

Mass Flow Controller



Responsive and stable control in 30 ms



High-flow controllers feature frictionless Rolamite valves.



Fast • Repeatable • Stable



The Fastest Flow Controller Company in the World!



alicat.com/mc

MCW Series
with low pressure drop



MCE Series
for SEMI apps



MCV Series
for SEMI or vacuum apps



MCS Series
for aggressive gases



See the video!



Mass Flow Controllers

Hit the mark every time! Control flows with rock-solid stability and responsiveness.

Making You Faster

- **30 ms control response:** stills upstream fluctuations.
- **Accessible PID valve tuning** for best speed and stability.
- **Custom valve orifice sizes:** yields full-range stability.
- **Control mass flow, vol. flow or pressure** with one device.
- **No warm-up:** ready to control process flows in one second.

Quick Specs

- Accuracy:** 0.6% of reading on most flow instruments (NIST-traceable).
- Linear range:** 0.01-100% of full scale.
- Multi-gas calibration:** 98-130 gases preloaded, plus COMPOSER™ gas composition firmware.
- Digital and analog outputs** in multiple formats.
- All flow data** visible on one screen (setpoint, mass flow, vol. flow, pressure, temperature).
- Stand-alone unit:** no need for computer or PLC.
- Lifetime warranty** gives you peace of mind.

Tailored for You

MCW Low Pressure Drop
Control flows near atmospheric pressure.
Max range: 0-500 slpm.

MCS Anti-Corrosive
Withstand corrosion caused by aggressive gases. All ranges.

MCE/V SEMI Compatible
Control better with our SEMI compatible MCE and MCV. Max range: 0-20 slpm.

LC Liquid Flows
Control liquid flows 100-ms control response time. Available in ranges to 0-5 lpm.

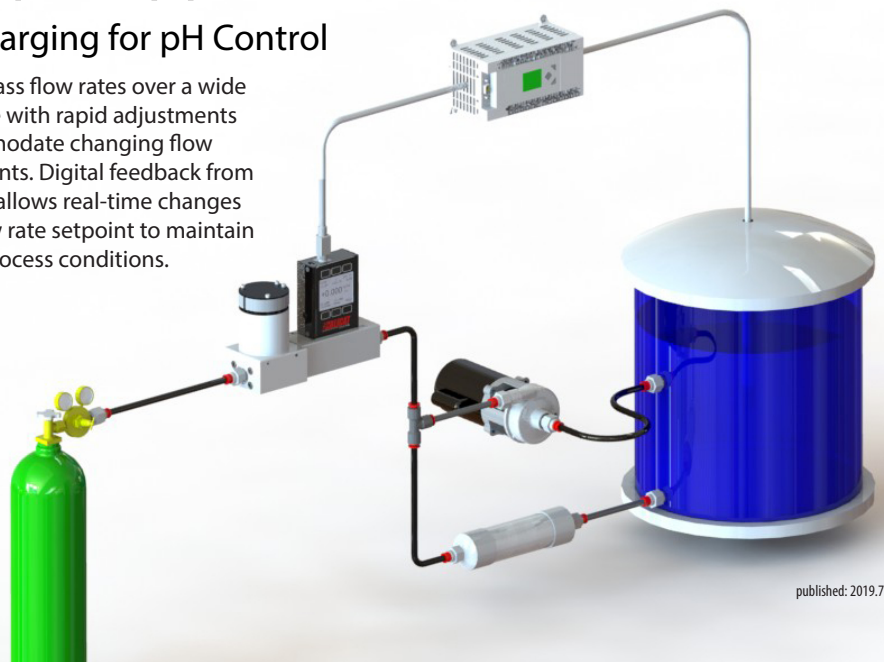
COMMON OPTIONS:

- Downstream Valve** optimizes control in vacuum conditions or backpressure applications.
- Precision Dispensing Package** relies on our fast valves to dispense metered amounts of fluid.
- CSA Class 1 Div 2 (ATEX Zone 2) Classification** permits operation in hazardous environments.
- Backlit Color Display** shines in low lighting.
- Industrial communications:** [EtherNet/IP](#), [DeviceNet](#), [PROFIBUS](#), or [Modbus](#)

Sample Application

Gas Sparging for pH Control

Control mass flow rates over a wide flow range with rapid adjustments to accommodate changing flow requirements. Digital feedback from PLC or PC allows real-time changes to the flow rate setpoint to maintain optimal process conditions.



Technical Data for Alicat **MC-Series** Mass Flow Controllers

0.5 sccm Full Scale through 5 sccm Full Scale



Tel: 888-290-6060

www.alicat.com/mc

Standard Specifications (Contact Alicat for available options.)

Performance	M-Series Mass Flow Meter
Mass Flow Accuracy at calibration conditions ¹	± (0.8% of Reading + 0.2% of Full Scale)
High Accuracy Option ¹	± (0.4% of Reading + 0.2% of Full Scale) High Accuracy option only available for 5 sccm units.
Repeatability (2σ)	± (0.2% of Reading + 0.02% of Full Scale)
Steady State Control Range ²	0.01% - 100% of Full Scale
Temperature Sensitivity	Mass Flow Zero and Span Shift: 0.02% Full Scale / °C
Pressure Sensitivity	Mass Flow Zero and Span Shift: ± (0.08% of Reading + 0.02% Full Scale) / atm from calibration conditions
Operating Temperature Range	-10 to 60°C (consult Alicat for expanded range)
Temperature Accuracy	± 0.75°C
Operating Pressure Full Scale	160 PSIA (consult Alicat for additional options)
Pressure Accuracy	Above 1 atm: ± 0.5% of Reading Below 1 atm: ± 0.07 PSIA
Totalizer Volume Uncertainty	± 0.5% of Reading in addition to base accuracy (above)
Typical Sensor Response Time	100 - 1000 ms (flow rate dependent)
Typical Warm-Up Time	< 1 s

1 Stated accuracy is after tare under equilibrium conditions. Extreme gas behavior (especially near state boundaries) can introduce additional flow uncertainties.

2 Achievable steady state control may be limited by user-configurable PID tuning and process conditions. Dynamic control performance is also limited by control response time, which may vary with the flow rate.

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 175 PSIA common mode pressure Damage possible above 75 PSID differential pressure
Leak Integrity Option	Available to 1 x 10 ⁻⁹ atm cc/s helium. (consult Alicat for more information)
Ingress Protection	IP40 (IP66 Option Available)
Humidity Range	0 to 95% non-condensing
Wetted Materials	302/303/430FR Stainless Steel, Viton, Brass, Polyamide, Alumina, Ceramic, Glass, Gold, Silicon Heat cured: Epoxy, RTV, Silicone

Control and Communications	
Analog I/O Options	4-20 mA, 0-5 VDC, 1-5 VDC, 0-10 VDC
Digital I/O Options	DeviceNet, EtherCAT, EtherNet/IP, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, Profibus, RS-232 Serial, RS-485 Serial
Electrical Connection Options	8 pin mini-DIN, DB-9, DB-15, 8 pin M12, 6 pin locking
Power Requirements ³	12-24 VDC, 250 mA min. (290 mA if equipped with 4-20 mA output)
Data Update Rate ³	Serial: 40 Hz at 19200 baud Analog: 1000 Hz
Display Update Rate	10 Hz
Analog Signal Accuracy	± 0.1% of Full Scale additional uncertainty
Typical Control Response Time	100 - 4000 ms to 63% of step change (T63)
Valve Function	Normally Closed

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

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, Pressure and Temperature
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™	Allows 20 user definable gas mixes. Up to 5 constituent gases per mix, down to percentages of 0.01%

Range Specific Specifications

Full Scale Flow Mass Meter	Pressure Drop at FS Flow (psid) venting to atmosphere ⁴	Mechanical Dimensions ⁵	Process Connections ⁶
0.5 sccm	1.0	3.9"H x 2.4"W x 1.1"D	M-5 (10-32) Female Thread ⁷
1 sccm to 5 sccm	2.0	3.9"H x 2.4"W x 1.1"D	M-5 (10-32) Female Thread ⁷

4 Lower Pressure Drops Available, please see our **WHISPER-Series** mass flow controllers at www.alicat.com/whisper.

5 See drawings for metric equivalents.

6 Compatible with Swagelok® tube, Parker®, face seal, push connect and compression adapter fittings. VCR and SAE connections upon request.

7 Shipped with M-5 (10-32) Male Buna-N O-ring face seal to 1/8" Female NPT fittings.

Alicat Gas Select™ Preloaded Gases

PURE NON-CORROSIVE GASES		
Gas Number	Short Name	Long Name
14	C2H2	Acetylene
0	Air	Air
1	Ar	Argon
16	i-C4H10	i-Butane
13	n-C4H10	n-Butane
4	CO2	Carbon Dioxide
3	CO	Carbon Monoxide
60	D2	Deuterium
5	C2H6	Ethane
15	C2H4	Ethylene (Ethene)
7	He	Helium
6	H2	Hydrogen
17	Kr	Krypton
2	CH4	Methane
10	Ne	Neon
8	N2	Nitrogen
9	N2O	Nitrous Oxide
11	O2	Oxygen
12	C3H8	Propane
19	SF6	Sulfur Hexafluoride
18	Xe	Xenon

BREATHING GASES		
Gas Number	Short Name	Long Name
164	EAN-32	32% O2 / 68% N2
165	EAN	36% O2 / 64% N2
166	EAN-40	40% O2 / 60% N2
167	HeOx-20	20% O2 / 80% He
168	HeOx-21	21% O2 / 79% He
169	HeOx-30	30% O2 / 70% He
170	HeOx-40	40% O2 / 60% He
171	HeOx-50	50% O2 / 50% He
172	HeOx-60	60% O2 / 40% He
173	HeOx-80	80% O2 / 20% He
174	HeOx-99	99% O2 / 1% He
175	EA-40	Enriched Air-40% O2
176	EA-60	Enriched Air-60% O2
177	EA-80	Enriched Air-80% O2
178	Metabol	Metabolic Exhalant (16% O2 / 78.04% N2 / 5% CO2 / 0.96% Ar)

FUEL GASES		
Gas Number	Short Name	Long Name
185	Syn Gas-1	40% H2 + 29% CO + 20% CO2 + 11% CH4
186	Syn Gas-2	64% H2 + 28% CO + 1% CO2 + 7% CH4
187	Syn Gas-3	70% H2 + 4% CO + 25% CO2 + 1% CH4
188	Syn Gas-4	83% H2 + 14% CO + 3% CH4
189	Nat Gas-1	93% CH4 / 3% C2H6 / 1% C3H8 / 2% N2 / 1% CO2
190	Nat Gas-2	95% CH4 / 3% C2H6 / 1% N2 / 1% CO2
191	Nat Gas-3	95.2% CH4 / 2.5% C2H6 / 0.2% C3H8 / 0.1% C4H10 / 1.3% N2 / 0.7% CO2
192	Coal Gas	50% H2 / 35% CH4 / 10% CO / 5% C2H4
193	Endo	75% H2 + 25% N2
194	HHO	66.67% H2 / 33.33% O2
195	HD-5	LPG 96.1% C3H8 / 1.5% C2H6 / 0.4% C3H6 / 1.9% n-C4H10
196	HD-10	LPG 85% C3H8 / 10% C3H6 / 5% n-C4H10

BIOREACTOR GASES		
Gas Number	Short Name	Long Name
145	Bio-5M	5% CH4 / 95% CO2
146	Bio-10M	10% CH4 / 90% CO2
147	Bio-15M	15% CH4 / 85% CO2
148	Bio-20M	20% CH4 / 80% CO2
149	Bio-25M	25% CH4 / 75% CO2
150	Bio-30M	30% CH4 / 70% CO2
151	Bio-35M	35% CH4 / 65% CO2
152	Bio-40M	40% CH4 / 60% CO2
153	Bio-45M	45% CH4 / 55% CO2
154	Bio-50M	50% CH4 / 50% CO2
155	Bio-55M	55% CH4 / 45% CO2
156	Bio-60M	60% CH4 / 40% CO2
157	Bio-65M	65% CH4 / 35% CO2
158	Bio-70M	70% CH4 / 30% CO2
159	Bio-75M	75% CH4 / 25% CO2
160	Bio-80M	80% CH4 / 20% CO2
161	Bio-85M	85% CH4 / 15% CO2
162	Bio-90M	90% CH4 / 10% CO2
163	Bio-95M	95% CH4 / 5% CO2

WELDING GASES		
Gas Number	Short Name	Long Name
23	C-2	2% CO2 / 98% Ar
22	C-8	8% CO2 / 92% Ar
21	C-10	10% CO2 / 90% Ar
140	C-15	15% CO2 / 85% Ar
141	C-20	20% CO2 / 80% Ar
20	C-25	25% CO2 / 75% Ar
142	C-50	50% CO2 / 50% Ar
24	C-75	75% CO2 / 25% Ar
25	He-25	25% He / 75% Ar
143	He-50	50% He / 50% Ar
26	He-75	75% He / 25% Ar
144	He-90	90% He / 10% Ar
27	A1025	90% He / 7.5% Ar / 2.5% CO2
28	Star29	Stargon CS 90% Ar / 8% CO2 / 2% O2

STACK GASES		
Gas Number	Short Name	Long Name
200	FG-1	2.5% O2 / 10.8% CO2 / 85.7% N2 / 1% Ar
201	FG-2	2.9% O2 / 14% CO2 / 82.1% N2 / 1% Ar
202	FG-3	3.7% O2 / 15% CO2 / 80.3% N2 / 1% Ar
203	FG-4	7% O2 / 12% CO2 / 80% N2 / 1% Ar
204	FG-5	10% O2 / 9.5% CO2 / 79.5% N2 / 1% Ar
205	FG-6	13% O2 / 7% CO2 / 79% N2 / 1% Ar

CHROMATOGRAPHY GASES		
Gas Number	Short Name	Long Name
29	P-5	5% CH4 / 95% Ar
206	P-10	10% CH4 / 90% Ar

O2 CONCENTRATOR GASES		
Gas Number	Short Name	Long Name
197	OCG-89	89% O2 / 7% N2 / 4% Ar
198	OCG-93	93% O2 / 3% N2 / 4% Ar
199	OCG-95	95% O2 / 1% N2 / 4% Ar

LASER GASES		
Gas Number	Short Name	Long Name
179	LG-4.5	4.5% CO2 / 13.5% N2 / 82% He
180	LG-6	6% CO2 / 14% N2 / 80% He
181	LG-7	7% CO2 / 14% N2 / 79% He
182	LG-9	9% CO2 / 15% N2 / 76% He
183	HeNe-9	9% Ne / 91% He
184	LG-9.4	9.4% CO2 / 19.25% N2 / 71.35% He

Additional Preloaded Gases for MS & MCS Series Units

PURE CORROSIVES*		
Gas Number	Short Name	Long Name
32	NH3	Ammonia
80	tButene	Butylene (1-Butene)
81	cButene	Cis-Butene (cis-2-butene)
82	iButene	Iso-Butene
83	tButene	Trans-Butene
84	COS	Carbonyl Sulfide
33	Cl2	Chlorine
85	CH3OCH3	Dimethylether
34	H2S	Hydrogen Sulfide (H2S)
31	NF3	NF3 (Nitrogen Trifluoride)
30	NO	NO (Nitric Oxide)
36	C3H6	Propylene (Propylene)
86	SiH4	Silane (SiH4)
35	SO2	Sulfur Dioxide

*Pure Corrosive gases are only available on S-Series instruments that are compatible with these gases.
Gas numbers 33 and 35 require custom valve on controllers.

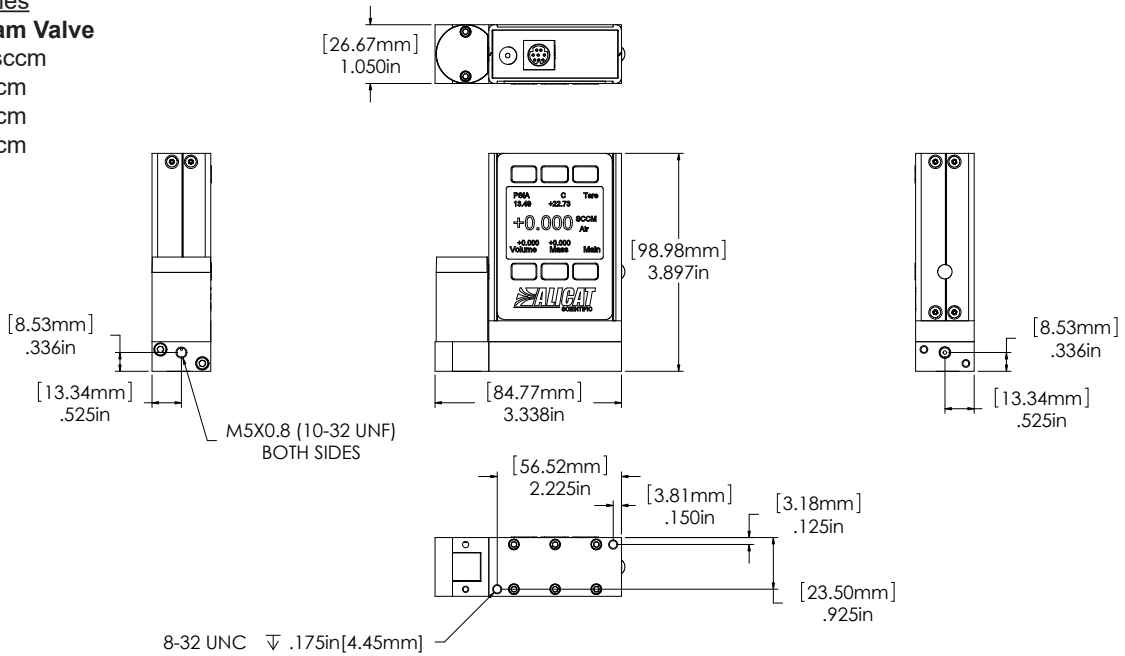
REFRIGERANTS*		
Gas Number	Short Name	Long Name
100	R-11	Trichlorofluoromethane
101	R-115	Chloropentafluoroethane
102	R-116	Hexafluoroethane
103	R-124	Chlorotetrafluoroethane
104	R-125	Pentafluoroethane
105	R-134A	Tetrafluoroethane
106	R-14	Tetrafluoromethane
107	R-142b	Chlorodifluoroethane
108	R-143a	Trifluoroethane
109	R-152a	Difluoroethane
110	R-22	Difluoromonochloromethane
111	R-23	Trifluoromethane
112	R-32	Difluoromethane
113	RC-318	Octafluorocyclobutane
114	R-404A	44% R-125 / 4% R-134A / 52% R-143A
115	R-407C	23% R-32 / 25% R-125 / 52% R-134A
116	R-410A	50% R-32 / 50% R-125
117	R-507A	50% R-125 / 50% R-143A

*Refrigerant gases are only available on S-Series instruments that are compatible with these gases.

MC-Series

Upstream Valve

- 0 - 0.5 sccm
- 0 - 1 sccm
- 0 - 2 sccm
- 0 - 5 sccm

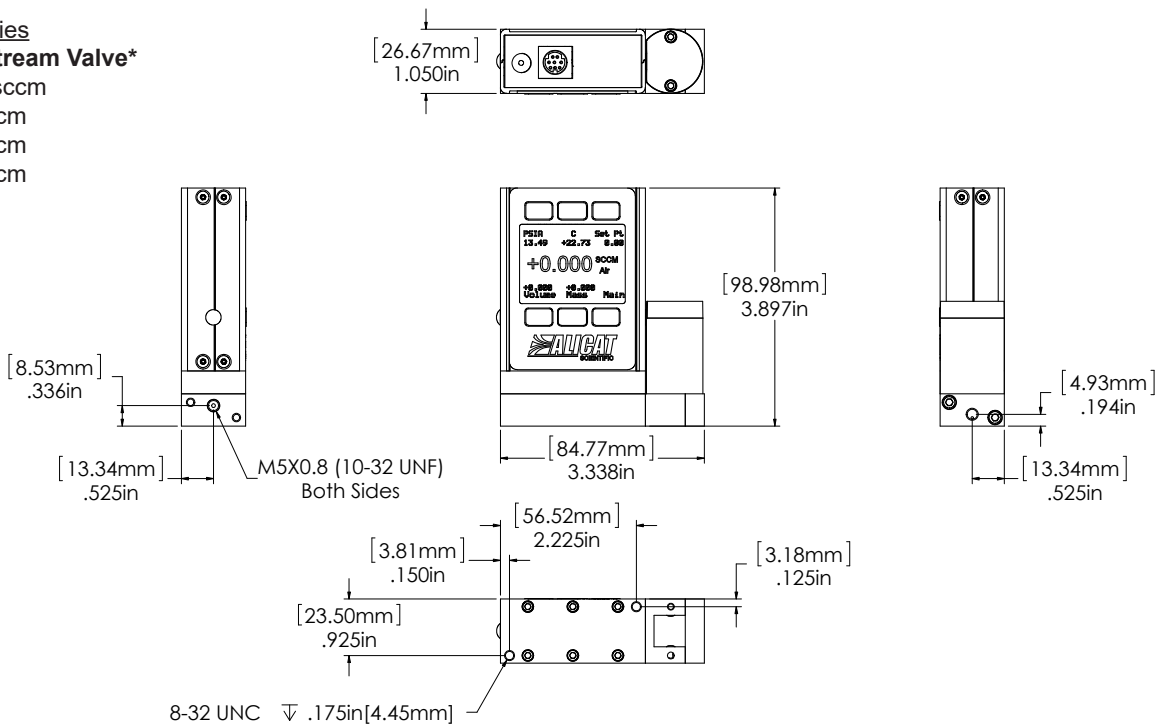


0.5 sccm to 5 sccm approximate shipping weight: 1.1 lb.

MC-Series

Downstream Valve*

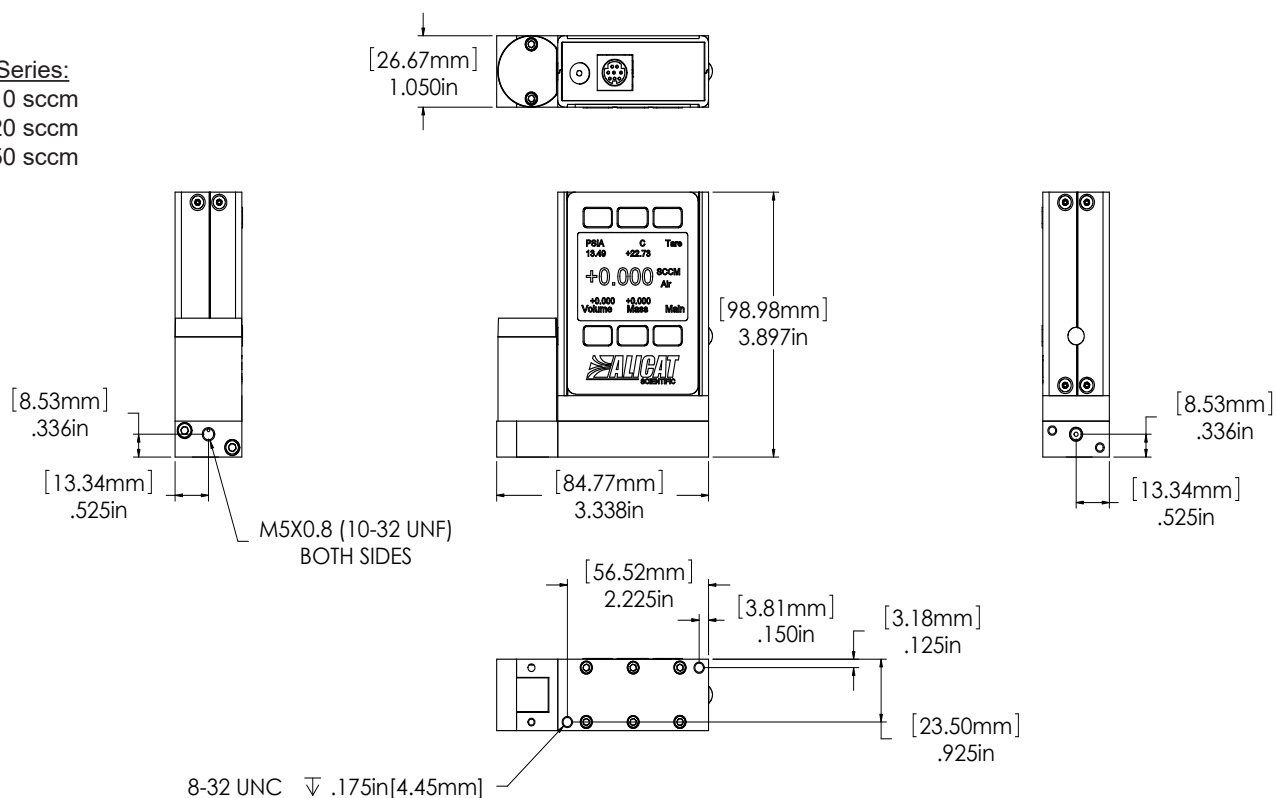
- 0 - 0.5 sccm
- 0 - 1 sccm
- 0 - 2 sccm
- 0 - 5 sccm



* Note process connection port locations for downstream valve in this flow range.

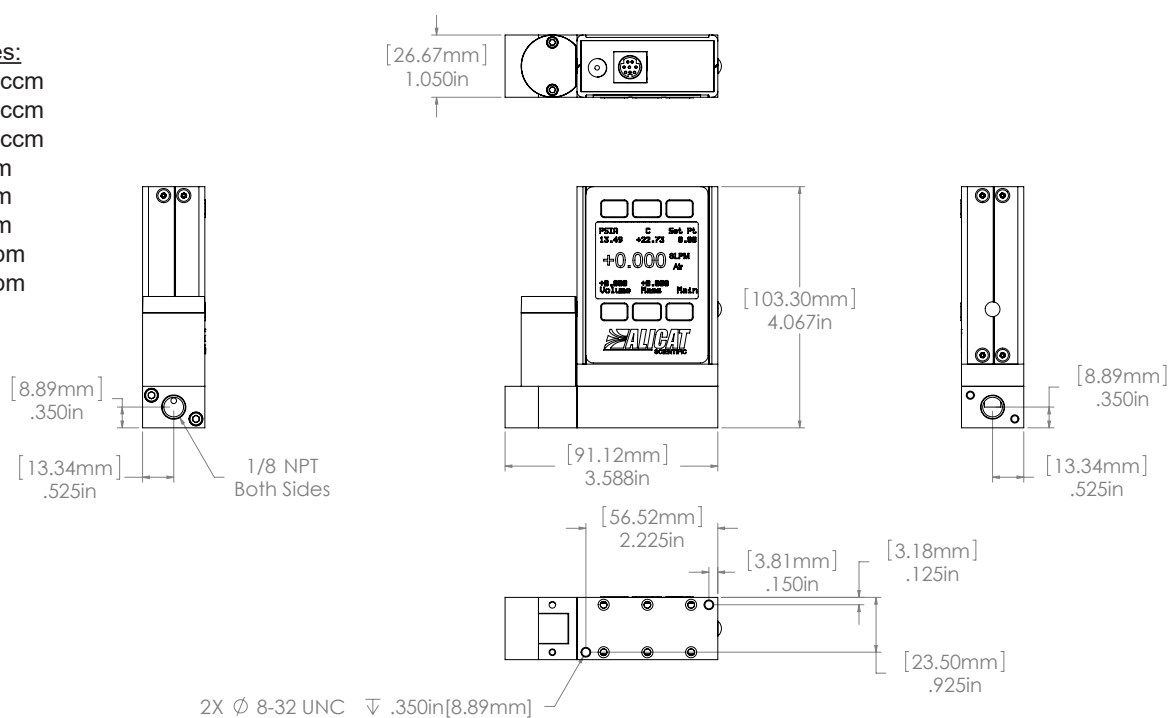
0.5 sccm to 5 sccm approximate shipping weight: 1.1 lb.

MC-Series:
0 – 10 sccm
0 – 20 sccm
0 – 50 sccm



10 sccm to 50 sccm approximate shipping weight: 0.8 lb

MC-Series:
0 – 100 sccm
0 – 200 sccm
0 – 500 sccm
0 – 1 slpm
0 – 2 slpm
0 – 5 slpm
0 – 10 slpm
0 – 20 slpm



100 sccm to 20 slpm approximate shipping weight: 1.0 lb

Technical Data for Alicat **MC-Series** Mass Flow Controllers

50 slpm of Full Scale through 5000 slpm of Full Scale



Tel: 888-290-6060

www.alicat.com/mc

Standard Specifications (Contact Alicat for available options.)

Sensor Performance	
Mass Flow Accuracy at calibration conditions ¹	± (0.8% of Reading + 0.2% of Full Scale)
High Accuracy Option ¹	± (0.4% of Reading + 0.2% of Full Scale) High Accuracy option only available for units ranged under 500 slpm.
Repeatability (2σ)	± (0.2% of Reading + 0.02% of Full Scale)
Steady State Control Range ²	0.01% - 100% of Full Scale
Temperature Sensitivity	Mass Flow Zero and Span Shift: 0.02% Full Scale / °C
Pressure Sensitivity	Mass Flow Zero and Span Shift: ± (0.08% of Reading + 0.02% Full Scale) / atm from calibration conditions
Operating Temperature Range	-10 to 60°C (consult Alicat for expanded range)
Temperature Accuracy	± 0.75°C
Operating Pressure Full Scale	160 PSIA (consult Alicat for additional options)
Pressure Accuracy	Above 1 atm: ± 0.5% of Reading Below 1 atm: ± 0.07 PSIA
Totalizer Volume Uncertainty	± 0.5% of Reading in addition to base accuracy (above)
Typical Sensor Response Time	65 - 255 ms (Adjustable)
Typical Warm-Up Time	< 1 s

1 Stated accuracy is after tare under equilibrium conditions. Extreme gas behavior (especially near state boundaries) can introduce additional flow uncertainties.

2 Achievable steady state control may be limited by user-configurable PID tuning and process conditions. Dynamic control performance is also

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 175 PSIA common mode pressure Damage possible above 75 PSID differential pressure
Leak Integrity Option	Available to 1×10^{-9} atm cc/s helium. (consult Alicat for more information)
Ingress Protection	IP40 (consult Alicat for weatherproofing options)
Humidity Range	0 to 95% non-condensing
Wetted Materials	302/303/304/410 Stainless Steel, Viton, Polyamide, Alumina, Ceramic, Glass, Gold, Silicon, Nylon, Delrin. Heat cured: Epoxy, RTV, Silicone

Control and Communications	
Analog I/O Options	4-20 mA, 0-5 VDC, 1-5 VDC, 0-10 VDC
Digital I/O Options	DeviceNet, EtherCAT, EtherNet/IP, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, Profibus, RS-232 Serial, RS-485 Serial
Electrical Connection Options	8 pin mini-DIN, DB-9, DB-15, 8 pin M12, 6 pin locking
Power Requirements ³	12-24 VDC, 250 mA min. (290 mA if equipped with 4-20 mA output)
Data Update Rate ³	Serial: 40 Hz at 19200 baud Analog: 1000 Hz
Display Update Rate	10 Hz
Analog Signal Accuracy	± 0.1% of Full Scale additional uncertainty
Typical Control Response Time	150 ms to 63% of step change (T63)
Valve Function	Normally Closed

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

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, Pressure and Temperature
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™	Allows 20 user definable gas mixes. Up to 5 constituent gases per mix, down to percentages of 0.01%

Range Specific Specifications

Full Scale Flow Mass Controller	Pressure Drop ⁴ at FS Flow (psid) venting to atmosphere	Mechanical Dimensions ⁵	Process Connections ⁶
MCR 50 slpm	2.0	5.5"H x 7.7"W x 2.3"D	1/4" NPT Female
MCR 100 slpm	3.2		
MCR 250 slpm	2.4	5.5"H x 7.7"W x 2.3"D	1/2" NPT Female
MCR 500 slpm	6.5	5.5"H x 7.4"W x 2.3"D	3/4" NPT Female (A 1-1/4" NPT Female process connection is available for 2000 slpm controllers.)
MCR 1000 slpm	14.0		
MCR 1500 slpm	17.0		
MCR 2000 slpm	28.6	5.5"H x 8.1" W x 2.9" D	1-1/4" NPT Female
MCR 3000 slpm	16.8	5.5"H x 8.9" W x 2.9" D	
MCRH 5000 slpm	14.1	6.3"H x 9.8"W x 4.5"D	

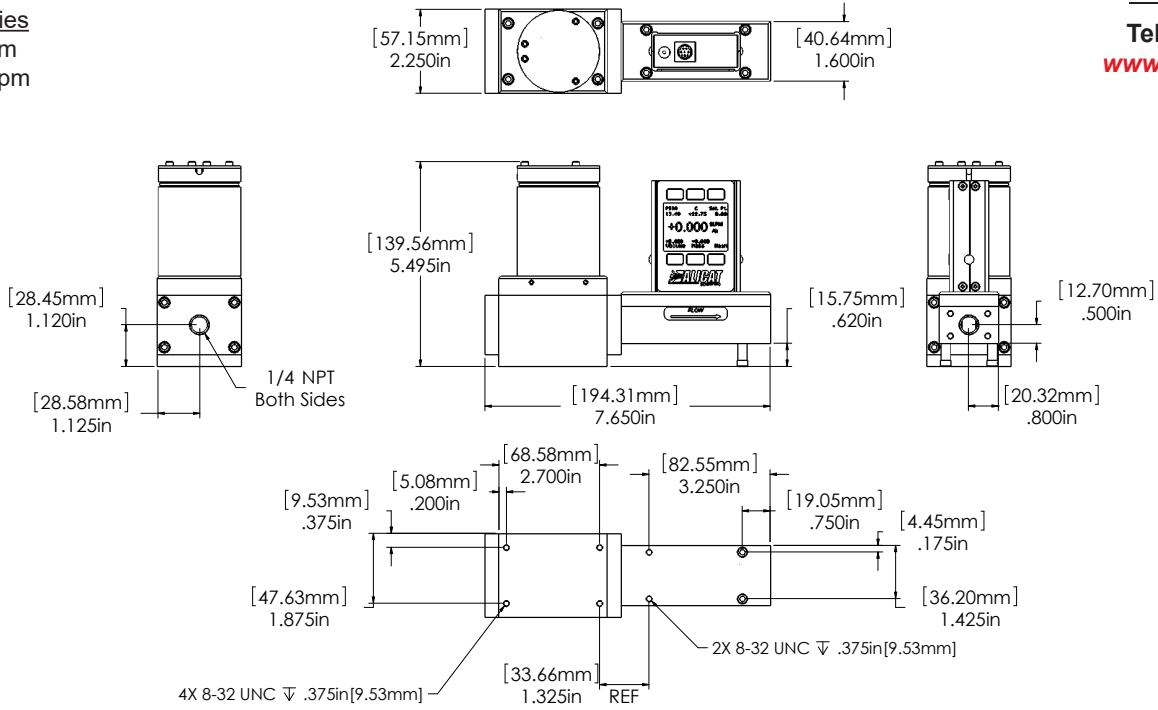
4 Lower Pressure Drops Available, please see our **WHISPER-Series** mass flow controllers at www.alicat.com/whisper.

5 See drawings for metric equivalents.

6 Compatible with Swagelok® tube, Parker®, face seal, push connect and compression adapter fittings. VCR and SAE connections upon request.

MCR-Series

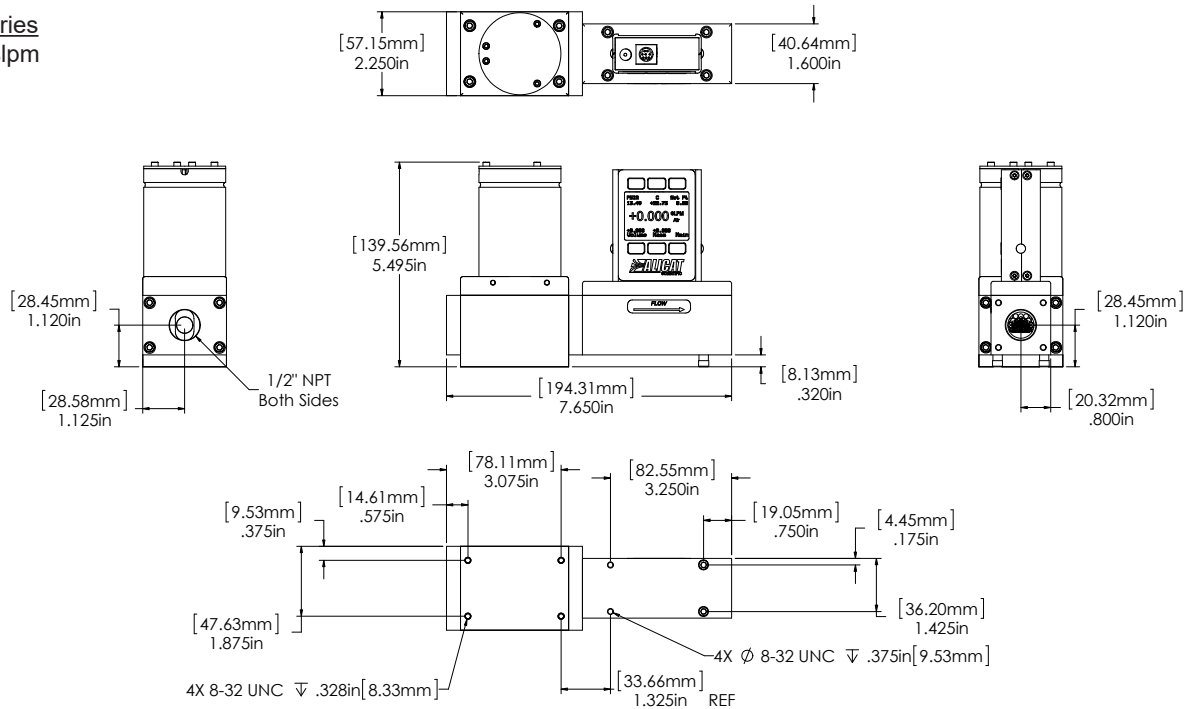
0 - 50 slpm
0 - 100 slpm



MCR 50 slpm to 100 slpm approximate weight: 9.0 lb.

MCR-Series

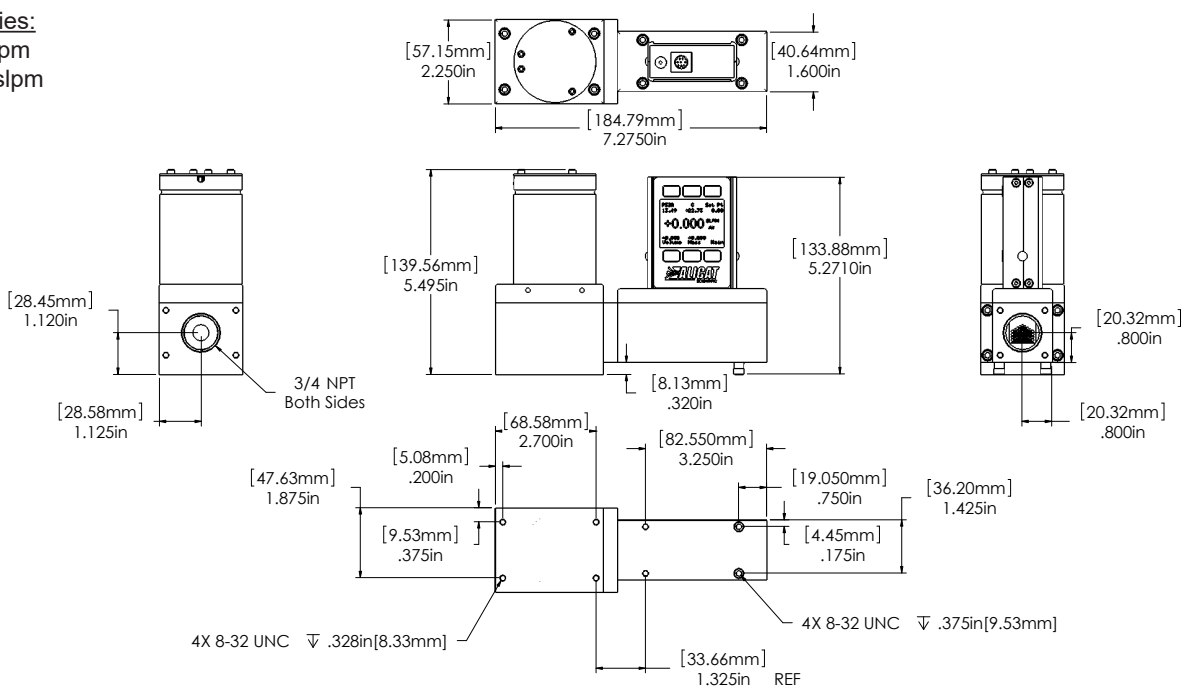
0 - 250 slpm



MCR 250 slpm approximate weight: 9.0 lb.

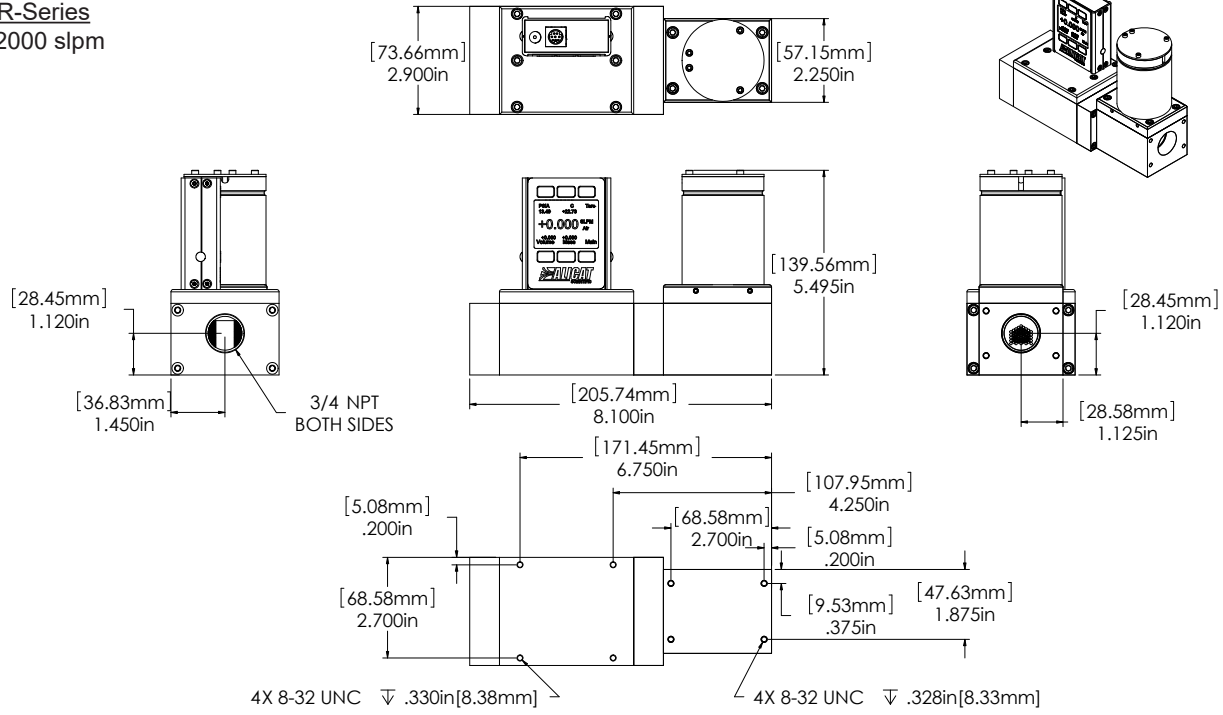
MCR-Series:

0 - 500 slpm
0 - 1000 slpm



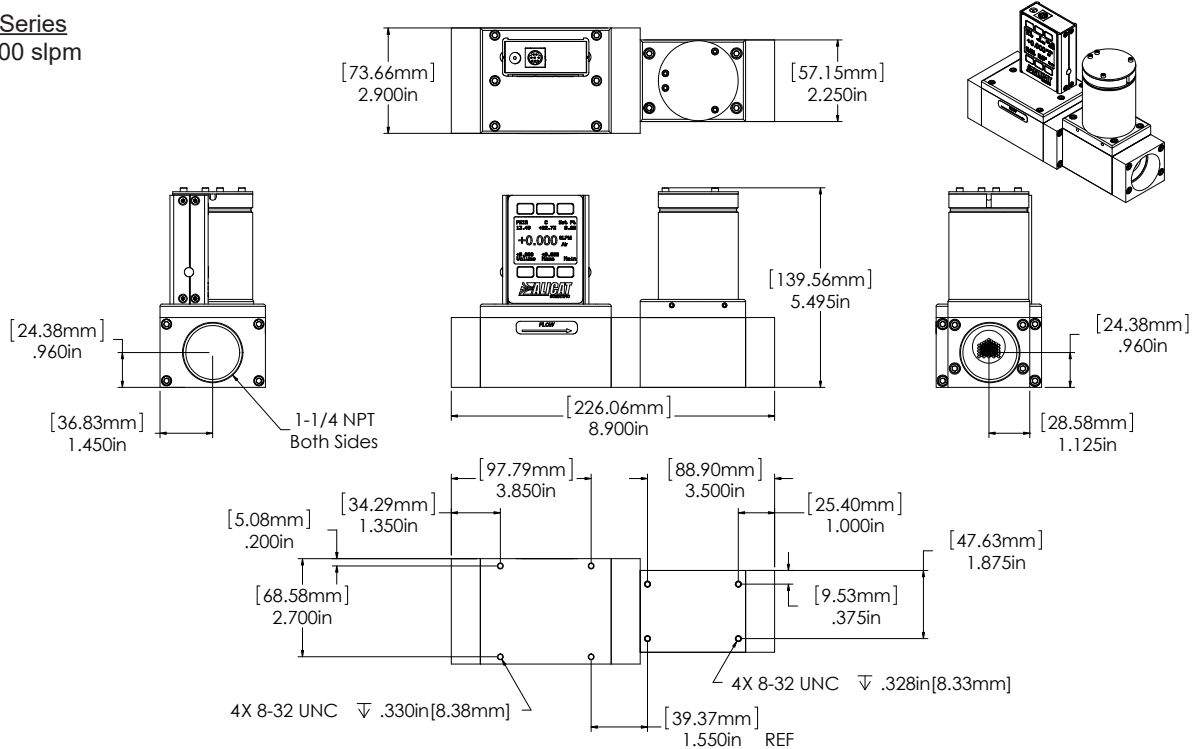
MCR 1000 slpm approximate weight: 9.0 lb.

MCR-Series
0 - 2000 slpm



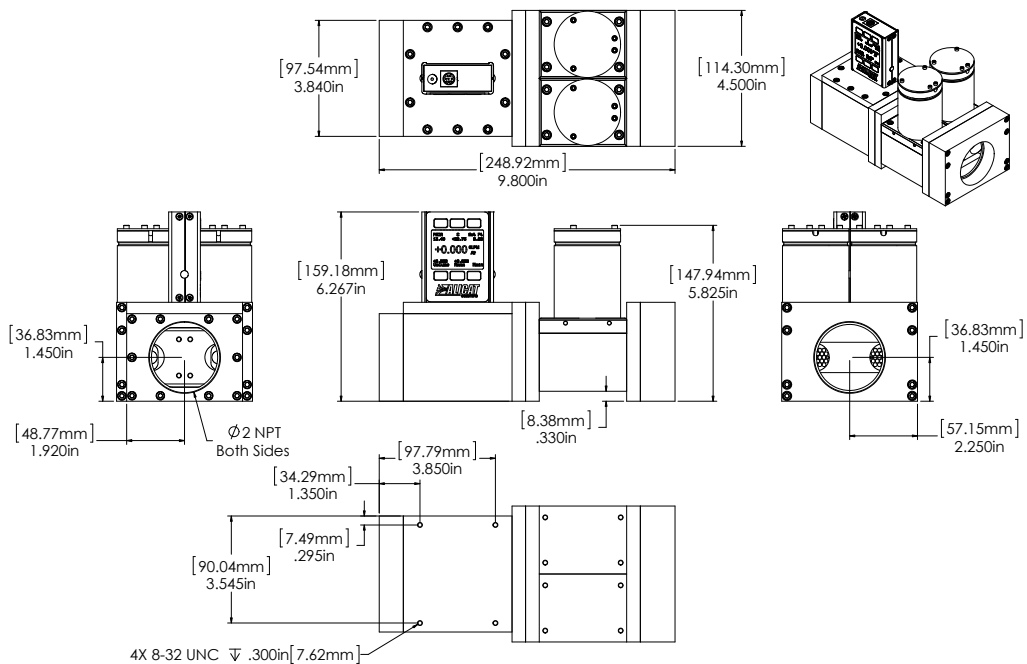
MCR 2000 slpm approximate weight: 12.0 lb.

MCR-Series
0 - 3000 slpm



MCR 3000 slpm approximate weight: 12.0 lb.

MCRH-Series
0 - 5000 slpm



MCRH 5000 slpm approximate weight: 28.0 lb.