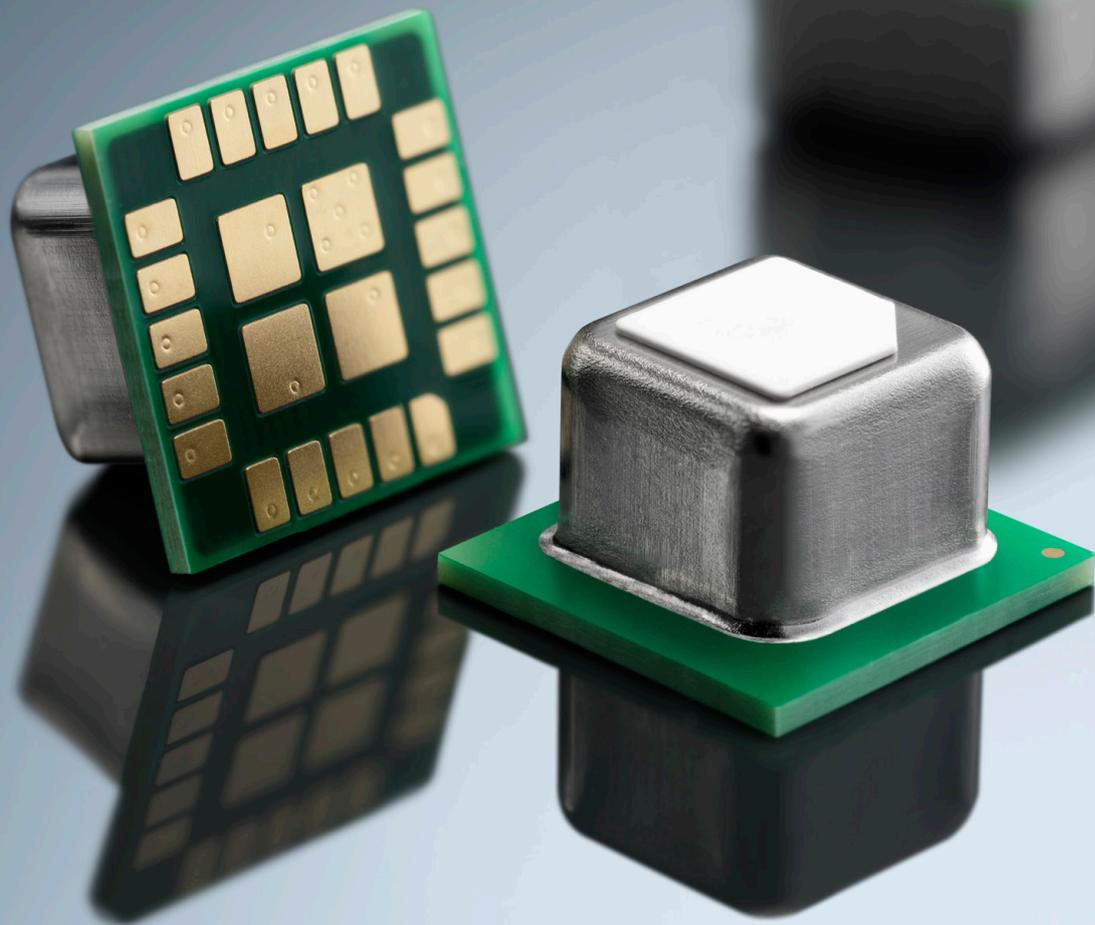# SCD4x Carbon Dioxide Sensor

Breaking the size barrier in CO₂ sensing

SENSIRION

SCD4x Carbon Dioxide Sensor

Description:

The SCD4x is Sensirion's next-generation miniature CO_2 sensor. Based on the photoacoustic NDIR sensing principle and Sensirion's patented PASens® and CMOSens® technology, it offers high accuracy at an unbeatable price with the smallest form factor. The SMD assembly allows cost- and space-efficient integration of the sensor with maximal design freedom. The integrated SHT4x humidity and temperature sensor provides on-chip signal compensation. The sensor's tape and reel packaging makes the SCD4x ideal for high-volume applications.

The SCD40 of the SCD4x product family provides accurate CO_2 sensing over a concentration range of 400–2,000 ppm and is ideal for cost-sensitive applications. For low power and indoor air quality applications, the SCD41 offers several important features, such as a specified CO_2 accuracy range from 400–5,000 ppm, higher accuracy specifications and low-power measurement modes. Applications requiring compliance with IAQ standards – such as RESET®, WELL Building Standard™ and California Title 24 Building Energy Efficiency Standards – are well served by the SCD41.

CO_2 is a key indicator for IAQ, as high levels affect cognitive performance and well-being. The SCD4x enables smart ventilation systems to regulate ventilation in the most energy-efficient way. In addition, IAQ monitors and other connected devices based on the SCD4x help maintain low CO_2 concentrations for a healthy and productive environment.

Applications

The SCD4x is perfectly suited for a wide range of commercial and residential HVAC applications:
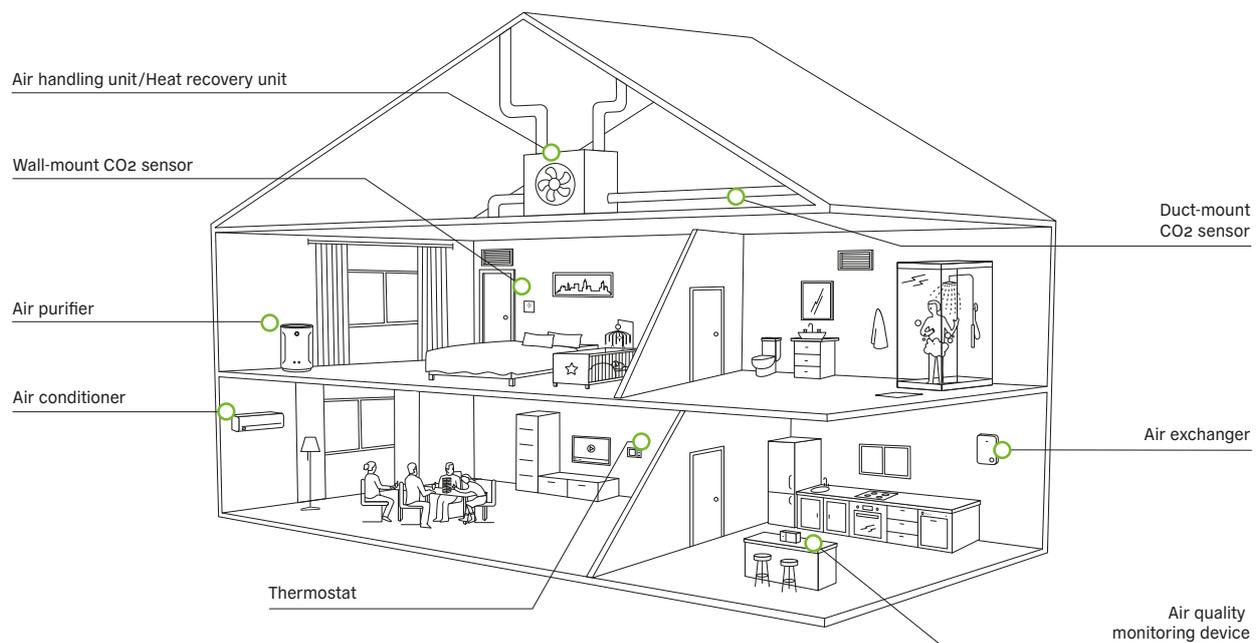
NDIR vs. photoacoustic sensing technology

Features	Typical NDIR CO₂ Sensor	SCD4x CO₂, RH + T Sensor
High selectivity	✔	✔
Small size	✘	✔
Additional sensor outputs	✘	✔
Cost-effective assembly	✘	✔
Mechanical robustness	✘	✔
Cost-effective BOM	✘	✔

| Technology	Benefits
Proprietary sensing technologies	Highest accuracy in smallest form factor
Small footprint	Fits into every device
Low number of components	High reliability
Long sensor lifetime of >10 years	Reliable sensor hardware
Voltage range of 2.4 – 5.5 V	Flexibility for battery and wired applications
Automatic self-calibration (ASC)	Enable autonomous drift compensation
Multiple low power modes	Potential for battery-powered applications
SMD soldering, tape & reel packaging	Straight-forward design-in
Built-in humidity and temperature sensor	On-chip signal compensation
Digital I²C interface	Simple sensor communication

Sensor Specifications

	SCD40	SCD41
Measurement accuracy[1]	± (50 ppm + 5% of reading) @ 400 – 2,000 ppm	± (50 ppm + 2.5% of reading) @ 400 – 1,000 ppm ± (50 ppm + 3% of reading) @ 1,001 – 2,000 ppm ± (40 ppm + 5% of reading) @ 2,001 – 5,000 ppm
CO₂ output range	0 – 40,000 ppm	
Minimum sampling rate	5 s	
Response time (τ63%)	60 s	
Size	10.1 × 10.1 × 6.3 mm³	
Assembly	SMD	
Interface	I²C	
Lifetime	>10 years	
Supply voltage range	2.4 – 5.5 V	
Average current for periodic mode	3.3 V = 15 mA, 5 V = 11 mA	
Temperature operating conditions	−10 to 60 °C	
Humidity operating conditions[2]	0 – 95% RH	

[1] Rough handling, shipping and sensor assembly can temporarily impact the accuracy. Accuracy can be fully restored through the forced recalibration (FRC) or ASC algorithms at least 5 days after sensor assembly. Please see the datasheet for more information.
[2] Accuracy can be reduced at relative humidity levels below 10%. Please see the datasheet for more information.

SEK-SCD41 Evaluation Kit

The SEK-SCD41 has been designed for easy evaluation of the SCD41 CO_2 sensor. In addition to the SCD41 development board, the evaluation kit includes two cable sets. The "adapter cable" allows you to connect to a computer via the SEK-SensorBridge, which must be bought separately and can be ordered via one of our distribution partners. Sensirion's SEK-ControlCenter viewer software can be used for evaluating the sensor. In addition, the kit includes a jumper cable that enables fast prototyping, e.g., through integration into existing platforms (like Arduino, RaspberryPi, etc.). The software and relevant documentation can be downloaded from our website.

Adapter cable

Jumper wire set

SCD41 development board
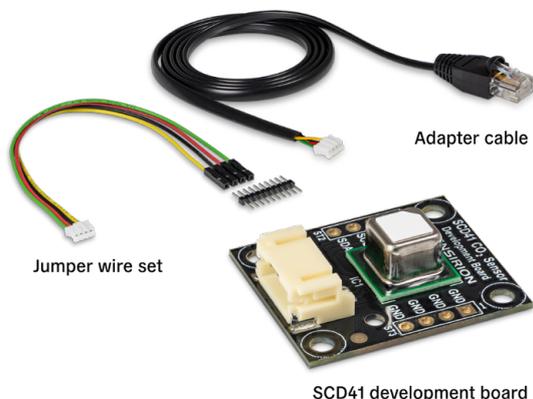
Learn more: www.sensirion.com/my-scd-ek

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 CO_2. 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.

CO2

HCHO

NOx

Environmental Sensing

RH/T

PM2.5

VOC

www.sensirion.com/scd4x