SALINITY SENSOR W48

USER GUIDE

cma-science.nl

Short description

CMA Wireless Salinity sensor W48 measures the salinity of a solution in the range from 0 to 50 ppt. The Salinity sensor consists of a Salinity electrode and an amplifier. Salinity is the measure of all the salts dissolved in water. Salinity is often expressed as parts per thousand (ppt), which is approximately equal to grams of salt per liter of solution. The average ocean salinity is 35 ppt[1] and the average river water salinity is 0.5 ppt or less.

The power button located on the top of the sensor allows you to turn it on and off. The sensor is equipped with an OLED color display which shows sensor information and the measured 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 sensor determines salinity based on electrical conductivity. The salinity probe measures how much electrical current flows through the water. Water that has dissolved salt in it will conduct electricity better than water with no dissolved salt. The more salt that is dissolved in the water, the better the water will conduct electricity. Salinity is then calculated from the measured conductivity value. The sensor has a built-in compensation for changes in conductivity due to temperature.

Automatic Temperature Compensation

The Salinity sensor is automatically temperature compensated between temperatures of 5 and 35°C. It measures the solution's temperature using a thermistor located between the graphite electrodes. Readings are automatically referenced to a conductivity value at 25°C – therefore the sensor will give the same conductivity in a solution that is at 15°C as it would if the same solution were warmed to 25°C. This means that one calibration can be used for measurements in water samples of different temperatures.

Calibration

The Salinity sensor is supplied with a factory calibration in ppt. The Coach 7 program allows shifting the pre-defined calibration if needed.

Conducting measurements with the sensor

Follow these steps when collecting data with the Salinity sensor:

- Soak the tip of the Salinity electrode in distilled water for about 10 minutes. If this is not possible, rinse the tip thoroughly with distilled water.

[1] 35 grams of salt per 1 liter ocean water

- Wipe the outer part of the electrode body with a clean paper towel. Shake vigorously to remove any droplets from the cell chamber.
- Place the Salinity electrode in the sample to be tested. The sample must be at least 3 cm deep to ensure the cell chamber is fully submerged.
- Stir the solution gently, wait for 10 seconds to allow the readings to stabilize.
- If you are taking readings in a solution that has a temperature below 10°C or above 35°C, allow more time for the readings to stabilize.
- Clean thoroughly after the measurement is completed to avoid any contamination for the electrode's next use. The probe can then be stored dry.

WARNING:

- ***Do not*** place the salinity electrode in viscous, organic liquids, such as heavy oils, glycerin (glycerol) or ethylene glycol. Do not place the probe in acetone or non-polar solvents, such as pentane or hexane.

Using the Salinity sensor with other sensors

It is very important to know that the Salinity sensor will interact with some other sensors, if they are placed in the same solution and they are connected via the USB to the same computer. This situation arises because the salinity sensor outputs a signal in the solution, and this signal can affect the reading of another sensor. The following sensors cannot be connected to the same interface and placed in the same solutions:

- Conductivity,
- Dissolved oxygen sensor,
- pH sensor.

In such situation more sensors can be connected at the same time to the interface but only one at a time can be placed inside the solution to take readings.

This restriction is not valid when the sensors are used wirelessly.

Software

You can use the Salinity sensor W48 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 this wireless sensor is added starting from Coach version 7.12.

Check the CMA website for the latest installations. https://cma-science.nl/downloads_en

Collecting data without software connection

- Turn the Salinity sensor on by pressing its power button.
- The sensor briefly displays its Bluetooth identification code. This ID 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 the sensor off 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 sensor on by pressing its power button.
- 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' which means that Bluetooth Low Energy is used.
- Start the Coach 7 or Coach 7 Lite program/app.
- Select the Dashboard Activity 'Measurement with Wireless sensors'.
- On opening of the Activity 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 Salinity 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 icon of the sensor appears showing the measured values.
- Now you are ready to use the Salinity 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 Salinity 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' which means that 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 Conductivity 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 icon of the sensor appears showing the measured conductivity values.
- Now you are ready to use the Salinity sensor for your measurement.

Collecting data via the USB connection

For computers (Windows and Mac) the Conductivity sensor can also be used as USB sensor.

- Turn the Salinity 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 icon shows measured data.
- Now you are ready to use the Salinity sensor for your measurement.

Storage and maintenance

When you have finished using the Salinity Probe, simply rinse it off with distilled water and gently blot it dry using a paper towel or lab wipe. Store the probe dry.

If the probe's cell surface becomes contaminated, soak it in water with a mild detergent for 15 minutes. Then soak it in a dilute acid solution (0.1 M hydrochloric acid or 0.5 M acetic acid works well) for another 15 minutes. Finally, rinse it thoroughly with distilled water. Important: Avoid scratching the inside electrode surfaces of the elongated cell.

CAUTION: The electrode surface is treated with graphite. Do not touch or contaminate this area.

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

The Salinity sensor can be used in the following experiments:

- Measure how temperature changes affect salinity readings of a fixed solution.
- Mix freshwater and seawater in different ratios and measure the resulting salinity.
- Observe salinity increase as water evaporates from a saline solution.
- Compare salinity of local water sources like tap water, river, and seawater.
- Gradually dissolve salt in distilled water and record salinity changes.
- Monitor the rate of reaction in a chemical reaction in which dissolved salt-ions and solution conductivity varies with time due to an ionic specie being consumed or produced.

Technical Specifications

Sensor kind	Digital (on-sensor digital conversion)
Measuring range	0 .. 50 ppt
Resolution	0.01 ppt
Accuracy	Typical ± 2 %
Temperature range	0°C to 80°C
Temperature compensation	Automatic between 5°C and 35°C
Cell constant	10 cm^{-1}
Maximal sampling rate	5 Hz
Battery life after full charge	Approximately 6 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	W30SALI-xxx

Warranty

The Salinity sensor W48 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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