Quickly integrate an Alicat into test stands for fast and accurate verification without any warm-up time. For in-field calibrations, a portable, battery-powered flow meter can be easily added into a flow line at any point for rapid system verification.



A Halma company

alicat.com/flow

Technical Data for M-Series Mass Flow Meters

0.5 sccm full scale through 5 sccm full scale

Standard specifications. Consult Alicat for available options.



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SENSOR PERFORMANCE	
Mass Flow Accuracy at Calibration Conditions ¹	±0.8% of reading and ±0.2% of full scale
High Accuracy Option ¹	±0.4% of reading and ±0.2% of full scale Available for ≥5 SCCM models
Bidirectional Option ¹	±0.2% of full scale in addition to base accuracy (above)
Repeatability (2σ)	±(0.2% of reading + 0.02% of full scale)
Flow Measurement Range	0.01–100% of full scale
Temperature Sensitivity	Mass flow zero shift and span shift: 0.02% of full scale per °C from 25°C
Pressure Sensitivity	Mass flow zero shift and span shift: ±(0.08% of reading + 0.02% of full scale) per atmosphere from calibration conditions
Operating Temperature Range	–10–60°C
Temperature Accuracy	±0.75°C
Operating Pressure Full Scale	160 PSIA
Pressure Accuracy above 1 atm	±0.5% of reading
Pressure Accuracy below 1 atm	±0.07 PSIA
Totalizer Volume Uncertainty	±0.5% of reading additional uncertainty
Sensor Response Time	<1 ms
Typical Indication Response Time ²	<10 ms, flow rate dependent
Typical Warm-Up Time	<1 s

¹ Stated accuracy is after tare under equilibrium conditions, includes repeatability and linearity.

² Indication response time includes user adjustable averaging up to 255 ms.

MECHANICAL	
Minimum Operating Pressure	11.5 PSIA common mode pressure (consult Alicat for lower operating pressures) Differential pressure must exceed 1 PSID
Maximum Operating Pressure	Damage possible above 200 PSIA common mode pressure Damage possible above 75 PSI differential pressure
Ingress Protection	IP40 (consult Alicat for weatherproofing options)
Humidity Range	0–95%, non-condensing
Wetted Materials	302, 303, 304, and 316L stainless steel; FKM, alumina ceramic, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon

COMMUNICATIONS	
Analog I/O Options ³	4–20 mA, 0–5 VDC, 1–5 VDC, 0–10 VDC
Digital I/O Options ³	RS-232 Serial by default RS-485 Serial, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, Profibus Portable devices (MB models): Serial over Micro-USB
Electrical Connection Options	6 pin locking, 8 pin mini-DIN, 8 pin M12, DB-9, DB-15 (contact Alicat for custom pinouts) Portable devices (MB models): Power over Micro-USB Type B
Power Requirements ⁴	9–24 VDC, 40 mA (12–24 VDC, 80 mA if equipped with 4–20 mA or 0–10 VDC output) Portable devices (MB models): 5 VDC, 1 A recommended via an outlet adapter to USB.
Battery Life (MB Series)	Monochrome screen: 18 hours, user configurable, contrast dependent Color TFT screen: 8 hours, user configurable, contrast dependent
Digital Data Update Rate ⁴	40 Hz at 19200 baud
Analog Data Update Rate ⁴	1 kHz
Display Update Rate	10 Hz
Analog Signal Accuracy	±0.1% of full scale additional uncertainty

³ Analog outputs unavailable on portable devices.

⁴ Consult the individual operating bulletins for specific industrial protocol power requirements and data transmission specifications.

Technical Data for M-Series Mass Flow Meters

0.5 sccm full scale through 5 sccm full scale

Standard specifications. Consult Alicat for available options.



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FEATURES	
STP Reference Conditions	25°C and 1 atm (default), user configurable
NTP Reference Conditions	0°C and 1 atm (default), user configurable
Monochrome LCD or Color TFT Display with Integrated Touchpad	Simultaneously displays mass flow, volumetric flow, temperature, and pressure
Gas Select™	98 user-selectable gases stored internally. Each gas optimized to match NIST's REFPROP 10 gas property calculations across the operating temperature and pressure ranges for highest accuracy.
COMPOSER™	20 user-definable gas mixes. Each mix may have up to 5 gases with 0.01% composition precision.

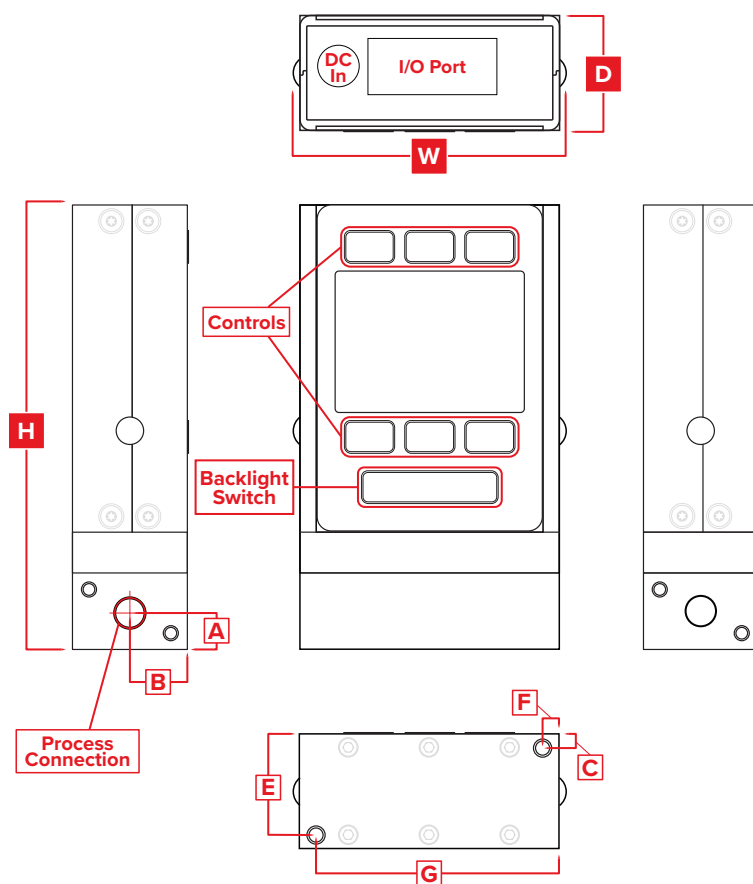
RANGE-SPECIFIC TECHNICAL DATA			
Full scale flow	Pressure drop at full scale flow venting to atmosphere ⁵	Process connections ⁶	Mount tap size
0.5–5 sccm	1.0 PSID	M5 female thread (10-32 compatible) ⁷	2× 8-32 UNC 0.175 in [4.45 mm]

⁵ Lower pressure drops available, please see our WHISPER™ series mass flow controllers at www.alicat.com/whisper.

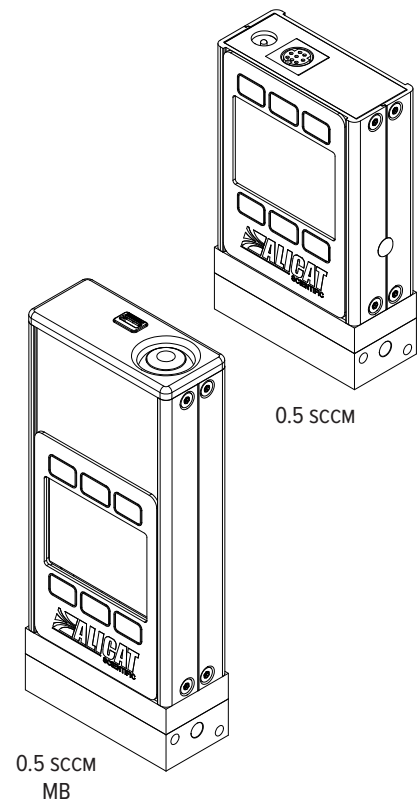
⁶ Consult Alicat for available process connection options, such as:

Compression, face seal, push-to-connect, BSPP, SAE, or Swagelok® (including tube, VCO®, and VCR®-compatible).

⁷ Shipped with Buna-N O-ring face seal to 1/8" female NPT fittings.



Representative Examples



DIMENSIONS ⁸										WEIGHT
Full scale flow	Height	Width	Depth	A	B	C	E	F	G	
0.5–5 sccm	3.897 in	2.375 in	1.050 in	0.336 in	0.525 in	0.125 in	0.925 in	0.150 in	2.225 in	≈ 0.8 lb
	98.98 mm	60.33 mm	26.67 mm	8.53 mm	13.34 mm	3.18 mm	23.50 mm	3.81 mm	56.52 mm	≈ 0.4 kg

⁸ Portable devices (MB Series) add 1.646" [41.81 mm] to height, and 0.2 lb. [90.72 g] to weight.

Technical Data for M-Series Mass Flow Meters

10 sccm full scale through 20 SLPM full scale

Standard specifications. Consult Alicat for available options.



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SENSOR PERFORMANCE	
Mass Flow Accuracy at Calibration Conditions ¹	±0.6% of reading or ±0.1% of full scale, whichever is greater
High Accuracy Option ¹	±0.5% of reading or ±0.1% of full scale, whichever is greater
Bidirectional Option ¹	No additional uncertainties
Repeatability (2σ)	±(0.1% of reading + 0.02% of full scale)
Flow Measurement Range	0.01–100% of full scale
Temperature Sensitivity	Mass flow zero shift: ±0.01% of full scale per °C from tare temperature Mass flow span shift: ±0.01% of reading per °C from 25°C
Pressure Sensitivity	Mass flow zero shift: ±0.01% of full scale per atm from tare pressure Mass flow span shift: ±0.1% of reading per atmosphere from calibration conditions
Operating Temperature Range	–10–60°C
Temperature Accuracy	±0.75°C
Operating Pressure Full Scale	160 PSIA
Pressure Accuracy above 1 atm	±0.5% of reading
Pressure Accuracy below 1 atm	±0.07 PSIA
Totalizer Volume Uncertainty	±0.5% of reading additional uncertainty
Sensor Response Time	<1 ms
Typical Indication Response Time ²	<10 ms, flow rate dependent
Typical Warm-Up Time	<1 s

¹ Stated accuracy is after tare under equilibrium conditions, includes repeatability and linearity.

² Indication response time includes user adjustable averaging up to 255 ms.

MECHANICAL	
Minimum Operating Pressure	11.5 PSIA common mode pressure (consult Alicat for lower operating pressures) Differential pressure must exceed model pressure drop, see below for details
Maximum Operating Pressure	Damage possible above 200 PSIA common mode pressure Damage possible above 75 PSI differential pressure
Ingress Protection	IP40 (consult Alicat for weatherproofing options)
Humidity Range	0–95%, non-condensing
Wetted Materials	302, 303, 304, and 316L stainless steel; FKM, alumina ceramic, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon

COMMUNICATIONS	
Analog I/O Options ³	4–20 mA, 0–5 VDC, 1–5 VDC, 0–10 VDC
Digital I/O Options ³	RS-232 Serial by default RS-485 Serial, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, Profibus Portable devices (MB models): Serial over Micro-USB
Electrical Connection Options	6 pin locking, 8 pin mini-DIN, 8 pin M12, DB-9, DB-15 (contact Alicat for custom pinouts) Portable devices (MB models): Power over Micro-USB Type B
Power Requirements ⁴	9–24 VDC, 40 mA (12–24 VDC, 80 mA if equipped with 4–20 mA or 0–10 VDC output) Portable devices (MB models): 5 VDC, 1 A recommended via an outlet adapter to USB.
Battery Life (MB Series)	Monochrome screen: 18 hours, user configurable, contrast dependent Color TFT screen: 8 hours, user configurable, contrast dependent
Digital Data Update Rate ⁴	40 Hz at 19200 baud
Analog Data Update Rate ⁴	1 kHz
Display Update Rate	10 Hz
Analog Signal Accuracy	±0.1% of full scale additional uncertainty

³ Analog outputs unavailable on portable devices.

⁴ Consult the individual operating bulletins for specific industrial protocol power requirements and data transmission specifications.

Technical Data for M-Series Mass Flow Meters

10 sccm full scale through 20 SLPM full scale

Standard specifications. Consult Alicat for available options.



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FEATURES	
STP Reference Conditions	25°C and 1 atm (default), user configurable
NTP Reference Conditions	0°C and 1 atm (default), user configurable
Monochrome LCD or Color TFT Display with Integrated Touchpad	Simultaneously displays mass flow, volumetric flow, temperature, and pressure
Gas Select™	98 user-selectable gases stored internally. Each gas optimized to match NIST's REFPROP 10 gas property calculations across the operating temperature and pressure ranges for highest accuracy.
COMPOSER™	20 user-definable gas mixes. Each mix may have up to 5 gases with 0.01% composition precision.

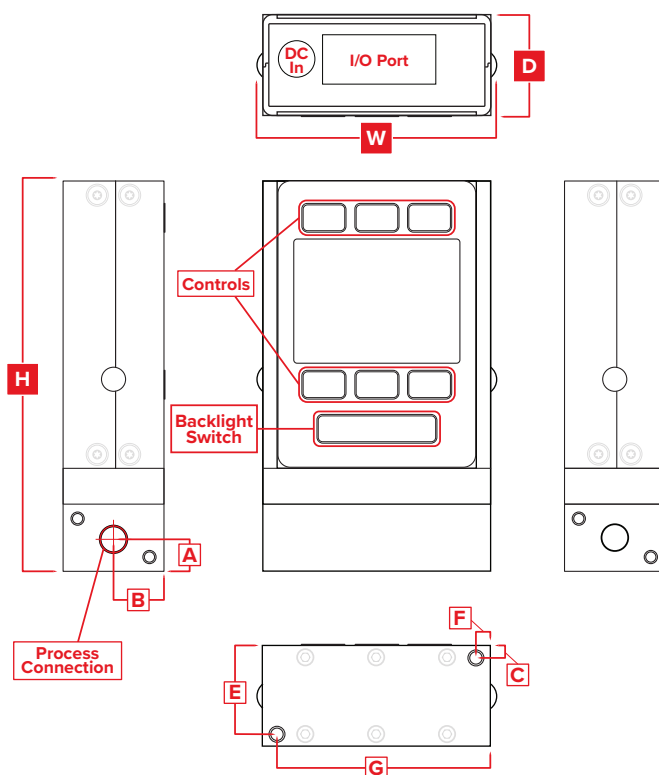
RANGE-SPECIFIC TECHNICAL DATA			
Full scale flow	Pressure drop at full scale flow venting to atmosphere ⁵	Process connections ⁶	Mount tap size
10–50 sccm	1.0 PSID	M5 female thread (10-32 compatible) ⁷	2× 8-32 UNC 0.175 in [4.45 mm]
100 sccm–20 SLPM	1.0 PSID	1/8" NPT female	2× 8-32 UNC 0.350 in [8.89 mm]

5 Lower pressure drops available, please see our WHISPER™ series mass flow controllers at www.alicat.com/whisper.

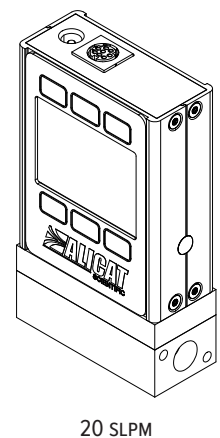
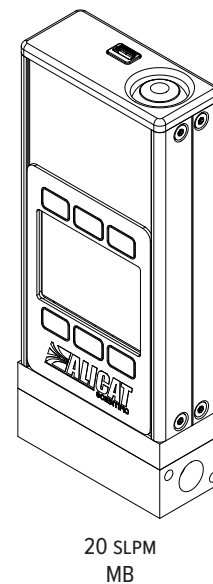
6 Consult Alicat for available process connection options, such as:

Compression, face seal, push-to-connect, BSPP, SAE, or Swagelok® (including tube, VCO®, and VCR®-compatible).

7 Shipped with Buna-N O-ring face seal to 1/8" female NPT fittings.



Representative Examples



DIMENSIONS ⁸										WEIGHT
Full scale flow	Height	Width	Depth	A	B	C	E	F	G	
10–50 sccm	3.897 in	2.375 in	1.050 in	0.336 in	0.525 in	0.125 in	0.925 in	0.150 in	2.225 in	≈ 0.8 lb
	98.98 mm	60.33 mm	26.67 mm	8.53 mm	13.34 mm	3.18 mm	23.50 mm	3.81 mm	56.52 mm	≈ 0.4 kg
100 sccm–20 SLPM	4.067 in	2.375 in	1.050 in	0.350 in	0.525 in	0.125 in	0.925 in	0.150 in	2.225 in	≈ 1.0 lb
	103.30 mm	60.33 mm	26.67 mm	8.89 mm	13.34 mm	3.18 mm	23.50 mm	3.81 mm	56.52 mm	≈ 0.5 kg

8 Portable devices (MB Series) add 1.646" [41.81 mm] to height, and 0.2 lb. [90.72 g] to weight.

Technical Data for M-Series Mass Flow Meters

50 SLPM full scale through 5000 SLPM full scale

Standard specifications. Consult Alicat for available options.



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SENSOR PERFORMANCE	
Mass Flow Accuracy at Calibration Conditions ¹	±0.8% of reading and ±0.2% of full scale
High Accuracy Option ¹	±0.4% of reading and ±0.2% of full scale Available for ≤500 SLPM models
Bidirectional Option ¹	±0.2% of full scale in addition to base accuracy (above)
Repeatability (2σ)	±(0.2% of reading + 0.02% of full scale)
Flow Measurement Range	0.01–100% of full scale
Temperature Sensitivity	Mass flow zero shift and span shift: 0.02% of full scale per °C from 25°C
Pressure Sensitivity	Mass flow zero shift and span shift: ±(0.08% of reading + 0.02% of full scale) per atmosphere from calibration conditions
Operating Temperature Range	–10–60°C
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Totalizer Volume Uncertainty	±0.5% of reading additional uncertainty
Sensor Response Time	<1 ms
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MECHANICAL	
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Maximum Operating Pressure	Damage possible above 200 PSIA common mode pressure Damage possible above 75 PSI differential pressure
Ingress Protection	IP40 (consult Alicat for weatherproofing options)
Humidity Range	0–95%, non-condensing
Wetted Materials	302, 303, 304, and 316L stainless steel; FKM, alumina ceramic, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon

COMMUNICATIONS	
Analog I/O Options ³	4–20 mA, 0–5 VDC, 1–5 VDC, 0–10 VDC
Digital I/O Options ³	RS-232 Serial by default RS-485 Serial, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, Profibus Portable devices (MB models): Serial over Micro-USB
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³ Analog outputs unavailable on portable devices.

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50 SLPM full scale through 5000 SLPM full scale

Standard specifications. Consult Alicat for available options.



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NTP Reference Conditions	0°C and 1 atm (default), user configurable
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Gas Select™	98 user-selectable gases stored internally. Each gas optimized to match NIST's REFPROP 10 gas property calculations across the operating temperature and pressure ranges for highest accuracy.
COMPOSER™	20 user-definable gas mixes. Each mix may have up to 5 gases with 0.01% composition precision.

RANGE-SPECIFIC TECHNICAL DATA			
Full scale flow	Pressure drop at full scale flow venting to atmosphere ⁵	Process connections ⁶	Mount tap size
50 SLPM	2.0 PSID	¼" NPT female	4× 8-32UNC 0.375 in [9.53 mm]
100 SLPM	2.5 PSID	¼" NPT female	4× 8-32UNC 0.375 in [9.53 mm]
250 SLPM	2.1 PSID	½" NPT female	4× 8-32UNC 0.375 in [9.53 mm]
500 SLPM	4.0 PSID	¾" NPT female	4× 8-32UNC 0.375 in [9.53 mm]
1000 SLPM	6.0 PSID	¾" NPT female	4× 8-32UNC 0.375 in [9.53 mm]
2000 SLPM	5.0 PSID	¾" NPT female	4× 8-32UNC 0.330 in [8.38 mm]
3000 SLPM	7.1 PSID	1¼" NPT female	4× 8-32UNC 0.330 in [8.38 mm]
5000 SLPM	3.4 PSID	1½" NPT female	4× 8-32UNC 0.330 in [8.38 mm]

⁵ Lower pressure drops available, please see our WHISPER™ series mass flow controllers at www.alicat.com/whisper.

⁶ Consult Alicat for available process connection options, such as:

Compression, face seal, push-to-connect, BSPP, SAE, or Swagelok® (including tube, VCO®, and VCR®-compatible).

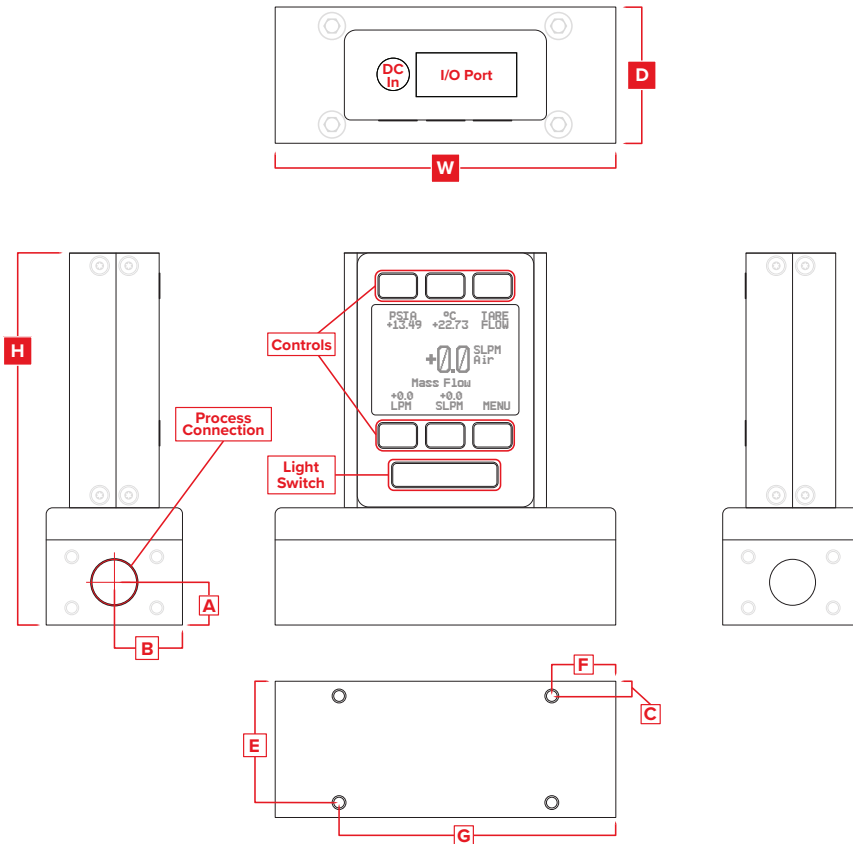
Technical Data for M-Series Mass Flow Meters

50 SLPM full scale through 5000 SLPM full scale

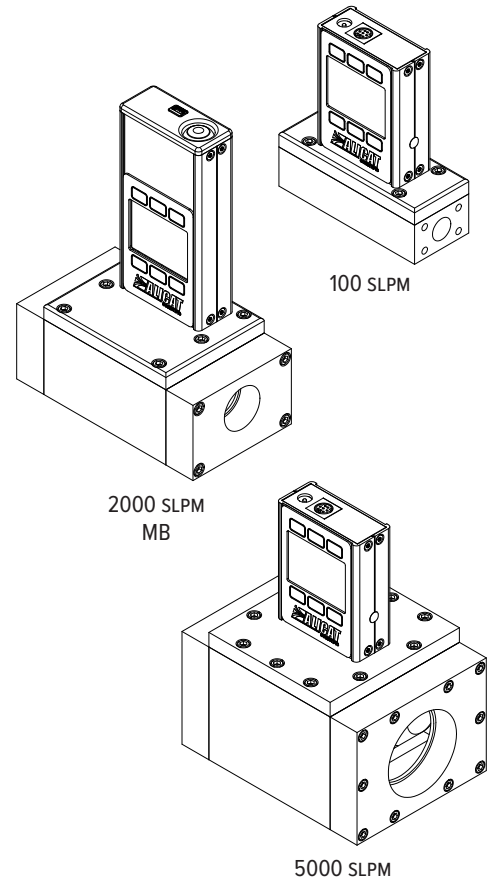
Standard specifications. Consult Alicat for available options.



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Representative Examples



Full scale flow	DIMENSIONS ⁷									WEIGHT
	Height	Width	Depth	A	B	C	E	F	G	
50 SLPM	4.367 in	4.000 in	1.600 in	0.500 in	0.800 in	0.175 in	1.425 in	0.750 in	3.250 in	≈ 2.4 lb
	110.92 mm	101.60 mm	40.64 mm	12.70 mm	20.32 mm	4.45 mm	36.20 mm	19.05 mm	82.55 mm	≈ 1.1 kg
100 SLPM	4.367 in	4.000 in	1.600 in	0.500 in	0.800 in	0.175 in	1.425 in	0.750 in	3.250 in	≈ 2.4 lb
	110.92 mm	101.60 mm	40.64 mm	12.70 mm	20.32 mm	4.45 mm	36.20 mm	19.05 mm	82.55 mm	≈ 1.1 kg
250 SLPM	4.967 in	4.000 in	1.600 in	0.800 in	0.800 in	0.175 in	1.425 in	0.750 in	3.250 in	≈ 2.4 lb
	126.16 mm	101.60 mm	40.64 mm	20.32 mm	20.32 mm	4.45 mm	36.20 mm	19.05 mm	82.55 mm	≈ 1.1 kg
500 SLPM	4.967 in	4.000 in	1.600 in	0.800 in	0.800 in	0.175 in	1.425 in	0.750 in	3.250 in	≈ 3.5 lb
	126.16 mm	101.60 mm	40.64 mm	20.32 mm	20.32 mm	4.45 mm	36.20 mm	19.05 mm	82.55 mm	≈ 1.6 kg
1000 SLPM	4.967 in	4.000 in	1.600 in	0.800 in	0.800 in	0.175 in	1.425 in	0.750 in	3.250 in	≈ 3.5 lb
	126.16 mm	101.60 mm	40.64 mm	20.32 mm	20.32 mm	4.45 mm	36.20 mm	19.05 mm	82.55 mm	≈ 1.6 kg
2000 SLPM	5.287 in	5.200 in	2.900 in	1.120 in	1.450 in	0.200 in	2.700 in	1.350 in	3.850 in	≈ 4.5 lb
	134.29 mm	132.08 mm	73.66 mm	28.45 mm	36.83 mm	5.08 mm	68.58 mm	34.29 mm	97.79 mm	≈ 2.0 kg
3000 SLPM	5.287 in	5.200 in	2.900 in	0.960 in	1.450 in	0.200 in	2.700 in	1.350 in	3.850 in	≈ 4.5 lb
	134.29 mm	132.08 mm	73.66 mm	24.38 mm	36.83 mm	5.08 mm	68.58 mm	34.29 mm	97.79 mm	≈ 2.0 kg
5000 SLPM	6.267 in	5.200 in	3.840 in	1.450 in	1.920 in	0.295 in	3.545 in	1.350 in	3.850 in	≈ 14.0 lb
	159.18 mm	132.08 mm	97.54 mm	36.83 mm	48.77 mm	7.49 mm	90.04 mm	34.29 mm	97.79 mm	≈ 6.4 kg

⁷ Portable devices (MB Series) add 1.646" [41.81 mm] to height, and 0.2 lb. [90.72 g] to weight.