SFM4100 Series

Low-cost Digital Mass Flow Meter for Gases

- Accuracy 3% m.v.
- Digital output (I²C)
- Multigas option available
- Calibrated and temperature compensated
- Excellent long-term stability
- Downmount or legris carstick fittings

Product Summary

The SFM4100 gas flow meter series is designed as a versatile OEM gas flow meter for demanding volume applications.

The SFM4100 is designed to measure **Air and non-aggressive gases** with excellent accuracy over a large dynamic range. **Mass flows ranges up to 20 slm** are available. The SFM4100 series operates with supply voltage 5-9 VDC and through its digital I2C interface it can be easily embedded into a microprocessor environment. The sturdy design of the SFM4100 sensor allows for **operation pressures up to 10 barg.** The flow signal is internally **lineralized and temperature compensated.**

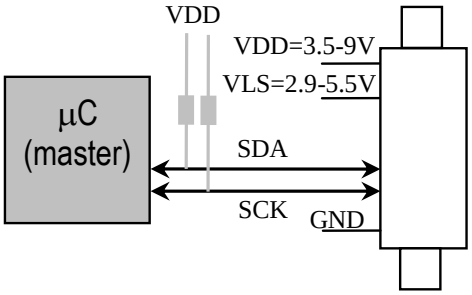
The outstanding performance of these sensors is based on Sensirion's **patented CMOSens® sensor technology**, which combines the sensor element, signal processing and digital calibration on a single microchip. The mass flow is measured by a thermal method on the MEMS sensor element. Compared to other thermal mass flow sensors (MEMS, hotwire or capillary type) the SFM4100 features an **extended dynamic range**, higher **long-term stability**, and improved repeatability.

The well-proven CMOS technology is perfectly suited for high-quality mass production and is the ideal choice **for demanding** and **cost-sensitive OEM applications**.

Applications

- Medical (e.g. respiratory care, anesthesia)
- Analytical Instruments
- Leak testing
- Process automation

Connection diagram



SFM4100 series with bidirectional digital communication (I²C bus)

Sensor chip

The SFM4100 series features a fourth-generation silicon sensor chip called SF04. In addition to a thermal mass flow sensor element, the chip contains an amplifier, A/D converter, EEPROM memory, digital signal processing circuitry, and interface. The highly sensitive chip is particularly sensitive at lowest flows, giving the SFM4100 sensor its large dynamic range.

SFM4100 OEM options

A variety of custom options such as other analog output, different gases, flow ranges, multigas calibration can be implemented for high-volume OEM applications (>1000pc/y). Ask us for more information.

1. Sensor Performance

1.1 Physical specifications

Parameter [1]	SFM4100
Measurement range	0-20 slm[2]
Calibration available	Air, N_2, O_2, N_2O, Ar or CO_2
Resolution	12 bits preset (for 9–16 bits see documentation)
Zero point accuracy[3,4]	0.03 slm
Accuracy[3,4]	0.15% of full scale or 3% of reading, whichever is bigger
Span repeatability	0.25% of reading or 5 sccm whichever is bigger
Offset shift due to temperature variation	2 sccm / °C
Span shift due to temperature variation	< 0.1% of reading per °C
Offset stability	< 0.01 slm/year
Pressure drop at full flow	<25mbar
Response time	4.6 ms @ 12-bit resolution (See documentation for response times with other resolutions, e.g. 1.3 ms with 10 bits)
Warm-up time for first reliable measurement	Max. 500ms in general 50 ms

[1] Unless otherwise noted, all sensor specifications are at 23°C and absolute pressure = 4,8 bar.
[2] Reference conditions for standard liters per minute slm: 20°C, 1013mbar; sccm denotes standard cubic centimeters per minute
[3] includes repeatability and hysteresis.
[4] The zero-point accuracy and span accuracy are independent uncertainties and add according to the principles of error propagation.

1.2 Ambient conditions

Parameter	SFM4100 Series
Media compatibility[5]	Noncorrosive gases and gas mixtures
Limited media compatibility	corrosive Gases[6]
Calibrated temperature range[5]	0 °C to +50 °C
Operating temperature	-20 °C to +80 °C
Storage temperature[5]	-40 °C to +80 °C
Operating Pressure Range	0-6 bar gauge
Position sensitivity	Use flow horizontally, electronic connector up

[5] Contact Sensirion for information about other gases, wider calibrated temperature ranges and higher storage temperatures.
[6] For a limited time period, depending on chemical. Not recommended.

1.3 Materials

Parameter	SFM4100 Series
Wetted materials	Si, Si_3N_4, SiOx, Gold, Viton®, Epoxy, PA-12, Stainless Steel, Nickel Plated Brass, Nylon, Nitrile, coated Aluminium, Oxygenoex
RoHS	fully RoHS compliant

2. Electrical Specifications

2.1 Power supply

The SFM4100 series sensors require a supply voltage (VDD) between 3.5V and 9 V. For the power supply of the level shifter (VLS) a voltage between 2.9V and 5.5V is required. Please be aware that the VLS must be the same as the voltage of SCK.

2.2 Electrical characteristics

Parameter	SFM4100
Supply voltage	3.5 – 9.0 VDD
Level Shifter Supply[7]	2.9 -5.5 VLS
Current drain	< 12.5 mA typical in operation
Interface	Digital 2-wire interface (I^2C)
Bus clock frequency	SCL: 100 kHz typical
Default I^2C address per gas type	Air: 1 (0000001) O_2: 2 (0000010) CO_2: 3 (0000011) N_2O: 4 (0000100) Ar: 5 (0000101)
Flow output signal	Flow in sccm = value received ∗ 1 Flow in slm = value received / 1000

[7] Same voltage as the communication level of the µP is required.