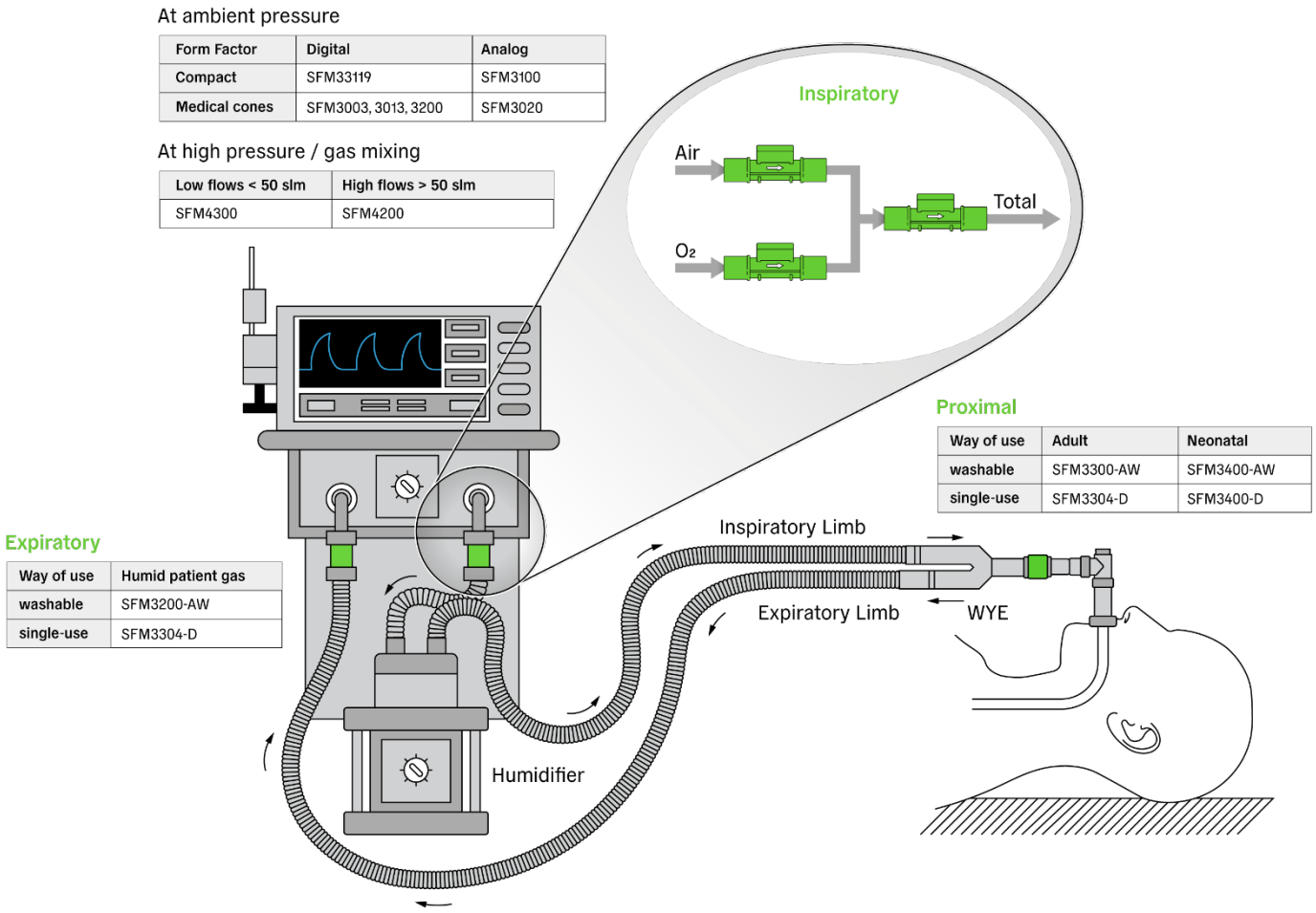
Selection guide for Sensirion gas flow sensors

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.



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.

1. 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 pressure[1]
    - > 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.

2. 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

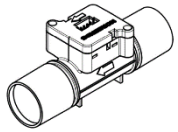
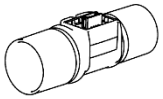
[1] Gage pressure describes the pressure difference between the gas pressure in the tubes / flow sensor and the ambient pressure

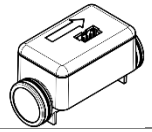
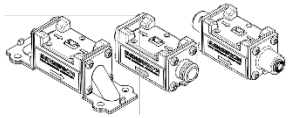
3. Expiratory flow sensors

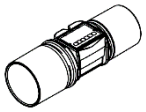
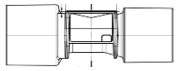
SFM3200-AW has been specifically designed for the expiratory position with a minimized pressure drop, washability, a heater and the capability to measure vapor-saturated gas/air.

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) *This form factor usually gives better accuracy at higher flows* 	SFM3003-CL	• Air • O_2 • Air/O_2 mixtures	-30 to +300	@60: 80Pa @200: 500Pa	@200: ±2%	3.3V (2.7 - 5.5V)	• Low pressure drop
	SFM3003-CE		**-150** to +300	@60: 100Pa @200: 600Pa	@200: ±2.5%	3.3V (2.7 - 5.5V)	• Extended negative flow range
	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
	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/O_2: -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 • O_2 • Air/O_2 mixtures formula provided	-10 to +160	@60: 80Pa @200: 500Pa	@160: ±2%	5V	• **Analog** output 0.5 – 4.5V
	SFM3200	• Air • O_2 • Air/O_2 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 *This form factor usually gives better accuracy at low flows/smaller offset* 	SFM3100-VC	• Air • O_2 • Air/O_2 mixtures formula provided	-24 to +240	@60: 300Pa @200: 1600Pa	@60: 2.5%	5V (4.75 - 5.25V)	• **NTC** temperature sensor in gas path • **Analog** output 0.095 – 2.45V • See successor SFM3119 (digital)
	SFM3119	• Air • O_2 • Air/ O_2 mixtures	-10 to +240	@60: 200Pa @200: 1600Pa	@100: 2%	3.3V (2.7 - 5.5V)	• Digital output
O-ring / Push-in Legris / Down-mount 	SFM4200	• Air • O_2 • Air/O_2 mixtures formula provided	0 to 160	@60: 2000Pa @160: 9000Pa	@80: 2.5%	5V	• Air, O_2 • Down-mount only • Operating **pressures up to 8 bar**
	SFM4300	• Air • O_2 • CO_2 • N_2O • Mixtures	0 to 20 0 to 50	@20: 2500Pa @50: 10000Pa	@20: 2% @50: 4%	3.3V (3.0 - 5.5V)	• Air, O_2, **CO_2, N_2O** and mixtures up to 20slm • Air, O_2 and mixtures up to 50slm • **High resolution** 0.4sccm for 20slm ranges • Operating **pressures up to 7 bar**

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 • O_2 • Air/ O_2 mixtures formula provided	-100 to +250	@60: 100Pa @200: 750Pa	@100: 3%	5V	• Bidirectional • Autoclavable & cleanable • Integrated heater to prevent condensation
	Proximal flow sensors						
Medical cones 22mm (ISO5356-1) 	SFM3300-D	• Air • O_2 • Air/ O_2 mixtures formula provided	-250 to +250	@60: 180Pa @200: 1400Pa	@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
	SFM3300-AW	• Air • O_2 • Air/ O_2 mixtures formula provided	-250 to +250	@60: 180Pa @200: 1400Pa	@100: 3%	5V	• Suitable for adults and children • **Autoclavable & cleanable** • Integrated heater to prevent condensation
	SFM3304-D	• Air • O_2 • Air/ O_2 mixtures formula provided	-250 to +250	@60: 100Pa @200: 1150Pa	@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
15mm (ISO5356-1) 	SFM3400-D	• Air • O_2 • Air/ O_2 mixtures formula provided	-33 to + 33	@5: 100Pa @25: 900Pa	@33: 3%	5V	• Suitable for **neonates** • Single-use • Integrated heater to prevent condensation
	SFM3400-AW	• Air • O_2 • Air/ O_2 mixtures formula provided	-33 to + 33	@5: 100Pa @25: 900Pa	@33: 3%	5V	• Suitable for **neonates** • Autoclavable & cleanable • Integrated heater to prevent condensation

Revision history

Date	Version	Pages	Changes
July 2024	1.0	all	First version