The C-Series Mass Flow Controller (MFC) is a compact, fast response model using a Micro-Electro-Mechanical Systems (MEMS) based flow sensor for non-corrosive gas applications. The device is available in Full Scale flow rates from 10 sccm to 10 slm (N\textsubscript{2} equivalent) with a control range from as low as 0.1% of Full Scale up to 100% of Full Scale and is also available as a flow meter. Either analog (0 to 5 VDC) or digital (RS485, PROFINET® or Modbus TCP/IP) communication interfaces are available. The required power supply voltage is 24 VDC nominal.

The C-Series compact design is only 1'' (25.4 mm) and less than 4.4'' (111.8 mm) high. It has standard lengths of 4.88'' (124 mm) for 4 VCR\textsuperscript® male and 4.54'' (113 mm) for ¼'' compression seal gas line connections. Downmount versions are also available.

A low thermal mass MEMS sensor provides rapid sensing of flow changes with low noise output. The solid state design of the sensor makes it resistant to water condensation, particles, pressure shock and vibration.

Fast response, wide dynamic control range, and 0.8% of set point accuracy make this MFC an excellent choice for flow control in critical process applications where non-corrosive gases are used. Typical uses can be found in mass spectroscopy, vacuum coating, bioreactor as well as many other applications. The C-Series incorporates a fast-acting solenoid control valve coupled with the flow sensor via the MFC’s superior flow signal processing and control algorithm. This results in response times to set point of less than 100 milliseconds.

**Product Features**

- Ultrafast response time of <100 msec
- Control range from 0.1% to 100% of Full Scale
- Accuracy of ±0.8% of set point
- Minimal zero and span drift assure long term reproducibility
- Standard length for drop in replacement of other MFCs
- Surface mount interface available for compact gas panel design
- Embedded web browser for setup and diagnostics

**Key Benefits**

- Achieve and maintain process conditions quickly
- Provide consistent process results device to device
- Provide consistent process results over extended periods
## Specifications

### Performance

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Scale Range (N₂ equivalent)</td>
<td>50, 100, 200, 500, 1000, 2000, 5000, 10000 sccm</td>
</tr>
<tr>
<td>Maximum Inlet Pressure</td>
<td>80 psig</td>
</tr>
<tr>
<td>Normal Operating Pressure Differential (with atmospheric pressure at the MFC outlet)</td>
<td>• 50 to 5000 sccm: 10 to 45 psid&lt;br&gt;• 10000: 15 to 45 psid</td>
</tr>
<tr>
<td>Proof Pressure</td>
<td>232 psi/16 bar</td>
</tr>
<tr>
<td>Burst Pressure</td>
<td>1000 psi/70 bar</td>
</tr>
<tr>
<td>Typical Control Range Digital I/O Analog I/O</td>
<td>• 0.1% to 100% of Full Scale&lt;br&gt;• 0.2% to 100% of Full Scale</td>
</tr>
<tr>
<td>Typical Accuracy (with N₂ calibration gas)</td>
<td>• ±0.8% of set point for 20 to 100% Full Scale&lt;br&gt;• ±0.16% of Full Scale for &lt;20% of Full Scale</td>
</tr>
<tr>
<td>Repeatability</td>
<td>±0.2% of Reading</td>
</tr>
<tr>
<td>Temperature Coefficients Zero Span</td>
<td>• ≤0.005% of Full Scale°C&lt;br&gt;• ≤0.06% of Reading°C</td>
</tr>
<tr>
<td>Pressure Coefficient</td>
<td>&lt;0.025% of Reading/psi</td>
</tr>
<tr>
<td>Typical Response Time¹ (per SEMI Guideline E-17-0600)</td>
<td>• ≤100 ms typical above 10% Full Scale, 50 sccm - 5 slm Full Scale models&lt;br&gt;• ≤150 ms typical above 10% Full Scale, 10 slm Full Scale models</td>
</tr>
<tr>
<td>Warm-up Time (to within 0.2% of Full Scale of set point)</td>
<td>≤1 min</td>
</tr>
<tr>
<td>Normal Operating Temperature Range</td>
<td>10°C to 50°C (32°F - 122°F)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>0°C to 60°C (32°F - 140°F)</td>
</tr>
</tbody>
</table>

¹ Response times may vary due to gas type and line pressure conditions.

### Mechanical

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fittings (compatible with)</td>
<td>Swagelok® 4 VCR® male, surface mount (o-ring and w-seal), 1/4” Swagelok compression</td>
</tr>
<tr>
<td>Leak Integrity External (scc/sec He) Through Closed Valve</td>
<td>• &lt;1 x 10⁻⁹&lt;br&gt;• &lt;0.1% of max. Full Scale range using valve closed override command (To assure no flow-through, a separate positive shut-off valve is required.)</td>
</tr>
<tr>
<td>Wetted Materials Standard Valve Seat</td>
<td>• Aluminum, Stainless Steel, Silicon, Silicon Oxide, Silicon Carbide, Viton®, Glob Top&lt;br&gt;• Viton</td>
</tr>
<tr>
<td>Weight</td>
<td>0.68 lbs (310 grams) (VCR)</td>
</tr>
<tr>
<td>Valve Type</td>
<td>Normally Closed</td>
</tr>
</tbody>
</table>

### Electrical Analog I/O

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power Required</td>
<td>24 VDC @ (±10%), &lt;4 watts</td>
</tr>
<tr>
<td>Set Point Command Signal</td>
<td>0 to 5 VDC (0 to 10 VDC, optional)</td>
</tr>
<tr>
<td>Output Signal</td>
<td>0 to 5 VDC (0 to 10 VDC, optional)</td>
</tr>
<tr>
<td>Connector</td>
<td>9-pin Type “D”</td>
</tr>
<tr>
<td>Compliance</td>
<td>CE</td>
</tr>
<tr>
<td>Digital I/O</td>
<td>RS485</td>
</tr>
<tr>
<td>----------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Input Power Required</td>
<td>24 VDC @ (±10%), &lt;4 watts</td>
</tr>
<tr>
<td>Connector</td>
<td>9 pin Type “D” male (power and comm.)</td>
</tr>
<tr>
<td>Data Rate Switch/Selection</td>
<td>• No switch</td>
</tr>
<tr>
<td></td>
<td>• Set data rate via RS485</td>
</tr>
<tr>
<td>Comm. Rate(s)</td>
<td>• 9.6 Kbps</td>
</tr>
<tr>
<td></td>
<td>• 19.2 Kbps</td>
</tr>
<tr>
<td></td>
<td>• 38.4 Kbps</td>
</tr>
<tr>
<td>MAC ID Switches/Addresses</td>
<td>• Set address over RS485</td>
</tr>
<tr>
<td></td>
<td>• Station addresses 0.0 to 9,9</td>
</tr>
<tr>
<td>Network Size</td>
<td>Up to 32 nodes</td>
</tr>
<tr>
<td>Visual Indicators</td>
<td>• LED PWR</td>
</tr>
<tr>
<td></td>
<td>• RUN (green)</td>
</tr>
<tr>
<td></td>
<td>• LED Ready (green)</td>
</tr>
<tr>
<td></td>
<td>• LED Sys Fault (red)</td>
</tr>
<tr>
<td>Compliance</td>
<td>CE</td>
</tr>
</tbody>
</table>

**Note:** Unless otherwise specified, dimensions are nominal values in inches (mm referenced).
# Ordering Information

**Ordering Code Example:** CMA10B013102RCV1010

<table>
<thead>
<tr>
<th>Model</th>
<th>Code</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEMS Mass Flow Controller &lt;br&gt;(Type based on gas and range per bottom table)</td>
<td>CMA10B</td>
<td>CMA10B</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gas (per Semi Standard E52-0703)*</th>
<th>Code</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Code</td>
<td>Formula</td>
</tr>
<tr>
<td>Helium</td>
<td>001</td>
<td>He</td>
</tr>
<tr>
<td>Argon</td>
<td>004</td>
<td>Ar</td>
</tr>
<tr>
<td>Air</td>
<td>008</td>
<td></td>
</tr>
<tr>
<td>Nitrogen</td>
<td>013</td>
<td>N(_2)</td>
</tr>
<tr>
<td>Oxygen</td>
<td>015</td>
<td>O(_2)</td>
</tr>
<tr>
<td>Sulfur hexafluoride</td>
<td>110</td>
<td>SF(_6)</td>
</tr>
<tr>
<td>Octafluorocyclobutane</td>
<td>129</td>
<td>C(_4)F(_8)</td>
</tr>
</tbody>
</table>

*For other gases, please consult factory.

<table>
<thead>
<tr>
<th>Flow Range Full Scale</th>
<th>Code</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 sccm</td>
<td>001</td>
<td></td>
</tr>
<tr>
<td>100 sccm</td>
<td>004</td>
<td></td>
</tr>
<tr>
<td>200 sccm</td>
<td>008</td>
<td></td>
</tr>
<tr>
<td>500 sccm</td>
<td>013</td>
<td></td>
</tr>
<tr>
<td>1000 sccm</td>
<td>015</td>
<td></td>
</tr>
<tr>
<td>2000 sccm</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>5000 sccm</td>
<td>129</td>
<td></td>
</tr>
</tbody>
</table>

**Fittings (compatible with)**

- 4 VCR male
- 1/4'' Compression
- Downmount O-Ring Seal
- W-Seal (1.125'' Wide Seal Configuration) - Consult Factory for other options

<table>
<thead>
<tr>
<th>Connector</th>
<th>Code</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dual I/O (Anal 9-Pin)</td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td>RS485 ASCII RS-485 Primary</td>
<td>C</td>
<td>M</td>
</tr>
<tr>
<td>Dual I/O (Anal 9-Pin)</td>
<td>R</td>
<td>C</td>
</tr>
<tr>
<td>RS485 ASCII Analog Primary</td>
<td>M</td>
<td>9</td>
</tr>
</tbody>
</table>

**Seal Materials**

- Viton
- V

**Valve/Device Type**

- Normally Closed/MFC
- No Valve/MFM (Same length as MFC)
- No Valve/MFM (Reduced Length)**

<table>
<thead>
<tr>
<th>Reserved #1 (for future use)</th>
<th>Code</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Build</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**Firmware (unless otherwise specified)**

- RS485/Analog Dual I/O
- Modbus TCP
- Profinet

<table>
<thead>
<tr>
<th>Code</th>
<th>Configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

**Reduced length is not available for W-Seal or Downmount O-ring Seal fittings.

<table>
<thead>
<tr>
<th>SEMI#</th>
<th>Gas Symbol</th>
<th>Gas</th>
<th>CMA10B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SEMI#</td>
<td>Min Full Scale</td>
</tr>
<tr>
<td>1</td>
<td>He</td>
<td>23</td>
<td>16000</td>
</tr>
<tr>
<td>4</td>
<td>Ar</td>
<td>40</td>
<td>23000</td>
</tr>
<tr>
<td>8</td>
<td>Air</td>
<td>15</td>
<td>14000</td>
</tr>
<tr>
<td>13</td>
<td>N(_2)</td>
<td>15</td>
<td>14000</td>
</tr>
<tr>
<td>15</td>
<td>O(_2)</td>
<td>14</td>
<td>13000</td>
</tr>
<tr>
<td>110</td>
<td>SF(_6)</td>
<td>7</td>
<td>7300</td>
</tr>
<tr>
<td>129</td>
<td>C(_4)F(_8)</td>
<td>4</td>
<td>2100</td>
</tr>
</tbody>
</table>

* For other gases, please consult factory.

** Reduced length is not available for W-Seal or Downmount O-ring Seal fittings.