

# OPTICAL DISSOLVED OXYGEN SENSOR

## W12

### USER GUIDE



[cma-science.nl](http://cma-science.nl)

## Short description

The CMA Wireless Dissolved Oxygen Sensor W12 measures oxygen levels in liquids from 0 to 50 mg/L using optical technology based on luminescence quenching. It provides fast, reliable, and oxygen-consumption-free measurements, distinguishing it from traditional electrochemical sensors.

The power button on the top of the sensor allows you to turn the sensor on/off. The sensor is equipped with an OLED color display which shows some sensor information and the measured by the sensor values. This makes the sensor suitable to use as an independent measuring instrument.

The sensor can be used wirelessly via Bluetooth or wired via USB with the Coach 7 or Coach 7 lite programs/apps on computers (Windows and Mac), Chromebooks and mobile devices (Android and iOS).

## How the sensor works

The optical dissolved oxygen sensor measures oxygen by using the principle of luminescence quenching. At the sensor tip, a special luminescent dye is excited by light from an LED, causing it to emit light (photons).

When oxygen molecules are present, they interact with the excited dye through a process called oxygen quenching. This means oxygen takes away some of the dye's energy without emitting light itself (a non-radiative energy transfer). As a result, the dye's glow becomes weaker and fades faster - the intensity and the time the light is emitted (called the fluorescence lifetime) both decrease. The sensor precisely measures these changes in the light's brightness and decay time to calculate the amount of dissolved oxygen in the water.

Because this optical method does not consume oxygen during measurement, it provides fast, stable, and accurate readings with very little maintenance, unlike traditional electrochemical probes.

## Calibration

The Dissolved Oxygen sensor is supplied calibrated with a factory calibration in mg/L. When working with the Coach program the pre-defined calibration can be shifted by using the **Set to Value** option.

## Software

You can use the Dissolved Oxygen sensor W12 with Coach 7 or Coach 7 Lite (free) program on computers (Windows and Mac) or Coach 7 and Coach 7 Lite (free) app on mobile devices (Android and iOS). For Chromebooks, we offer a special Android app. The support for wireless sensors is added starting from Coach version 7.12.



Check the CMA website for the latest installations.

[https://cma-science.nl/downloads\\_en](https://cma-science.nl/downloads_en)

## Collecting data without software connection

- Turn the Dissolved Oxygen sensor on by pressing its power button.
- The sensor briefly displays its Bluetooth identification code. This code is also printed on the sticker located on the bottom side of the sensor box.
- Then the display shows:
  - the Bluetooth mode, 'Mobile' or 'PC'.  
Mobile indicates Bluetooth Low Energy mode which should be used when working with mobile devices (Android, iOS), Chromebook and Apple computers.  
PC indicates Bluetooth Classic which should be used for Windows computers.
  - the battery level, and
  - the current measured value.
- Now you can use the sensor as an independent measuring instrument.
- To turn off the sensor press and hold its power button for 3 sec. To save its battery the sensor automatically turns off after a few minutes of inactivity (no connection to power, no communication).

## Collecting data via the Bluetooth connection

### *Mobile devices, Chromebooks, and Apple computers*

For mobile devices (Android, iOS), Chromebooks and Apple computers Bluetooth Low Energy technology is used for wireless communication. For these devices **do not pair** the sensor just use it directly in the Coach software.

- Turn the Dissolved Oxygen sensor on.
- Ensure your sensor is set to Mobile mode.  
If the display shows in the top-left corner 'PC' first you must set the sensor to the Mobile mode. Turn off the sensor. Then press and hold the power button until the text 'Bluetooth mode Change Mobile' is shown, then release the button. The mode is set to 'Mobile', meaning Bluetooth Low Energy is used.
- Start the Coach 7 or Coach 7 Lite program/app.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.
- Coach starts searching for sensors which are turned on and in the Mobile discovery mode. The found Bluetooth sensors appear in the list.
- Select Dissolved Oxygen sensor you want to connect to. If needed check the sensor's Bluetooth ID which is located on the sensor's bottom label.
- When the connection is established the Bluetooth symbol appears in the top-left corner of the sensor's display and the sensor icon appears showing the measured concentration values.
- Now you are ready to use the Dissolved Oxygen sensor for your measurement.

## **Windows computers**

For Windows computers, Bluetooth Classic technology is used for wireless communication. Before you start to use the sensor for measurement in Coach **you have to pair it**.

- Turn the Dissolved Oxygen sensor on.
- Ensure your sensor is set to PC mode.  
If the display shows in the top-left corner 'Mobile' first you must set the sensor to the PC mode. Turn off the sensor. Then press and hold the power button until the text 'Bluetooth mode Change PC' is shown, then release the button. The mode is set to 'PC', meaning Bluetooth Classic is used.
- Pair your sensor.
  - Go to the Windows Settings **Bluetooth and other devices** and select **Add Bluetooth or other devices**. Select **Bluetooth device**.
  - Windows looks for Bluetooth devices and after a while lists discovered devices. The wireless sensors are listed with their Bluetooth IDs.
  - Select the sensor you want to connect to. If needed check the sensor's Bluetooth ID which is located on the bottom label of your sensors.
  - When the connection is successfully established Windows indicates that the sensor is paired and ready to go.
  - Click **Done** to accept it. The sensor appears in the list of paired Bluetooth devices.
- Start the Coach 7 or Coach 7 Lite program.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.
- Coach starts searching and displays the list with detected sensors, even if they are not paired.
- Select Dissolved Oxygen sensor you want to connect to. If needed check the sensor's Bluetooth ID which is located on the sensor's bottom label. If the sensor was not paired yet Coach will force you to pair the sensor first via Windows Settings.
- When the connection is established the Bluetooth symbol appears in the top-left corner of the sensor's display and the sensor icon appears showing the measured voltage values.
- Now you are ready to use the Dissolved Oxygen sensor for your measurement.

## **Collecting data via the USB connection**

For computers (Windows and Mac) the Dissolved Oxygen can also be used as a USB sensor. When using this connection, the sensor can measure with a higher sampling frequency of up to 1000 Hz.

- Turn the Dissolved Oxygen sensor on.
- Use the provided USB cable to connect the sensor to a USB port.
- Start the Coach 7 or Coach 7 Lite program.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.

- The connected USB sensor should be detected automatically, and its icon appears on the first empty sensor position in the Wireless sensors panel.
- When the connection is established the USB symbol appears in the top-left corner of the sensor's display and the sensor icon shows measured data.
- Now you are ready to use the Dissolved Oxygen sensor for your measurement.

### Working with the Dissolved Oxygen Sensor

- Remove the storage cap (long plastic cap with moist sponge) and rinse the sensor tip briefly with fresh water to remove any storage solution residues.
- Submerge the sensor tip in the sample so that the cap is fully covered (avoid air bubbles around the cap).
- Allow the sensor to equilibrate before recording readings, especially if the temperature of the sample differs from storage conditions.
- Avoid touching or wiping the coated surface of the cap. If cleaning is needed during measurements, gently rinse in clean water.
- After use
  - Rinse the sensor cap thoroughly with fresh water.
  - Lightly shake off excess water; do not dry-wipe the cap.
  - Reinstall the storage cap with a moist sponge to keep the sensor tip hydrated until the next use.

### Storage and maintenance

Proper care and storage of the Dissolved Oxygen sensor are essential to maintain accurate measurements and extend the sensor's lifespan.

1. Probe Maintenance: This includes cleaning the sensor cap, and properly conditioning, preparing, and storing the probe and test system.
2. Storage: When not in use, store the probe with the sensor cap installed and the original calibration/storage bottle threaded onto the probe. If the bottle is unavailable, a beaker of clean water or a moist capping mechanism is sufficient. Keep the sponge inside the bottle moist for best results.
3. Handling: Avoid exposing the sensor cap to organic solvents, scratches, or mechanical shocks. Clean the cap coating by dipping the probe and cap in fresh water and gently tapping dry with a tissue; do not wipe the coating surface.
4. Cap Replacement: Replace the sensor cap if the coating is faded or stripped. **DO NOT touch the clear window on the probe tip after unscrewing the old cap.** If contaminants are present on the window or inside the cap, carefully remove them with a powder-free wipe before attaching the new cap.

### Charging a battery

An internal rechargeable battery (Li-Poly 3.7 V, 700 mAh) powers the sensor. The battery symbol located in the top-right corner of the sensor's display shows the battery level. When the battery level becomes critical, the battery gauge shows an

empty battery. Use the provided cable to connect the sensor to a USB port for charging. A fully discharged battery requires up to 2 hours of charge time to become fully charged again. To prolong battery life, automatic power down turns the sensor off after 5 minutes of inactivity.

To replace the battery, use **only** the approved rechargeable batteries provided by CMA.

### **Suggested experiments**

Dissolved oxygen levels are used as a general indicator of water quality. Oxygen is essential to life and vital for countless aquatic forms. The sensor can be used to perform a variety of experiments:

- Monitoring dissolved oxygen in an aquarium containing different combinations of plant and animal species.
- Measuring changes in dissolved oxygen concentration resulting from photosynthesis and respiration in aquatic plants.
- Measuring dissolved oxygen concentration in a stream or lake survey, in order to evaluate the capability of the water to support different types of plant and animal life.
- Measure Biological Oxygen Demand (B.O.D.) in water samples containing organic matter that consumes oxygen as it decays.
- Determine the relationship between the dissolved oxygen concentration and the temperature of a water sample.

## Technical Specifications

<i>Sensor kind</i>	Digital, on-sensor digital conversion,
<i>Measuring range</i>	0 .. 50 mg/L
<i>Resolution</i>	0.01 mg/L
<i>Accuracy</i>	0 - 10 mg/L < $\pm 1\%$ 10 - 20 mg/L < $\pm 2\%$
<i>Operating temperature</i>	0 to 50°C
<i>Storage temperature</i>	0 to 50°C
<i>Response time</i>	T90 ~ 35 s, which means when the oxygen concentration changes suddenly, the sensor reaches 90% of the new value within about 35 seconds
<i>Maximal sampling rate</i>	1 Hz
<i>Display</i>	OLED 0.96" (128*64 px)
<i>Expected Sensor Cap Life</i>	A useful life of up to 2 years is feasible in optimum situations
<i>Battery</i>	Li-Poly Rechargeable Battery (3,7 V 700 mAh)
<i>Battery life after full charge</i>	Approximately 6 hours Battery life varies by use, configuration, temperature, and many other factors; actual results will vary.
<i>Connection</i>	Bluetooth 5, Low Energy (Mac, Android, iOS) Bluetooth 2.1, Classic (Windows) USB 2.0 (type C)
<i>Bluetooth ID</i>	W12DISO-xxx

## Warranty

The Charge sensor W18 is warranted to be free from defects in materials and workmanship for a period of 3 years from the date of purchase provided that it has been used under normal laboratory conditions. This warranty does not apply if the sensor has been damaged by accident or misuse.

The sensor battery is consumable and is warranted to be free from defects in materials and workmanship for a period of 12 months from the date of purchase.

Discard batteries according to local regulations.



**Note:** *This product is to be used for educational purposes only.  
It is not appropriate for industrial, medical, research, or commercial applications.*

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