# Particulate matter sensors
Environmental sensor modules
Simplifying indoor air quality sensing

SENSIRION

Optical measurement principle

Our particulate matter sensors build on an optical measurement principle based on laser light scattering. When particles in the air pass through the beam of an integrated laser, the light is scattered, which is then captured by photodetectors. Onboard algorithms analyze the scattered light to determine the size distribution and mass concentration of the particles. With an integrated ASIC, no external processing is needed.

Laser beam

Particles in
air flow

Detectors

Scattered light
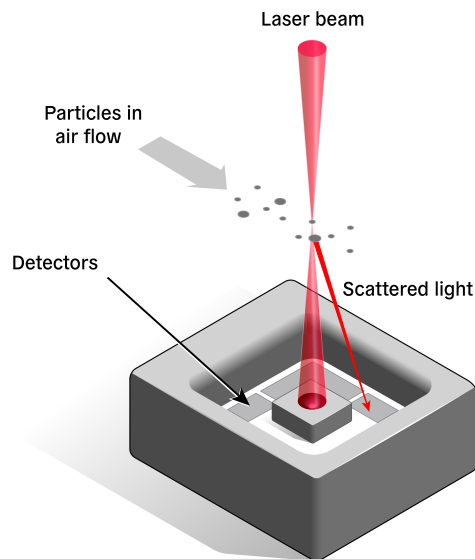
Dust resistance
Based on more than 25 years of experience in designing flow sensors for numerous demanding markets and applications, Sensirion's engineers have developed innovative and proprietary flow guidance technology.

With its help, dust and dirt deposits on the optical components are avoided and exceptional long-term stability is made possible.

Performance
Sensirion's proprietary algorithms use a new concept that allows size classes to be determined regardless of particle type, significantly improving the measurement of mass concentration. This provides greater accuracy in distinguishing aerosols and enables exceptionally precise measurement in a wide range of environmental conditions.

Environmental sensor modules

Environmental sensor modules are compact devices designed to monitor various environmental parameters such as temperature, humidity, particulate matter (PM), carbon dioxide (CO_2), volatile organic compounds (VOCs), formaldehyde and more. They eliminate the complexities of sensor integration and development work, as they incorporate all the necessary algorithms. Manufacturers can focus on their core competencies and create user-friendly applications without the worry of costly and time-consuming optimizations, resulting in reduced time-to-market and cost of ownership.

Sensirion's SEN6x series, thanks to its modular approach, provides flexibility and customization options. With just one design-in, manufacturers can serve different product tiers, simplifying the production process and enabling tailored solutions for specific needs.

SPS30

The MCERTS-certified SPS30 marks a technological breakthrough in optical PM sensors. Its measurement principle is based on laser scattering and makes use of Sensirion's innovative contamination-resistance technology. This technology, together with high-quality and long-lasting components, enables precise measurements from the device's first operation and throughout its lifetime of more than ten years.
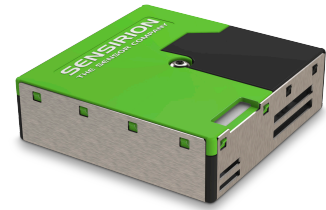
Features	Benefits
Proprietary contamination-resistance technology and long-lasting components	Over 10 years of continuous 24/7 operation with no cleaning or maintenance, eliminating sensor drift or malfunction issues
Laser-based scattering principle and advanced algorithms	Accurate measurements for different types of dust and other particles
Accurate high-resolution particle size binning	Enables new use cases and device-specific actions based on detected particle composition
Small, ultra-slim package	Easy to integrate into devices where size and space are limited
Fully calibrated digital output. UART and I²C interfaces	Straight-forward interfacing & read-out

Applications

- Air purifiers
- HVAC/ventilation systems
- Demand-controlled ventilation systems
- Air conditioners
- Air quality monitors
- Smart home and IoT devices

SEK-SPS30 evaluation kit

- 1× SPS30
- 1× UART to USB adapter cable (2 meter length)
- 1× SEK-SensorBridge required (must be bought separately)

Learn more

about the
SPS30

about the
SEK-SPS30

SEN6x

The SEN6x combines multiple sensors in a never-before-seen form factor and can measure up to ten environmental parameters (PM1, PM2.5, PM4, PM10, RH, T, VOC index, NOx index, CO_2 and HCHO). The innovative design simplifies integration, reduces costs, and allows for customization. It eliminates the complexities of sensor integration and development work, as it incorporates all the necessary algorithms.

Features	Benefits
All-in-one environmental node: no co-integration of separate sensor components required	Fast time-to-market, less R&D expenses, bill of material and assembly costs
Integrated temperature and humidity compensation and VOC/NOx index calculation	Reliable and trustworthy measurements
Optimized and tested air flow channel geometry and proven design-in examples	Fast hardware design
Patented sheath-flow technology combined with high-quality components	Dust-protection and long lifetime

Applications

- Air purifiers
- HVAC/ventilation systems
- Air conditioners
- Air quality monitors

Modularity

- **SEN62** – PM, RH/T
- **SEN63C** – PM, RH/T, CO_2
- **SEN65** – PM, RH/T, VOC, NOx
- **SEN66** – PM, RH/T, VOC, NOx, CO_2
- **SEN68** – PM, RH/T, VOC, NOx, HCHO
- **SEN69C** – PM, RH/T, VOC, NOx, HCHO, CO_2

SPS6x – Miniaturized particulate matter sensing building block

At the core of the SEN6x is a miniaturized, MEMS-based particulate matter sensing component. It integrates all the necessary building blocks for measuring PM1, PM2.5, PM4, and PM10, revolutionizing particulate matter sensing. The patented geometric arrangement, along with advanced MEMS and packaging techniques, allows for the integration of the light source, detector, signal processing, and algorithm into one cost-and space-efficient solution.

STAR engine

To improve the reaction time and provide a better user experience, Sensirion has developed the "Sensirion Temperature Acceleration Routine" (STAR) engine. This algorithm, which is implemented in the SEN6x range, estimates the value of the temperature dynamically and before the end product reaches a thermally stable state. This allows end users to obtain 2–3x faster and more reliable temperature readings from their products.
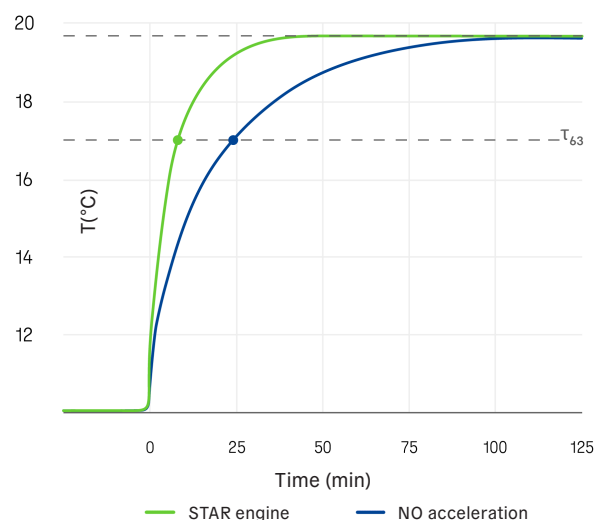
SEK-SEN6x Evaluation Kit

- 1× SEN6x variant
  (depending on selected evaluation kit)
- 1× adapter cable
- 1× jumper wire set
- 1× adapter cable Qwiic
- 1× SEK-SensorBridge required
  (must be bought separately)
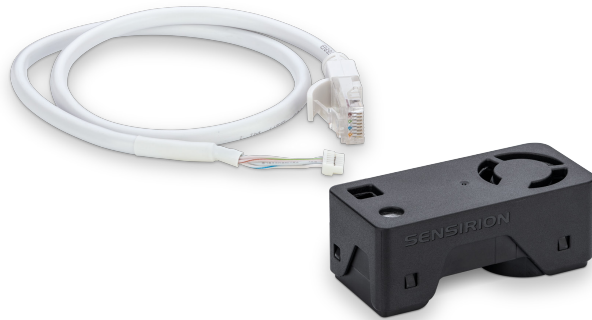
Learn more

about the
SEN6x

about the
SEK-SEN6x

	SPS30	SEN62	SEN63C	SEN65	SEN66	SEN68	SEN69C
Particulate matter specifications							
Mass concentration accuracy	± (5 µg/m³ + 5%) @ 0–100 µg/m³						
Mass concentration range	0–1,000 µg/m³						
Temperature and humidity specifications							
Typical accuracy temperature	-	± 0.45°C @ 15 – 30 °C, 50%RH					
Typical accuracy relative humidity	-	± 4.5% @ 25 °C, 30 – 70%RH					
VOC specifications							
Output signals	-	-	-	1 – 500 VOC Index points			
Device-to-device variation	-	-	-	< ± 15 VOC Index points or 15% m.v. (whichever is larger)			
NOx specifications							
Output signals	-	-	-	1 – 500 VOC Index points			
Device-to-device variation	-	-	-	< ± 50 NOx Index points or 50% m.v. (whichever is larger)			
CO₂ specifications							
Output range	-	-	0 – 32,000 ppm	-	0 – 40,000 ppm	-	0 – 32,000 ppm
Measurement accuracy (400–1,000 ppm)	-	-	± (100 ppm + 10 % of reading)	-	± (50 ppm + 2.5 % of reading)	-	± (100 ppm + 10 % of reading)
Formaldehyde specifications							
Measurement range	-	-	-	-	-	0 – 1,000 ppb	
Measurement accuracy (0 – 200 ppb HCHO in clean air, 25°C, 50 % RH)	-	-	-	-	-	± 20 ppb or ± 20%, whichever is larger	
Electrical							
Interface	I²C, UART	I²C					
Supply voltage range (V)	4.5-5.5V	3.15-3.45V					
Other							
Size	12.3 × 41.2 × 41.2 mm³	55.5 × 25.6 × 21.5 mm³					
Lifetime	> 10 years operating continuously 24 h/day						
Compliance with IAQ standards			RESET, WELL		RESET, WELL California Title 24		RESET, WELL

Technology at heart,
future in mind.