HUMIDITY SENSOR W30

USER GUIDE

cma-science.nl

Short description

CMA Wireless Humidity sensor W30 can be used to measure the relative humidity in a range between 0 and 100% and air temperature. From these measurements, it calculates dew point. The sensor, housed inside a perforated aluminum probe, uses a polymer-based capacitive element combined with a silicon temperature sensor to measure humidity and temperature together. Air flows through the probe, allowing the sensor to respond, typically within about 15 seconds in slow-moving air at 25°C.

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

This sensor operates on the principle of a polymer-based capacitive humidity sensor. It has capacitor electrodes with a polymer layer in between that changes its electrical properties when it absorbs moisture. Changes in humidity cause the capacitance to vary, and the sensor converts this into a digital measurement of the humidity level. A built-in temperature sensor measures ambient temperature and allows the sensor to compensate for temperature effects, ensuring accurate humidity readings.

Display of temperature and dew point

When you press the power button while the sensor is on, the display shows the measured values of humidity and temperature, as well as the calculated dew point. The dew point is the temperature at which air becomes fully saturated with water vapor. Cooling below this temperature causes condensation, forming dew on surfaces. The dew point is calculated using the following equations:

$$T_d = \frac{b\gamma}{a-\gamma} \text{ where } \gamma = \ln\left(\frac{RH}{100}\right) + \frac{a*T}{b+T}$$

T_d: Dew point temperature in °C
T: Air temperature in °C
RH: Relative humidity in %
a = 17.62
b = 243.12

This approximation is widely used in meteorology and is accurate for typical temperatures between 0°C and 60°C and relative humidity from 5% to 100%.

In the Coach software, by default only humidity and temperature values are displayed**.**

Calibration

The Humidity sensor is supplied with a factory calibration for humidity in % RH, and for temperature in °C. The Coach 7 program allows shifting the pre-defined calibration if needed.

Software

You can use the Humidity sensor W04 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 Humidity 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 Humidity 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 Humidity 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 Humidity 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 Humidity 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 Humidity sensor for your measurement.

Collecting data via the USB connection

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

- Turn the Humidity 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 Humidity sensor for your measurement.

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 Humidity sensor can be used in a variety of experiment such as:
- Measure indoor humidity and temperature over a day to observe daily fluctuations.
- Compare humidity levels in different rooms of a school to see microclimate differences.
- Track outdoor humidity and temperature changes and correlate with local weather reports.
- Measure how quickly a sealed container reaches equilibrium humidity after adding water.
- Study the effect of a fan or ventilation on humidity and temperature in a closed space.
- Observe dew formation by cooling a surface and measuring the dew point.

- Compare humidity readings in warm vs. cold environments to see how temperature affects relative humidity.
- Monitor humidity and temperature in a greenhouse or terrarium over time.

Technical Specifications

Sensor kind	Digital (on-sensor digital conversion) 14-bit resolution
Measuring range	Humidity: 0 .. 100 % RH Temperature: - 40 .. 125 °C
Resolution	Humidity: 0.01 % RH (sensor display 0.1 % RH) Temperature: 0.01 °C (sensor display 1°C)
Accuracy	± 2% RH (@0 ~ 80 % RH) ± 0.25 °C (@-40 ~ 60°C)
Optimal Condition	- 20 .. 30 °C (room temperature) 20 .. 8% RH in clean and well-ventilated air
Response time	15 s at 25 °C in slowly flowing air
Maximal sampling rate	60 Hz
Battery life after full charge	Approximately 12 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	W30HUMI-xxx

Warranty

The Humidity 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.   CE ⌧

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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