



WLRD40COPM

User Manual

Capetti ELETTRONICA DAL 1973

WineCap™ LoRa®

General warnings.

- The following information must be read and understood before proceeding with the installation, commissioning and maintenance of the devices described in this document.
- ATTENTION! Any omission or failure to follow these instructions scrupulously can cause danger.
- ATTENTION! Explosion hazard. In case of batteries substitution, make sure that the type is compatible and complies with the specifications indicated by the manufacturer.
- In case of batteries substitution, DO NOT disconnect the flat cable which connect the electronic boards without removing batteries before.
- ALWAYS substitute all the batteries, also in case of one single battery exhausted.
- If the device is powered by a fixed network, make sure you have disconnected the power supply before carrying out any type of intervention. Failure to comply with this indication can cause damage to people and/or property.
- Follow the manufacturer's suggested warm-up time (*time required to obtain a reliable measurement*) of the transducer.
- Follow the manufacturer's suggested electric wiring of the transducer to measure (*ground shields at a single point, cable length and section*); voltage measures on distances exceed 15/20 meters are subjected to electromagnetic disturbances. 0÷25mA inputs have a superior electromagnetic compatibility (*EMC*).
- Avoid passage in cavities with power or high voltage cables.
- The protection and safety measures and the warranty provided by the manufacturer with the equipment may be compromised if it's used in a manner that does not comply with this user manual.
- This equipment complies with CE regulations.
- Modifications or tampering not expressly approved by the manufacturer could void the user's authorization to operate the equipment.
- This equipment must be installed by qualified personnel and in accordance with national regulations and/or related local requirements.
- Make sure that the object is properly fixed to supports/infrastructures capable of withstanding this load. Make sure proper methods and materials are used when fixing the equipment to a wall.
- Only personnel expressly authorized by the manufacturer can open the container. There are no user serviceable parts inside.

ATTENTION: for proper configuration and correct operation of the device, it is necessary to use WineCapManager version 5.5.0 (*or later*).

1. Description.

The WLRD40COPM is a wireless datalogger designed for continuous and autonomous monitoring of indoor air quality, with a specific focus on ventilation dynamics and the presence of physical pollutants.

Thanks to WineCap™ technology and LoRa® radio communication, it provides reliable long-range transmissions with extremely low power consumption, making it ideal for long-term installations with minimal maintenance.

The device accurately measures:

- CO_2 [*ppm*] – A direct indicator of ventilation effectiveness and potential overcrowding.
- PM2.5 and PM10 [$\mu g/m^3$] – Fine and inhalable particulate matter, useful for identifying internal and external pollution sources.
- Atmospheric pressure [*mbar*] – A key parameter for interpreting microclimatic variations and correctly calibrating collected data.



Picture 1 - Product Image

These four carefully selected measurement channels provide an objective and reliable overview of indoor air health, supporting timely actions and efficient ventilation strategies.

a. Main technical features:

- NDIR CO_2 sensor, time-stable and maintenance-free, no periodic recalibration required
- MCERTS-certified particulate sensor with automatic self-cleaning, compliant with DIN EN 15267
- Up to 65 000 measurements per channel stored locally in case of radio communication blackout
- Hybrid power supply: internal batteries (*up to 4 years of autonomy*) or external USB-C power adapter, with automatic switchover
- Wall-mount installation with an IP30 enclosure optimized for natural sensor airflow

2. Application scope and optional integration

The WLRD40COPM is designed for technicians, designers, and indoor safety and well-being managers, offering a reliable platform for assessing air quality in school, healthcare, workplace, and residential environments.

The device operates as a complete and standalone solution.

When required by technical specifications or more advanced environmental goals, the system can be modularly expanded by integrating, within the same WineCap™ network, one of the IAQ series dataloggers dedicated to measuring thermo-hygrometric parameters and total volatile organic compounds (*TVOC*).

Complementary model	Additional parameters	Available indexes	Recommended use cases
WLRD00THIAQ	Temperature, Relative Humidity, TVOC	IAQ_Rating (*1–5*)	• Thermal comfort optimization • CAM/GPP compliance checks on VOC
WLRD00IAQ	TVOC	IAQ_Rating (*1–5*), IAQ_RelIndex (*0–500*)	• VOC monitoring in labs, archives, libraries • Integration with BMS or HVAC systems

This scalable and flexible architecture allows for the creation of a customized monitoring network, using the WLRD40COPM as the main node already compliant with many regulatory requirements and expanding it only when needed.

This approach effectively addresses a wide range of application scenarios: from the minimum requirements set by CAM and GPP to the more stringent environmental standards demanded by EPC contracts or corporate sustainability plans.

3. Device pre-set and use mode.

a. Wireless mode:

In this use mode, the datalogger records and transmits each measure sampled to the linked gateway.
Typically, the monitoring system is configured in factory, so, if the device is already associated to the system gateway is in STANDBY mode (*refer to "Picture 4 - Status table – Wireless mode"*).

In this case, it is necessary to start it with the TEST command (*refer to "Picture 3 - Commands table"*).
After this operation, the datalogger reactivates, resumes measure activity, and performs the connection to the gateway or to a *repeater WR12.*
Connection The onboard LED shows the radio signal quality for 2 minutes *refer to* (*"Picture 4 - Status table – Wireless mode"*).
Otherwise, in case the device is in FACTORY RESET mode *refer to* (*"Picture 4 - Status table – Wireless mode"*), that means it's ready for connecting to an existing system, in order to associate it using the ENROL command, refer to the *"WineCap System - User Manual R31.1"* software manual.
It is necessary to use the *WineCapManager* software on the PC connected to the gateway that will be linked with the device.

b. USB logger mode :

For this operation mode, the datalogger works in stand-alone, recording data in its internal memory and without any wireless connection. This is not the factory setup so, to select it, the connection with the PC and the *WineCapManager* running on it is necessary to modify the device 's operation mode.

The device must be set in STAND-ALONE (*refer to "7 - Stand-alone USB datalogger installation."*) mode and the sample time must be configured; automatically, the device 's clock is aligned with the PC's clock, in order to assure the temporal reference of the sample.

Sampling operations start may be selected disconnecting the USB cable or giving the proper command with the magnetic key (*refer to "7 - Stand-alone USB datalogger installation."*).

More details on device 's connection/disconnection through the USB cable are available on the *"WineCap System - User Manual R31.1"* manual.

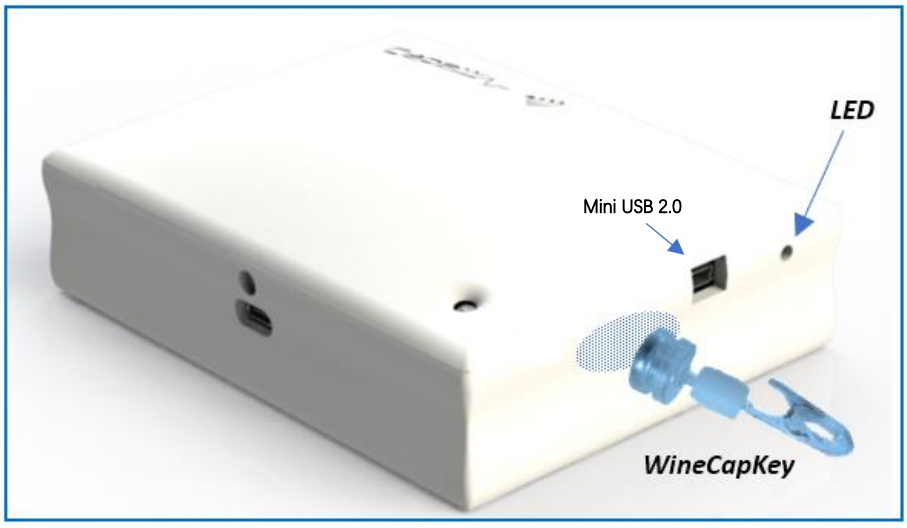
c. On field transition from USB to wireless datalogger:

This transition is practicable in field, during the sampling period, using the wireless network association command.

When the association is done, the datalogger becomes a wireless datalogger and, besides sending new measures to the gateway, starts a download process towards the same gateway of the measures acquired during the STAND-ALONE period (*refer to "Picture 5 - Status table - Stand-alone mode"*).

4. Wireless device user interface.

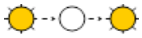
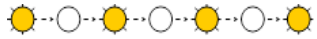
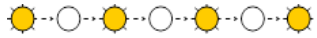
The user interface consists of a "virtual" button that can be activated using the *WineCapKey* and of a two-colours led.
To give a command, user must approach the *WineCapKey* to the device's sensible area and keep it in that position; the following picture (*"Picture 2 - WineCapKey positioning"*) shows device's sensible points.



Picture 2 - WineCapKey positioning

The following COMMANDS table describes the available commands:

COMMANDS TABLE WIRELESS MODE

Flash count	Command	Description
1 flash 	STATUS	Shows the device **STATUS**. As answer the led perform a flash sequence as reported in the **STATUS** table. If the device is performing the **TEST** (*refer to TEST command*) this command stops it.
2 flashes 	TEST	Enter in **TEST** mode and transmits status and measurements every 5 seconds. If the device is in **STANDBY** mode or it is out of radio range, this command forces the connection procedure to the WSN and the return to the operative mode. The **TEST** stops after 120 seconds. During **TEST**, the led continuously shows the **STATUS** to monitor the received radio signal quality. CAUTION: Measures acquired during TEST phase are NOT saved.
3 flashes 	ENROL	Association to the network: must be used when the device has not yet been included in a network, starts the entry and association procedure to the gateway (*refer to "WineCap System - User Manual R31.1"*).
4 flashes  + 4 flashes 	STANDBY	Temporary device deactivation: the device is stopped. The sampling process and the radio are/is. turned off losing the connection to the network. To reactivate, a **TEST** command is necessary. The **STANDBY** command must be given twice to confirm it: at the first sequence the led flashes alternating RED and GREEN lights, waiting for the second confirm sequence within 15 seconds. At the command execution the led flashes as the **STANDBY** status *refer to* (*"Picture 4 - Status table – Wireless mode"*)
5 flashes  + 5 flashes 	FACTORY RESET	The device performs the memory deleting procedure and goes in STOP status. All samples, configuration and wireless network data associated are LOST. To reactivate the device a new association and configuration procedure is necessary (***ENROL** command*). Also in this case, the ***FACTORY RESET*** command must be given twice to confirm it. At the command execution the led flashes as the "PROBE/DATALOGGER NOT ASSOCIATED" status (*refer to "Picture 4 - Status table – Wireless mode"*)
5 flashes  + 3 flashes 	LOGGER NO WSN	As the previous command but performs only the WSN deleting procedure and disassociate from the **gateway**. The device enters in **LOGGER STAND ALONE** mode: data are kept, and the sampling activity **CONTINUES** with previous setup. Command must be given with 2 sequences: 5 flashes and then 3 flashes. At the command execution wait for the device reboot. At the **STATUS** command, "***LOGGER***" will be the answer (*refer to "Picture 5 - Status table - Stand-alone mode"*). A new association (***ENROL** command*) is possible to a new **gateway**.

Picture 3 - Commands table

5. Device enrolment.

Not necessary if performed in factory before delivery.

Enrol the device to the wireless network referring to the *"WineCap System - User Manual R31.1"*. In case the device is already enrolled but in **STANDBY** status, a **TEST** command must be issued (*refer to "Picture 3 - Commands table"*)

6. Installation procedure.

After installing the **gateway** in appropriate place in charge, (*refer to "WineCap System - User Manual R31.1"*), be sure that the device is enrolled to the **gateway** and activated.

Head for the installation point. On the way, to check the quality of the radio coverage, use the "*field measurer*" function.

This function is activated issuing the **TEST** (*refer to "Picture 3 - Commands table"*) command: position the *WineCapKey* in the spot indicated in *"Picture 2 - WineCapKey positioning"* and wait for two ORANGE flashes, then remove the *WineCapKey* from device. The 'Field Measurer' function lasts enabled for two minutes.

To issue commands to the device, place the *WineCapKey* where indicated.

Once the *WineCapKey*, is detected, the **LED** periodically emits ORANGE flashes with a 2 second cadence.

For each flash, a different command is associated; to confirm the command the *WineCapKey* must be removed from the sensible area immediately after the number of flashes corresponding at the desired command. The **TEST** corresponds to the second pulse and activate the 'Field Measurer' function.

The device will give back the radio signal quality through led flashes:

STATUS TABLE WIRELESS MODE

FLASH COUNT – WIRELESS MODE		STATUS/RADIO SIGNAL QUALITY
	5 green flashes	ACTIVE - Radio signal: Excellent
	4 green flashes	ACTIVE - Radio signal: Good
	3 green flashes	ACTIVE - Radio signal: Fair
	2 orange flashes	ACTIVE - Radio signal: Sufficient
	1 red flash	ACTIVE - Radio signal: Insufficient
	1 long red flash (*2 s*)	OUT OF RANGE Network searching
	2 long red flashes (*2 s each*)	STANDBY Radio off - No Logging
	red flash sequence: short – long (*2 s*) – short	FACTORY RESET Device not enrolled – No logging

Picture 4 - Status table – Wireless mode

Optimize reception selecting the best position: small movements can help.
If the signal is absent or insufficient at the install point, a *enhancer WLRE* should be put between (*refer to "WineCap System - User Manual R31.1"*). The *enhancer WLRE* itself must be in a position where the signal level is at least sufficient.

The network will reconfigure itself automatically; the signal will be good again when the device synchronizes with *enhancer WLRE*

The wireless communication will not be reconfigured until completely lost by the device. Because of this, in some cases it could be necessary to force the operation. In such cases, put the device in **STANDBY** mode, then run the **TEST** again (*refer to "WineCap System - User Manual R31.1"*).

NOTE: The display equipped datalogger (*WLR-TST*) is recommended, to verify the signal quality during devices installation.

7. Stand-alone USB datalogger installation.

Install the datalogger in appropriate place.

If the sampling process has not yet been activated, you can start it through the *WineCapKey*.

Bring it closer to the sensitive point, wait for 2 flashes (***TEST***) (*refer to "Picture 3 - Commands table"*) and remove. The datalogger begins sampling according to your settings through your PC.

Through the *WineCapKey* is possible to ask for the status, bring it close to the datalogger for 1 flash (***STATUS***) and remove it.

STATUS TABLE STAND-ALONE MODE

FLASH COUNT –STAND ALONE MODE		STATUS
	1 long green flash (*2 s*)	ACTIVE
	2 long red flashes (*2 s each*)	STANDBY
	red flash sequence: short – long (*2 s*) – short	FACTORY RESET **INVALID datalogger clock!** PC connection required.

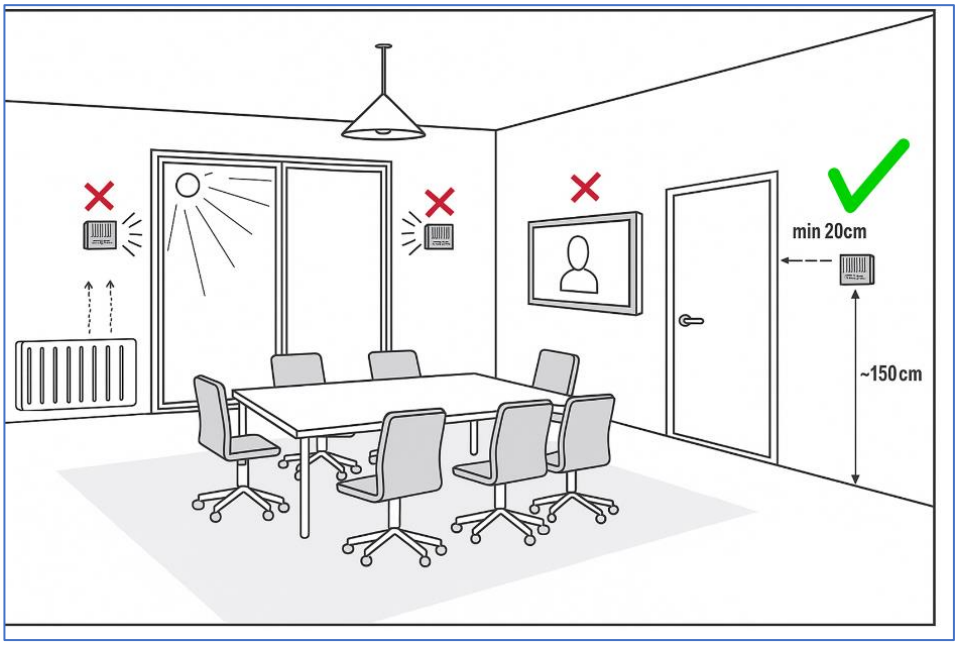
Picture 5 - Status table - Stand-alone mode

8. Shutting off/Reactivating the device.

If the device is shut off and left unused for a long time, you can issue the STANDBY command (*refer to "Picture 3 - Commands table"*) It corresponds to the command number 4 and must be issued twice to confirm the operation.

Position the *WineCapKey* in the spot indicated in (*"Picture 2 - WineCapKey positioning"*), and wait for four ORANGE flashes, then remove the *WineCapKey* from device. Verify that the device asks for confirmation of STANDBY command with alternate RED/GREEN flashing, then position again the *WineCapKey* and wait for four flashes again. The device will confirm the STANDBY status lighting the RED led for 2 seconds twice. To reactivate the device the TEST command must be issued.

9. Datalogger probe positioning.



Picture 6 - Datalogger probe placement

To ensure measurement reliability and the representativeness of the collected data, the datalogger must be installed in accordance with the following technical criteria. Proper installation allows for accurate monitoring of environmental parameters in the actual occupied zone and ensures compliance with indoor comfort design standards.

- Installation height: The device must be positioned at a height between 1.1 m and 1.5 m above the floor, corresponding to the typical breathing zone of occupants, whether seated or standing. In special applications, due to system constraints or architectural limitations, the WLRD40COPM datalogger may be installed up to 1.7 m without compromising measurement accuracy.
- Wall mounting: Install the datalogger on an internal wall, not exposed to thermal fluctuations or direct sunlight. Avoid external walls or surfaces subject to significant temperature changes.
- Device orientation: Mount the datalogger horizontally, with the sensors freely exposed to the environment. Avoid tilted positions and ensure that the front panel and side sensors are unobstructed.
- Free space around the device: Leave at least 20 cm of clearance on all sides of the datalogger. Avoid installations in niches, behind curtains, panels, or furniture that restrict air circulation.
- Distance from interference sources: Do not install the device above or near radiators, convectors, split units, fans, HVAC vents, or openable windows to prevent interference from heat sources or air turbulence. Maintain a minimum distance of 1.5–2 meters from such elements.
- Environments with forced ventilation or air drafts: Avoid installing the device in areas subject to airflows greater than 1 m/s, such as entrances, ventilated corridors, or zones with direct mechanical ventilation. In such cases, choose an intermediate or shielded location relative to the airflow.

⚠ Cleaning note

The datalogger is designed for continuous use in indoor environments and does not require routine maintenance.
To maintain measurement reliability, avoid direct application of liquids or cleaning sprays on sensitive surfaces.
If cleaning the surrounding area, use slightly damp cloths and apply any products indirectly and with care.

10. Guideline values and purpose of environmental monitoring.

The WLRD40COPM is designed for monitoring indoor air quality (*IAQ*), with a specific focus on:

- environmental ventilation
- presence of physical pollutants (*CO_2, PM*)
- microclimatic variations (*atmospheric pressure*)

The measured parameters provide an objective basis for assessing air quality, comfort, and regulatory compliance.

Guideline values

Parameter	Unit	Guideline value	Technical source
CO_2 – Carbon dioxide	ppm	< 1 000 ppm	UNI EN 16798-1:2019; CAM Building
PM2.5 – Fine particulate	µg/m³	Annual avg: ⩽ 5 µg/m³ 24h avg: ⩽ 15 µg/m³	WHO AQG 2021
PM10 – Inhalable particulate	µg/m³	Annual avg: ⩽ 15 µg/m³ 24h avg: ⩽ 45 µg/m³	WHO AQG 2021
Atmospheric pressure	mbar	No indoor legal limits (*used as environmental indicator*)	—

Technical note:

In the absence of binding indoor limits for particulate matter, the reference values suggested by the World Health Organization (*WHO, 2021*) are adopted as a public health safeguard in highly occupied buildings.

Application contexts

Building category	Typical environments	Monitoring objectives
Schools	Classrooms, canteens, labs, staff offices	CO_2 and PM monitoring, ventilation support, Sick Building Syndrome prevention
Universities	Lecture halls, libraries, study areas	HVAC optimization, comfort management, energy efficiency support
Hospitals	Clinics, waiting rooms, wards	Environmental monitoring for patients and staff, Sick Building Syndrome prevention
Nursing homes	Dining areas, common rooms	Microclimate and air quality control for vulnerable residents
Public offices	Open spaces, service counters, meeting rooms	Indoor comfort and air quality monitoring for workers and users

Operational goals:

Assessment of breathable air quality and ventilation performance (*natural or mechanical*)
Detection of critical conditions: stale air, overcrowding, PM accumulation
Support for the drafting of technical documentation for:

- CAM for buildings and schools
- Ministry of Health Guidelines (*2021*) on CO_2 use
- Legislative Decree 81/2008 – Occupational Health and Safety

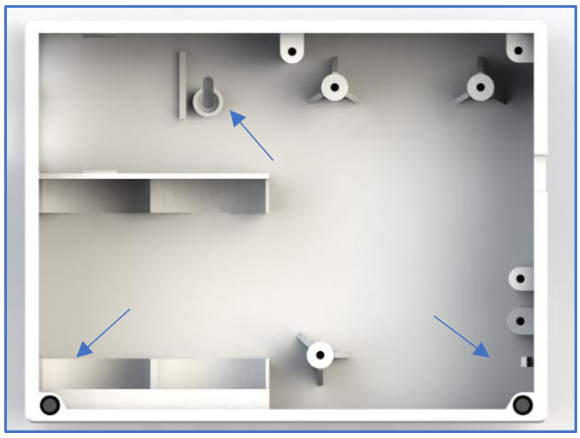
Application in GPP, public tenders, EPC projects, and environmental digitalization

Legend:

- TVOC: Total Volatile Organic Compounds
- IAQ_Rating (*UBA*): Indoor Air Quality Rating (*1–5*)
- SBS: Sick Building Syndrome
- HVAC: Heating, Ventilation and Air Conditioning
- CAM: Minimum Environmental Criteria
- GPP: Green Public Procurement
- EPC: Energy Performance Contract
- ISS: Italian National Institute of Health
- WHO: World Health Organization

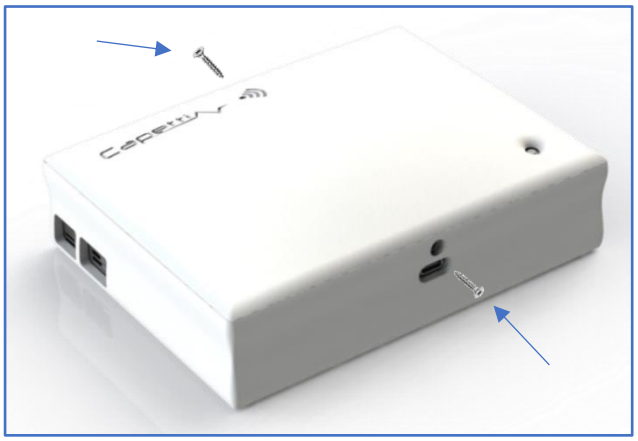
11. Enclosure and mounting.

Install the device in the designated location (*using 4 mm wall plugs*):



Picture 7 - Mounting points

To open the cover, unscrew the 2 phillips head (*PH*) screws:

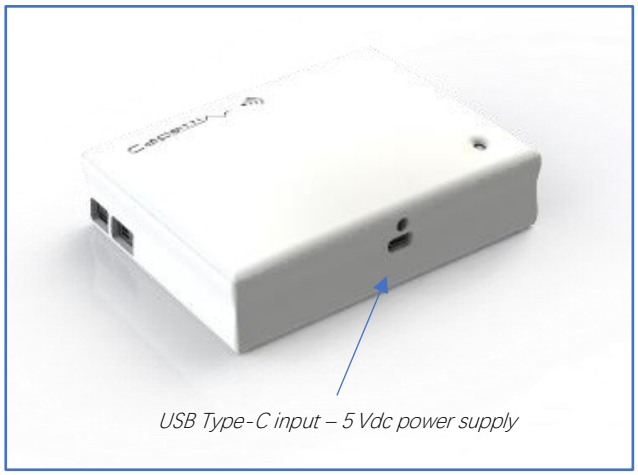


Picture 8 - Positioning of 2 closure screws

12. Auxiliary power supply.

The device can be powered using a standard mobile phone charger with the following specifications:

- Voltage: 5 VDC
- Current: 1 A
- Connector: USB Type-C



Picture 9 - USB connector positioning

13. Mechanical dimensions.



Picture 10 - Mechanical dimensions

14. Technical specifications.

Power supply	2 internal lithium "D" batteries, 19 Ah - 3.6 V (*BAT3*) Optional external power supply via USB Type-C input (*5 Vdc 1 A*)
Battery life (*)	Up to 4 years (*acquisition every 60 minutes and at least sufficient radio signal*)
Measured quantities (*4 channels*)	• CO_2 – Carbon dioxide concentration [*ppm*] • Atmospheric pressure [*mbar*] • PM2.5 – Fine particulate matter [*µg/m³*] • PM10 – Inhalable particulate matter [*µg/m³*]
Sampling interval (*)	Selectable from 1 minute to 24 hours (*default: 60 minutes*)
Datalogger capacity	65 000 measurements (*per channel*)
Operating temperature	• Operation: -10°C to +60°C • Storage: -40°C to +70°C
Radio frequency	ISM 868 MHz
Line-of-sight radio coverage (**)	Up to 15 km (*extendable using WLRE battery-powered enhancers*)
Protection rating	IP30
Dimensions (*W x H x D*)	155 × 120 × 50 mm
Weight	500 g
Enclosure material	ABS
Mounting	3-point mounting
Connections	Wireless, Mini USB 2.0
CO_2 concentration – Measurement principle	Dual-wavelength NDIR sensor with integrated auto-calibration
CO_2 concentration – Measurement range	0–5 000 ppm
CO_2 concentration – Measurement resolution	1 ppm
CO_2 concentration – Measurement accuracy	0–5 000 ppm: < ±(*50 ppm + 3% of reading*)
CO_2 concentration – Compensations	Compensated for temperature and atmospheric pressure
CO_2 concentration – Calibrations	No calibration required. No need for ambient air zeroing periods
Atmospheric pressure – Measurement range	700–1 100 mbar
Atmospheric pressure – Measurement resolution	0.1 mbar
Atmospheric pressure – Accuracy at 25°C	Typical: ±2 mbar (*20–80% RH*)
Atmospheric pressure – Temperature dependence	±0.015 mbar/K
Particulate matter PM2.5 and PM10 – Measurement principle	Laser-based scattering
Particulate matter PM2.5 and PM10 – Measurement range	0–1 000 µg/m³
PM2.5 – Measurement accuracy range 0–100 µg/m³	±5 [*µg/m³ + 5 % of reading*]
PM2.5 – Measurement accuracy range 100–1000 µg/m³	±10 % of reading
PM10 – Measurement accuracy range 0–100 µg/m³	±25 µg/m³
PM10 – Measurement accuracy range 100–1000 µg/m³	±25 % of reading
Particulate matter PM2.5 and PM10 – Measurement resolution	0.1 µg/m³
Particulate matter PM2.5 and PM10 – Certifications	MCERTS

** battery life may be influenced by fieldwork conditions, sampling/measuring interval and system configuration.*
*** radio coverage can be extended using up to 32 enhancer WLRE (maximum 16 for each path) between the device and the gateway.*

15. Disclaimer.

- Specifications are subject to change without notice and should not be interpreted as a commitment on the part of Capetti Elettronica S.r.l.
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- The product is not intended for use in applications where safety is critical, such as life-security systems or medical-related applications.
- If a channel is saturated or disrupted "Frequency hopping" transmitting method allows data integrity and security, but correct functioning of the product in environments with high radio activity is not guaranteed.

16. Reference standards.

EN 61010 -1

For electromagnetic compatibility

EN 61000 - 3 - 2
EN 61000 - 3 - 3
EN 300 220 -2
EN 301 489 - 03
EN 61000 - 6 -1

This symbol indicates that this product is compliant with the European Directive 2011/65/CE that restricts the use of substances in the manufacturing of electronic devices.

RoHs
2011/65/CE

The “WEEE” logo on the label indicates that this product is compliant with the "WEEE" EC Directive. This symbol (*valid only in the European Union countries*) indicates that the product it is applied to, MUST NOT be discarded with ordinary household or industrial waste, but must be sent to an authorized reception point. The end user should contact the device provider, either the manufacturer or the reseller, to agree a collection and disposal process, after having checked the terms and conditions of sale.

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