

Preliminary Data Sheet SEN5x

Environmental Sensor Node for HVAC and Air Quality Applications

- PM, NO_x, VOC, RH & T sensor platform
- Fast & easy integration
- One driver for up to 8 data signals
- Superior sensing accuracy and lifetime
- Fully calibrated digital output



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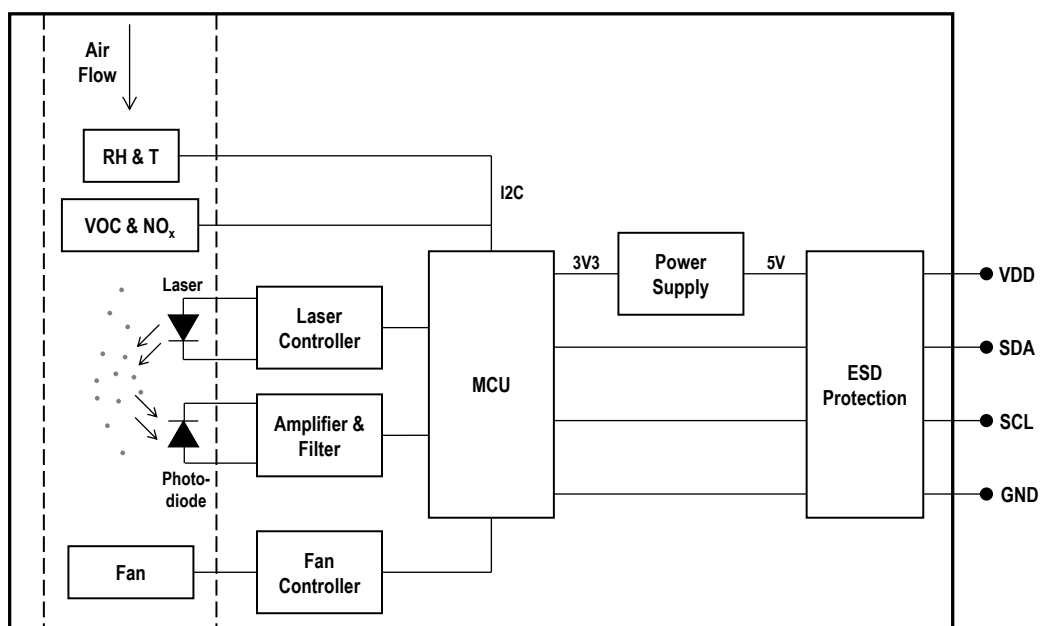


Figure 1 Functional block diagram of the SEN5X.

Content

1 Product Family Overview and Ordering Information	4
2 Environmental Sensor Node Specifications	4
3 Electrical Specifications	9
4 Hardware Interface Specifications	10
5 Functional Overview	11
6 Operation and Communication through the I ² C Interface	14
7 Technical Drawings	19
8 Revision History	21
9 Important Notices	22
10 Headquarters and Subsidiaries	23

1 Product Family Overview and Ordering Information

The SEN5x product family consists of a lineup of sensors with identical dimensions, identical hardware & firmware interface, and varying number of sensor outputs. **Table 1** gives an overview of all available product variants with their respective sensor outputs.

Specifications for sensor outputs only apply for the given product if the sensor is part of this product.

Products	Sensor outputs	Description	Article Number
SEN50-SDN-T	Particulate Matter	Particulate matter sensor, tray packaging, 45 pcs. per tray	<i>Available Q2/2022</i>
SEN54-SDN-T	Particulate Matter Relative Humidity Temperature VOC Index	Environmental sensor node, tray packaging, 45 pcs. per tray	3.000.535
SEN55-SDN-T	Particulate Matter Relative Humidity Temperature VOC Index NO _x Index	Environmental sensor node, tray packaging, 45 pcs. per tray	<i>Available Q2/2022</i>

Table 1: Sensor module specifications.

2 Environmental Sensor Node Specifications

Default conditions of standard Measurement-Mode (6.1.1), 25 °C and 5 V supply voltage apply to values in the table below, unless otherwise stated.

2.1 Sensor Module Specifications

Parameter	Conditions	Value	Units
Sampling interval	-	1 ± 0.03	s
Lifetime ¹	24 h/day operation	> 10	years
Acoustic emission level	0.2 m	24	dB(A)
Long term acoustic emission level drift	0.2 m	+0.5	dB(A) / year
Weight	-	36.4 ± 10%	g

Table 2: Sensor module specifications.

¹ Lifetime is based on mean-time-to-failure (MTTF) calculation. Lifetime might vary depending on different operating conditions.

2.2 Particulate Matter Specifications

Parameter	Conditions		Value	Units
Mass concentration specified range	-		0 to 1'000	µg/m³
Mass concentration size range	PM1.0		0.3 to 1.0	µm
	PM2.5		0.3 to 2.5	µm
	PM4		0.3 to 4.0	µm
	PM10		0.3 to 10.0	µm
Mass concentration precision ^{2,3} for PM1 and PM2.5 ⁴	0 to 100 µg/m³		±5 µg/m³ AND 5 % m.v.	
	100 to 1000 µg/m³		±10	% m.v.
Mass concentration precision ^{2,3} for PM4, PM10 ⁵	0 to 100 µg/m³		±25	µg/m³
	100 to 1000 µg/m³		±25	% m.v.
Maximum long-term mass concentration precision limit drift	0 to 100 µg/m³		±1.25	µg/m³ / year
	100 to 1000 µg/m³		±1.25	% m.v. / year
Typical start-up time ⁶	number concentration	200 – 3000 #/cm³	8	s
		100 – 200 #/cm³	16	s
		50 – 100 #/cm³	30	s
Sensor output characteristics	PM2.5 mass concentration		Calibrated to TSI DustTrak™ DRX 8533 Ambient Mode	
Additional T-dependent mass precision limit drift ³	temperature difference to 25°C	typ.	±0.5	% m.v. / °C
Laser wavelength (DIN EN 60825-1 Class 1)			typ.	660 nm

Table 3: Particulate matter sensor specifications. Default conditions of 25±2 °C, 50±10% relative humidity and 5 V supply voltage apply unless otherwise stated. 'max.' means 'maximum', 'typ.' means 'typical', '% m.v.' means '% of measured value'.

² Also referred to as "between-parts variation" or "device-to-device variation".

³ For further details, please refer to the document "Sensirion Particulate Matter Sensor Specification Statement".

⁴ 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.

⁵ PM4 and PM10 output values are calculated based on distribution profile of all measured particles.

⁶ Time after starting Measurement-Mode, until a stable measurement is obtained.

2.1 Temperature and Humidity Specifications

Parameter	Conditions	Value ⁷	Units
Compensated outputs ⁸	-	Temperature and Relative Humidity	°C %RH
Typical accuracy temperature	@ 15-30 °C, 50 %RH	±0.45	°C
Max. accuracy temperature	@ 15-30 °C, 50 %RH	±0.7	°C
Repeatability temperature	@ 25 °C, 50 %RH	0.1	°C
Response time temperature ⁹	@ 25 °C, 50 %RH, τ 63%	< 60	s
Typical accuracy relative humidity	@ 25 °C, 30-70 %RH	±4.5	%RH
Max. accuracy relative humidity	@ 25 °C, 30-70 %RH	±6	%RH
Repeatability relative humidity	@ 25 °C, 50 %RH	±1	%RH
Response time relative humidity ¹⁰	@ 25 °C, 50 %RH, τ 63%	< 20	s

Table 4: Temperature and humidity specifications.

⁷ For definition of typical and max. accuracy tolerance, please refer to the document "Sensirion Humidity Sensor Specification Statement".

⁸ Self-heating of the module is compensated according to the application note "SEN5x – Temperature Compensation Instruction".

⁹ For a step from 15°C to 25°C

¹⁰ For a step from 75%RH to 25%RH

2.2 Gas Specifications

Parameter	Comments		Values			Units
			Min.	Typ. ¹¹	Max.	
Output signals	VOC Index		1	–	500	VOC Index points
	NO _x Index		1	–	500	NO _x Index points
Device-to-device variation	VOC Index ¹²		–	<±15 <±15	–	VOC Index points or % VOC Index m.v. (the larger)
	NO _x Index ¹²		–	<±25 <±25	–	NO _x Index points or % NO _x Index m.v. (the larger)
Repeatability	VOC Index ¹²		–	<±5 <±5	–	VOC Index points or % VOC Index m.v. (the larger)
	NO _x Index ¹²		–	<±10 <±10	–	NO _x Index points or % NO _x Index m.v. (the larger)
Response time	Changing concentration from 5 to 10 ppm of ethanol, at sampling interval of 1 s	τ ₆₃	–	<10	–	s
		τ ₉₀	–	<30	–	s
Switch-on behavior	Time until reliably detecting events ¹³		–	<60	–	s
	Time until specifications in this table are met		–	<1	–	h

Table 5: Gas sensing specifications at 25 °C and 50 % RH in zero air (considered as clean air for indoor air quality applications). All concentrations refer to ethanol as test gas.

¹¹ 95 % of the sensors will be within the typical tolerance corresponding to 2σ assuming a normal distribution for ≥100 sensors.

¹² Evaluated using the calibration and test sequence according to the application note *SGP41 – Testing Guide*.

¹³ Signal increase during 60-s event of 5 to 10 ppm of ethanol is three times larger than signal drift without this event during the same duration.

2.3 Recommended and Absolute Maximum/Minimum Operating and Storage Conditions

The SEN5X contains different sensing components with different recommended operating and storage ranges. Table 6 and Figure 2 show the recommended operating and storage conditions in which all the sensing components of the SEN5x show best performance, as well as absolute maximum/minimum conditions which must not be exceeded. Gas sensing specifications are guaranteed only when the SEN5x is operated and stored under the recommended conditions given in Table 6.

Exposure to conditions outside the recommended range may temporarily reduce sensor performance (reversible RH drift, reduced RH, T, gas, PM accuracy). Exposure to conditions outside absolute maximum/minimum range may lead to permanently reduced sensor performance (gas sensitivity drift) or cause permanent damage to the device.

The sensor must not be exposed towards condensing conditions at any time.

Condition	Parameter	Recommended		Absolute Maximum/Minimum		Unit
		Min.	Max.	Min.	Max.	
Operating conditions	Temperature	10	40	-10	50	°C
	Relative humidity	20	80	0	90 (non-condensing)	% RH
Storage conditions	Temperature	10	30	-40	70	°C
	Relative Humidity	20	60	0	80 (non-condensing)	% RH

Table 6 Recommended and absolute maximum/minimum operating and storage conditions for SEN5x.

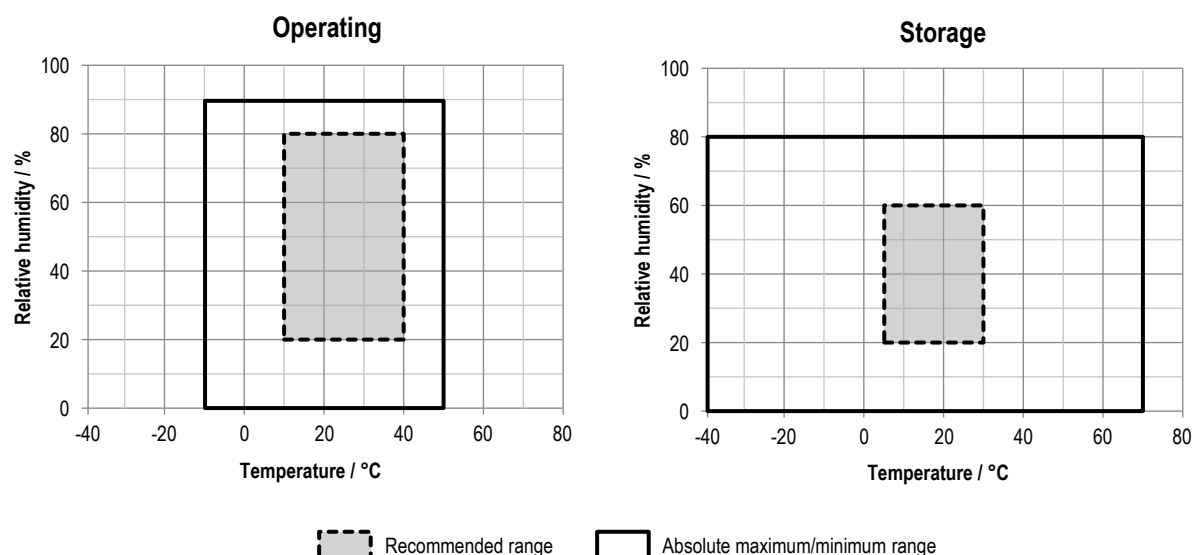


Figure 2 Recommended and absolute maximum/minimum operating and storage conditions for SEN5x.

To ensure an optimal performance of the SEN5x, the “SEN5x Handling Instructions” as well as the “SEN5x Mechanical Assembly and Design-in Guidelines” need to be followed.

3 Electrical Specifications

3.1 Electrical Characteristics

Parameter	Conditions	Min	Typ	Max	Unit
Supply voltage	-	4.5	5.0	5.5	V
Average supply current	Idle Mode (first 10 seconds)	-	3.8	4.2	mA
	Idle Mode (after first 10 seconds)	-	2.6	3	
	RHT/Gas-only Measurement Mode	-	6.8	8	
	Measurement-Mode (first 60 seconds)	-	70	100	
	Measurement-Mode (after first 60 seconds)	-	63	70	
Peak supply current	Measurement mode (pulse width of 16µs)	-	100	110	
Input high level voltage (V _{IH})	-	2.31	-	5.5	V
Input low level voltage (V _{IL})	-	0	-	0.99	
Output high level voltage (V _{OH})	-	2.9	3.3	3.37	
Output low level voltage (V _{OL})	-	0	0	0.4	

Table 7 Electrical specifications at 25°C.

3.2 Absolute Maximum Ratings

Stress levels beyond those listed in Table 8 may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions cannot be guaranteed. Exposure to the absolute maximum rating conditions for extended periods may affect the reliability of the device.

Parameter	Min	Max	Unit
Supply voltage VDD	-0.3	5.5	V
Interface Select SEL	-0.3	5.5	
I/O pins (RX/SDA, TX/SCL)	-0.3	5.5	
Max. current on any I/O pin	-16	16	mA
Operating temperature range	see Table 6		
Operating humidity range	see Table 6		
Storage temperature range (short-term, e.g. transport)	see Table 6		
Storage humidity range (short-term, e.g. transport)	see Table 6		

Table 8: Absolute minimum and maximum ratings.

3.3 ESD / EMC Ratings

Immunity

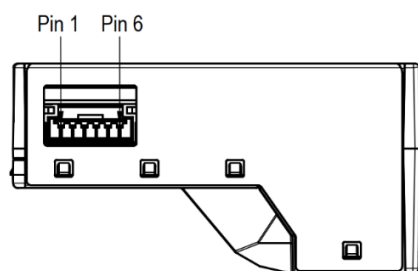
Description	Standard	Rating
Electro Static Discharge	IEC 61000-4-2	±4 kV contact, ±8 kV air
Power-Frequency Magnetic Field	IEC 61000-4-8	30A/m, 50Hz and 60Hz
Radio-Frequency EM-Field AM-modulated	IEC 61000-4-3	80MHz - 1000MHz, 3V/m, 80% AM @1kHz
Radio-Frequency EM-Field AM-modulated	IEC 61000-4-3	1.4GHz – 6GHz, 3V/m, 80% AM @1kHz

Emission

Description	Standard	Rating
Emission in SAC for 30MHz to 230MHz	IEC/CISPR 16	40dB(µV/m) QP @3m
Emission in SAC for 230MHz to 1000MHz	IEC/CISPR 16	47dB(µV/m) QP @3m

4 Hardware Interface Specifications

The sensor is equipped with a serial communication interface. The interface connector is located at the side of the sensor adjacent to the air outlet. The used connector is ACES 51451-0060N-001 or another compatible connector. The corresponding male plug is ACES 51452-006H0H0-001. At the time of writing JST GHR-06V-S is compatible and can be used as well. In Figure 3 a description of the pin layout is given.



Pin	Name	Description	Comments
1	VDD	Supply voltage	5V ± 10%
2	GND	Ground	
3	SDA	Serial data input / output	LVTTTL 3.3V compatible
4	SCL	Serial clock input	LVTTTL 3.3V compatible
5	RES	Reserved	Connect to GND
6	NC	Do not connect	

Figure 3 Pin layout. The communication interface connector (ACES 51451-0060N-001) is located at the side of the sensor adjacent to the air outlet.

Table 9: SEN5x pin assignment.

Note, that there is an internal electrical connection between GND pin (5) and metal shielding. Keep this metal shielding electrically floating to avoid any unintended currents through this internal connection. If this is not an option, proper external potential equalization between GND pin and any potential connected to the shielding is mandatory. Any current through the connection between GND and metal shielding may damage the product and poses a safety risk through overheating.

5 Functional Overview

5.1 Operating Modes

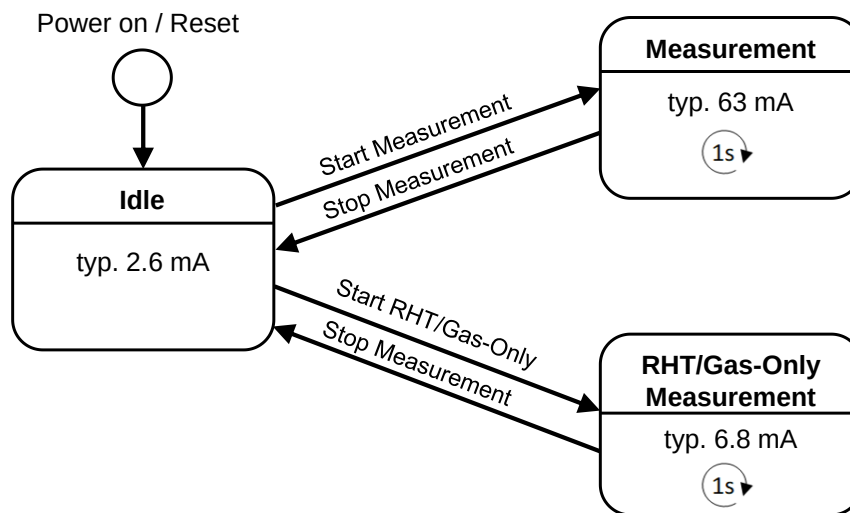


Figure 4 SEN5x operating modes.

Idle

- After power on or reset the module is in Idle-Mode.
- Most of the internal electronics switched off /reduced power consumption.
- Fan and laser are switched off.
- The module is ready to receive and process any command.

Measurement

- The Measurement-Mode can only be entered from Idle-Mode.
- All electronics switched on / max. power consumption.
- The measurement is running, and the module is continuously processing measurement data.
- New readings are available every second.

RHT/Gas-Only Measurement Mode

- The RHT/Gas-Only Measurement Mode can only be entered from Idle Mode.
- Fan and laser are switched off for reduced power consumption.
- RHT and gas sensor are switched on. RHT and gas measurement is running and the module is continuously processing measurement data.
- New readings are available every second.

5.2 Fan Auto Cleaning

When the module is in Measurement-Mode an automatic fan-cleaning procedure will be triggered periodically following a defined cleaning interval. This will accelerate the fan to maximum speed for 10 seconds to blow out the dust accumulated inside the fan.

- Measurement values are not updated while the fan-cleaning is running.
- The cleaning interval is set to 604'800 seconds (i.e., 168 hours or 1 week) with a tolerance of $\pm 3\%$.
- The interval can be configured using the Set Automatic Cleaning Interval command.
- Set the interval to 0 to disable the automatic cleaning.
- A sensor reset, resets the cleaning interval to its default value
- If the sensor is switched off, the time counter is reset to 0. Make sure to trigger a cleaning cycle at least every week if the sensor is switched off and on periodically (e.g., once per day).
- The cleaning procedure can also be started manually with the Start Cleaning command.

5.3 Temperature compensation

By default, the temperature and humidity outputs from the sensor are compensated for the modules self-heating. If the module is designed into a device, the temperature compensation might need to be adapted to incorporate the change in thermal coupling and self-heating of other device components.

A guide to achieve optimal performance, including references to mechanical design-in examples can be found in the app note "SEN5x – Temperature Compensation Instruction" at www.sensirion.com.

5.4 Measurement Output Formats

The measurement results can be read with the "Read Measured Values" command. The returned data structure depends on the selected output format. The output format must be specified when stating the measurement with the "Start Measurement command".

The returned data needs to be divided by the corresponding scale factor to obtain the described unit.

Output format 1:

Byte #	Datatype	Scale factor	Description
0..1	big-endian, uint16	10	Mass Concentration PM1.0 [$\mu\text{g}/\text{m}^3$]
3..4	big-endian, uint16	10	Mass Concentration PM2.5 [$\mu\text{g}/\text{m}^3$]
6..7	big-endian, uint16	10	Mass Concentration PM4.0 [$\mu\text{g}/\text{m}^3$]
9..10	big-endian, uint16	10	Mass Concentration PM10 [$\mu\text{g}/\text{m}^3$]
12..13	big-endian, int16	100	Compensated Ambient Humidity [%RH]
15..16	big-endian, int16	200	Compensated Ambient Temperature [$^{\circ}\text{C}$]
18..19	big-endian, int16	10	VOC Index
21..22	big-endian, int16	10	NOx Index

5.5 Device Status Register

The Device Status Register is a 32-bit register that contains information about the internal state of the module.

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
res.	res.	res.	res.	res.	res.	res.	res.	res.	res.	Warning	Info	Info	res.	res.	res.
										SPEED	FAN.	FAN			
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	res.	res.	res.	res.	res.	res.	res.	Error	Error	Error	Error	res.	res.	res.	res.
								VOC	RHT	LASER	FAN				

Note: All “res.” bits are reserved for internal use or future versions. These bits can be both 0 and 1 and should therefore be ignored.

Bit 21 **SPEED**: Fan speed out of range

- 0: Fan speed is ok.
- 1: Fan speed is too high or too low.

- During the first 3 seconds after starting the measurement (fan start-up) the fan speed is not checked.
- The fan speed is also not checked during the auto cleaning procedure.
- Apart from the two exceptions mentioned above, the fan speed is checked once per second in the measurement mode. If it is out of range twice in succession, the SPEED-bit is set.
- At very high or low ambient temperatures, the fan may take longer to reach its target speed after start-up. In this case, the bit will be set. As soon as the target speed is reached, this bit is cleared automatically.
- If this bit is constantly set, this indicates a problem with the power supply or that the fan is no longer working properly

Bit 20 **FAN**: Fan is not ready

- 0: Fan is running normal.
- 1: Active during the first 3 seconds after starting measurement (fan start-up).

Bit 19 **FAN**: Fan cleaning active

- 0: Fan is running normal.
- 1: Active during the automatic cleaning procedure of the fan

Bit 7 **GAS SENSOR**: Gas sensor error

- 0: Gas sensor is running normal.
- 1: Gas sensor error

Bit 6 **RHT**: RHT communication error

- 0: RHT sensor is running normal.
- 1: Error in internal communication with the RHT sensor

Bit 5 **LASER**: Laser failure

- 0: Laser current is ok.
- 1: Laser is switched on and current is out of range.
- The laser current is checked once per second in the measurement mode. If it is out of range twice in succession, the LASER-bit is set.

- If the laser current is back within limits, this bit will be cleared automatically.
- A laser failure can occur at very high temperatures outside of specifications or when the laser module is defective.

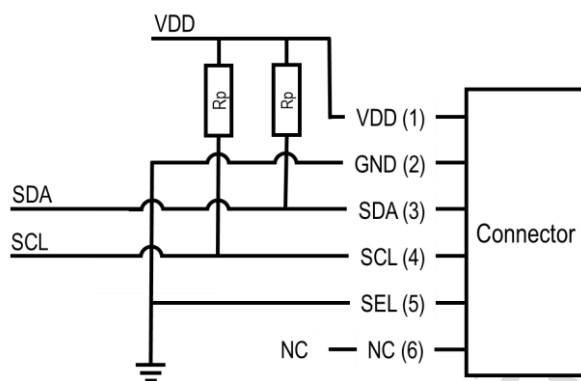
Bit 4 **FAN**: Fan failure, fan is mechanically blocked or broken.

0: Fan works as expected.

1: Fan is switched on, but the measured fan speed is 0 RPM.

- The fan is checked once per second in the measurement mode. If 0 RPM is measured twice in succession, the FAN bit is set.
- The FAN-bit will not be cleared automatically.
- A fan failure can occur if the fan is mechanically blocked or broken.

6 Operation and Communication through the I²C Interface



Usage:

- I²C address: 0x69
- Max. speed: standard mode, 100 kbit/s
- Clock stretching: not used

Both SCL and SDA lines are open drain I/Os. They should be connected to external pull-up resistors (e.g. $R_p = 10\text{ k}\Omega$). **Important notice:** in order to correctly select I²C as interface, the interface select (SEL) pin must be pulled to GND before or at the same time the sensor is powered up.

Figure 5: Typical I²C application circuit.

To avoid electromagnetic interference and crosstalk, use as short as possible electronic connections (< 10 cm) and/or well shielded connection cables.

For detailed information on the I²C protocol, refer to NXP I²C-bus specification¹⁴.

¹⁴ http://www.nxp.com/documents/user_manual/UM10204.pdf

Checksum Calculation

The Read and Write Commands transmit the data in 2-byte packets, followed by an 8-bit checksum. The checksum is calculated as follows:

Property	Value
Name	CRC-8
Protected Data	read and/or write data
Width	8 bit
Polynomial	$0x31 (x^8 + x^5 + x^4 + 1)$
Initialization	0xFF
Reflect Input	false
Reflect Output	false
Final XOR	0x00
Example	CRC(0xBEEF) = 0x92

```
uint8_t CalcCrc(uint8_t data[2]) {
    uint8_t crc = 0xFF;
    for(int i = 0; i < 2; i++) {
        crc ^= data[i];
        for(uint8_t bit = 8; bit > 0; --bit) {
            if(crc & 0x80) {
                crc = (crc << 1) ^ 0x31u;
            } else {
                crc = (crc << 1);
            }
        }
    }
    return crc;
}
```

Please note that the checksums are used only for the 2-byte data packets. The command code itself already contains a 3-bit CRC and therefore no checksum must be appended to it.

6.1 I²C Commands

The following table shows an overview of the available I²C commands.

Address Pointer	Command Name	Transfer Type	Command execution time
0x0021	Start Measurement	Set Pointer & Write Data	< 50 ms
0x0104	Stop Measurement	Set Pointer	< 200 ms
0x0202	Read Data-Ready Flag	Set Pointer & Read Data	< 20 ms
0x03C4	Read Measured Values	Set Pointer & Read Data	< 20 ms
0x60B2	Read/ Write Temperature Compensation Parameters	Set Pointer & Read/ Write Data	< 20 ms
0x60C6	Read/ Write Warm Start Parameters	Set Pointer & Read/ Write Data	< 20 ms
0x5607	Start Fan Cleaning	Set Pointer	< 10 ms
0x8004	Read/Write Auto Cleaning Interval	Set Pointer & Read/Write Data	< 20 ms
0xD014	Read Product Name	Set Pointer & Read Data	< 20 ms
0xD033	Read Serial Number	Set Pointer & Read Data	< 20 ms
0xD100	Read Firmware Version	Set Pointer & Read Data	< 20 ms
0xD206	Read Device Status	Set Pointer & Read Data	< 20 ms
0xD210	Clear Device Status	Set Pointer	< 20 ms
0xD304	Reset	Set Pointer	< 100 ms

Table 10: Reference table for I²C commands.

6.1.1 Start Measurement (0x0021)

Starts the measurement. After power up, the module is in Idle-Mode. Before any measurement values can be read, the Measurement-Mode needs to be started using this command.

6.1.2 Stop Measurement (0x0104)

Stops the measurement. Use this command to return to the initial state (Idle-Mode).

6.1.3 Read Data-Ready Flag (0x0202)

This command can be used for polling to find out when new measurements are available. The pointer address only must be set once. Repeated read requests get the status of the Data-Ready Flag.

Read Data:

Byte #	Description
0	unused, always 0x00
1	Data-Ready Flag 0x00: no new measurements available 0x01: new measurements ready to read
2	Checksum for bytes 0, 1

6.1.4 Read Measured Values (0x03C4)

Reads the measured values from the sensor module and resets the "Data-Ready Flag". If the sensor module is in Measurement-Mode, an updated measurement value is provided every second and the "Data-Ready Flag" is set. If no synchronized readout is desired, the "Data-Ready Flag" can be ignored. The command "Read Measured Values" always returns the latest measured values. After sending the "Read Measured Values" command, a wait time of 10 ms is needed so that the sensor internally can fill the data buffers. After 10 ms, the read data header can be sent to read out the sensor data.

Command	Returned data
0x03C4	PM Mass concentration, Relative humidity, Temperature, VOC Index, NOx Index

For the data format see section 5.4 Measurement Output Formats. Note that after every two bytes, the checksum of the previous two bytes is transferred.

Example Data Structure:

Byte #	Description
0, 1	two bytes of measurement data
2	checksum for bytes 0, 1
3, 4	two bytes of measurement data
5	checksum for bytes 3, 4
...	...

6.1.5 Read/ Write Temperature Compensation Parameters (0x60B2)

This command allows to compensate temperature effects from mechanical integration at customer side by applying a custom temperature offset to the ambient temperature. The additional slope applies an additional shape to the temperature and humidity output curve. The specified time constant defines how fast slope and offset are applied.

Read/Write Data:

Byte #	Datatype	Scale factor	Description
0..1	big-endian, int16	200	Temperature offset [°C] (default value: 0)
2	Checksum for bytes 0, 1		

3..4	big-endian, int16	10000	Normalized temperature offset slope (default value: 0)
5	Checksum for bytes 3, 4		
6..7	big-endian, uint16	1	Time constant in seconds (default value: 0)
8	Checksum for bytes 6, 7		

6.1.6 Read/ Write Warm Start Parameter (0x60C6)

The temperature compensation algorithm is optimized for a cold start by default, i.e. it is assumed that the "Start Measurement" commands are called on a device not yet warmed up by previous measurements. If the measurement is started on a device that is already warmed up, this parameter can be used to improve the initial accuracy of the ambient temperature output.

Read/Write Data:

Byte #	Datatype	Scale factor	Description
0..1	big-endian, uint16	1	Warm start behavior as a value in the range from 0 (cold start, default value) to 65535 (warm start). (default value: 0)
2	Checksum for bytes 0, 1		

6.1.7 Start Fan Cleaning (0x5607)

Starts the fan-cleaning manually. This command can only be executed in Measurement-Mode. For more details, note the explanations given in 4.2 Fan Auto Cleaning.

6.1.8 Read/Write Auto Cleaning Interval (0x8004)

Reads/Writes the interval [s] of the periodic fan-cleaning. For more details, note the explanations given in 5.2 Fan Auto Cleaning. This configuration is volatile. It will be reverted to the default value after a device reset.

Read/Write Data:

Byte #	Description	
0, 1	Most Significant Byte	big-endian, unsigned 32-bit integer value: Auto Cleaning Interval [s]
2	Checksum for bytes 0, 1	
3, 4	Least Significant Byte	
5	Checksum for bytes 3, 4	

6.1.9 Read Product Name (0xD014)

This command returns the product name SEN5x. It is defined as a string value with a maximum length of 32 ASCII characters (including terminating null-character).

Read Data:

Byte #	Description
0	ASCII Character 0
1	ASCII Character 1
2	Checksum for bytes 0, 1
...	...
45	ASCII Character 30
46	ASCII Character 31
47	Checksum for bytes 45, 46

6.1.10 Read Serial Number (0xD033)

This command returns the requested serial number. It is defined as a string value with a maximum length of 32 ASCII characters (including terminating null-character).

Read Data:

Byte #	Description
0	ASCII Character 0
1	ASCII Character 1
2	Checksum for bytes 0, 1
...	...
45	ASCII Character 30
46	ASCII Character 31
47	Checksum for bytes 45, 46

6.1.11 Read Firmware Version (0xD100)

Get firmware version.

Read Data:

Byte #	Description
0	Firmware version
1	Reserved
2	Checksum for bytes 0, 1

6.1.12 Read Device Status (0xD206)

Use this command to read the Device Status Register. For more details, note the explanations given in section 5.5 Device Status Register.

Read Data:

Byte #	Description	big-endian, unsigned 32-bit integer value: Device Status Register
0, 1	Most Significant Byte	
2	Checksum for bytes 0, 1	
3, 4	Least Significant Byte	
5	Checksum for bytes 3, 4	

6.1.13 Clear Device Status (0xD210)

Clears all flags in device status register.

6.1.14 Device Reset (0xD304)

Device software reset command. After calling this command, the module is in the same state as after a power reset.

7 Technical Drawings

7.1 Product outline drawings

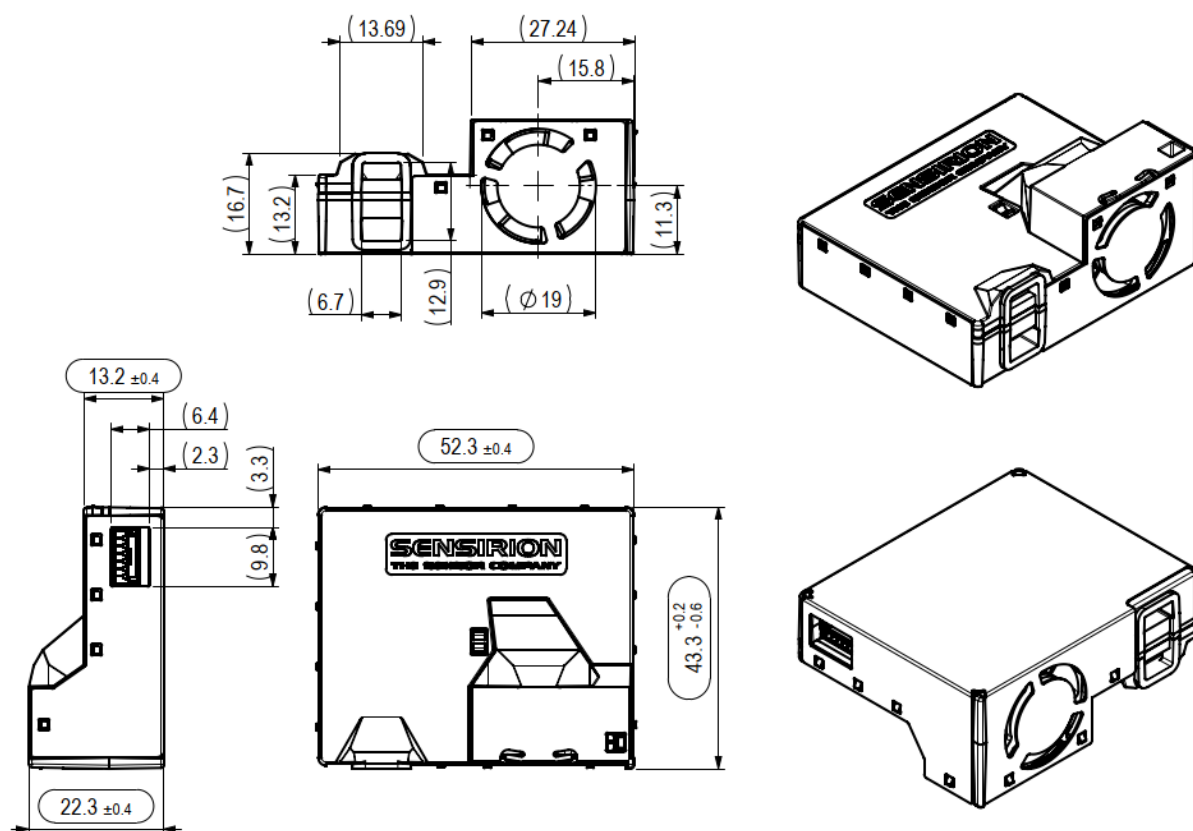


Figure 6: Package outline dimensions (given in mm) of the SEN5x.

7.2 Product Label

The SEN5x contains a label (size: 18 x 12 mm) which is attached to one side of the sensor and contains the following information:

Label Design	Label Content	Description
	SEN5x	Product name
	SDN-T	Sensirion internal marking
	xxxxxxxxxxxxxxxxxx / S	16-digit decimal serial number

Table 11 Label information.

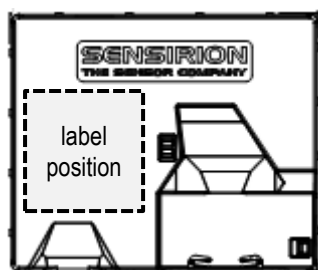


Figure 7: Indication of label position on SEN5x.

8 Revision History

Date	Version	Page(s)	Changes
Oct 2020 - Jun 2021	0.1-0.2	all	Initial release, separate datasheets for SEN54 and SEN55
7. October 2021	0.3	all	First combined datasheet for SEN5x family (SEN50, SEN54, SEN55)

9 Important Notices

9.1 Warning, Personal Injury

Do not use this product as safety or emergency stop devices or in any other application where failure of the product could result in personal injury. Do not use this product for applications other than its intended and authorized use. Before installing, handling, using or servicing this product, please consult the data sheet and application notes. Failure to comply with these instructions could result in death or serious injury.

If the Buyer shall purchase or use SENSIRION products for any unintended or unauthorized application, Buyer shall defend, indemnify and hold harmless SENSIRION and its officers, employees, subsidiaries, affiliates and distributors against all claims, costs, damages and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if SENSIRION shall be allegedly negligent with respect to the design or the manufacture of the product.

9.2 ESD Precautions

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation, take customary and statutory ESD precautions when handling this product.

9.3 Warranty

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