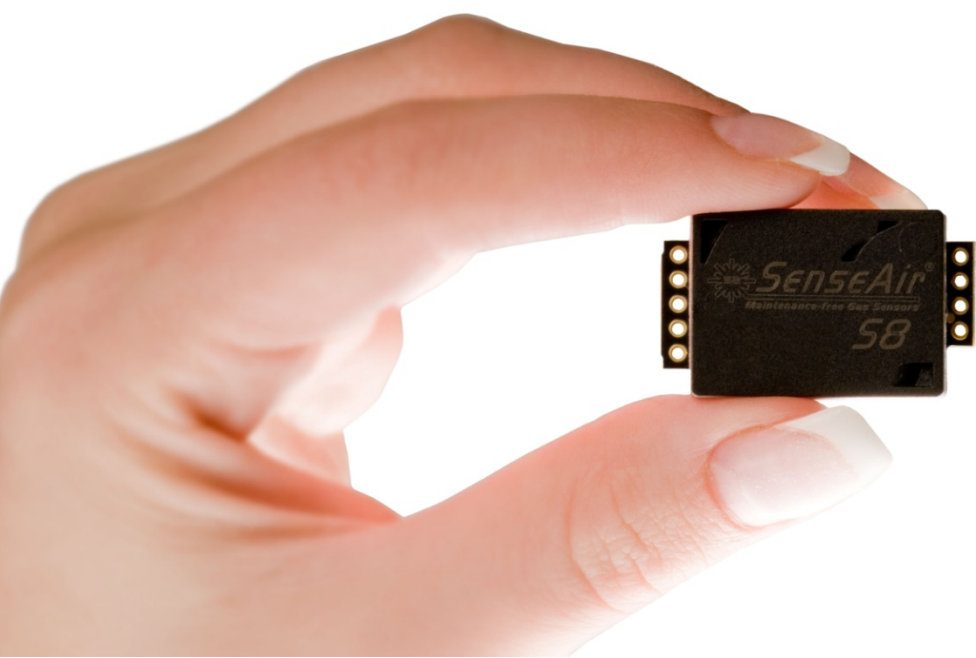


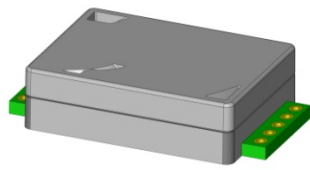
Product Specification

SenseAir[®] S8

Miniature CO₂ sensor safety switch



SenseAir[®] S8 Miniature infrared CO₂ sensor module



**Warning! ESD
sensitive device!**

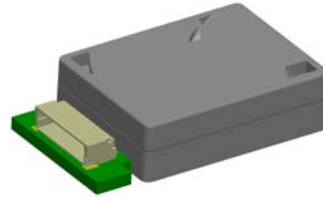


Figure 1a. *SenseAir*[®] S8 Article no. 004-0-0050 Figure 1b. *SenseAir*[®] S8 Article no. 004-0-0051

General

The unit runs at 5V +-5% power input voltages. The power input voltage is measured at two seconds intervals. If the loaded input voltage gets lower than ~3,5 V the system will fail and immediately set the output alarm.

During normal operation, the sensor module measures ambient gas CO₂ concentration and compares the result with a predetermined CO₂ High Level Alarm set point. An internal diagnostic routine sets Fault Alarm in the event that any malfunction is detected. An alarm filter is configured to make the unit resistant to random disturbances and yet matching requested response time.

The module outputs the logic OR alarm if any of the three alarm events “CO₂ High”, “Power Low” or “Sensor Fault” occur (Note 1). The output is an open collector transistor switch, which sinks the output pin to zero volts in normal operation. The presence of the sensor module can therefore be detected by the host system using an external pull-up resistor. In alarm conditions, as well as during start-up, the output enters an open, non-conducting state. The output will stay in alarm mode until the result of the next measurement cycle is analyzed and filtered. The shortest alarm time is 2 seconds.

Note 1: Sensors delivered earlier than setup series have simplified “Sensor Fault” indications including fatal errors only.

Key technical specification

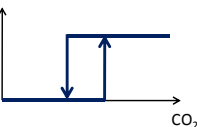
Item	SenseAir [®] S8
Target gas	CO ₂
Operating Principle	Non-dispersive infrared (NDIR)
Measurement range	0.04 to 2% volume CO ₂ (Note 1) Up to 3.2% volume CO ₂ extended range (Note 2)
Accuracy	+0.02% volume CO ₂ +-3% of reading (Notes 3 and 4)
Response time	2 minutes by 90% for diffusion sampling method model
Operating temperature	0 to 50C (Sensor works from -20C but values valid only for 0-50C)
Operating humidity	0 to 85% RH non condensed (Note 5)
Storage temperature	-40° to + 70° C
Dimensions (mm)	Article no: 004-0-0050 32.7 x 19.7 x 9.9 Article no: 004-0-0051 33.3 x 19.7 x 9.9
Weight	< 8 grams
Power supply	5V ±5% unprotected against surges and reverse connection
Power consumption	300 mA peak, 30 mA average, configurable
Sensor life	15 years in normal commercial environments
Serial communication	UART, Modbus protocol Direction control pin for direct connection to RS485 transceiver integrated circuit.
PWM output, 1 kHz	0 to 100% for 0-20 000 ppm; 3.3V push-pull CMOS output, unprotected
Alarm_OC	 <p>8500/6500 ppm, Normally conducting max 100mA. Transistor open at CO₂ High, OR Power Low, OR at Sensor Failure</p>

Table 1. Key technical specification for the SenseAir[®] S8

Note 1: Sensor is designed to measure in the range 0 to 32000 ppm with specified in the table accuracy. Nevertheless exposure to concentrations below 400 ppm may result in incorrect operation of ABC algorithm and shall be avoided for model with ABC on.

Note 2: Sensor provides readings via UART in the extended range but the accuracy is degraded compared to specified in the table one.

Note 3: In normal IAQ applications. Accuracy is defined after minimum 3 weeks of continuous operation. However, some industrial applications do require maintenance. Please, contact SenseAir for further information!

Note 4: Accuracy is specified over operating temperature range. Specification is referenced to certified calibration mixtures. Uncertainty of calibration gas mixtures (+-2% currently) is to be added to the specified accuracy for absolute measurements.

Note 5: Specification provides operating conditions 100% tested in production. Normally sensors shall operate at 0..95%RH and 0..50C temperature range

Absolute maximum ratings

Stress greater than those listed in Table II may cause permanent damage to the device. These ratings are stress ratings only. Operation of the device at any condition outside those indicated in the operational section of these specifications is not implied. Exposure to absolute maximum rating for extended periods may affect device reliability.

Parameter	Minimum	Maximum	Units
Ambient temperature under bias	-40	85	C
Voltage on G+ pin with respect to G0 pin	-0.3	5.5	V
Maximum output current from active output pin	-25	+25	mA
Maximum current on input	-5	+5	uA

Table 2. Absolute maximum ratings specification for the SenseAir® S8

Sample gas diffusion area

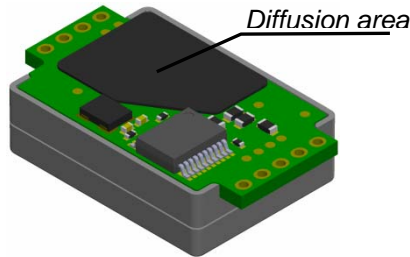


Figure 2. Diffusion area

Pin assignment

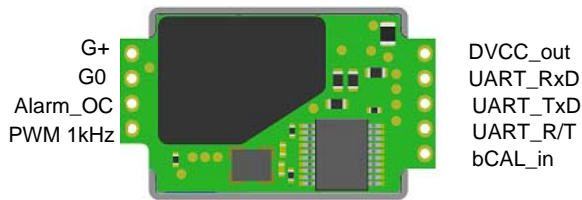


Figure 3a. Attachment to customer's PCB, not in scale. Article No 004-0-0050

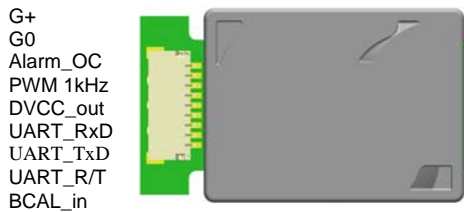


Figure 3b. Attachment to customer's PCB, not in scale. Article No 004-0-0051

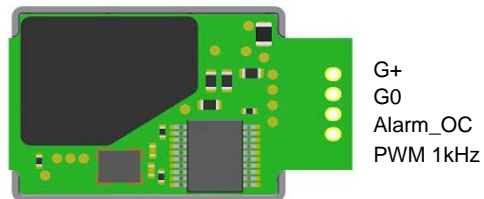


Figure 3c. Attachment to customer's PCB, not in scale. Article No 004-0-0051

Terminals description

The table below specifies terminals and I/O options dedicated in *SenseAir® S8* model.

Pin Function	Pin description / Parameter description	Electrical specification
Power pins		
G0	Power supply minus terminal Sensor's reference (ground) terminal	
G+ referred to G0	Power supply plus terminal Operating voltage range	Unprotected against reverse connection! 5VDC \pm 5%
PWM 1kHz	PWM output Configured as digital output Used for direct reading by customer's microcontroller or to provide analog output. Refer "Use scenario suggestion" for details and ideas	No internal protection, Pulled down at processor reset (power up and power down)
	Duty cycle min	0%, output Low
	Duty cycle max	100%, output High
	PWM resolution	0.5usec \pm 4%
	PWM period	1 msec \pm 4%
	Absolute max voltage range (Note 1)	G0 - 0.3V to DVCC_out + 0.5V
	Internal pull down do G0 resistor	120k
	Output low level (Note 1)	0.75 VDC max at 10mA sink
	Internal pull down do G0 resistor	120k
	Output high level (Note 1)	2.4 VDC at 2mA source
Alarm_OC	Open Collector output for alarm indication Absolute max voltage range(Note 1) Internal pull up to G+ resistor Max sink current (Note 1) Saturation voltage (Note 1)	No internal protection, Pulled up to G+ at processor reset (power up and power down) G0 - 0.3V to 5.5V 120k 100 mA 2.3V to DVCC_out+0.3V

Table 3. I/O notations, description and electrical specification.

Note 1: Specified parameter relies on specification of subcontractor and is not tested by SenseAir

Maintenance

The models based on *SenseAir[®] S8* platform are basically maintenance free in normal environments thanks to the built-in self-correcting **ABC algorithm**. Discuss your application with SenseAir in order to get advice for a proper calibration strategy.

When checking the sensor accuracy, PLEASE NOTE that the sensor accuracy is defined at continuous operation (at least 3 weeks after installation for sensors with long period ABC)!

ABC (Automatic Baseline Correction)

The default sensor OEM unit is maintenance free in normal environments thanks to the built-in self-correcting **ABC algorithm** (*Automatic Baseline Correction*). This algorithm constantly keeps track of the sensor's lowest reading over preconfigured time interval and slowly corrects for any long-term drift detected as compared to the expected fresh air value of 400ppm (or 0.04%_{vol}) CO₂.

ABC parameter	Specification
ABC period	15 days
Max correction	150 ppm (0.015% volume CO ₂) typical

Table 4. ABC default configurations for *SenseAir[®] S8* Article no. 004-0-0050 and Article no. 004-0-0051

Calibration

Rough handling and transportation might result in a reduction of sensor reading accuracy. With time, the ABC function will tune the readings back to the correct numbers. The default “tuning speed” is however limited to about 150 ppm/week. For post calibration convenience, in the event that one cannot wait for the ABC algorithm to cure any calibration offset, switch input is defined for the operator or master system to select one out of two prepared calibration codes. One of internal calibration codes is **bCAL** (*background calibration*), in which case it is assumed that the sensor is operating in a fresh air environment (400 ppm CO₂). Another operation code is **CAL** (*zero calibration*), in which case the sensor must be purged by some gas mixture free from CO₂ (i.e. Nitrogen or Soda Lime CO₂ scrubbed air). Make sure that the sensor environment is steady and calm!

Input	Default function
bCAL_in	(when closed for minimum 4, max 8 seconds) bCAL (background calibration) assuming 400 ppm CO ₂ sensor exposure
CAL_in	(when closed for minimum 16 seconds) CAL (zero calibration) assuming 0 ppm CO ₂ sensor exposure

Table 5. Switch input default configurations for *SenseAir[®] S8*

General mechanical overview

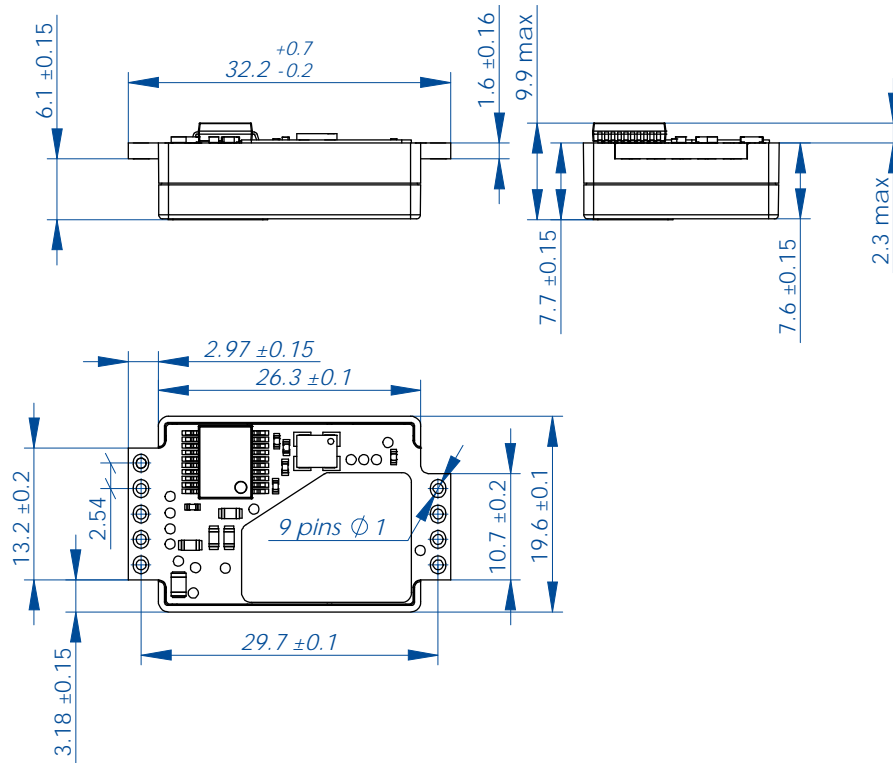
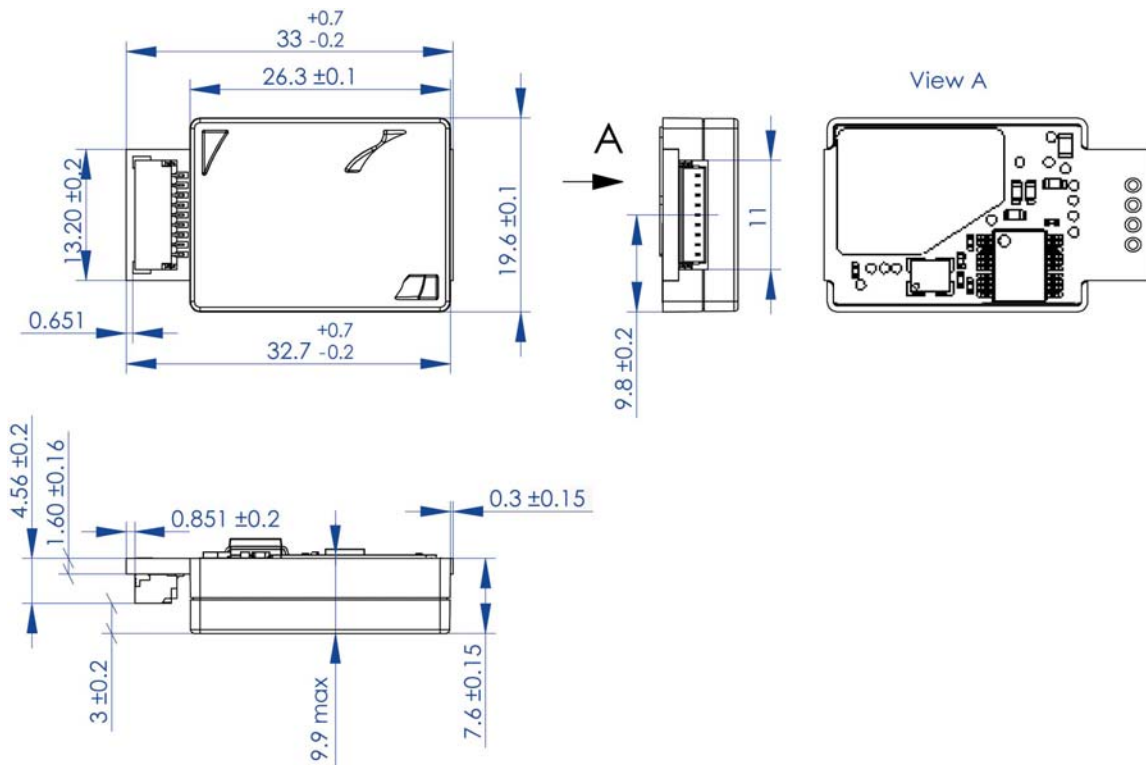


Figure 4a. Mechanical drawing *SenseAir® S8* Article No 004-0-0050



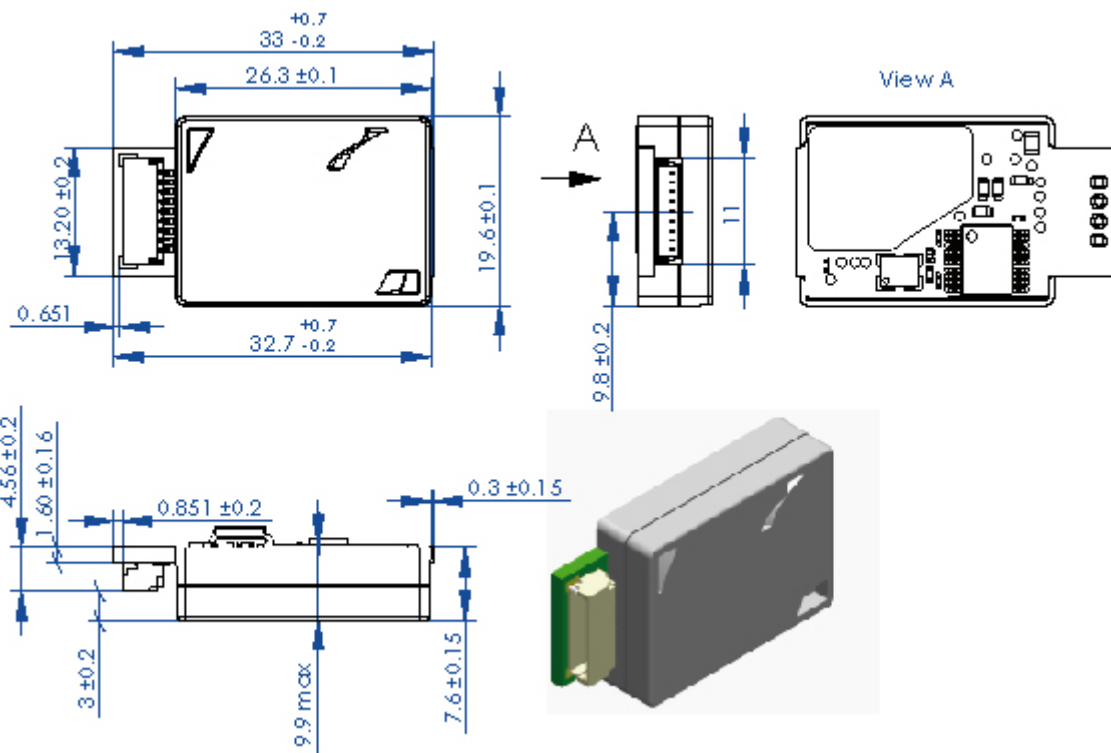


Figure 4b. Mechanical drawing *SenseAir*® S8 Article No 004-0-0051



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