THERMOCOUPLE SENSOR W58

USER GUIDE

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Short description

The CMA Wireless Thermocouple Sensor W58 is designed to measure high and low temperatures in a wide range from -200 to +1200 °C. It uses a Type K thermocouple, making it suitable for experiments such as flame temperature measurements and ignition point detection.

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 uses a K-type thermocouple, consisting of Chromega™ (Nickel-Chromium) and Alomega™ (Nickel-Aluminium) wires joined at one end to form the measuring (hot) junction. The other ends form the cold junction. The thermocouple generates a voltage proportional to the temperature difference between the hot and cold junctions, so the cold junction temperature must be known for accurate measurements. An on-board temperature sensor measures the cold junction, and its signal is combined with the thermocouple voltage to provide automatic cold-junction compensation, ensuring precise temperature readings even when the sensor's surroundings change.

Calibration

The Thermocouple sensor W58 is factory-calibrated in °C. 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 Thermocouple sensor W58 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 Thermocouple 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 Thermocouple 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 Thermocouple 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 Thermocouple 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 Thermocouple 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 values.
- Now you are ready to use the Thermocouple sensor for your measurement.

Collecting data via the USB connection

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

- Turn the Thermocouple 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 Thermocouple sensor for your measurement.

Practical information

- Do not expose the thermocouple to open flames, explosive gases, or highly contaminated environments.
- Use caution at temperatures above 480 °C, as insulation may degrade.
- Avoid using the sensor beyond its rated temperature limits.

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 Thermocouple can be used for temperature measurements.

1. Low temperature experiments (< 0 °C)
   - Compare freezing points of pure water and saltwater solutions.
   - Record the temperature profile of water, ethanol, or oil as they are cooled below 0 °C.
2. Moderate temperature measurements (0 to 150 °C)
   - Measuring freezing and boiling points
   - Specific heat experiments
   - Measurement of breath
3. High temperature measurements (> 150 °C)
   - Measure temperature at different regions in a Bunsen burner or candle flame (inner cone, outer cone, tip)
   - Measure ignition temperature of materials paper, wood shavings or cooking oil.
   - Heat one end of a metal rod with a flame and record the temperature gradient along the rod.
   - Experimentally determine the melting point of copper, bismuth, or other solids

Safety Reminder:

High-temperature experiments involve hot materials and open flames. Ensure students are supervised, use proper protective equipment, and follow safety protocols.

Technical Specifications

Sensor kind	Digital (on-sensor digital conversion)
Measuring range	-200 to 1200 °C
Resolution	0.6 °C
Operating Environment	-20 to 60 °C, < 85% RH
Limitations	Can be damaged when used in the presence of sulphur or under reducing conditions.
Insulation	Glass braid insulation
Chromega™/Alomega™ wire	Length = 65 cm
Maximal sampling rate	4 Hz
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	W59THCO-xxx

Warranty

The Thermocouple sensor W58 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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