

# 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](http://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.

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

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

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

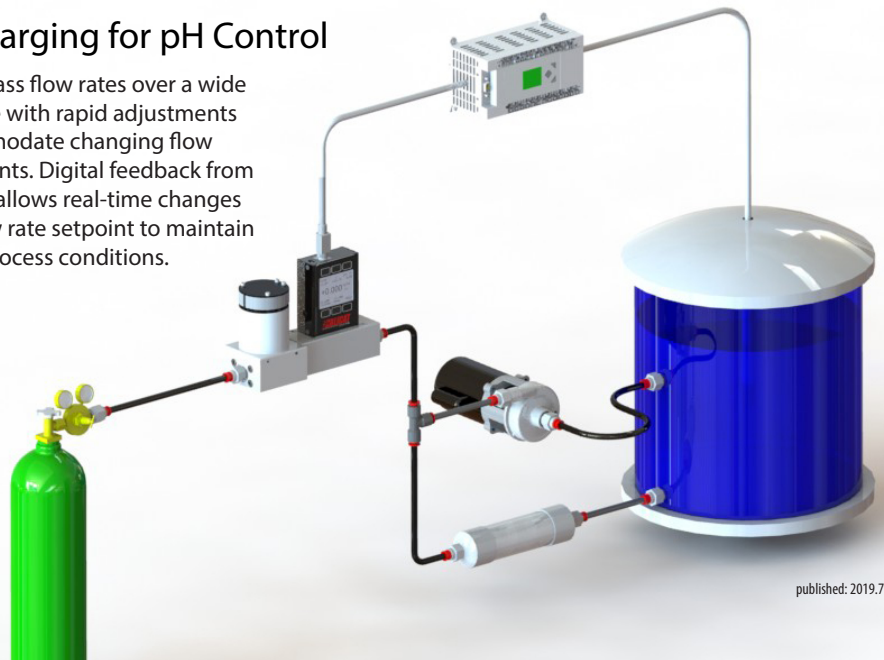
### COMMON OPTIONS:

- 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 MC-Series Mass Flow Controllers

0.5 sccm full scale through 5 sccm full scale

Standard specifications. Consult Alicat for available options.



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SENSOR AND CONTROL PERFORMANCE	
Mass Flow Accuracy at Calibration Conditions <sup>1</sup>	±0.8% of reading and ±0.2% of full scale
High Accuracy Option <sup>1</sup>	±0.4% of reading and ±0.2% of full scale Available for ≥5 SCCM models
Repeatability (2σ)	±(0.2% of reading + 0.02% of full scale)
Steady State Control Range	0.01–100% of full scale
Typical Control Response Time	As fast as 100 ms, flow rate dependent, user adjustable
Valve Function	Normally closed
Temperature Sensitivity	Mass flow zero and span shift: 0.02% of full scale per °C from 25°C
Pressure Sensitivity	Mass flow zero and span shift: ±(0.08% of reading + 0.02% of full scale) per atm 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 in additional uncertainty
Sensor Response Time	<1 ms
Typical Indication Response Time	<10 ms, flow rate dependent
Typical Warm-Up Time	<1 s

<sup>1</sup> Stated accuracy is after tare under equilibrium conditions, includes repeatability and linearity.

MECHANICAL	
Minimum Operating Pressure	11.5 PSIA common mode pressure (consult Alicat for lower operating pressures).
Maximum Operating Pressure	Damage possible above 175 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, 316L, and 430FR stainless steel; FKM, alumina ceramic, brass, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon

COMMUNICATIONS	
Analog I/O Options	4–20 mA, 0–5 VDC, 1–5 VDC, 0–10 VDC
Digital I/O Options	RS-232 Serial by default RS-485 Serial, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, Profibus
Electrical Connection Options	6 pin locking, 8 pin mini-DIN, 8 pin M12, DB-9, DB-15
Power Requirements <sup>2</sup>	12–24 VDC, 250 mA (290 mA if equipped with 4–20 mA output)
Digital Data Update Rate <sup>2</sup>	40 Hz at 19200 baud
Analog Data Update Rate <sup>2</sup>	1 kHz
Display Update Rate	10 Hz
Analog Signal Accuracy	±0.1% of full scale additional uncertainty

<sup>2</sup> Consult the individual operating bulletins for specific industrial protocol power requirements and data transmission specifications.

# Technical Data for MC-Series Mass Flow Controllers

## 0.5 sccm full scale through 5 sccm full scale

Standard specifications. Consult Alicat for available options.

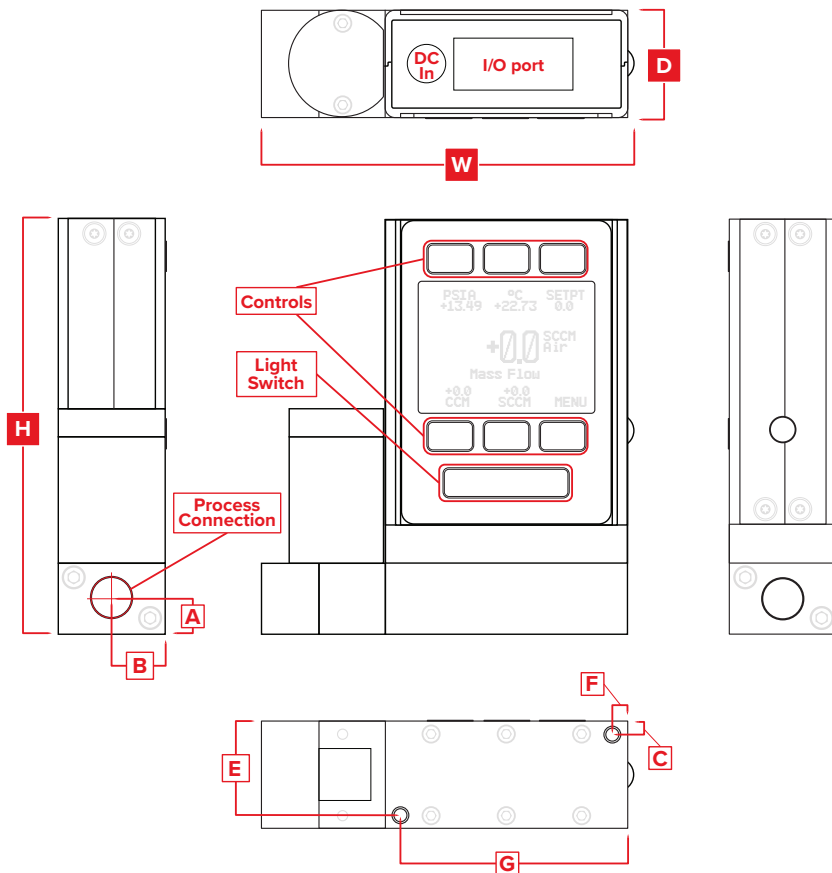
FEATURES	
STP Reference Conditions	25°C and 1 atm (default), user configurable
NTP Reference Conditions	0°C and 1 atm (default), user configurable
Monochrome LCD or Color TFT Display with Integrated Touchpad	Simultaneously displays mass flow, volumetric flow, temperature, setpoint, and pressure
Gas Select™	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 <sup>3</sup>	Process connections <sup>4</sup>	Mount tap size
0.5 sccm	1.0 PSID	M5 female (10-32 compatible) <sup>5</sup>	2× 8-32 UNC 0.175 in [4.45 mm]
1 sccm–5 sccm	2.0 PSID	M5 female (10-32 compatible) <sup>5</sup>	2× 8-32 UNC 0.175 in [4.45 mm]

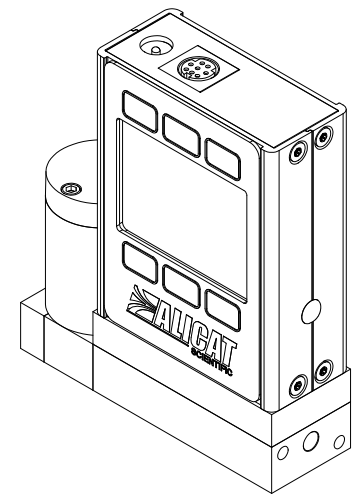
<sup>3</sup> Default valve venting air to atmosphere. Lower pressure drops and other valves available, including our WHISPER™ series mass flow controllers at [www.alicat.com/mcw](http://www.alicat.com/mcw).

<sup>4</sup> Consult Alicat for available process connection options, such as: Compression, face seal, push-to-connect, BSPP, SAE, or Swagelok® (including tube, VCO®, and VCR®).

<sup>5</sup> Shipped with Buna-N O-ring face seal to 1/8" female NPT fittings.



Representative Example



0.5 sccm

DIMENSIONS										WEIGHT
Full scale flow	Height	Width	Depth	A	B	C	E	F	G	
0.5–5 sccm	3.897 in	3.338 in	1.050 in	0.336 in	0.525 in	0.125 in	0.925 in	0.150 in	2.225 in	≈ 1.1 lb
	98.98 mm	84.79 mm	26.67 mm	8.53 mm	13.34 mm	3.18 mm	23.50 mm	3.81 mm	56.52 mm	≈ 0.5 kg

# Technical Data for MC-Series Mass Flow Controllers

10 sccm full scale through 20 SLPM full scale

Standard specifications. Consult Alicat for available options.



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SENSOR AND CONTROL PERFORMANCE	
Mass Flow Accuracy at Calibration Conditions <sup>1</sup>	±0.6% of reading or ±0.1% of full scale, whichever is greater
High Accuracy Option <sup>1</sup>	±0.5% of reading or ±0.1% of full scale, whichever is greater
Repeatability (2σ)	±(0.1% of reading + 0.02% of full scale)
Steady State Control Range	0.01–100% of full scale
Typical Control Response Time	As fast as 30 ms, flow rate dependent, user adjustable
Valve Function	Normally closed
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 atm 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 in additional uncertainty
Sensor Response Time	<1 ms
Typical Indication Response Time	<10 ms, flow rate dependent
Typical Warm-Up Time	<1 s

<sup>1</sup> Stated accuracy is after tare under equilibrium conditions, includes repeatability and linearity.

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 PSI differential pressure.
Ingress Protection	IP40 (consult Alicat for weatherproofing options)
Humidity Range	0–95%, non-condensing
Wetted Materials	302, 303, 304, 316L, and 430FR stainless steel; FKM, alumina ceramic, brass, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon

COMMUNICATIONS	
Analog I/O Options	4–20 mA, 0–5 VDC, 1–5 VDC, 0–10 VDC
Digital I/O Options	RS-232 Serial by default RS-485 Serial, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, Profibus
Electrical Connection Options	6-pin locking, 8-pin mini-DIN, 8-pin M12, DB-9, DB-15
Power Requirements <sup>2</sup>	12–24 VDC, 250 mA (290 mA if equipped with 4–20 mA output)
Digital Data Update Rate <sup>2</sup>	40 Hz at 19200 baud
Analog Data Update Rate <sup>2</sup>	1 kHz
Display Update Rate	10 Hz
Analog Signal Accuracy	±0.1% of full scale additional uncertainty

<sup>2</sup> Consult the individual operating bulletins for specific industrial protocol power requirements and data transmission specifications.



# Technical Data for MC-Series Mass Flow Controllers

**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, setpoint, 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 <sup>3</sup>	Process connections <sup>4</sup>	Mount tap size
10 sccm	2.8 PSID	M5 female (10-32 compatible) <sup>5</sup>	2× 8-32 UNC 0.175 in [4.45 mm]
20–50 sccm	1.0 PSID	M5 female (10-32 compatible) <sup>5</sup>	2× 8-32 UNC 0.175 in [4.45 mm]
100–500 sccm	1.0 PSID	1/8" NPT female	2× 8-32 UNC 0.175 in [4.45 mm]
1 SLPM	1.5 PSID	1/8" NPT female	2× 8-32 UNC 0.175 in [4.45 mm]
2 SLPM	3.0 PSID	1/8" NPT female	2× 8-32 UNC 0.175 in [4.45 mm]
5 SLPM	2.0 PSID	1/8" NPT female	2× 8-32 UNC 0.175 in [4.45 mm]
10 SLPM	5.5 PSID	1/8" NPT female	2× 8-32 UNC 0.175 in [4.45 mm]
20 SLPM	20.0 PSID	1/8" NPT female	2× 8-32 UNC 0.175 in [4.45 mm]

<sup>3</sup> Default valve venting air to atmosphere. Lower pressure drops and other valves available, including our WHISPER™ series mass flow controllers at [www.alicat.com/mcw](http://www.alicat.com/mcw).

<sup>4</sup> Consult Alicat for available process connection options, such as: Compression, face seal, push-to-connect, BSPP, SAE, or Swagelok® (including tube, VCO®, and VCR®).

<sup>5</sup> Shipped with Buna-N O-ring face seal to 1/8" female NPT fittings.

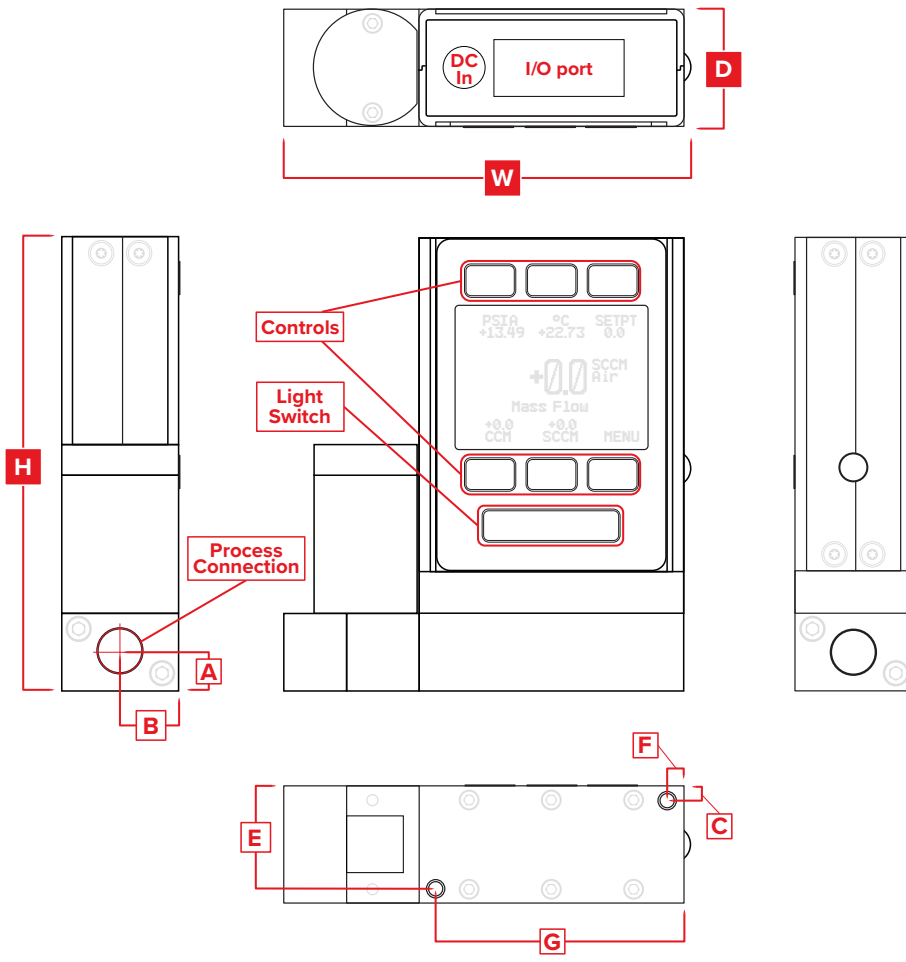
# Technical Data for MC-Series Mass Flow Controllers

10 sccm full scale through 20 SLPM full scale

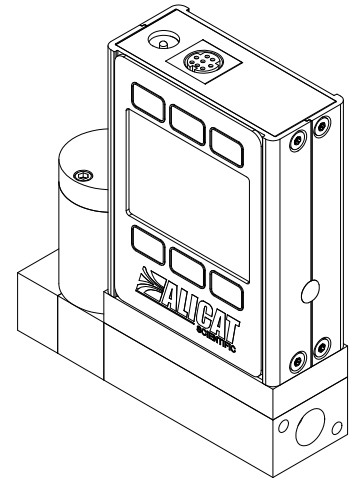
Standard specifications. Consult Alicat for available options.



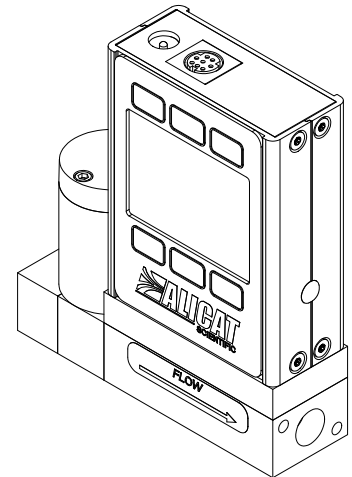
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## Representative Examples



100 sccm



10 SLPM

DIMENSIONS										WEIGHT
Full scale flow	Height	Width	Depth	A	B	C	E	F	G	
10–50 sccm	3.897 in	3.338 in	1.050 in	0.336 in	0.525 in	0.125 in	0.925 in	0.150 in	2.225 in	≈ 1.1 lb
	98.98 mm	84.79 mm	26.67 mm	8.53 mm	13.34 mm	3.18 mm	23.50 mm	3.81 mm	56.52 mm	≈ 0.5 kg
100 sccm– 20 SLPM	4.067 in	3.588 in	1.050 in	0.350 in	0.525 in	0.125 in	0.925 in	0.150 in	2.225 in	≈ 1.2 lb
	103.30 mm	91.14 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

# Technical Data for MC-Series Mass Flow Controllers

50 SLPM full scale through 5000 SLPM full scale

Standard specifications. Consult Alicat for available options.



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SENSOR AND CONTROL PERFORMANCE	
Mass Flow Accuracy at Calibration Conditions <sup>1</sup>	±0.8% of reading and ±0.2% of full scale
High Accuracy Option <sup>1</sup>	±0.4% of reading and ±0.2% of full scale Available for ≤500 SLPM models
Repeatability (2σ)	±(0.2% of reading + 0.02% of full scale)
Steady State Control Range	0.01–100% of full scale
Typical Control Response Time	As fast as 30 ms, flow rate dependent, user adjustable
Valve Function	Normally closed
Temperature Sensitivity	Mass flow zero and span shift: 0.02% of full scale per °C from 25°C
Pressure Sensitivity	Mass flow zero and span shift: ±(0.08% of reading + 0.02% of full scale) per atm 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 in additional uncertainty
Sensor Response Time	<1 ms
Typical Indication Response Time	<10 ms, flow rate dependent
Typical Warm-Up Time	<1 s

<sup>1</sup> Stated accuracy is after tare under equilibrium conditions, includes repeatability and linearity.

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 PSI differential pressure.
Ingress Protection	IP40 (consult Alicat for weatherproofing options)
Humidity Range	0–95%, non-condensing
Wetted Materials	<b>MC and MCP:</b> 302, 303, 304, 316L, and 430FR stainless steel; FKM, alumina ceramic, brass, glass, gold, heat-cured epoxy, heat-cured silicone rubber, polyamide, silicon <b>MCR and MCRH:</b> 302, 303, 304, 316L, and 410 stainless steel; FKM, alumina ceramic, Delrin®, glass, gold, heat-cured epoxy, heat-cured silicone rubber, nylon, polyamide, silicon

COMMUNICATIONS	
Analog I/O Options	4–20 mA, 0–5 VDC, 1–5 VDC, 0–10 VDC
Digital I/O Options	RS-232 Serial by default RS-485 Serial, Modbus RTU (over RS-232 or RS-485), Modbus TCP/IP, DeviceNet, EtherCAT, EtherNet/IP, Profibus
Electrical Connection Options	6-pin locking, 8-pin mini-DIN, 8-pin M12, DB-9, DB-15
Power Requirements <sup>2</sup>	<b>MCP (miniature valve):</b> 12–24 VDC, 250 mA <b>MCR (Rolamite valve):</b> 24 VDC, 1 A <b>MCRH (dual Rolamite valves):</b> 24–30 VDC, 2 A Add 40 mA if equipped with 4–20 mA output
Digital Data Update Rate <sup>2</sup>	40 Hz at 19200 baud
Analog Data Update Rate <sup>2</sup>	1 kHz
Display Update Rate	10 Hz
Analog Signal Accuracy	±0.1% of full scale additional uncertainty

<sup>2</sup> Consult the individual operating bulletins for specific industrial protocol power requirements and data transmission specifications.



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

**50 SLPM** full scale through **5000 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, setpoint, 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	Type	Pressure drop at full scale flow <sup>3</sup>	Process connections <sup>4</sup>	Mount tap size
50 SLPM	MCP	5.0 PSID	¼" NPT female	4× 8-32 UNC 0.375 in [9.53 mm]
100 SLPM	MCP	15.5 PSID	¼" NPT female	4× 8-32 UNC 0.375 in [9.53 mm]
250 SLPM	MCR	2.4 PSID	½" NPT female	4× 8-32 UNC 0.328 in [8.33 mm]
500 SLPM	MCR	6.5 PSID	¾" NPT female	4× 8-32 UNC 0.328 in [8.33 mm]
1000 SLPM	MCR	14.0 PSID	¾" NPT female	4× 8-32 UNC 0.328 in [8.33 mm]
1500 SLPM	MCR	17.0 PSID	¾" NPT female	4× 8-32 UNC 0.328 in [8.33 mm]
2000 SLPM	MCR	28.6 PSID	¾" NPT female (1¼" NPT connection available)	4× 8-32 UNC 0.330 in [8.38 mm]
3000 SLPM	MCR	16.8 PSID	1¼" NPT female	4× 8-32 UNC 0.330 in [8.38 mm]
5000 SLPM	MCRH	14.1 PSID	1½" NPT female	4× 8-32 UNC 0.300 in [7.62 mm]

<sup>3</sup> Default valve venting air to atmosphere. Lower pressure drops and other valves available, including our WHISPER™ series mass flow controllers at [www.alicat.com/mcw](http://www.alicat.com/mcw).

<sup>4</sup> Consult Alicat for available process connection options, such as: Compression, face seal, push-to-connect, BSPP, SAE, or Swagelok® (including tube, VCO®, and VCR®).

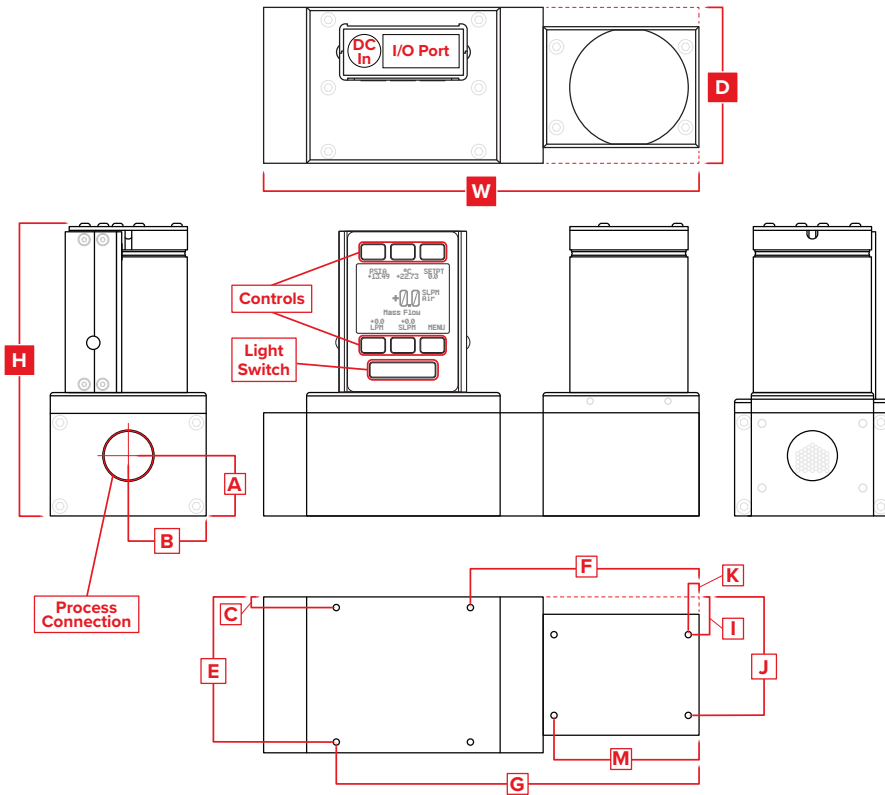
# Technical Data for MC-Series Mass Flow Controllers

50 SLPM full scale through 5000 SLPM full scale

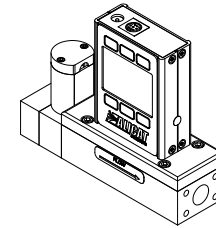
Standard specifications. Consult Alicat for available options.



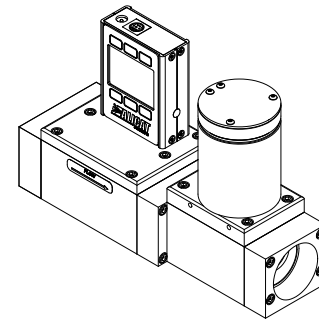
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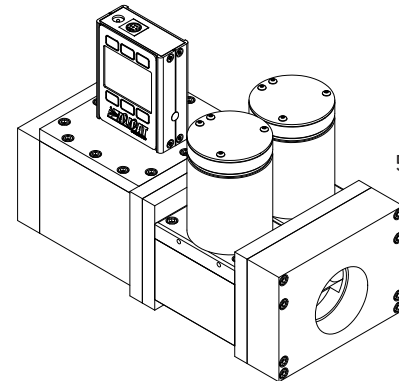
## Representative Examples



100 SLPM



2000 SLPM



5000 SLPM

DIMENSIONS														WEIGHT	
Full scale flow	Type	Height	Width	Depth	A	B	C	E	F	G	I	J	K	M	
50–100 SLPM	MCP	4.367 in	5.408 in	1.600 in	0.500 in	0.800 in	0.175 in	1.425 in	0.750 in	3.250 in	—	—	—	—	≈ 9.0 lb
		110.92 mm	137.36 mm	40.64 mm	12.70 mm	20.32 mm	4.45 mm	36.20 mm	19.05 mm	82.55 mm	—	—	—	—	≈ 4.1 kg
250 SLPM	MCR	5.495 in	7.650 in	2.250 in	1.120 in	1.125 in	0.175 in	1.425 in	4.400 in	6.900 in	0.375 in	1.875 in	0.575 in	3.075 in	≈ 9.0 lb
		139.57 mm	194.31 mm	57.15 mm	28.45 mm	28.58 mm	4.45 mm	36.20 mm	111.76 mm	175.26 mm	9.53 mm	47.63 mm	14.61 mm	78.11 mm	≈ 4.1 kg
500–1000 SLPM	MCR	5.495 in	7.275 in	2.250 in	1.120 in	1.125 in	0.175 in	1.425 in	4.025 in	6.525 in	0.375 in	1.875 in	0.200 in	2.700 in	≈ 9.0 lb
		139.57 mm	184.79 mm	57.15 mm	28.45 mm	28.58 mm	4.45 mm	36.20 mm	102.24 mm	165.74 mm	9.53 mm	47.63 mm	5.08 mm	68.58 mm	≈ 4.1 kg
2000 SLPM	MCR	5.495 in	8.100 in	2.900 in	1.120 in	1.450 in	0.200 in	2.700 in	4.250 in	6.750 in	0.700 in	2.200 in	0.200 in	2.700 in	≈ 12.0 lb
		139.57 mm	205.74 mm	73.66 mm	28.45 mm	36.83 mm	5.08 mm	68.58 mm	107.95 mm	171.45 mm	17.78 mm	55.88 mm	5.08 mm	68.58 mm	≈ 5.4 kg
3000 SLPM	MCR	5.495 in	8.900 in	2.900 in	0.960 in	1.450 in	0.200 in	2.700 in	5.050 in	7.550 in	0.700 in	2.200 in	1.000 in	3.500 in	≈ 12.0 lb
		139.57 mm	226.06 mm	73.66 mm	24.38 mm	36.83 mm	5.08 mm	68.58 mm	128.27 mm	191.77 mm	17.78 mm	55.88 mm	25.40 mm	88.90 mm	≈ 5.4 kg
5000 SLPM	MCRH	6.267 in	9.800 in	3.840 in	1.450 in	1.920 in	0.295 in	3.545 in	5.958 in	8.455 in	—	—	—	—	≈ 28.0 lb
		159.18 mm	248.92 mm	97.54 mm	36.83 mm	48.77 mm	7.49 mm	90.04 mm	151.32 mm	214.76 mm	—	—	—	—	≈ 12.7 kg