ORP SENSOR W40

USER GUIDE

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Short description

CMA Wireless ORP sensor W30 measures the ability of a solution to act as an oxidizing or reducing agent. ORP stands for oxidation-reduction potential also known as Redox Potential.
The ORP sensor consists of an amplifier and an ORP electrode attached to the amplifier through a BNC connector. The electrode is housed in a long plastic tube with an opening at the bottom and is supplied with a storage bottle containing a protective solution. When not in use, the electrode must be stored in this bottle. During measurements, the electrode should be immersed in the test solution to a depth of about 1 cm.

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 ORP electrode itself contains two parts: a measuring half-cell and a reference half-cell. The measuring half-cell is a platinum electrode immersed in the test solution, where redox reactions occur. The reference half-cell is a sealed, gel-filled Ag/AgCl electrode surrounded by a salt solution. The platinum electrode acts as an electron donor or acceptor depending on the properties of the test solution, while the reference electrode provides a constant, stable potential for comparison.
The ORP electrode measures the redox potential—the voltage difference between the platinum measuring electrode and the reference electrode. Readings toward the positive end of this range indicate a strong oxidizing agent, whereas readings toward the negative end indicate a strong reducing agent.

Calibration

The ORP sensor is supplied calibrated with a factory calibration in mV. 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 ORP sensor W30 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.

https://cma-science.nl/downloads_en

The support for wireless sensors is added starting from Coach version 7.12. Check the CMA website for the latest installations.

Collecting data without software connection

- Turn the ORP 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 ORP 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 the ORP 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 values.
- Now you are ready to use the ORP 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 ORP 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 the ORP 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 values.
- Now you are ready to use the ORP sensor for your measurement.

Collecting data via the USB connection

For computers (Windows and Mac) the ORP sensor 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 ORP 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 ORP sensor for your measurement.

Storage and maintenance

- When the ORP electrode is not in use, rinse it with distilled water, remove excess water, and place it in the supplied 3.3 M KCl storage solution.
- For short-term storage (up to several hours), the electrode may be kept in a standard pH 4.0 or pH 7.0 buffer solution.
- For long-term storage, however, it must be kept in the supplied pH 4.0 / 3.3 M KCl solution.
- If the electrode has dried out due to improper storage, immerse it in buffer solution for at least two hours before use.
- If the measured ORP value in the 3.3 M KCl storage solution changes significantly or responds slowly, the electrode should be discarded and replaced with a new one.

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

Redox reactions control the behavior of many chemical constituents in drinking water, wastewater, and aquatic environments. The reactivity and solubility of critical elements in living systems are strongly dependent on redox conditions. ORP values are used much like pH values to determine water quality. For example, for swimming pools at a normal pH value between 7.2 and 7.6, the ORP value must be kept above 700 mV to kill unwanted organisms. In contrast, in order to support life, natural waters need a much lower ORP value. Generally, ORP values above 400 mV are harmful to aquatic life.

The ORP sensor can also be used for redox titrations to determine the equivalence point in an oxidation-reduction reaction.

Technical Specifications

Sensor kind	Digital, on-sensor digital conversion
Measuring range	-450 mV .. 1100 mV
Resolution	0.1 mV
Type ORP electrode	Sealed, gel-filled, epoxy body, Ag/AgCl reference
Storage solution	pH-4/KCl solution (10 g KCl in 100 mL buffer pH-4 solution)
Temperature range	0 - 60°C
Impedance	~20 kΩ at 25°C
ORP element	99% pure platinum band sealed on a glass stem
Maximal sampling rate	2 Hz
Display	OLED 0.96" (128*64 px)
Battery	Li-Poly Rechargeable Battery (3,7 V 700 mAh)
Battery life after full charge	Approximately 8 hours Battery life varies by use, configuration, temperature, and many other factors; actual results will vary.
Connection	Bluetooth 5, Low Energy (Mac, Android, iOS) Bluetooth 2.1, Classic (Windows) USB 2.0 (type C)
Bluetooth ID	W40ORP-xxx

Warranty

The ORP sensor W30 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 intended for industrial, medical, research, or commercial applications.

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