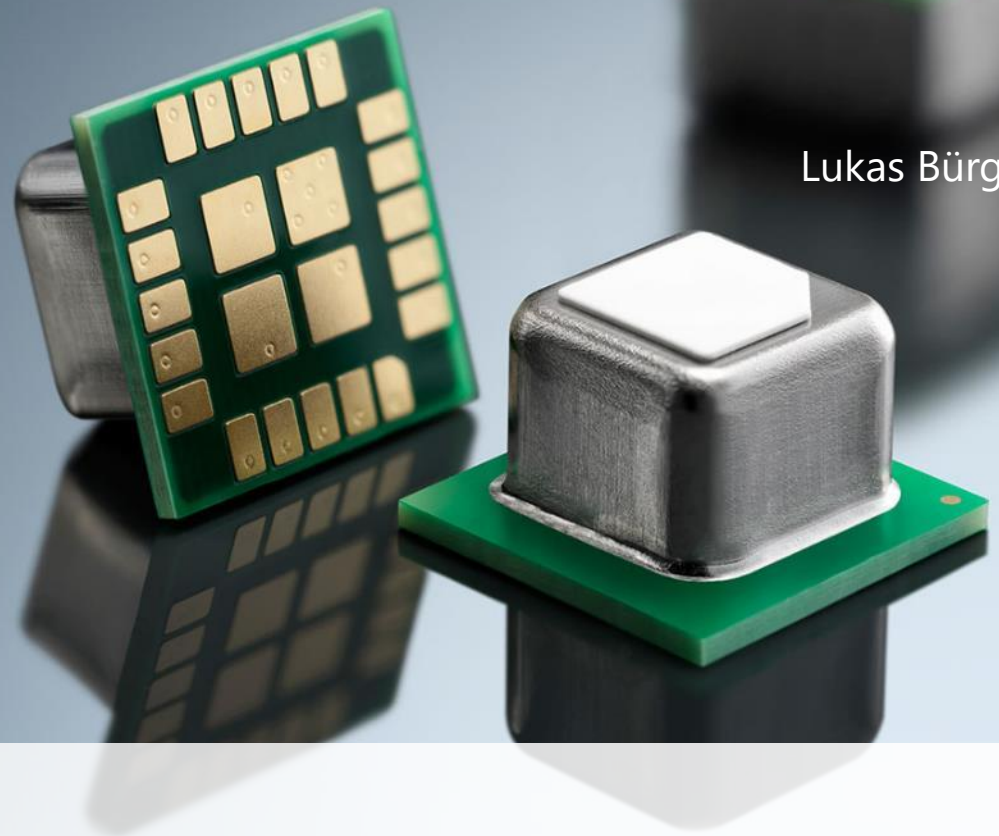
SENSIRION

From ETH Start-Up to global leader in environmental and flow sensing

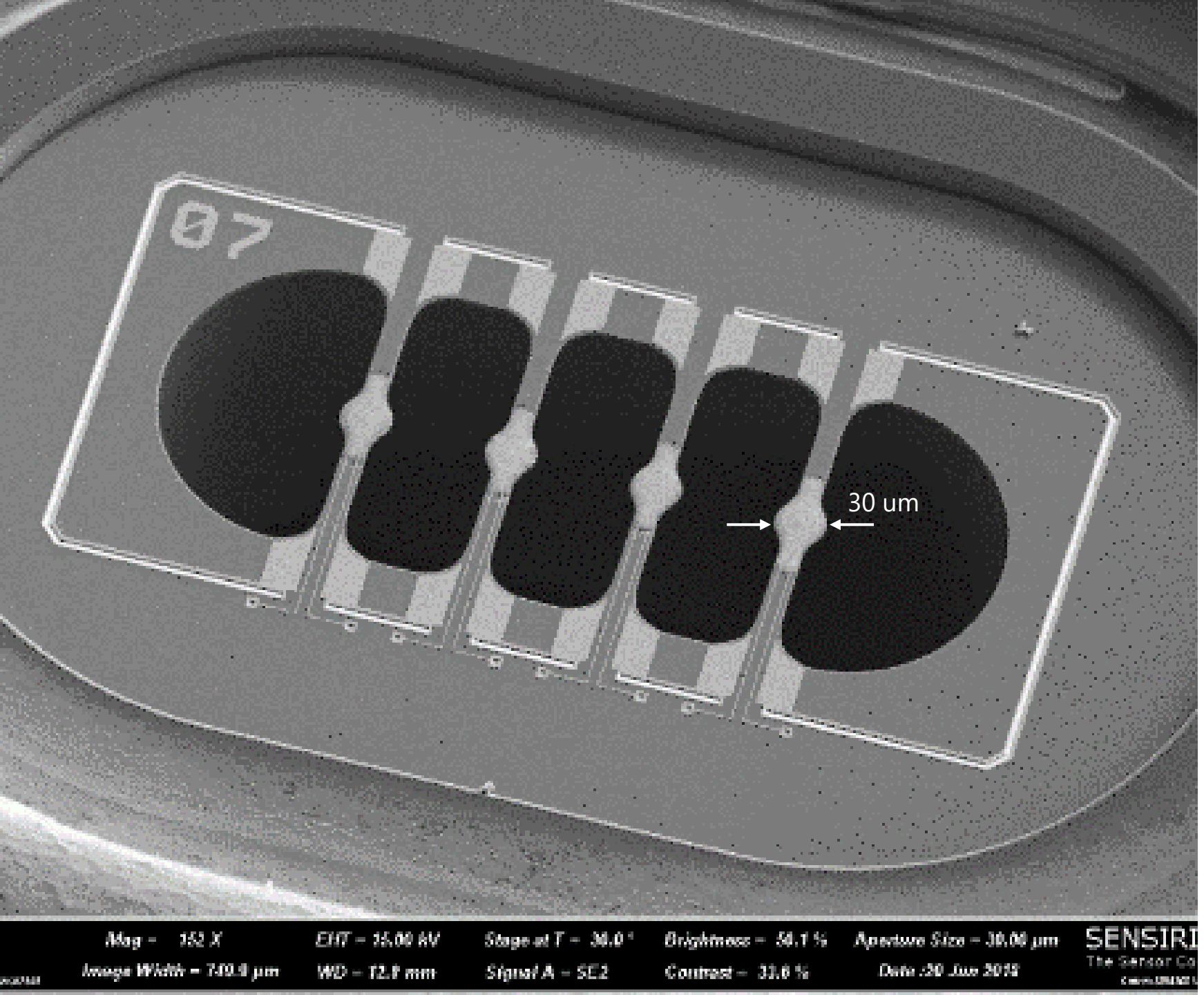


Lukas Bürgi, Director R&D Sensor Innovations | 25 March 2025

Speaker CV

Lukas Bürgi

ETH zürich	MSc in Physics
EPFL	PhD in experimental Physics Electron dynamics and transport at metal surfaces
UNIVERSITY OF CAMBRIDGE	Postdoc Organic optoelectronics
csem	Project Manager & Deputy Section Head Polymer Optoelectronics, Division Photonics
SENSIRION	2008 - 2012 Project Manager R&D Gasflow 2012 - Today Director R&D Sensor Innovation

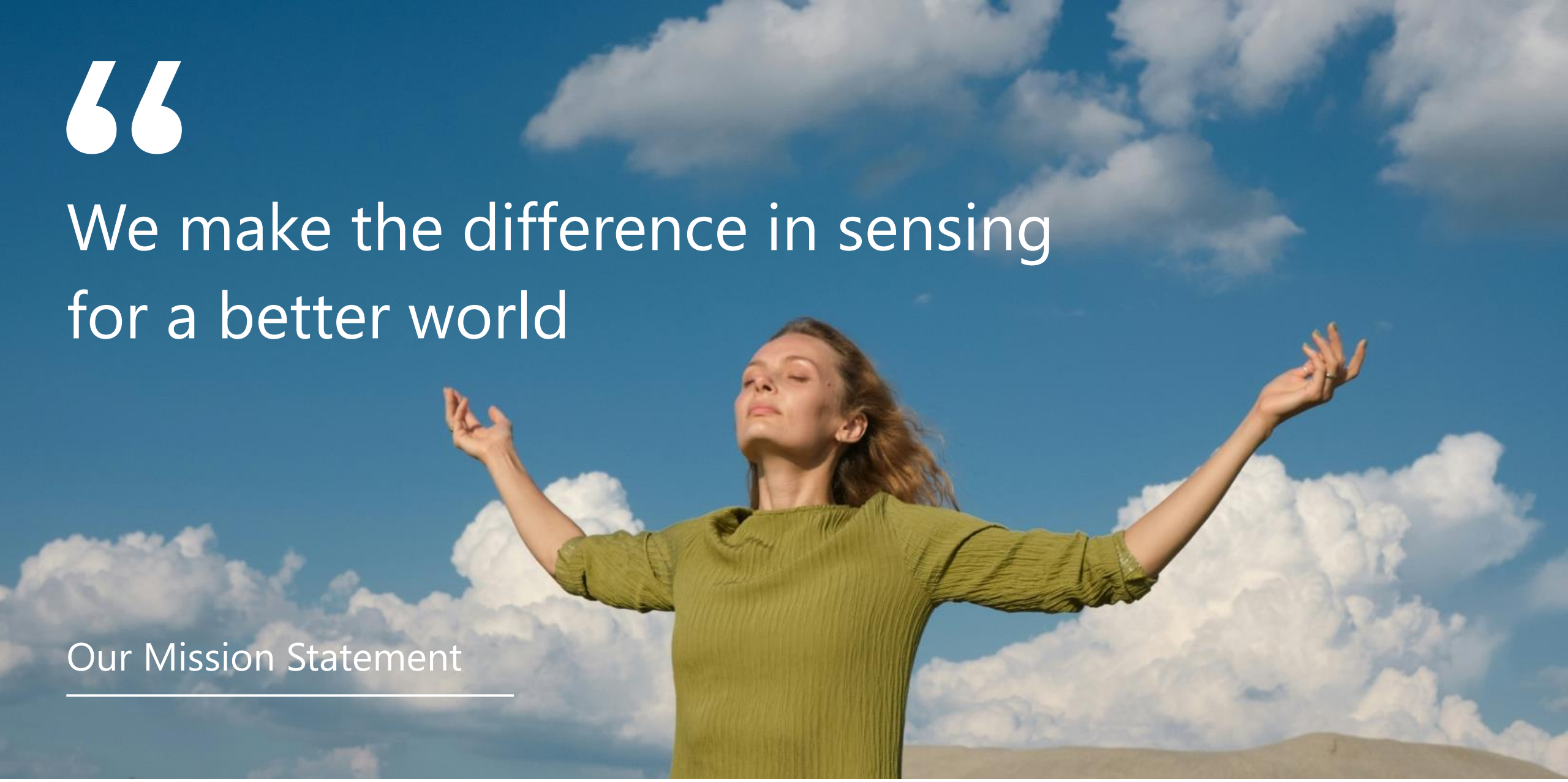


The heart of a Sensirion microsensor

SENSIRION

Agenda

1. Sensirion in brief
2. Sensirion technology: Some examples
3. R&D and innovation in industry



We make the difference in sensing for a better world

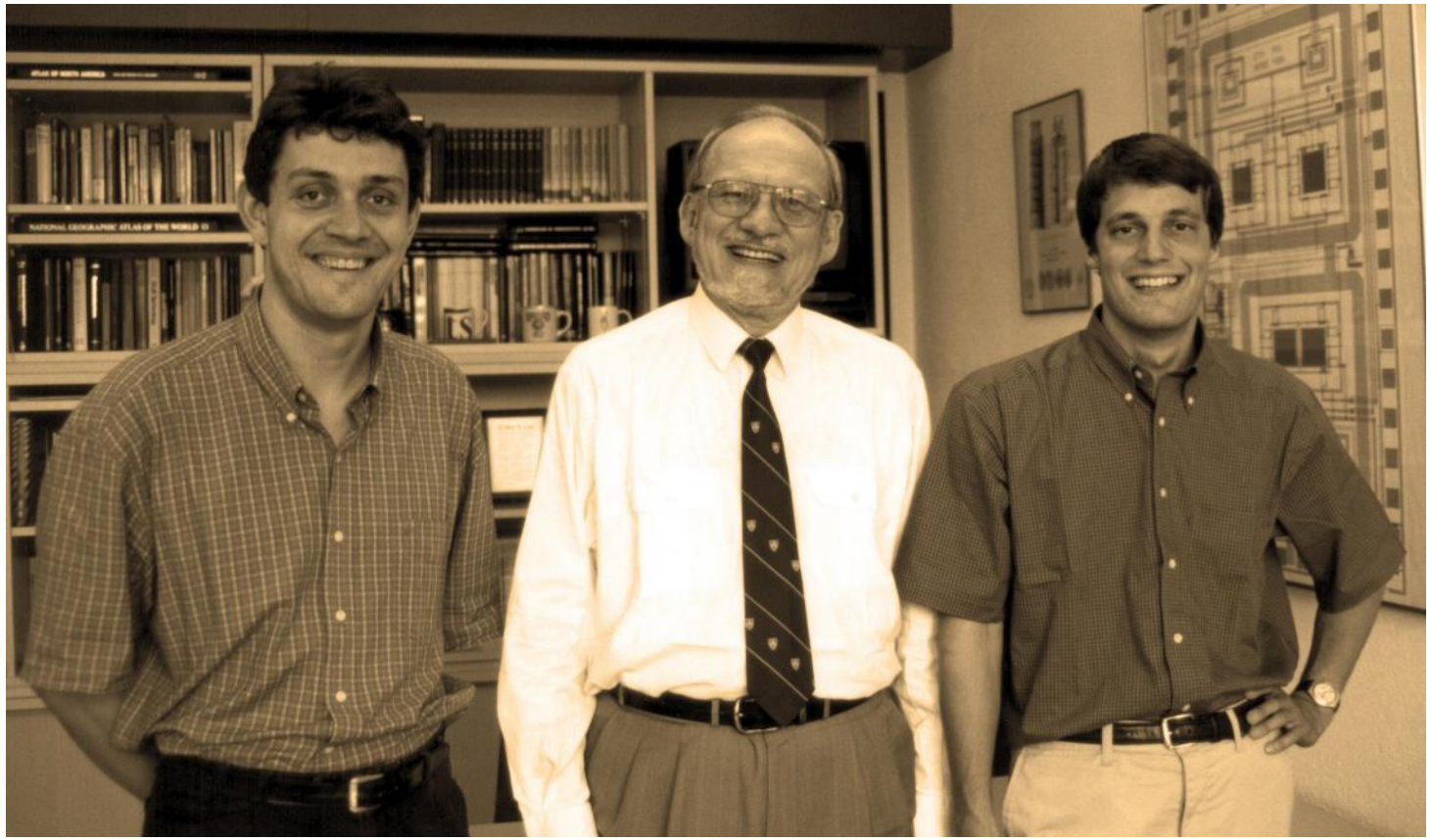
Our Mission Statement

Facts & figures

1998 founded

2018 IPO

ETH Zürich, 1998



Felix Mayer **Prof Henry Baltes** **Moritz Lechner**

Facts & figures

1998 founded

2018 IPO

1164 (1)
Full-time equivalents (FTEs)

Bregenz 2015

(1) As of 31st December 2024

Facts & figures

1998 founded
2018 IPO

~200 Mio
sensors
produced per year

277 M CHF 2024
233 M CHF 2023
Revenue

1164 (1)
Full-time equivalents (FTEs)

> 200
Patent families

~20%
Of revenue invested in R&D

(1) As of 31st December 2024

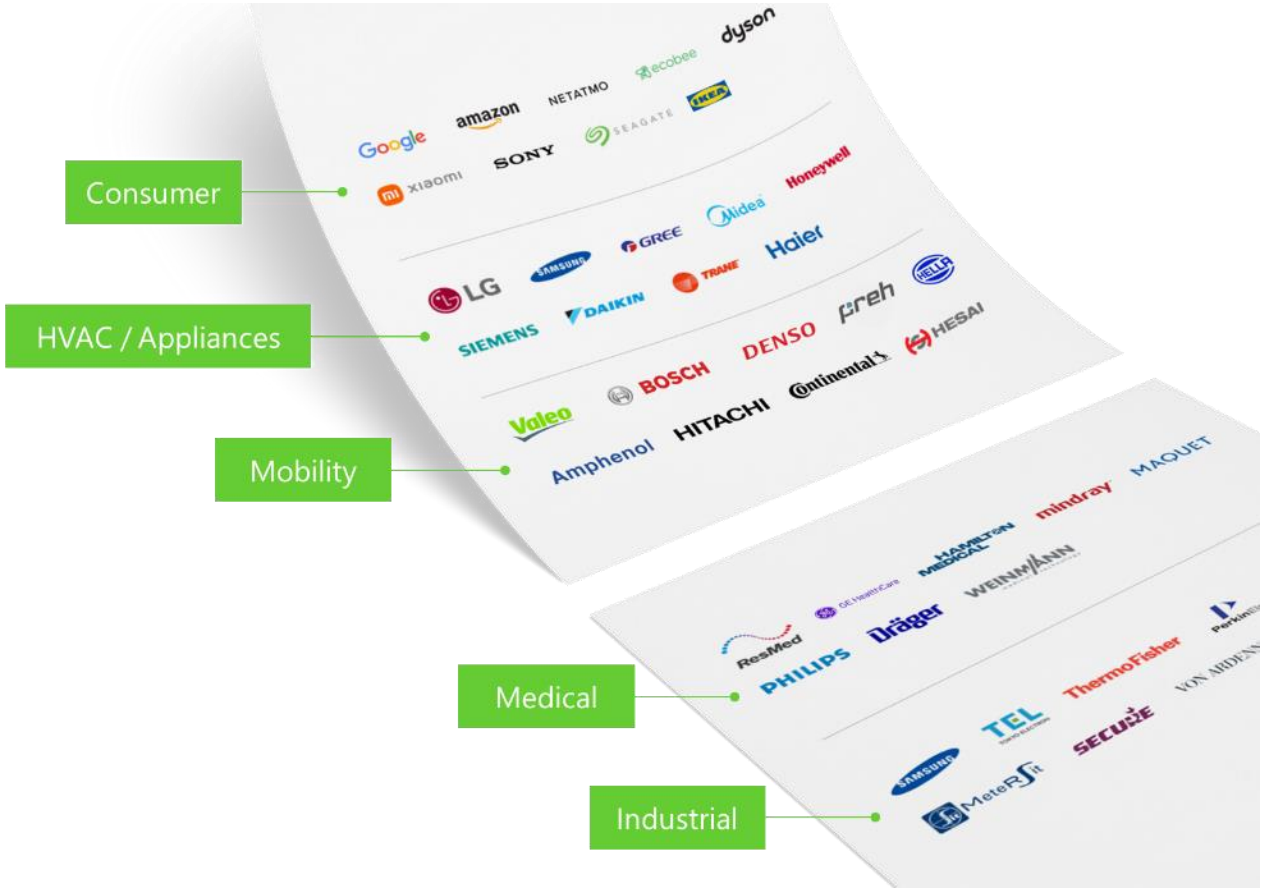
Versatile products for a broad market and customer base

Differential Pressure

Particulate matter

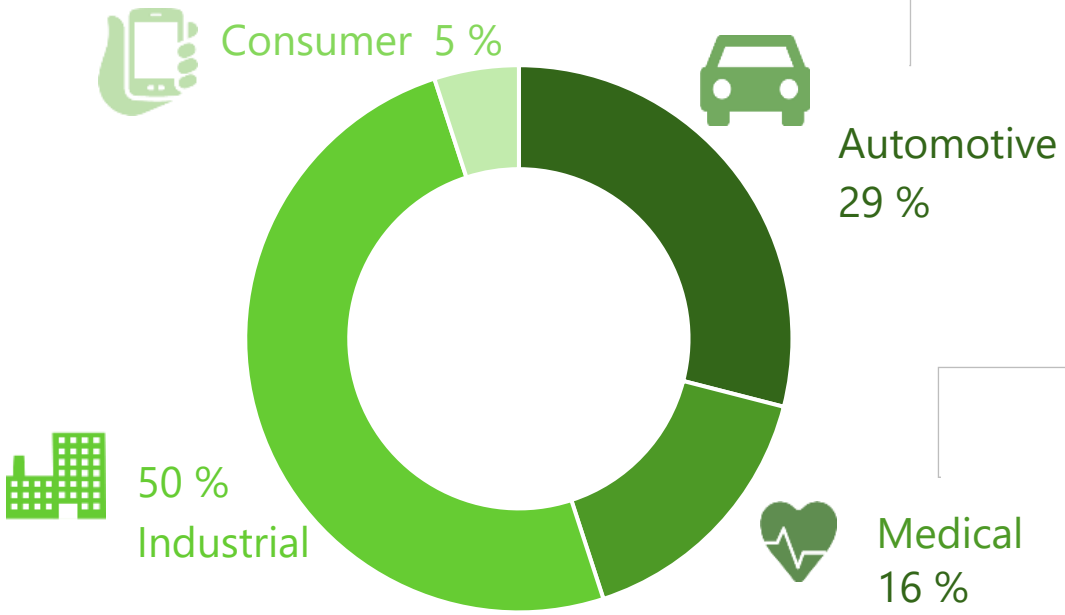
Gas Sensing

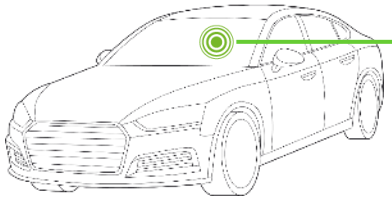
Environmental combo



Our markets and applications

Revenue by Market 2024



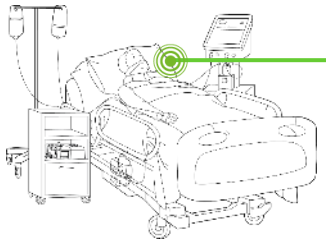


Anti-fogging

- Auto defogging
- Climate control
- Engine control

~1 in 3

Cars



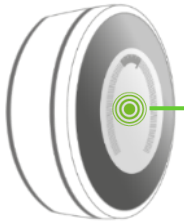
Mass flow

- Ventilators
- CPAP
- Anesthesia

> 90%

Of all CPAP devices

Our markets and applications



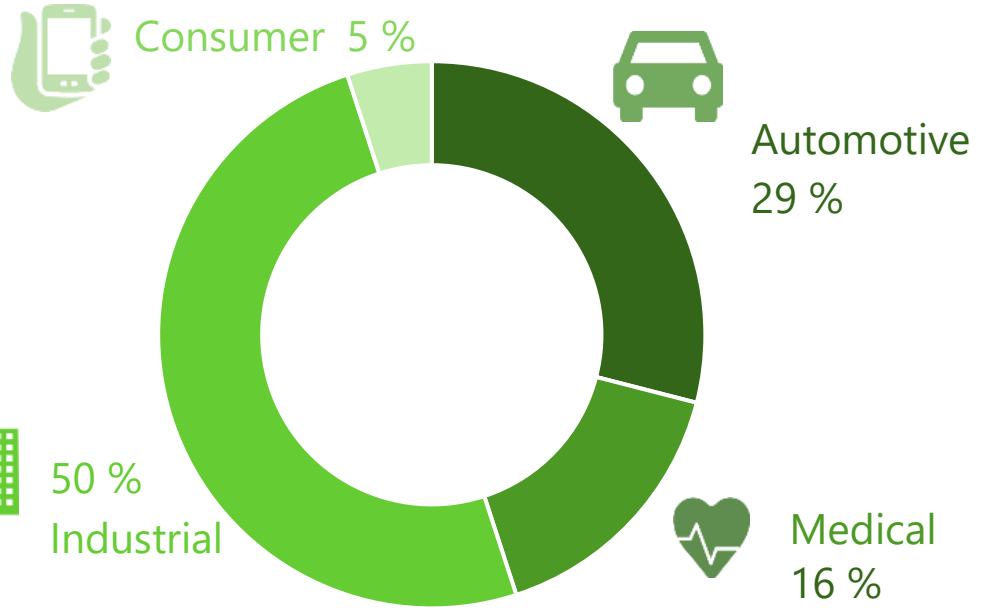
Humidity & temperature

- Thermostats
- IP-Cams
- Gadgets

Natural gas

- Gas metering
- Appliances
- HVAC

Revenue by Market 2024



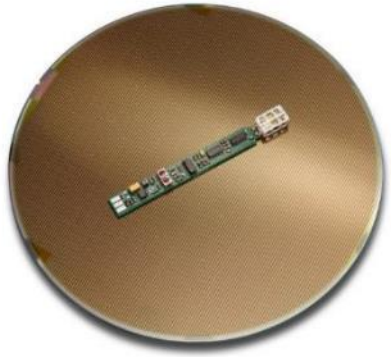
Agenda

1 Sensirion in brief

2 Sensirion technology: Some examples

3 R&D and innovation in industry

CMOSens® is the heart of Sensirion products

1998	CMOSens®	CMOSens®
		
1 humidity sensor ~11 cm	1 humidity sensor ~1.2 mm	50’000 humidity sensors per wafer

Miniaturization

Scalability

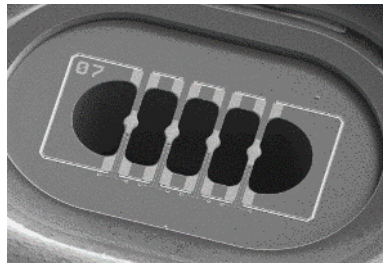
Evolution of humidity & T sensors

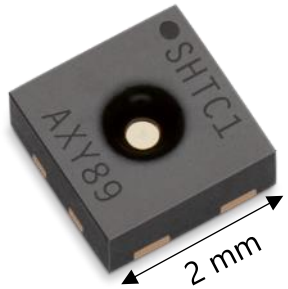
200 pcs each of

SHT10 I SHT20 I SHTC3 I SHT40

Our competencies for innovation

Automated high-volume production

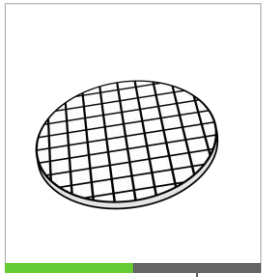




Development of design and processes

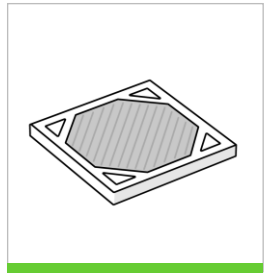
Calibration expertise

Application expertise

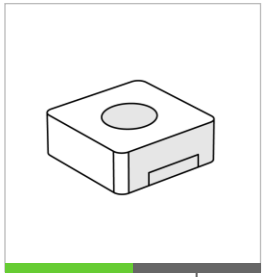


ASIC

Manufacturing outsourced

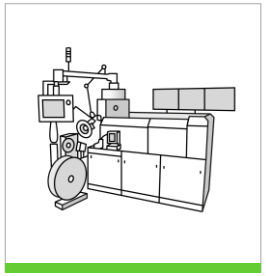


MEMS

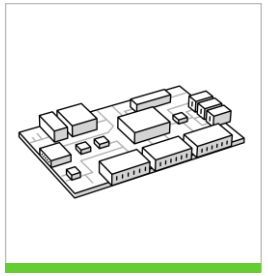


Packaging

Manufacturing partially outsourced



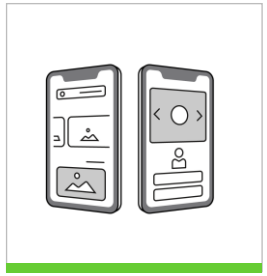
Automation



Hardware

Software

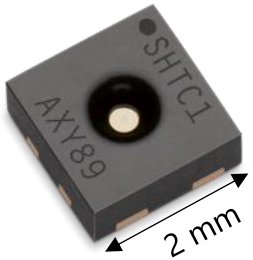
Market and Cloud Solutions

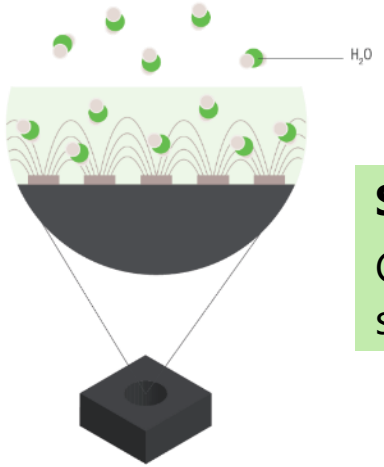


Field application support

CMOSens example 1: Humidity & temperature sensor

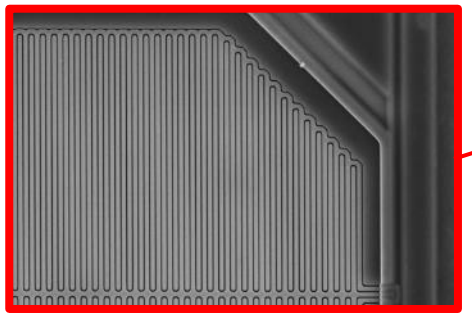
CMOSens = Sensing element & CMOS electronics, monolithic, fully calibrated, digital output

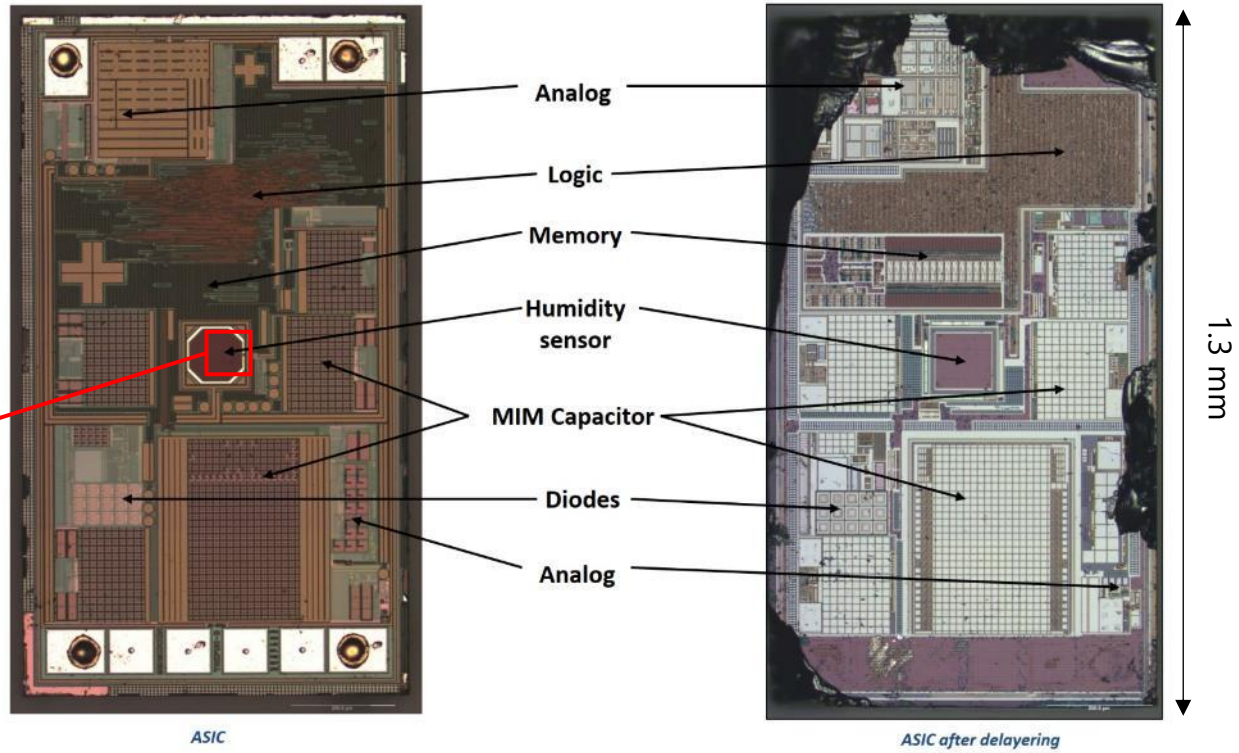




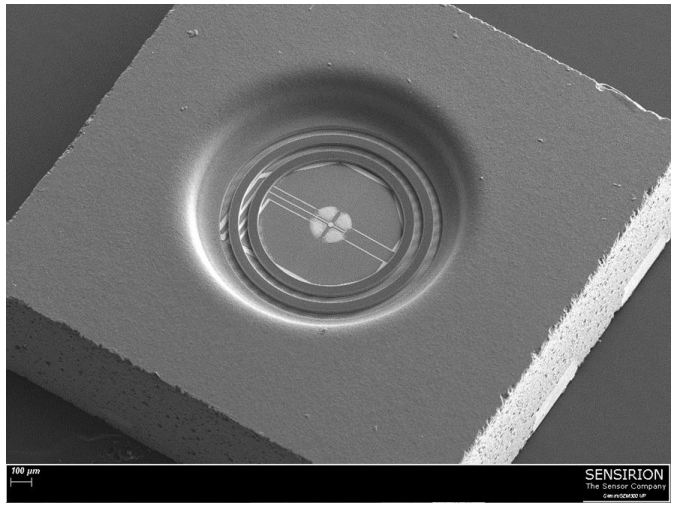
Sensing principle:

Capacitive, polymer sensing layer

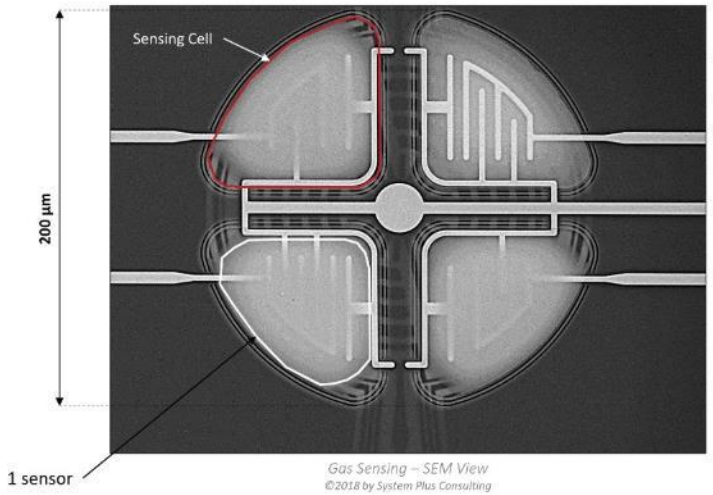




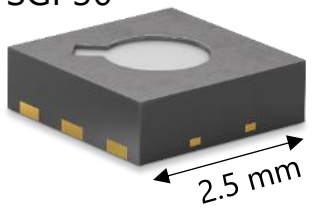
CMOSens example 2: Multi-pixel MOX gas sensor



Hotplate

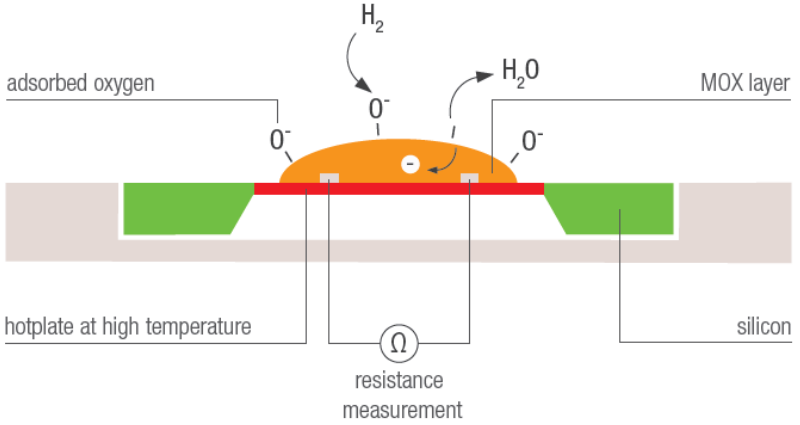


SGP30

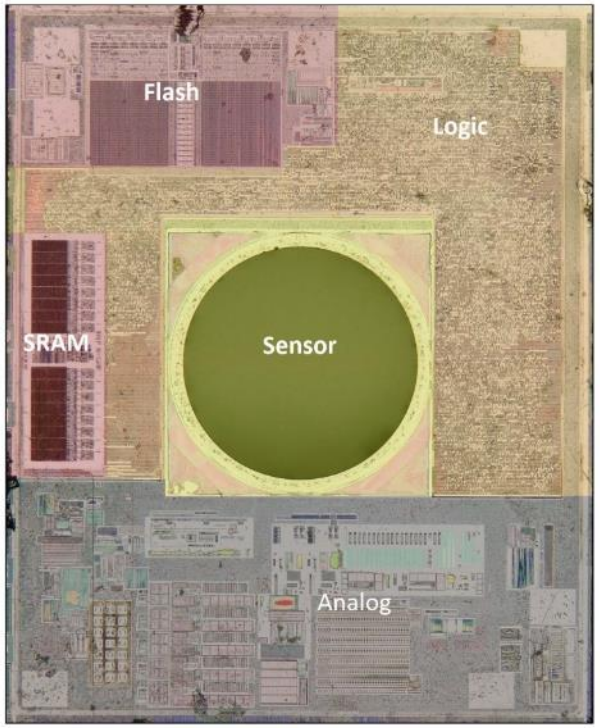


Sensing principle:

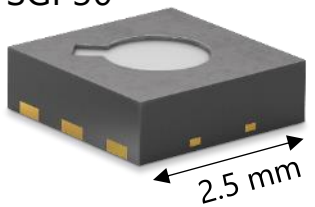
Chemoresistive, heated metal-oxide (MOX) sensing layer



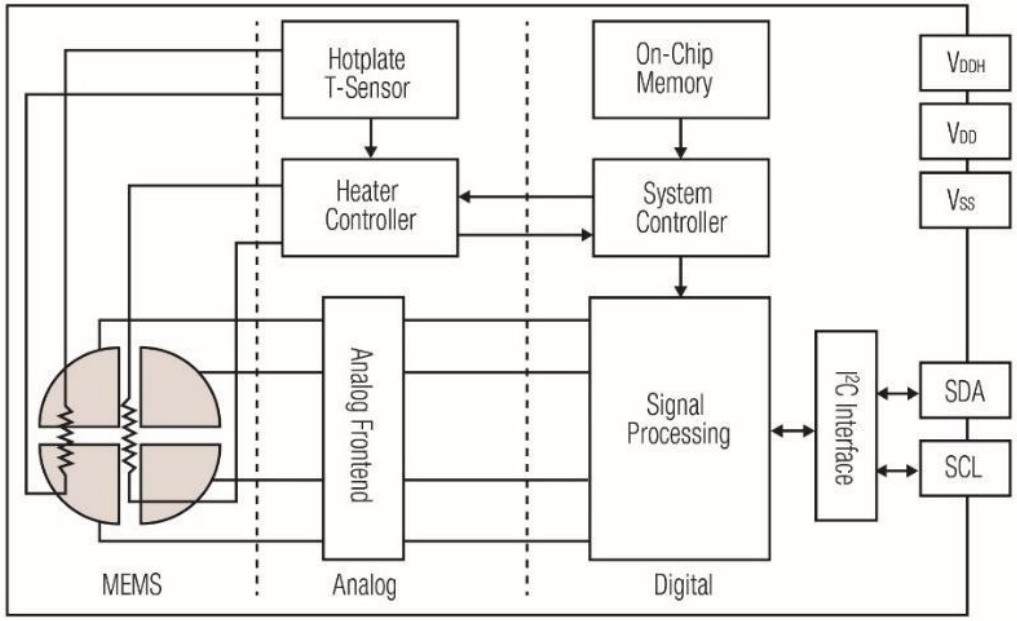
CMOSens example 2: Multi-pixel MOX gas sensor



SGP30

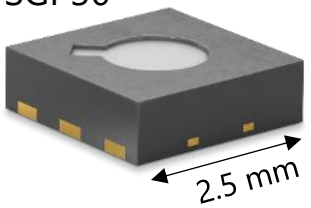


Block diagram SGP30

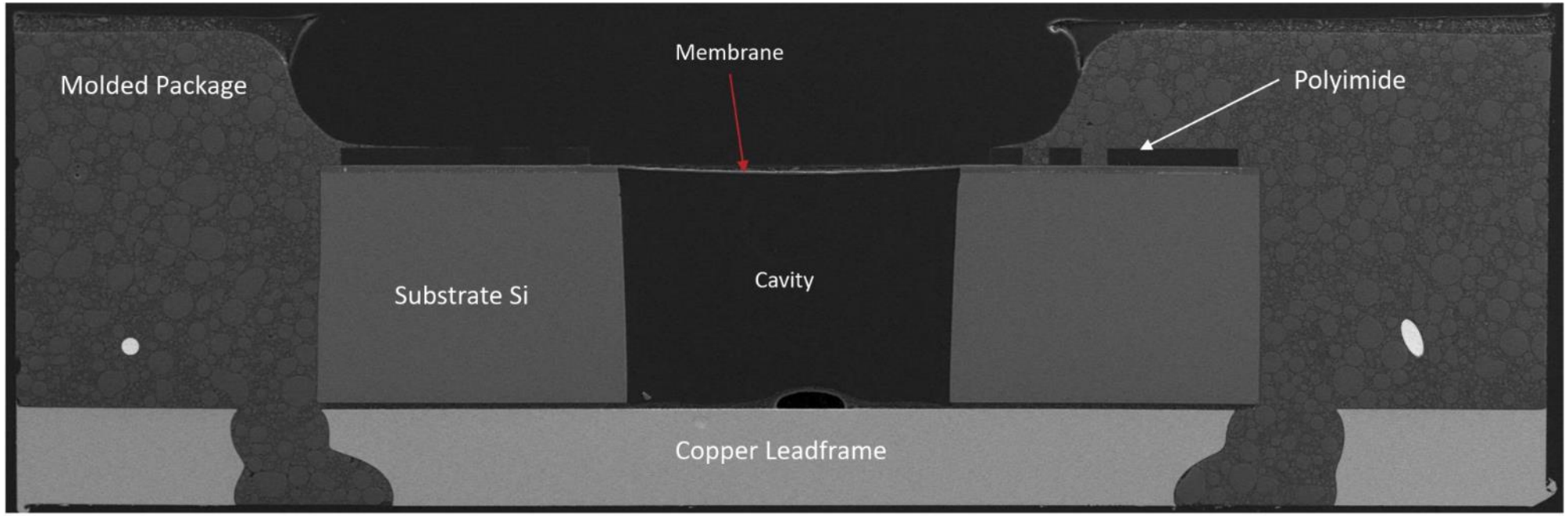


CMOSens example 2: Multi-pixel MOX gas sensor

SGP30

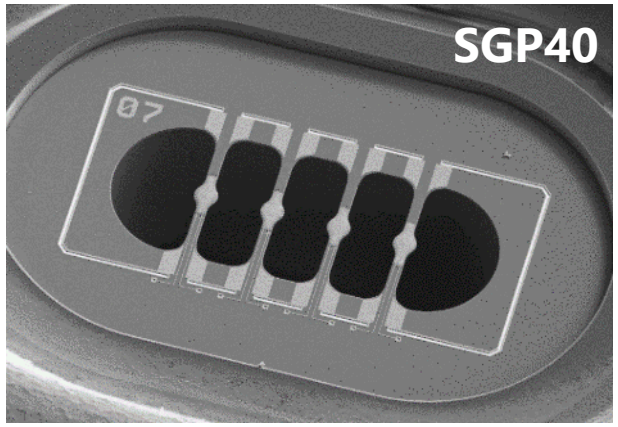


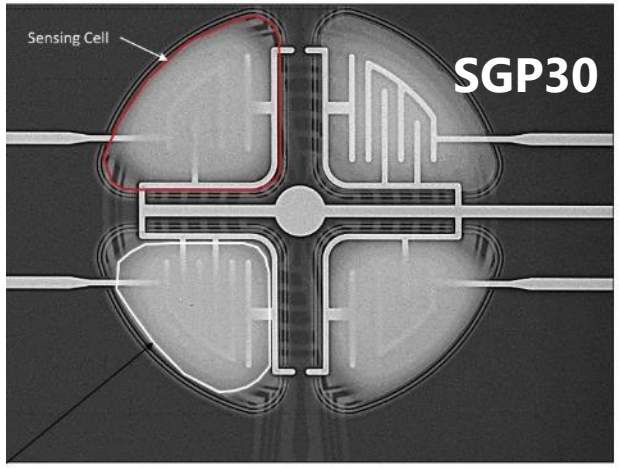
Main MEMS process: Backside release of membrane by deep reactive-ion etching



Package: Open-cavity molded, 6-pin DFN (Dual Flat No lead), reflow solderable

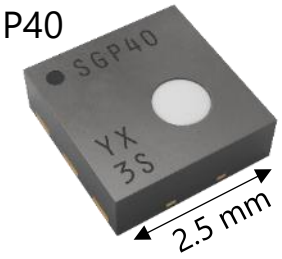
CMOSens example 2: Multi-pixel MOX gas sensor





- SGP40: 4 individual hotplates on freestanding suspended micro-bridges
- Offers the following advantages over SGP30
  - More power-efficient heating
  - Individual temperature profile for each pixel → Sensing conditions can be optimized for the different MOX sensing materials on the 4 pixels

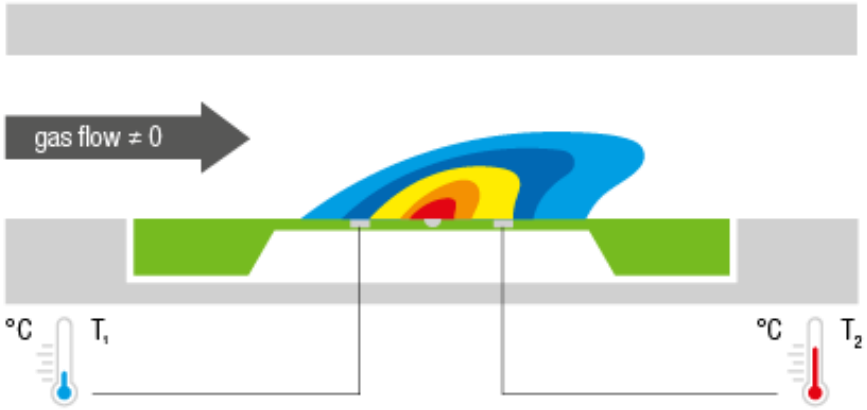
SGP40

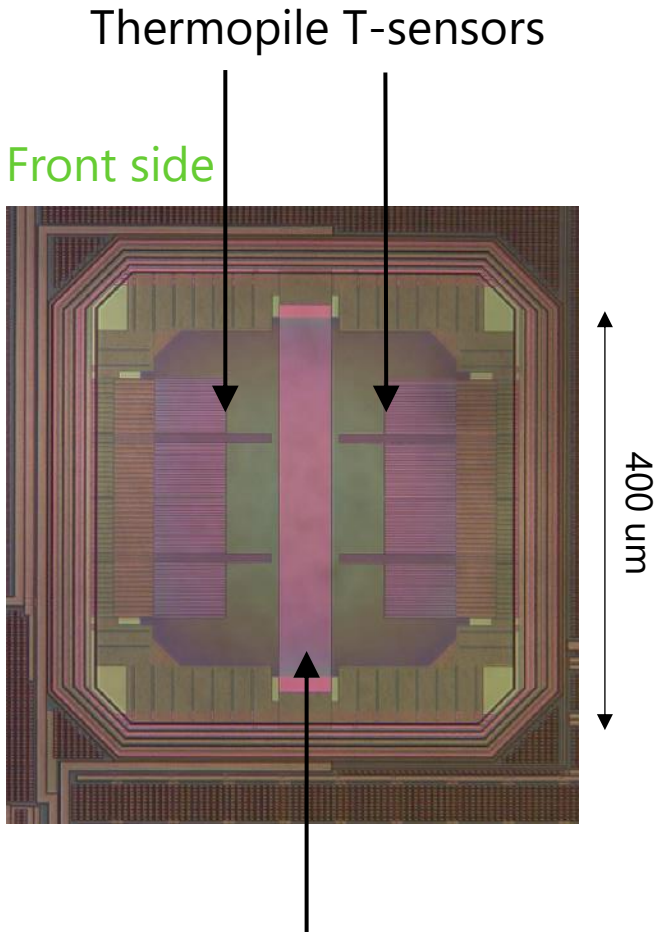


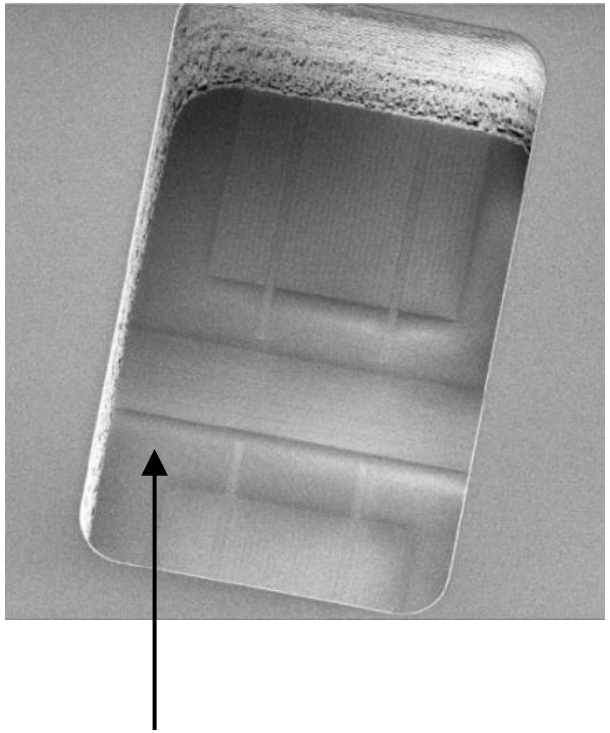
CMOSens example 3: Gasflow sensor chip

SFM3200

Sensing principle:
Microthermal anemometer

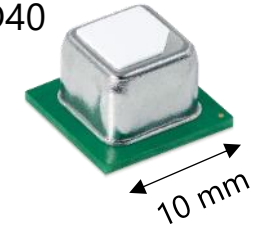




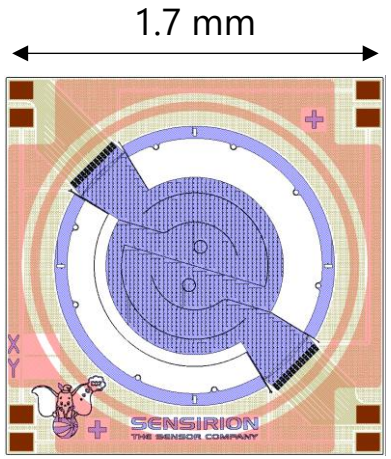


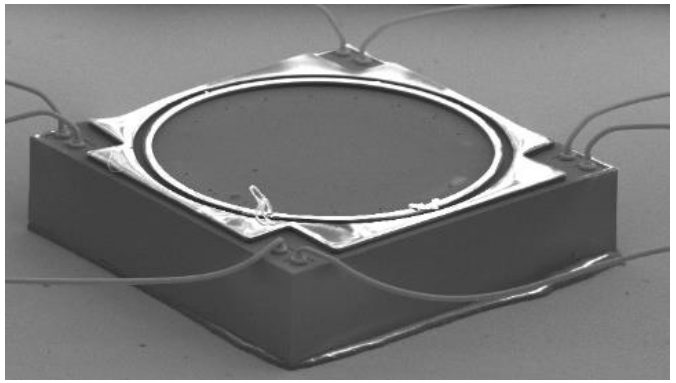
Module example: Miniature CO2 sensor

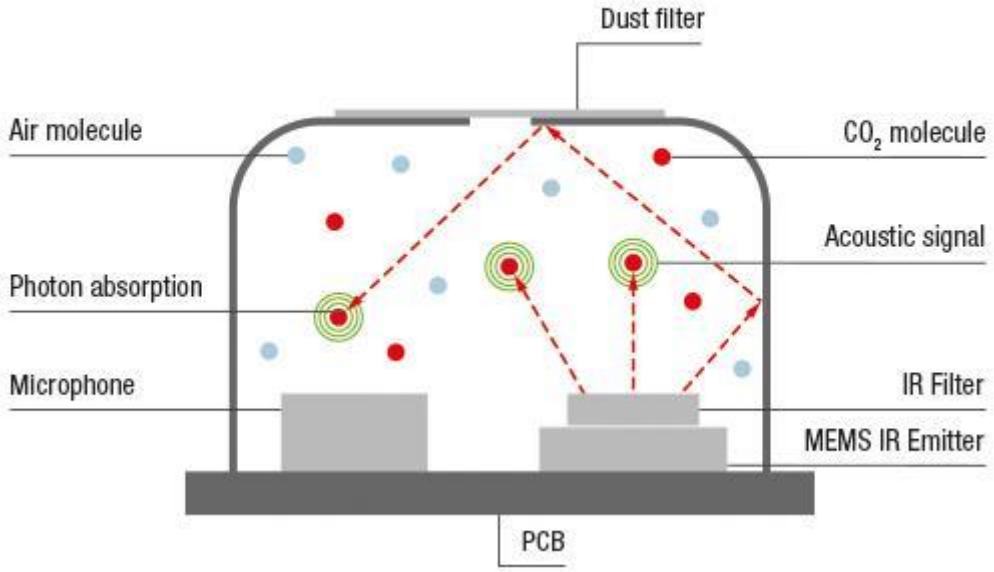
SCD40

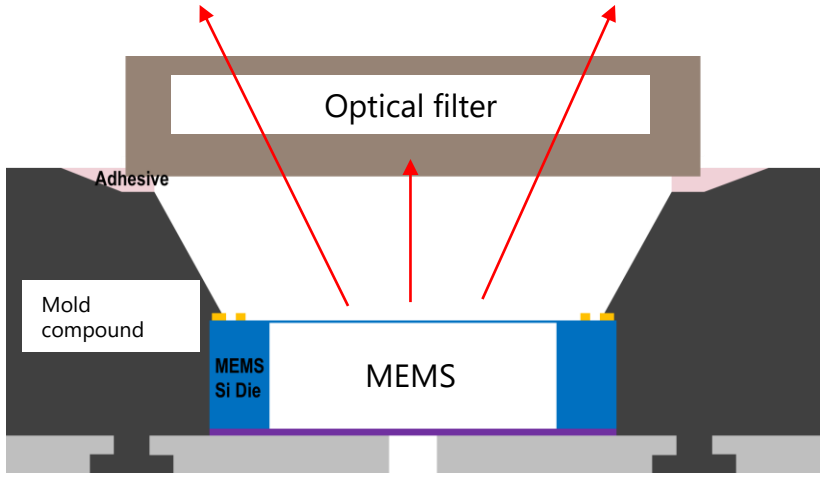


Sensing principle:
Photoacoustic



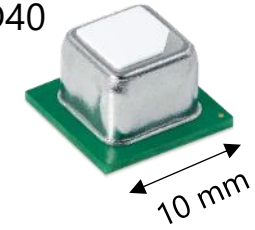






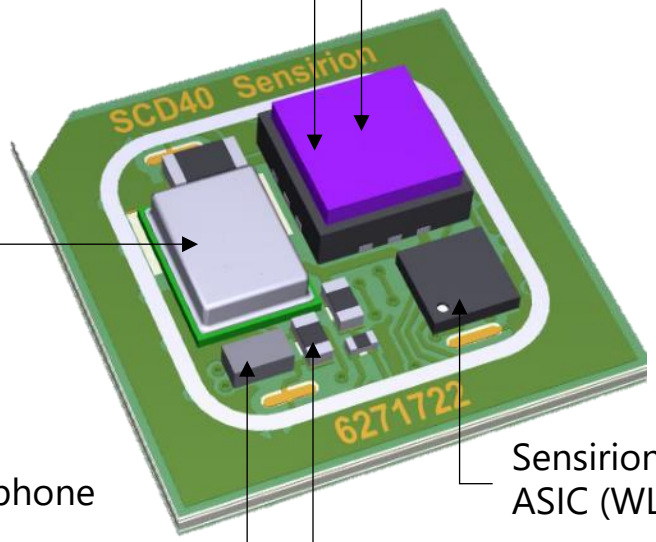
Module example: Miniature CO2 sensor

SCD40



MEMS only hotplate with 4-pt T-sens in QFN (molded)

Optical filter on top of hotplate package



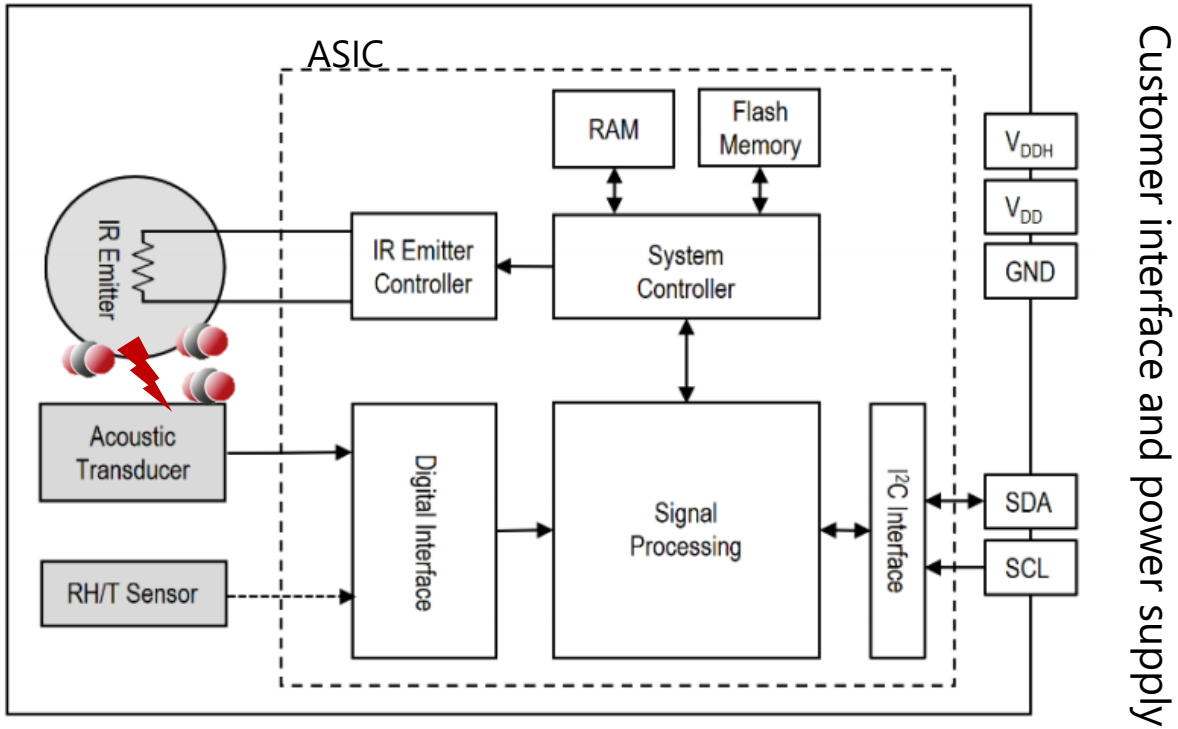
Off-the-shelf MEMS microphone

Sensirion ASIC (WLCSP)

Capacitances

RH/T Sensor

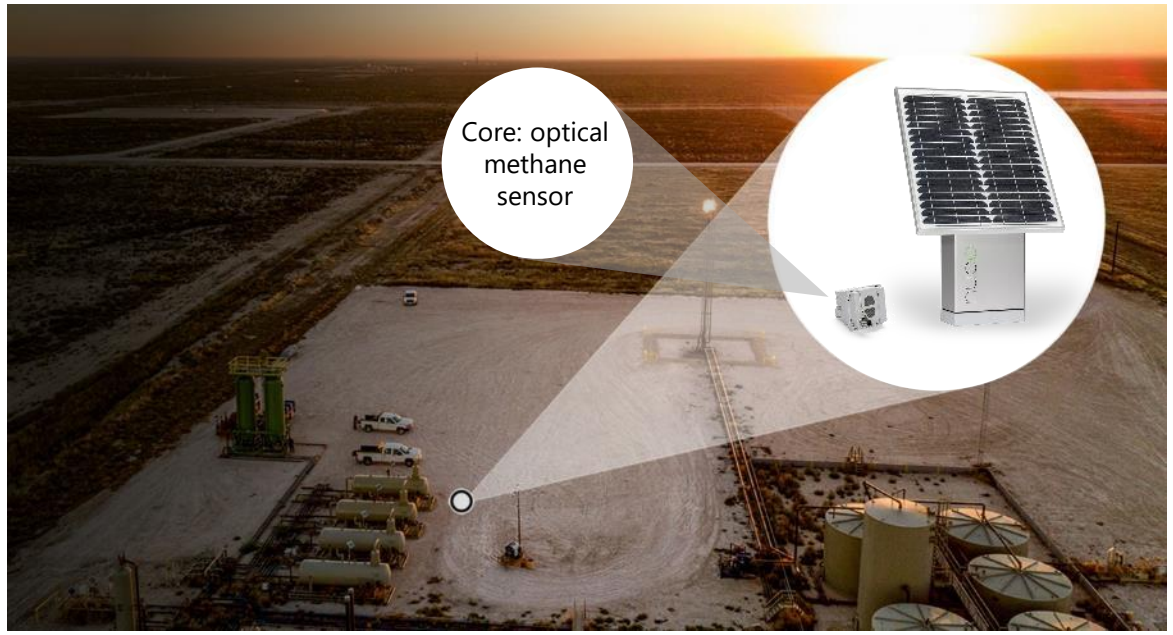
Block diagram SCD40

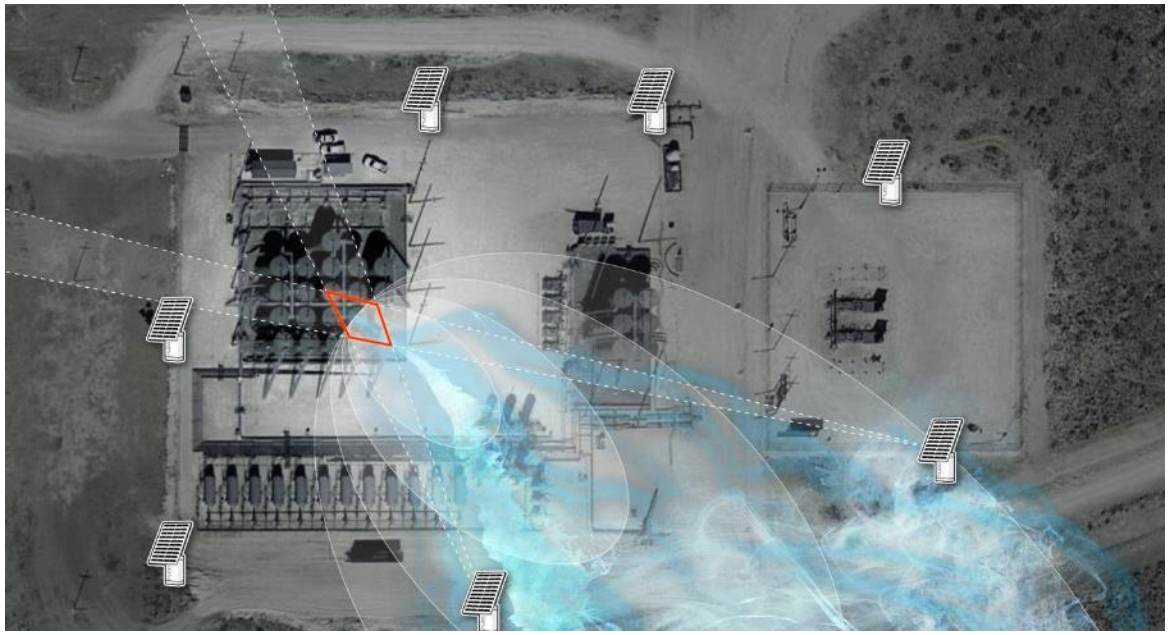


SENSIRION

Full Solution example: Nubo Sphere

End-to-end solution for continuous methane emissions monitoring





Leak detection and repair

Emissions quantification, reporting and reconciliation

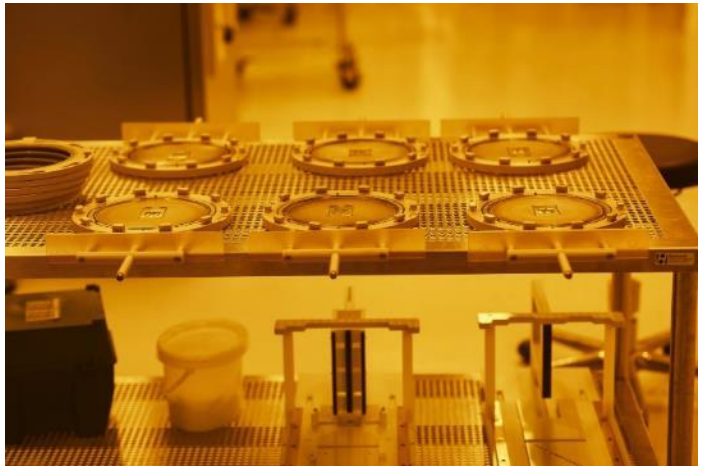
Alerting; Emission localization and quantification

Continuous monitoring enables fast reaction time and a complete picture of emissions

MEMS technology @ Sensirion

25’000
Wafers per year

1’000 m2
Clean room ISO 6



Feasibility | **Design and prototyping** | **Industrialization** | **Qualification** | **Production support**

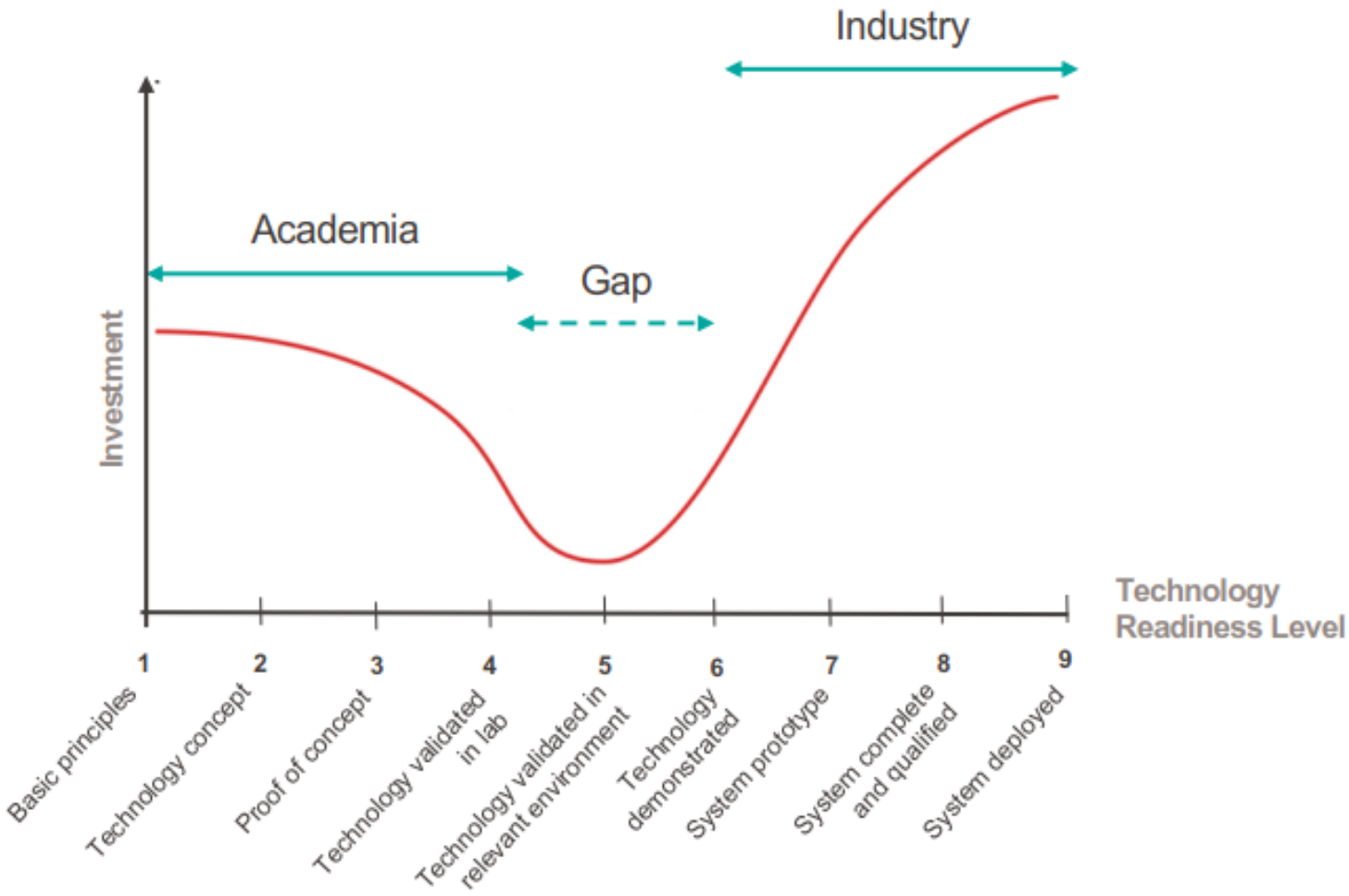
Agenda

1 Sensirion in brief

2 Sensirion technology: Some examples

3 R&D and innovation in industry

Research in academia compared to R&D in industry



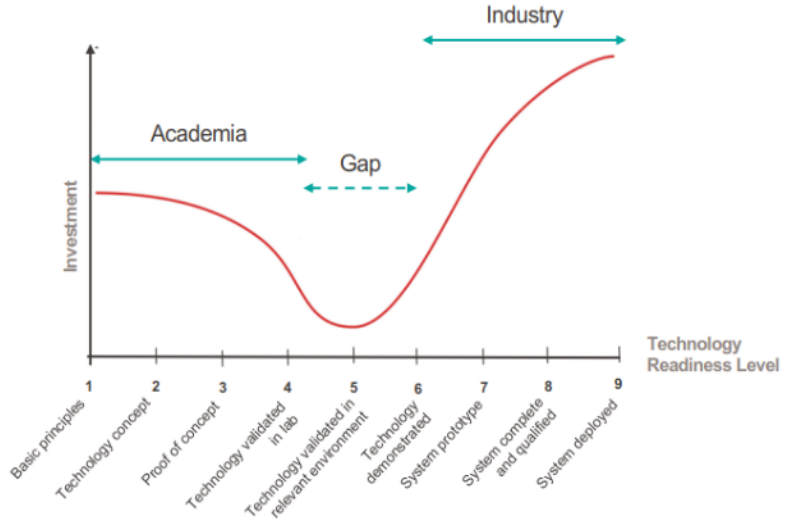
Research in academia

compared to

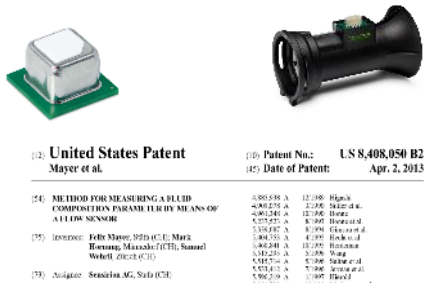
R&D in industry

- Understand and predict natural phenomena
- Fundamental principles
- **Publications**

- Typ. project size: 4 person years
- Small team
- "World-record" **sensitivity**
- Few samples



- Solve "real-world" problems
- Technology development
- **Product,** patents



- Typ. project size: 40+ person years
- Large interdisciplinary teams
- Sensitivity, **selectivity, stability, scalability**
- Millions of sensors → reproducibility is key: Qualification, process control, quality control

SENSIRION