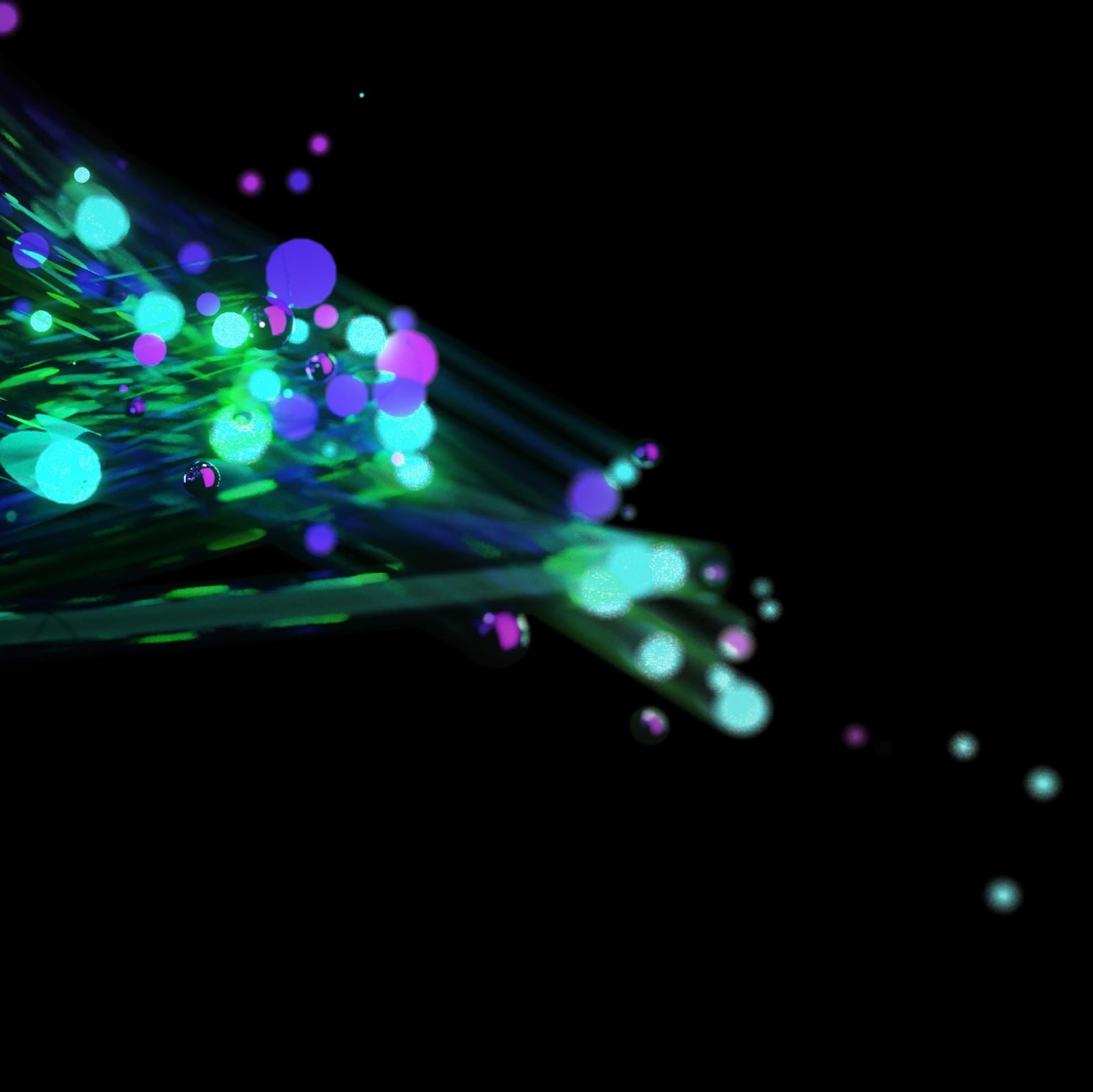


# Gas metering solutions

Experts in flow sensing



**SENSIRION**

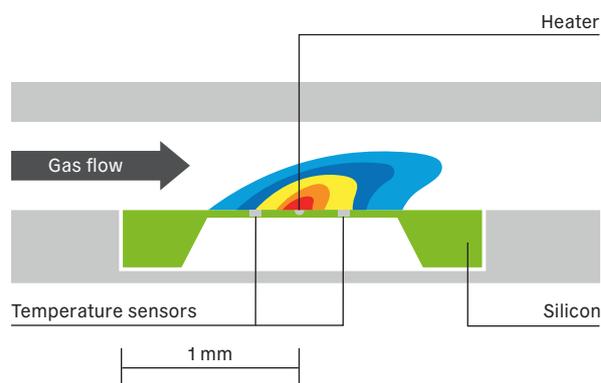
# Thermal-mass modules for smart gas metering



Sensirion gas meter modules are based on the thermal-mass measurement principle, which is the best technology to measure flow to date and is used in high volumes in a wide range of challenging key applications in automotive, medical and industrial sectors. Sensirion's success is due to the proven CMOSens® Technology, which combines the sensor and analysis electronics on a single semiconductor chip. This technology provides excellent sensing performance and robustness at ultra-low power consumption and attractive costs.

## Thermal-mass measurement principle

At the heart of every Sensirion gas meter module is a MEMS-based calorimetric microsensors, which measures the flow of natural gas using the thermal-mass measurement principle. The sensor element is located on a membrane and consists of a micro-heater and upstream and downstream temperature sensors. It is integrated with the signal conditioning electronics, including memory for calibration data, on a single CMOSens® chip.



## Hydrogen-ready with Sensirion

The use of hydrogen for energy storage and distribution purposes requires the key components of the existing gas infrastructure to be adapted. This infrastructure includes gas meters, which must be able to measure natural gas, hydrogen blends and eventually pure hydrogen. It is highly desirable to futureproof a meter and make it ready for this transition today to prevent any need for meter replacement when pure hydrogen enters the pipes.

Gas meters incorporating thermal-mass gas meter modules are the ideal candidates for this task. Thanks to the unique measurement principle, the same thermal-mass sensor can measure natural gas, LNG, hydrogen blends and pure hydrogen (alongside biomethane). This is despite the three times higher hydrogen flow rates required compared to natural gas (e.g. G4 meters have  $Q_{max}$  of 6 m<sup>3</sup>/h for natural gas and 20 m<sup>3</sup>/h for hydrogen to compensate for hydrogen's calorific value that is three times lower). It is a unique feature, which cannot be easily implemented with a diaphragm or other static metering technologies, which either have to be tripled in size or require additional complexity and cost for high hydrogen contents.



## Evaluation certificate

Sensirion's standard gas meter modules have achieved an evaluation certification in accordance with the harmonized standard EN 14236 and the normative document OIML R 137 (EN 17526 from 2022). The evaluation certificate is issued by NMI, one of the leading notified bodies in Europe for type approval examination and certification of measuring instruments. The evaluation certificate enables easier and faster MID approval for gas meter manufacturers that use Sensirion's thermal-mass sensor modules as the core metrological unit in their gas meters.

# Thermal-mass technology – key features

## Established technology

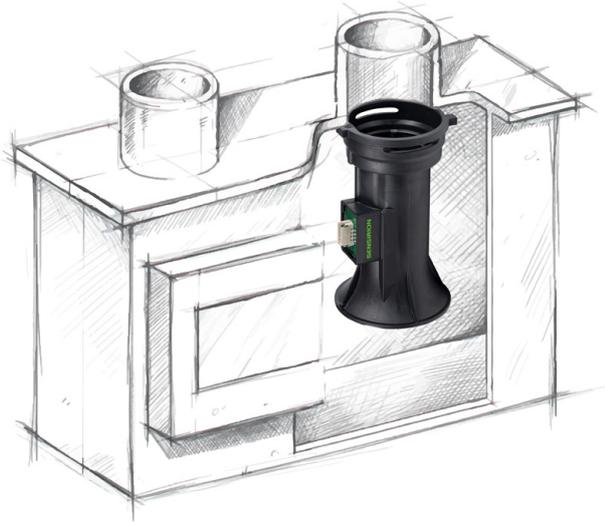
Proven by over 6 million meters in the field, billions of hours of reliable metering and independent laboratory tests after 10 years of field installation.

## Natural gas and H<sub>2</sub>-ready

Ready for the future and any gas mixture, including natural gas types H, L and E, LNG, H<sub>2</sub> blends, pure H<sub>2</sub> and bio-methane.

## Cut battery costs

Thanks to ultra-low power consumption of <105 mAh/year.



## Compact static meter and lower logistics costs

Thanks to a highly compact size and no moving parts. The meter size is independent of the H<sub>2</sub> content.

## No need for a volume converter

Sensors output volume flow referred to standard temperature and pressure (standard m<sup>3</sup>/h).

## Detect leakages

Equip your meter with leak detection functionality, thanks to ultra-low flow sensitivity and the sensor's absolute pressure output.

## Lower certification costs

Save 30% of your meter certification costs thanks to sensor evaluation certification according to EN 14236 and OIML R 137 (EN 17526 from 2022).

## A clear H<sub>2</sub> ratio in the gas

The module can determine the H<sub>2</sub> ratio in the gas mixture. This information can be used for grid monitoring purposes, shared with environmentally conscious consumers, and used for connected appliances.

## Zero service costs

No more need for meter recalibration, thanks to zero offset and zero sensor drift. No moving parts mean no wear and tear.

## Tamper-proof and smart

Enable smart features like tampering detection, self-diagnostics and grid analytics.

## Competitive on costs

Thanks to a streamlined design, high-volume production and a high level of integration on a semiconductor chip.

## Trend toward energy metering

This forms the foundation of natural gas energy content monitoring being implemented in the future. The sensors can estimate the gas calorific value even today.

# Class 1.5 gas meter modules

Sensirion offers gas meter modules for residential and industrial smart gas metering applications. They fulfill MID accuracy class 1.5, and are available for gas meter sizes G1.6 to G25. They feature a digital I<sup>2</sup>C interface and are fully calibrated for air and natural gas.

Sensirion's gas meter modules have achieved an evaluation certification in accordance with the harmonized standard EN 14236 and the normative document OIML R 137 (EN 17526 from 2022) for natural gas containing up to 23% H<sub>2</sub> (e.g. limit gas G222 according to EN 437). The latest products can also measure up to 100% H<sub>2</sub>.



## Specification of flow ranges

Parameter	G1.6	G2.5	G4	G6	G10	G16	G25	Unit
Q <sub>min</sub>	0.016	0.025	0.040	0.060	0.100	0.160	0.250	m <sup>3</sup> /h
Q <sub>t</sub>	0.250	0.400	0.600	1.00	1.60	2.50	4.00	m <sup>3</sup> /h
Q <sub>max</sub>	2.50	4.00	6.00	10.0	16.0	25.0	40.0	m <sup>3</sup> /h
Q <sub>start</sub>	$< \frac{1}{4} Q_{min}$							
Q <sub>overflow</sub>	$2 Q_{max}$							
Q <sub>reverse</sub>	$-0.2 Q_{max}$							

## Physical specifications

Parameter	Description	Value	Unit
Temperature	Operating temperature	-25 to 55	°C
Humidity	Operating humidity in natural gas	0 to 40	% RH
Accuracy (for T = 15°C)	Flow range: $Q_{reverse} \leq Q \leq -Q_{min}$	± 10	% m.v.
	Flow range: $Q_{min} \leq Q < 0.1Q_{max}$	± 3.0 (+0.5)	% m.v.
	Flow range: $0.1Q_{max} \leq Q \leq Q_{max}$	± 1.5 (+0.5)	% m.v.
Initial pressure drop without meter housing	Pressure drop at Q <sub>max</sub>	< 1.0	mbar in air

## Electrical specifications

Parameter	Value	Unit
Operating voltage	2.7 to 3.6	Vdc
Average current consumption (approx.) <sup>1</sup>	< 12	µA
	< 105	mAh/year
Electrical interface	I <sup>2</sup> C	

<sup>1</sup> Exact current consumption depends on the exact electronic host environment.

# Complete design-in solution

Sensirion provides a support package to enable fast and easy integration of Sensirion gas meter modules into customer gas meter products.

## Sensirion gas meter modules



### Evaluation certification

Make use of the Sensirion evaluation certificate to gain MID approval faster and more easily for gas meter products that use Sensirion gas meter modules as the core metrological unit.



### Complete documentation

Integrate Sensirion gas meter modules into gas meter products quickly and efficiently, thanks to comprehensive documentation.



### Evaluation kit

Perform a basic technology evaluation of Sensirion thermal-mass gas modules using the convenient evaluation kit, including readout software.



### Electronic reference design

Use the Sensirion electronic board, including sample code, as a reference during implementation of the sensor-relevant firmware code for a thermal-mass gas meter.



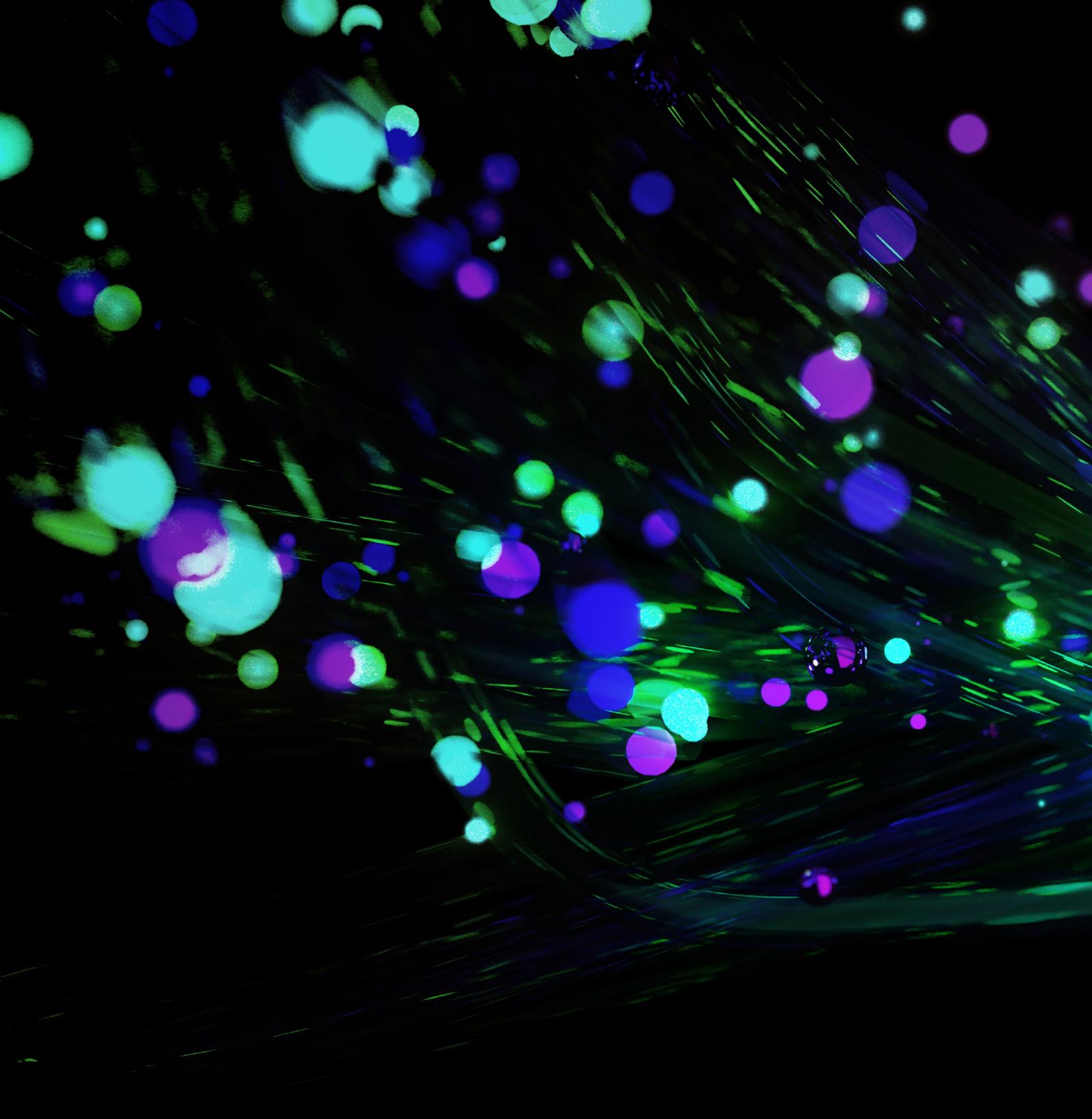
### Benchtop measurement setup

Perform flow characterization of Sensirion gas meter modules with Sensirion's compact R&D benchtop setup for flow measurement.



### Partner network

Benefit from Sensirion's partner network in the gas meter component industry.



Technology at heart,  
future in mind.