SENSIRION SFM3003-C Gas Flow Sensors Instruction Manual

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SENSIRION

SENSIRION SFM3003-C Gas Flow Sensors Instruction

Specifications:

- Form factor: Medical cones 22mm (ISO5356)
- Supply voltage: 3.3V (2.7 – 5.5V) or 5V

Product Information

Sensirion offers a range of gas flow sensors optimized for medical applications. The SFM product line is engineered for medical ventilation and is categorized into three families based on sensor position: Inspiratory, Expiratory, and Proximal. Each family addresses specific flow monitoring requirements.

- Inspiratory Flow Sensors:
  The Inspiratory flow sensors are designed for accurate measurements at higher flows and are available in various models such as SFM3003-CL, SFM3003-CE, SFM3013-CL, and more.
- Proximal Flow Sensors:
  These sensors are suitable for applications where gage pressure needs to be monitored and are compatible with a supply voltage of 3.3V or 5V.
- Expiratory Flow Sensors:
  The SFM3200-AW sensor is specifically designed for the expiratory position with features like minimized pressure drop, washability, a heater, and the ability to measure vapor-saturated gas/air

Product Usage Instructions

Inspiratory Flow Sensors:

1. If you have multiple sensor options, evaluate them in your device to account for specific device design influences on measurement.
2. Ensure non-condensing operating conditions for accurate readings.

Proximal Flow Sensors:

1. Monitor gage pressure accurately to maintain optimal performance.
2. Operate within the recommended supply voltage range for reliable measurements.

Expiratory Flow Sensors:

1. Clean the sensor to prevent contamination and condensation buildup.
2. Utilize the sensor in expiratory positions for best results.

FAQ:

- **Q: Can I clean the Inspiratory flow sensors?**
  A: No, the Inspiratory flow sensors are not designed to be cleaned or disinfected and should be used under non-condensing conditions.

Selection guide for Sensirion gas flow sensors

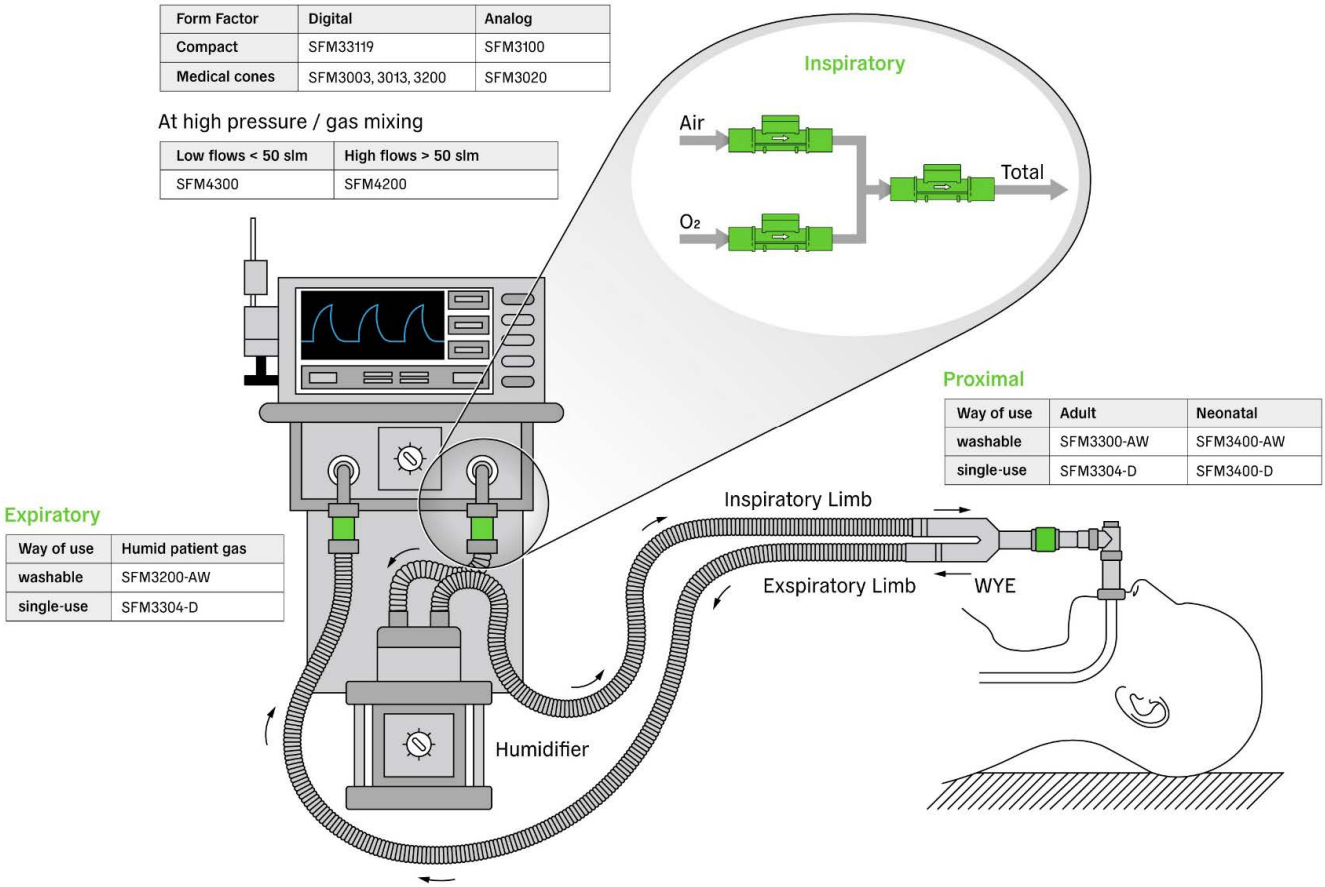
- Finding the right flow sensor (SFM) for your medical ventilation or high flow device.
- Our flow sensor portfolio offers a comprehensive range of gas flow sensors optimized for medical applications. The SFM product range is specifically engineered for medical ventilation, addresses all relevant flow monitoring requirements and is organized in three families, depending on the position of the sensor in the ventilation system:
  1. Inspiratory
  2. Expiratory
  3. Proximal
- The figure below provides a first guideline to select a suitable sensor depending on the beforementioned position in the application.

At ambient pressure

Form Factor	Digital	Analog
Compact	SFM33119	SFM3100
Medical cones	SFM3003, 3013, 3200	SFM3020

At high pressure / gas mixing

Low flows < 50 slm	High flows > 50 slm
SFM4300	SFM4200



- In addition, some sensors offer unique features and characteristics that may be considered during sensor selection. These features are summarized in the following while the table on page 4-6 provides a comprehensive overview.

Inspiratory flow sensors

Our inspiratory flow sensors are typically used inside the ventilator to measure the individual air/O2/heliox gas lines as well as the total flow of the mixed gas before delivery to the patient.

- Selection based on operating gage pressure1
  - 1bar → SFM4300 (or SFM4200 for flows > 50slm)
  - 150mbar → SFM3013
- Lower operating pressure: all other sensors (SFM3003 family, SFM3100, SFM3119 and SFM3200).
- Consider the following criteria according to your requirements to identify the most suitable sensor in the table on page 4:
  - Form factor and size
  - Mechanical connection
  - Measured gases
  - Flow range and range of best performance (low or high flows)
  - Analog or digital output
  - Special features like gas NTC temperature sensor etc.

If you identify more than one sensor option, it is recommended to evaluate the sensor(s) in your device as the specific device design can influence the measurement.

Proximal flow sensors

Gas flow sensors specifically designed to monitor flow in close proximity to the patient, where the following main challenges have been resolved by our portfolio:

- High humidity and condensation
- All our proximal sensors are capable to measure saturated gas/air and feature a heater to prevent condensation at the sensor's chip, therefore ensuring continued accuracy.
- Contamination
- We offer both single-use and washable sensors.
- Sensor handling by medical personnel
- All our proximal sensors feature a mechanical interface allowing a clip-on connection, easy to disconnect and reconnect.
- Inspiration and expiration flow
- All our proximal sensors allow bi-directional flow sensing.
- Individual sensor packaging for single-use sensors
- Individual sensors are protected against contamination from their production until their use by caregivers. Quality control is improved, supply chain management is simplified, and a customized label brings all needed information to the users.

The selection of the right sensor is based on two main criteria

- Patient group: neonates or adults/pediatric
- Use in clinical setting: single use/disposable or washable

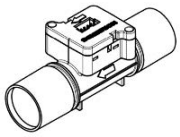
1 Gage pressure describes the pressure difference between the gas pressure in the tubes / flow sensor and the ambient pressure

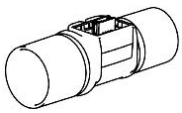
Expiratory flow sensors

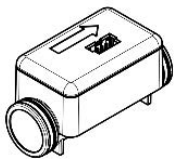
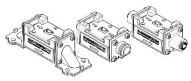
SFM3200-AW has been specifically designed for the expiratory position with a minimized pressure drop, washability, a heater and the capability to measure vapor-saturated gas/air.
Alternative options

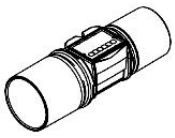
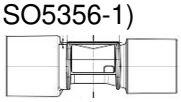
- Proximal sensors can be used further from the patient in expiratory position, in case a disposable option is preferred.
- Inspiratory sensors can be placed in the expiratory position if measures are taken against contamination (like HMF filters) and condensation (water traps). Inspiratory sensors are not designed to be cleaned or disinfected and require non-condensing operating conditions.

Form factor	Sensor	Measured gases	Flow range [slm]	Pressure drop @flow[slm]	Typ. accuracy [%m.v.] @flow[slm]	Recommended supply voltage (allowed)	Special features

Inspiratory flow sensors							
Medical cones 22mm (ISO5356)	**SFM3003-CL** _____ _____ __		-30 to +300	@60: 80Pa @ 200: 500Pa	@200: ±2%	3.3V (2.7 – 5.5V)	Low pressure drop
This form factor usually gives better accuracy at	**SFM3003-CE**		**–150** to +300	@60: 100Pa @200: 600Pa	@200: ±2.5%	3.3V (2.7 – 5.5V)	Extended negative flow range
higher flows	**SFM3003-CET**		**–150** to +300	@60: 100Pa @200: 600Pa	@200: ±2.5%	3.3V (2.7 – 5.5V)	• Extended negative flow range • **NTC** temperature sensor in gas path
	_____ _____ __	• Air • O2 • Air/O2 mixtures					
	SFM3013-CL		-30 to +300	@60: 80Pa @ 200: 500Pa	@200: ±2%	3.3V (2.7 – 5.5V)	• Low pressure drop • Higher pressure resistance up to **1bar gauge**
	**SFM3013-CLM**		• Air/O2: -30 to +300 • **HeliOx**: -30 to +200	@60: 80Pa @ 200: 500Pa	@200: ±2% Heliox: ±4.5%	3.3V (2.7 – 5.5V)	• Higher pressure resistance up to **1bar gauge** • Additional **HeliOx** calibration
	SFM3019		-10 to +240	@60: 80Pa @ 200: 500Pa	@200: ±2%	3.3V (2.7 – 5.5V)	See successor SFM3003-300-CL
	SFM3020	· Air · O2 · Air/O2 mixtures formula provided	-10 to +160	@60: 80Pa @ 200: 500Pa	@160: ±2%	5V	**Analog** output 0.5 – 4.5 V

	**SFM3200**	· Air · O2 · Air/O2 mixtures formula provided	-100 to +250	@60: 100Pa @200: 750Pa	@100: ±3%	5V	See successor SFM3003-CL or CE

Form factor	Sensor	Measured gases	Flow range [slm]	Pressure drop @flow[slm]	Typ. accuracy [%m.v.],@flow [slm]	Recommended supply voltage (allowed)	Special features
Compact	SFM3100-VC	• Air • O2 • Air/O2 mixtures formula provided	-24 to +240	@60: 300Pa	@60: 2.5%	5V	**NTC** temperature sensor in gas path
*T*his form factor usually gives better accuracy at				@200: 1600Pa		(4.75 – 5.25V)	• Analog output 0.095 – 2.45V • See successor SFM3119 (digital)
low flows/smaller offse*t*							
	SFM3119	Air	-10 to +240	@60: 200Pa	@100: 2%	3.3V	Digital output
		O2		@200: 1600Pa		(2.7 – 5.5V)	
		Air/ O2 mixtures					
	SFM4200	• Air • O2 • Air/O2 mixtures formula provided	0 to 160	@60: 2000Pa @160: 9000Pa	@80: 2.5%	5V	• Air, O2 • Down-mount only • Operating **pressures up to 8 bar**
O-ring / Push-in Legris / Down-mount							
	SFM4300	Air	0 to 20	@20: 2500Pa	@20: 2 %	3.3V	• Air, O2, **CO2, N2O** and mixtures up to 20slm • Air, O2 and mixtures up to 50slm • **High resolution** 0.4sccm for 20slm ranges • Operating **pressures up to 7 bar**
		O2	0 to 50	@50: 10000Pa	@50: 4 %	(3.0 – 5.5V)	
		CO2					
		N2O					
		Mixtures					

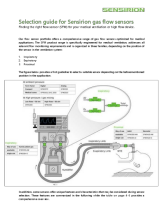
Form factor	Sensor	Measured gases	Flow range [slm]	Pressure drop @flow[slm]	Typ. accuracy [%m.v.] @flow[slm]	Recommended supply voltage (allowed)	Special features
Expiratory flow sensors							
Medical cones 22mm (ISO5356-1) 	**SFM3200-AW**	• Air • O2 • Air/ O2 mixtures formula provided	-100 to +250	@60: 100Pa @200: 750 Pa	@100: 3%	5V	• Bidirectional • Autoclavable & cleanable • Integrated heater to prevent condensation
Proximal flow sensors							
	SFM3300-D	• Air • O2 • Air/ O2 mixtures formula provided	-250 to +250	@60: 180Pa @200: 1400 Pa	@100: 3%	5V	• See successor SFM3304-D for OEM projects • Suitable for adults and children • Single-use • Integrated heater to prevent condensation • Available in catalog distribution
Medical cones 22mm (ISO5356-1) 15mm (ISO5356-1) 	**SFM3300-AW**	• Air • O2 • Air/ O2 mixtures formula provided	-250 to +250	@60: 180Pa @200: 1400 Pa	@100: 3%	5V	• Suitable for adults and children • **Autoclavable & cleanable** • Integrated heater to prevent condensation

	SFM3304-D	• Air • O2 • Air/ O2 mixtures formula provided	-250 to +250	@60: 100Pa @200: 1150 Pa	@100: 3%	3.3V (3.15 – 3.45V)	• Improved **independence** to **inlet conditions** • Suitable for adults and children • Single-use • Integrated heater to prevent condensation • Includes **individual sensor packaging** • · Only available for OEM projects
	SFM3400-D	• Air • O2 • Air/ O2 mixtures formula provided	-33 to + 33	@5: 100 Pa @25: 900Pa	@33: 3 %	5V	• Suitable for **neonates** • Single-use • Integrated heater to prevent condensation
	SFM3400-AW	• Air • O2 • Air/ O2 mixtures formula provided	-33 to + 33	@5: 100 Pa @25: 900Pa	@33: 3 %		• Suitable for **neonates** • Autoclavable & cleanable • Integrated heater to prevent condensation
						5V	

Revision history

Date	Version	Pages	Changes
July 2024	1.0	all	First version

Documents / Resources

	**SENSIRION SFM3003-C Gas Flow Sensors** [pdf] Instruction Manual SFM3003-C Gas Flow Sensors, SFM3003-C, Gas Flow Sensors, Flow Sensors, Sensors

References

- **User Manual**