

Environmental Sensor Node SEN6x

Simplifying indoor air quality sensing



SENSIRION

Sensing platform for indoor air quality measurements

Experience the future of air quality sensing with the compact and powerful SEN6x sensing platform. It combines multiple sensors in a never-before-seen form factor and can measure up to nine environmental parameters (PM1, PM2.5, PM4, PM10, RH, T, VOC Index, NO_x Index, CO₂ or HCHO). The innovative design simplifies integration, reduces costs, and allows for customization.



The SEN6x eliminates the complexities of sensor integration and development work, as it incorporates all the necessary algorithms. Customers can now focus on their core competencies and create user-friendly applications resulting in fast time to market and low cost of ownership.

Modularity:

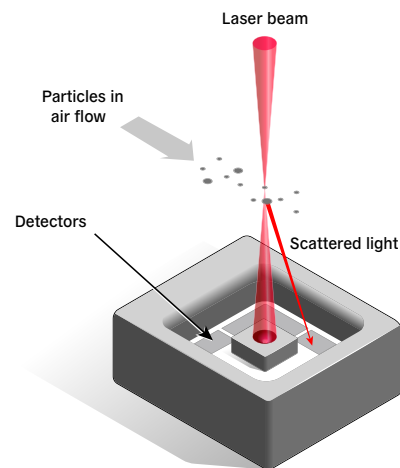
Thanks to its modular approach, SEN6x offers flexibility and customization options. With just one design-in, customers can serve different product tiers, simplifying the production process and enabling tailored solutions for specific needs. Whether they require particulate matter measurements or a comprehensive range of air quality parameters, such as temperature, humidity, volatile organic compounds, nitrogen oxides, CO₂, or formaldehyde, the SEN6x provides the perfect combination. Simply select the most suitable variant:

- **SEN60** – PM
- **SEN65** – PM, RH&T, VOC & NO_x
- **SEN66** – PM, RH&T, VOC & NO_x, CO₂
- **SEN68** – PM, RH&T, VOC & NO_x, HCHO

SPS6x – Miniaturized particulate matter sensing building block

At the core of the SEN6x is a brand-new, 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.

The measurement of particulate matter relies on 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, and the SPS6x provides fully processed values through an I²C communication.



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Sensor module specifications

Sensor module target specifications ¹		
Lifetime ²	> 10 years operating continuously 24 h/day	
Operating conditions ¹⁰	-10 – 50 °C	
Digital interface	I ² C	
Size	~54 × 24 × 22 mm ³	
Particulate matter target specifications ¹		
Mass concentration range	0–1,000 µg/m ³	
Mass concentration precision ^{3,4} for PM2.5 ⁵	± 5 µg/m ³ AND 5% m.v. @ 0–100 µg/m ³ ± 10% m.v. @ 100–1,000 µg/m ³	
Temperature and humidity target specifications ¹		
Typical accuracy temperature	± 0.45 °C @ 15–30 °C, 50 %RH	
Typical accuracy relative humidity	± 4.5 %RH @ 25 °C, 30–70 %RH	
Gas target specifications ¹		
	VOC	NO _x
Output signals	1–500 VOC Index points	1–500 NO _x index points
Device-to-device variation ^{6,7}	< ± 15 VOC Index points or % m.v. (whichever is larger)	< ± 50 NO _x Index points or % m.v. (whichever is larger)
CO ₂ target specifications ¹		
CO ₂ output range ⁸	0–40,000 ppm	
CO ₂ measurement accuracy ⁹ (400–1,000 ppm)	± (50 ppm + 2.5% of reading)	
Formaldehyde target specifications ¹		
HCHO measurement range	0–1,000 ppb	
HCHO measurement accuracy (0–200 ppb HCHO in clean air, 25 °C, 50% RH)	± 20 ppb or ± 20%, whichever is larger	

¹ Subject to change

² Lifetime is based on mean-time-to-failure (MTTF) calculation. Lifetime might vary depending on different operating conditions.

³ Also referred to as “between-parts variation” or “device-to-device variation”.

⁴ For further details, please refer to the document “Sensirion Particulate Matter Sensor Specification Statement”.

⁵ Verification Aerosol for PM2.5 is a 3% atomized KCl solution. Deviation to reference instrument is verified in end-tests for every sensor after calibration.

⁶ 95% of the sensors will be within the typical tolerance corresponding to 2 assuming a normal distribution for ≥ 100 sensors.

⁷ Evaluated using the calibration and test sequence according to the application note SGP41 – Testing Guide.

⁸ Exposure to CO₂ concentrations smaller than 400 ppm can affect the sensor accuracy if the automatic self-calibration (ASC) is on.

⁹ Deviation from a high-precision reference with gas mixtures having a tolerance of ± 2%. Rough handling and shipping can reduce the accuracy of the sensor. Accuracy is fully restored with FRC or ASC recalibration features after at most 5 days.

¹⁰ For variants without formaldehyde, 0–50 °C for variants with formaldehyde

Most important benefits of SEN6x

Technology	Benefits
All-in-one environmental node: no co-integration of separate sensor components required	Faster time-to-market, less R&D expenses, bill of material and assembly costs
Integrated algorithms: temperature and humidity compensation, VOC/NO _x 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 life-time
Reduced power modes. PM Algorithm optimized for single shot	Reduced power operation

Environmental sensing

Environmental conditions have a major impact on our well-being, comfort, and productivity. Sensirion's sensor solutions provide detailed and reliable data on key environmental parameters such as humidity, temperature, volatile organic compounds (VOCs), particulate matter (PM2.5), formaldehyde, NO_x and CO₂. Environmental sensing opens up new possibilities to create smarter devices that improve our comfort and well-being as well as increase energy efficiency in a wide variety of applications. We accompany you through the entire product development process, from the initial idea to product launch and beyond. Our expertise ranges from prototype construction, design-in support and use-case development to inline testing at the mass production stage.

