Mass Flow Controllers for Gases

Experts for Smart Sensor Solutions
Customized Solutions

Our cutting-edge sensor technology combined with our wealth of experience as a solution provider enables us to support high performance gas flow control systems with customized sensors and controllers. Our goal in doing so is to develop a deep understanding of the requirements of our customers, which can then form the basis for a tailor-made solution. Thanks to our outstanding technology, our customers benefit from several advantages:

LOW FLOW CAPABILITIES
Our experience and expertise in fluid dynamics and flow channel design enable our mass flow controllers to control gas flows in extremely low ranges, down to fractions of milliliters per minute.

HIGH SPEED FLOW CONTROL
The MEMS sensor integrated on a CMOS chip permits ultra-fast response times due to its small thermal mass. Sensirion can realize settling times of better than 50 ms, which remains unrivalled on the mass flow controller market.

FLEXIBILITY AND COST EFFICIENCY
With our technology, we have the flexibility to address the customer’s requirements in a way that ensures a customized sensor solution that is both high performance and cost efficient. In specific applications, emphasis can be made on performance or on price-efficiency.
The SFC5400 is a standardized series of Sensirion’s digital mass flow controllers. It enables extremely precise and long-term stable measurement and control of mass flow over a wide control range of 1000:1. Based on the innovative CMOSens® Technology, it has an extremely fast response time. Best-in-class settling time of about 50 ms makes it the first choice for the most demanding applications. In addition, the SFC5400 mass flow controller features a multi-gas option with gas recognition and self-test capability. It is available with various communication interfaces (digital and analog) and mechanical fittings. The SFC5400 mass flow controller is the ideal solution for controlling and monitoring mass flow in diverse applications in the industrial and medical markets. The SFM5400 is a mass flow meter series based on Sensirion’s mass flow controller platform with similar performance characteristics.

VERSATILE SFC5400
The SFC5400 mass flow controller series is based on Sensirion’s SFC5300 and SFM5300. It is available with various gas recognition and self-test capability. It is available with various communication interfaces (digital and analog) and mechanical fittings. The SFC5400 mass flow controller is the ideal solution for controlling and monitoring mass flow in diverse applications in the industrial and medical markets. The SFM5400 is a mass flow meter series based on Sensirion’s mass flow controller platform with similar performance characteristics.

**Table: Selection of Sensirion Mass Flow Controllers**

<table>
<thead>
<tr>
<th>Model</th>
<th>SFC5400</th>
<th>SFM5400</th>
<th>SFC5300</th>
<th>SFM5300</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flow range</strong></td>
<td>50, 100, 200, 500 sccm; 1, 2, 5, 10 slm</td>
<td>50, 100, 200, 500 sccm; 1, 2, 5, 10 slm</td>
<td>50, 100, 200, 500 sccm; 1, 2, 5, 10 slm</td>
<td>50, 100, 200, 500 sccm; 1, 2, 5, 10 slm</td>
</tr>
<tr>
<td><strong>Repeatability, % of reading</strong></td>
<td>0.1% s.p.</td>
<td>0.2% s.p.</td>
<td>0.1% s.p.</td>
<td>0.2% s.p.</td>
</tr>
<tr>
<td><strong>Repeatability, % of full scale</strong></td>
<td>0.01% FS</td>
<td>0.02% FS</td>
<td>0.01% FS</td>
<td>0.02% FS</td>
</tr>
<tr>
<td><strong>Accuracy, % of reading</strong></td>
<td>0.8% s.p.</td>
<td>1% s.p.</td>
<td>0.8% s.p.</td>
<td>1% s.p.</td>
</tr>
<tr>
<td><strong>Accuracy, % of full scale</strong></td>
<td>0.08% FS</td>
<td>0.1% FS</td>
<td>0.08% FS</td>
<td>0.1% FS</td>
</tr>
<tr>
<td><strong>External leak rate</strong></td>
<td>9 x 10^-9 mbar l/s (He)</td>
<td>10 x 10^-9 mbar l/s (He)</td>
<td>9 x 10^-9 mbar l/s (He)</td>
<td>10 x 10^-9 mbar l/s (He)</td>
</tr>
<tr>
<td><strong>Leak rate through closed valve</strong></td>
<td>1 x 10^-10 mbar l/s (He)</td>
<td>not applicable for SFM</td>
<td>not applicable for SFM</td>
<td>1 x 10^-10 mbar l/s (He)</td>
</tr>
<tr>
<td><strong>Pressure drop at max full scale</strong></td>
<td>&lt; 2 bar</td>
<td>&lt; 3 bar</td>
<td>not applicable for SFM</td>
<td>not applicable for SFM</td>
</tr>
<tr>
<td><strong>Settling time for OEM</strong></td>
<td>50 ms</td>
<td>not applicable for SFM flow meter version</td>
<td>50 ms</td>
<td>not applicable for SFM flow meter version</td>
</tr>
<tr>
<td><strong>Settling time, typ.</strong></td>
<td>100 ms</td>
<td>not applicable for SFM flow meter version</td>
<td>100 ms</td>
<td>not applicable for SFM flow meter version</td>
</tr>
<tr>
<td><strong>Control range</strong></td>
<td>1000:1 (digital interface)</td>
<td>not applicable for SFM</td>
<td>1000:1</td>
<td>not applicable for SFM</td>
</tr>
<tr>
<td><strong>Communication interface</strong></td>
<td>digital (RS485, IO-Link, DeviceNet) and analog (0 to 5 VDC, 0 to 10 VDC or 4 to 20 mA)</td>
<td>digital (RS485, IO-Link, DeviceNet) and analog (0 to 5 VDC, 0 to 10 VDC or 4 to 20 mA)</td>
<td>digital (RS485 &amp; IO-Link)</td>
<td>digital (RS485 &amp; IO-Link)</td>
</tr>
<tr>
<td><strong>Real gas calibration</strong></td>
<td>Ar, N₂, H₂, O₂, Ne, Ar, CO₂</td>
<td>Ar, N₂, H₂, O₂, Ne, Ar, CO₂</td>
<td>Ar, N₂, H₂, O₂, Ne, Ar, CO₂</td>
<td>Ar, N₂, H₂, O₂, Ne, Ar, CO₂</td>
</tr>
<tr>
<td><strong>Gas conversion</strong></td>
<td>SF₆, CF₄, C₂F₆, NH₃, N₂O, CO, CH₄, CH₃F, Ne, Ar, and other gases on request</td>
<td>SF₆, CF₄, C₂F₆, NH₃, N₂O, CO, CH₄, CH₃F, Ne, Ne, Kr, and other gases on request</td>
<td>SF₆, CF₄, C₂F₆, NH₃, N₂O, CO, CH₄, CH₃F, Ne, Ne, Kr, and other gases on request</td>
<td>SF₆, CF₄, C₂F₆, NH₃, N₂O, CO, CH₄, CH₃F, Ne, Ne, Kr, and other gases on request</td>
</tr>
<tr>
<td><strong>Nominal power supply</strong></td>
<td>14.0 to 26.0 VDC</td>
<td>14.0 to 26.0 VDC</td>
<td>14.0 to 26.0 VDC</td>
<td>14.0 to 26.0 VDC</td>
</tr>
<tr>
<td><strong>Electric connector</strong></td>
<td>D-Sub, 9 Pin</td>
<td>D-Sub, 9 Pin</td>
<td>D-Sub, 9 Pin</td>
<td>D-Sub, 9 Pin</td>
</tr>
<tr>
<td><strong>Mounting, gas connection</strong></td>
<td>Downmount, Swagelok, VCR, VCO, Legris, UNF Thread</td>
<td>Downmount, Swagelok, VCR, VCO, Legris, UNF Thread</td>
<td>Downmount</td>
<td>Downmount</td>
</tr>
<tr>
<td><strong>Max working pressure</strong></td>
<td>10 bar</td>
<td>10 bar</td>
<td>10 bar</td>
<td>10 bar</td>
</tr>
<tr>
<td><strong>Operation temperature</strong></td>
<td>0 to 50°C / 32 to 122°F</td>
<td>0 to 50°C / 32 to 122°F</td>
<td>0 to 50°C / 32 to 122°F</td>
<td>0 to 50°C / 32 to 122°F</td>
</tr>
<tr>
<td><strong>Gas type switchable by software</strong></td>
<td>on request</td>
<td>on request</td>
<td>on request</td>
<td>on request</td>
</tr>
<tr>
<td><strong>Gas recognition</strong></td>
<td>on request</td>
<td>on request</td>
<td>on request</td>
<td>on request</td>
</tr>
</tbody>
</table>

* slm = standard liters per minute, sccm = standard cubic centimeters per minute  
** whichever is bigger, s.p. = % of ambient, p.s. = % of setpoint, m.v. = % of reading  
† whichever is bigger, s.p. = % of setpoint, m.v. = % of reading  
‡ whenever is bigger, s.p. = % of ambient, p.s. = % of setpoint, m.v. = % of reading  
§ whichever is bigger, s.p. = % of setpoint, m.v. = % of reading  
||
**High Performance Gas Flow Control**

Our many years of experience in industrial automation and medical technology support your devices, machines and processes with optimal solutions. Sensirion's mass flow controllers are suitable for diverse applications and provide the following key features:

- Ultra-fast settling time (50 ms)
- Excellent accuracy and repeatability
- Wide control range (1000:1)
- Long-term stability and reliability
- Optional multi-gas/multi-range and gas recognition
- Customized solutions

For more information, please visit: [www.sensirion.com/massflowcontroller](http://www.sensirion.com/massflowcontroller)

**UNIQUE MEASUREMENT PROPERTIES**

Sensirion's mass flow controllers are characterized by fast and accurate control of gas flow over a wide dynamic range. Based on the innovative CMOSens® Technology, the heart of the mass flow controllers is a calorimetric microsensor (MEMS) that is integrated with the complete signal conditioning electronics on a single chip. Flow is measured using the thermal measurement principle (see figure 1) and efficient control is provided by a digital controlling circuit. This unique integrated technological approach results in excellent performance and reliability – at a very attractive cost.

The mass flow controllers have an ultra-fast settling time of approximately 50 ms (see figure 2). The extensive control range of Sensirion’s mass flow controllers is highly beneficial for applications with a wide control range. Instead of employing two devices for the respective high and low flow ranges, a single SFC5400 device can efficiently cover a flow range of three orders of magnitude.

Sensirion's mass flow controllers can be equipped with a multi-gas feature, which enables the user to switch between a set of gas calibrations stored in the device memory. Another feature is gas recognition, which analyzes whether the activated gas calibration matches the media in the gas line (safety feature).

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