CO_2 and Temperature Sensor

Measures carbon dioxide (CO_2) concentration, temperature, and atmospheric pressure. This device, belonging to the PRO sensor series, includes Aranet Sub-GHz ISM band radio which wirelessly transmits sensor measurements to the Aranet PRO base station.

Product numbers

European Union	TDSPC005
United States	TDSPC0U5
Asia	TDSPC0U5
Japan	TDSPC0J5

Sensor performance

General notes

- 95 % of the sensors perform within the specified accuracy limits at the time of purchase, assuming they are in an equilibrium state. For evaluation of the total measurement error, long-term drift has to be taken into account.
- Measurement time constant τ is determined in accordance with standard VDI/VDE 3522 Part 2. This constant refers to the time it takes for the sensor reading to reach 63 % of a new steady-state value in response to a step change in the environment. It essentially represents the speed at which the sensor adjusts to changes in the measured quantity.

CO_2 concentration

Range	0–9999 ppm
Resolution	1 ppm
Accuracy	±(30 ppm + 3 % of reading)
Long term drift	Not available
Time constant τ	3 min

- CO_2 sensor of the device is calibrated at standard atmospheric pressure. CO_2 readings are pressure compensated and comply with the specifications down to 750 hPa. If the device has to be used at high altitude for a prolonged period of time, manual calibration of the unit should be performed for optimal performance. It is not intended to use

the device higher than 4000 m (13'000 ft) above the sea level.

- CO_2 measurement accuracy is provided for a range 0–5000 ppm, temperature 15–35 °C (59–95 °F) and relative humidity 0–80 %. Accuracy above 5000 ppm is 10 % of reading, but not guaranteed since it is extrapolated form the calibrated range.
- If a drift of the CO_2 measurements occurs, calibration feature of the device should be used. Auto calibration mode is utilizing *automatic baseline calibration* (ABC) algorithm whereas manual calibration mode demands sensor to be exposed to fresh air (see calibration procedure on page 4).

Temperature

Range	0–50 °C	32–122 °F
Resolution	0.1 °C	0.1 °F
Accuracy	±0.3 °C	±0.5 °F
Long term drift	0.03 °C/year	0.05 °F/year
Time constant τ	12 min	

Atmospheric pressure

Range	300–1100 hPa
Resolution	1 hPa
Accuracy	+3 hPa / -2 hPa
Long term drift	1 hPa/year
Time constant τ	0 s (instantaneous)

- Device measures absolute pressure, i.e., readings are not compensated for an elevation above the sea level.

General specifications

Ingress protection rating	IP67	
Operating temperature range	0–50 °C	32–122 °F
Operating relative humidity range	0–85 %	
Dimensions	⌀43×147 mm	⌀1.7×5.8 in
Weight (incl. battery)	93 g	3.3 oz
Enclosure material	ASA plastic	
Power supply	1 pc AA battery	
Packaging includes	1 pc AA alkaline battery, polyester string for hanging the device	

Aranet radio parameters

Line of sight range	3 km	1.9 mi
Transmitter power	14 dBm	25 mW
Data transmission interval	1, 2, 5 or 10 min	
Data protection	XXTEA encryption	

Battery lifetime

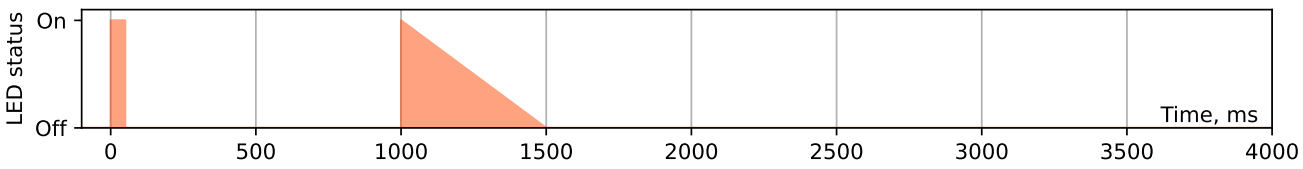
Measurement interval	Alkaline battery lifetime
1 min	1.3 years
2 min	2.5 years
5 min	5.3 years
10 min	8.4 years

- Battery lifetime data has been obtained by mathematical extrapolation and is provided for descriptive purposes only and is not intended to make or imply any guarantee or warranty.
- Battery lifetime tests and calculations performed assuming device is at 20 °C (68 °F) and using *Fujitsu Premium LR6G07* (alkaline) and *Energizer Ultimate Lithium L91* (lithium) AA batteries as reference.
- The operating temperature range may vary based on the battery type used. Generally, the range for alkaline batteries is between -20–50 °C (-4–122 °F), whereas for lithium batteries, it is -40–60 °C (-40–140 °F).

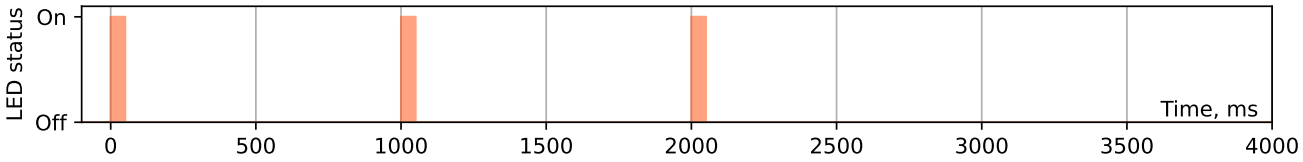
Pairing process description

As part of the Aranet PRO product series, this device enables wireless sensor reading transmission to the Aranet PRO and PRO Plus base station. Here's how to pair the sensor with the base station:

- Place the sensor within 20 m (60 ft) of the base station during pairing. Once paired, it can communicate over a much greater distance (up to 3 km / 1.9 mi line of sight).
- If the sensor uses a power supply unit, unplug it. Open the sensor casing and remove the battery for at least 20 seconds. Alternatively (for newer hardware revisions), locate the `PAIRING` button on the sensor PCB which can be used to initiate pairing without the removal of battery.
- Access the `SENSORS` menu in the base station Web GUI. Set the measurement interval and select `PAIR SENSOR` to start the pairing process.
- Within a 2-minute window, insert the battery or press the `PAIRING` button on the sensor PCB (for newer hardware revisions) to initiate pairing.
- A successful pairing is indicated by the sensor appearing in the Web GUI and a specific LED blink sequence on the sensor PCB (one to three short blinks followed by a longer fade-out blink of the LED):



- If pairing fails, the sensor won't appear in the Web GUI, and the LED blink sequence will consist only of three short blinks. In this case, repeat the procedure closer to the base station.

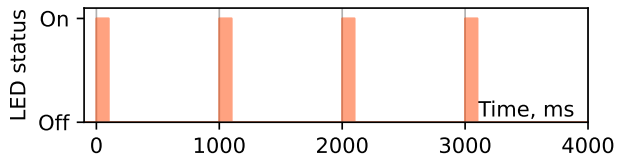


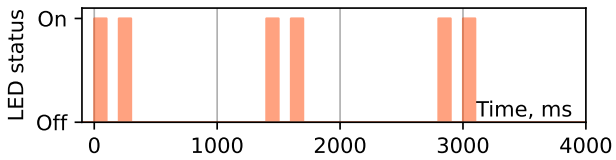
- After successful pairing, customize parameters like name and tags in the Web GUI. Close the sensor casing and install it in the desired location.

CO_2 measurement calibration procedure

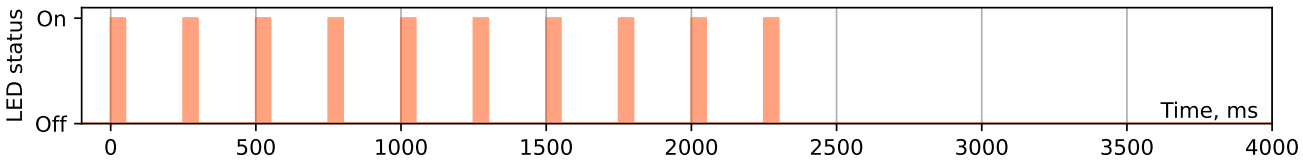
The sensor arrives factory-calibrated and includes an auto-calibration feature. However, should measurement drift occur or any discrepancy between the sensor reading and the actual environment become apparent, manual recalibration in an ambient CO_2 level environment is possible. The steps for manual calibration are outlined below:

- Unscrew the top part of the sensor casing and find the small dipswitch on the circuit board and ensure it is set to the "MAN" position.
- Press and hold the button labeled "CALIBR." for 3 seconds. This activates the calibration mode, indicated by the blinking LED on the PCB. The blinking patterns are shown below (left — older hardware revision with green PCB material, right — newer revision with white PCB).

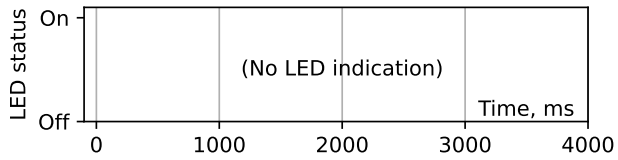


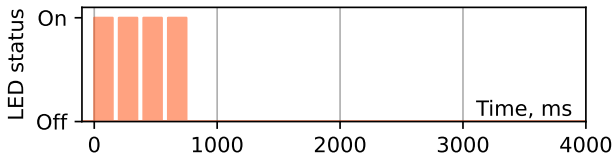


- Allow the sensor to sit for 30 minutes in an environment with ambient CO_2 concentration levels, such as fresh outdoor air, ensuring no one is close enough for breathed-out air to reach the sensor.
- Once the calibration time elapses, the LED will blink rapidly ten times, signaling that the calibration is complete. Screw the sensor casing back on and resume normal use.

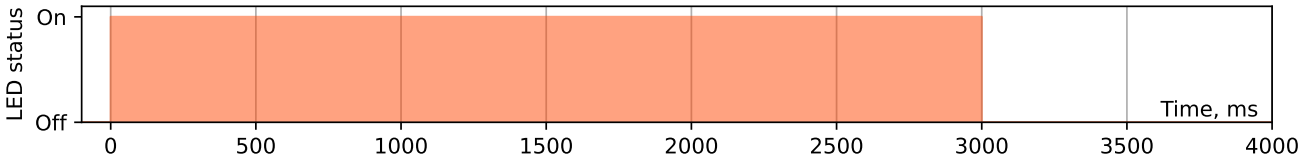


- If needed, you can manually stop the calibration mode before the time is up by pressing the "CALIBR." button for 3 seconds. The LED will blink as shown below, and the sensor will return to normal operation (left — older hardware revision with green PCB material, right — newer revision with white PCB).





- If the sensor detects unusually high fluctuations in CO_2 readings during calibration, the process will fail. This failure is indicated by continuous LED blinking (3 seconds on, 1 second off) and an error message in the Aranet base station. To resolve this, repeat the calibration process in an environment with stable CO_2 levels.



Important notes

- Device is qualified to work properly within ambient clean air. Qualification for use in harsh environment is the duty of the user of the sensor. Exposure to volatile organic compounds, acids or bases, etching substances such as H_2O_2, NH_3, shall be avoided.

Compliance information

CE Conformité Européenne

FC Federal Communications Commission (USA)

IC Innovation, Science and Economic Development Canada