



## Product Specifications

### Apex Low Pressure Drop Mass Flow Controllers 10 SCCM to 100 SLPM Full Scale

#### SENSOR AND CONTROL PERFORMANCE

|                                                           |                                                                                                                                                            |
|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mass Flow Accuracy at calibration conditions <sup>1</sup> | ±0.75% of reading or ±0.1% of full scale, whichever is greater                                                                                             |
| High Accuracy Option <sup>1</sup>                         | ±0.6% of reading or ±0.1% of full scale, whichever is greater                                                                                              |
| Repeatability (2σ)                                        | ±(0.2% of reading + 0.02% of full scale)                                                                                                                   |
| Steady State Control Range <sup>2</sup>                   | 0.5–100% of full scale                                                                                                                                     |
| Typical Control Response Time                             | MCW: 30 ms to 63% of step change (T63), user adjustable<br>MCRW: 150 ms to 63% of step change (T63), user adjustable                                       |
| Valve Function                                            | Normally Closed                                                                                                                                            |
| Temperature Sensitivity                                   | Mass flow zero shift: ±0.03% of full scale per °C from tare temperature<br>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<br>Mass flow span shift: ±0.1% of reading per atmosphere from calibration conditions |
| Operating Temperature Range                               | –10–60°C (expanded range available)                                                                                                                        |
| Temperature Accuracy                                      | ±0.75°C                                                                                                                                                    |
| Operating Pressure Full Scale                             | 60 PSIA                                                                                                                                                    |
| Pressure Accuracy above 1 ATM                             | ±0.75% of reading                                                                                                                                          |
| Pressure Accuracy below 1 ATM                             | ±0.1 PSIA                                                                                                                                                  |
| Totalizer Volume Uncertainty                              | ±0.5% of reading additional uncertainty                                                                                                                    |
| Sensor Response Time                                      | <1 ms                                                                                                                                                      |
| Typical Indication Response Time <sup>3</sup>             | 127 ms (user 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 limited by control response time, which may vary with the flow rate.

**3** Indication response time includes user-adjustable averaging up to 255 ms.

#### MECHANICAL

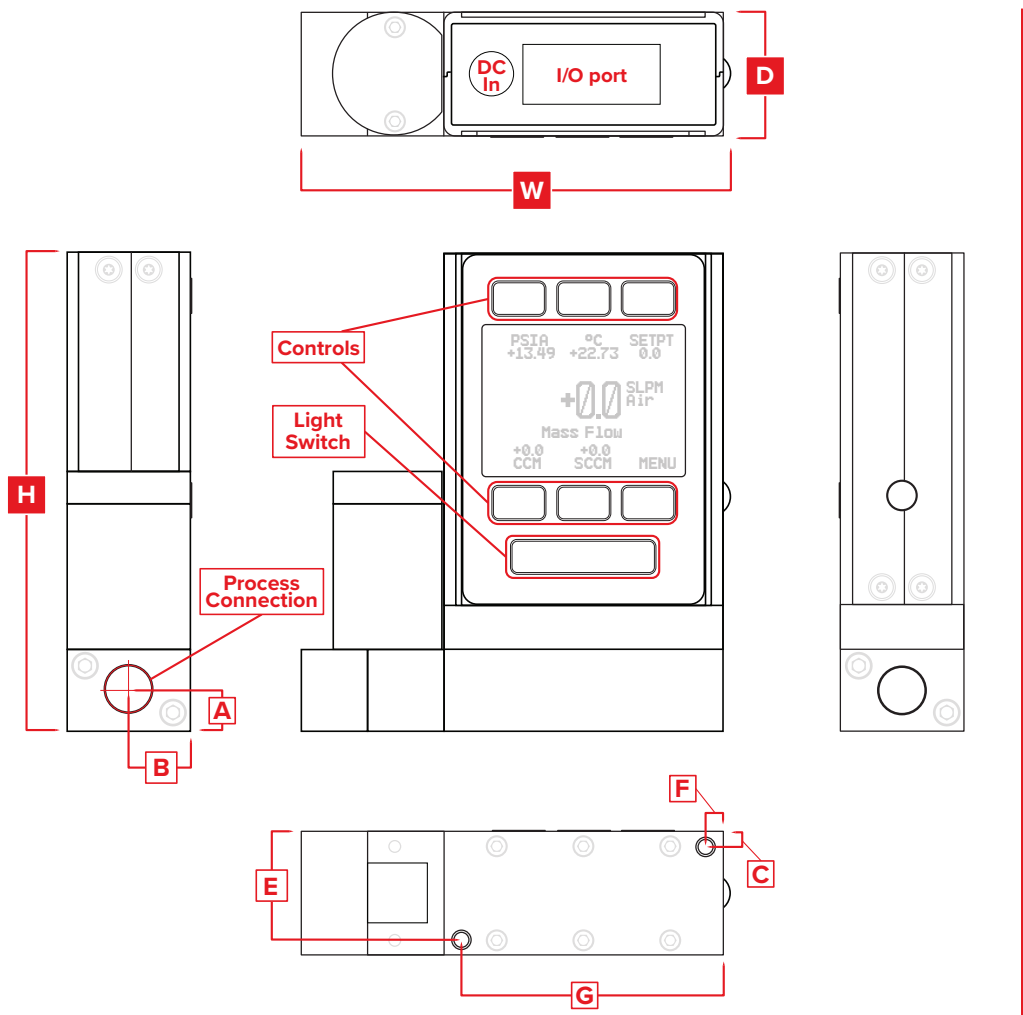
|                            |                                                                                                                                                                                                                                                |
|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Minimum Operating Pressure | 11.5 PSIA common mode pressure (lower operating pressures available)<br>Differential pressure must exceed model pressure drop, see below for details                                                                                           |
| Maximum Operating Pressure | Damage possible above 80 PSIA common mode pressure<br>Damage possible above 15 PSID differential pressure                                                                                                                                      |
| Ingress Protection         | IP40 (consult Alicat for weatherproofing options)                                                                                                                                                                                              |
| Humidity Range             | 0–95%, non-condensing                                                                                                                                                                                                                          |
| Wetted Materials           | 302 / 303 / 304 stainless steel, Viton®, heat-cured silicone rubber,<br>glass-reinforced polyphenylene sulfide, heat-cured epoxy, alumina, gold, silicon, glass<br>MCW: Add brass and 430FR stainless steel.<br>MCRW: Add 410 stainless steel. |

| 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<br>RS-485 Serial, Modbus RTU (over RS-232 or RS-485),<br>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>4</sup>       | MCW: 12–24 VDC, 250 mA<br>MCRW: 24 VDC, 1 A<br>Add 40 mA if equipped with 4–20 mA output                                                    |
| Digital Data Update Rate <sup>4</sup> | 40 Hz at 19200 baud                                                                                                                         |
| Analog Data Update Rate               | 1 kHz                                                                                                                                       |
| Display Update Rate                   | 10 Hz                                                                                                                                       |
| Analog Signal Accuracy                | ±0.1% of full scale additional uncertainty                                                                                                  |

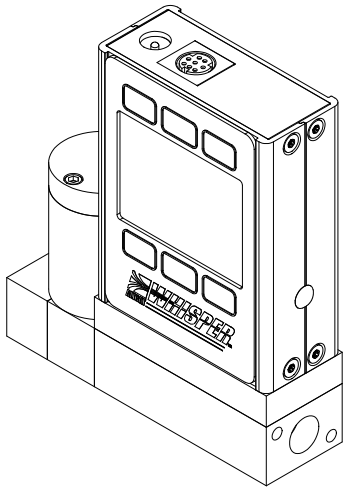
**4** Consult the individual operating bulletins for specific industrial protocol power requirements and data transmission specifications.

| 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, 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% precision.                                                                                                             |

| RANGE SPECIFIC SPECIFICATIONS |      |                                                                     |                                                  |                               |
|-------------------------------|------|---------------------------------------------------------------------|--------------------------------------------------|-------------------------------|
| Full scale flow               | Type | Pressure drop at full scale flow venting to atmosphere <sup>5</sup> | Process connections <sup>6</sup>                 | Mount tap size                |
| 10–20 sccm                    | MCW  | 0.07 PSID                                                           | M5 female thread (10-32 compatible) <sup>7</sup> | 2× 8-32 UNC 0.175 in [4.45mm] |
| 50–500 sccm                   | MCW  | 0.07 PSID                                                           | ⅛" NPT Female                                    | 2× 8-32 UNC 0.300 in [7.62mm] |
| 1 SLPM                        | MCW  | 0.10 PSID                                                           | ⅛" NPT Female                                    | 2× 8-32 UNC 0.300 in [7.62mm] |
| 2 SLPM                        | MCW  | 0.18 PSID                                                           | ⅛" NPT Female                                    | 2× 8-32 UNC 0.300 in [7.62mm] |



Representative Example

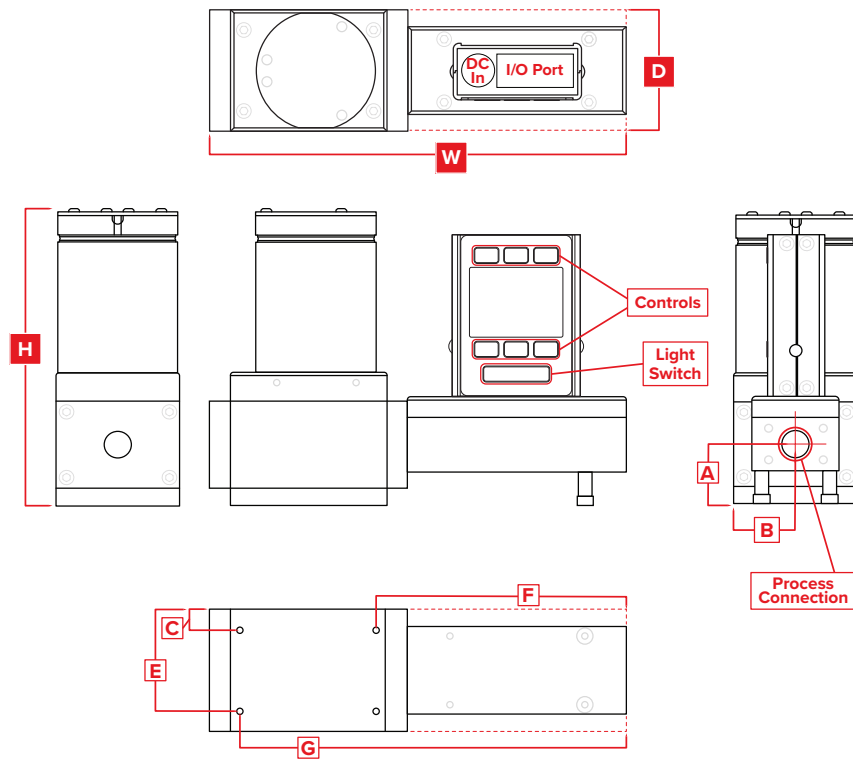


2 SLPM

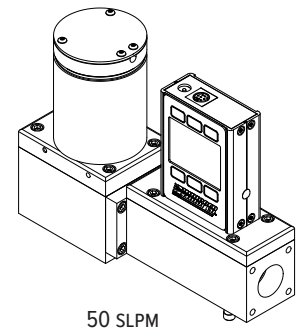
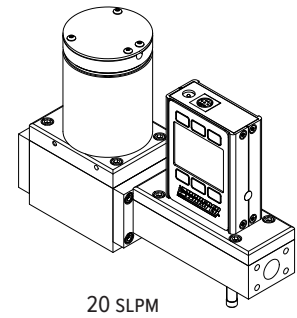
| DIMENSIONS      |      |          |           |          |          |          |          |          |          |          |          |
|-----------------|------|----------|-----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Full scale flow | Type | Weight   | Height    | Width    | Depth    | A        | B        | C        | E        | F        | G        |
| 10–20 sccm      | MCW  | ≈ 1.1 lb | 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 |
|                 |      | ≈ 0.5 kg | 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 |
| 50 sccm–2 SLPM  | MCW  | ≈ 1.2 lb | 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 |
|                 |      | ≈ 0.5 kg | 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 |

## RANGE SPECIFIC SPECIFICATIONS

| Full scale flow | Type | Pressure drop at full scale flow venting to atmosphere <sup>5</sup> | Process connections <sup>6</sup> | Mount tap size                 |
|-----------------|------|---------------------------------------------------------------------|----------------------------------|--------------------------------|
| 5 SLPM          | MCRW | 0.10 PSID                                                           | ¼" NPT Female                    | 4× 8-32 UNC 0.375 in [9.53 mm] |
| 10 SLPM         | MCRW | 0.12 PSID                                                           | ¼" NPT Female                    | 4× 8-32 UNC 0.375 in [9.53 mm] |
| 20 SLPM         | MCRW | 0.26 PSID                                                           | ¼" NPT Female                    | 4× 8-32 UNC 0.375 in [9.53 mm] |
| 40 SLPM         | MCRW | 0.14 PSID                                                           | ½" NPT Female                    | 4× 8-32 UNC 0.328 in [8.33 mm] |
| 50 SLPM         | MCRW | 0.17 PSID                                                           | ¾" NPT Female                    | 4× 8-32 UNC 0.328 in [8.33 mm] |
| 100 SLPM        | MCRW | 0.30 PSID                                                           | ¾" NPT Female                    | 4× 8-32 UNC 0.328 in [8.33 mm] |



## Representative Examples



## DIMENSIONS

| Full scale flow  | Type | Weight   | Height    | Width     | Depth    | A        | B        | C        | E        | F         | G         |
|------------------|------|----------|-----------|-----------|----------|----------|----------|----------|----------|-----------|-----------|
| 5 SLPM           | MCRW | ≈ 9.0 lb | 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  |
|                  |      | ≈ 4.1 kg | 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  |
| 10 SLPM          | MCRW | ≈ 9.0 lb | 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  |
|                  |      | ≈ 4.1 kg | 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  |
| 20 SLPM          | MCRW | ≈ 9.0 lb | 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  |
|                  |      | ≈ 4.1 kg | 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  |
| 40 SLPM          | MCRW | ≈ 9.0 lb | 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  |
|                  |      | ≈ 4.1 kg | 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 |
| 50 SLPM–100 SLPM | MCRW | ≈ 9.0 lb | 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  |
|                  |      | ≈ 4.1 kg | 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 |