Smart Wireless Temperature Sensor

(Product No. 1100)

Ranges:
Celsius: -40˚C to 125˚C
Fahrenheit: -40˚F to 257˚F

Accuracy: ±0.3˚C (0.5˚F) at 0 - 70˚C, rising to ±0.6˚C (1.1˚F) at extremes of range.

Resolution 0.1˚C (0.1˚F)

Contents

Introduction

The Smart Wireless Temperature sensor is both USB and Bluetooth compatible and can wirelessly connect to mobile devices such tablets and mobile phones as well as desktop or laptop computers giving students the ability to run experiments independently without being tethered to a traditional data logger. See the EasySense2 user manual system requirements for further details.

This Temperature sensor has a thermistor housed at the end of the stainless steel tube. The tube is 3 mm by 160 mm and is made from AISI 316 stainless steel, which has a particularly low thermal inertia with negligible effect on the measured temperature. It provides a high level of corrosion and chemical resistance making it suitable for use with experiments in chemistry, biology, physics, earth & environmental science.

The sensor is supplied with a mini USB lead and calibrated with degrees Celsius (˚C) as the default range.

The Smart Wireless Temperature sensor

Status light

On/Off switch

USB input

Unique ID
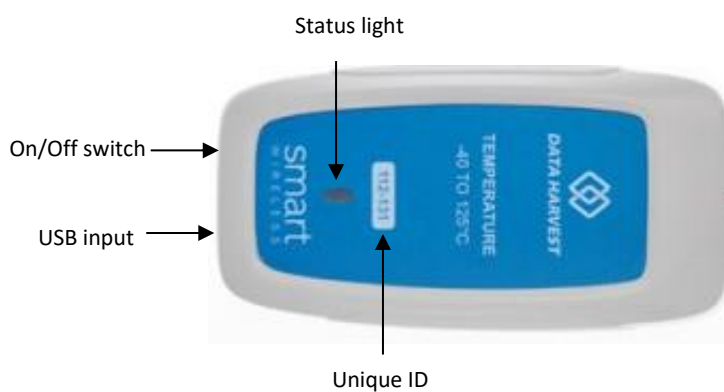
Charge the Smart Wireless Temperature sensor fully before first use

Use the mini USB lead supplied to connect the Temperature sensor either direct to a USB port on your computer* or to a USB mains charger that outputs 5 V at 500 mA or more. A full charge can take up to 4 hours.

*Or a powered USB hub. Your computer must be turned on and not in sleep or standby mode; otherwise the battery may drain instead of charge.

Status Light		Indicates
No light		Sensor is Off. Short press the On/Off switch
Blue flashing		Sensor On and Bluetooth advertising
White flashing		Charging via USB mains charger or USB port
Green flashing		Communication with the EasySense2 software (via USB or Bluetooth) has been established
Orange/green flashing		Recording data

To switch the Temperature sensor off: Press and hold down the On/Off switch for about 2 seconds until the white light is lit solidly then release.

If not communicating with the EasySense2 software the sensor will puts itself to sleep after a period of about one hour of inactivity (blue LED flashing).

Connecting the Smart Wireless Temperature sensor to a computer

*Bluetooth users: Do **NOT pair devices** (if paired the sensor will not be available to the EasySense2 software). Computers or devices will need to support Bluetooth Low Energy (BLE), for further information refer to the instructions provided for the EasySense2 software.*

Install the EasySense2 software, if it is not already on your computer. For details of how to install and operate this app, please refer to the instructions provided for the EasySense2 software.

On the computer acting as the **Controller** (interface connected to the computer).

If connecting via USB:

Step 1: Connect the Temperature sensor to the computer's USB port using the USB cable supplied. The computer will automatically detect a new device and install the drivers. The status light on the Temperature sensor will flash white to show its charging.

Step 2: Open the EasySense2 app.

Lab Setup will open showing the Smart Temperature sensor as connected (Devices icon green). The status light on the Temperature sensor will flash green to indicate a connection is established.
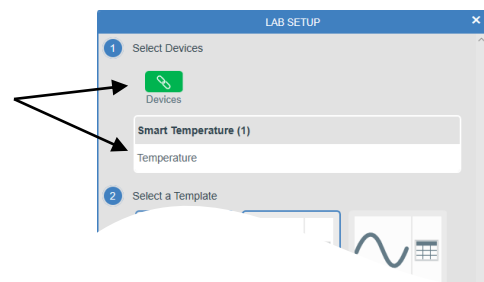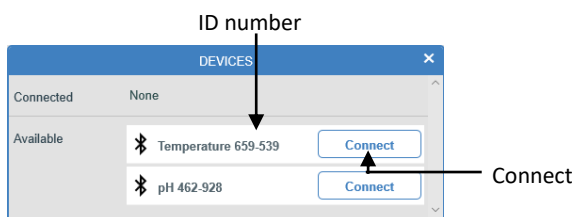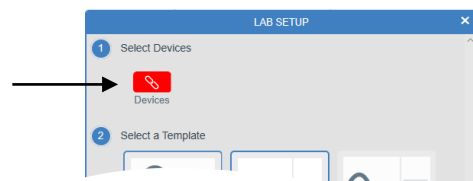

If connecting via Bluetooth:

Step 1: Switch the Temperature sensor On.

Step 2: Open the EasySense2 app.

**Step 3:** Lab Setup will open, select the red Devices icon.

Step 4: Select to connect to the Temperature sensor (the list will show the ID number printed on the sensor).

3

The Devices icon will alter to green and the status light on the pH adaptor will flash green to indicate a connection has been established.

Click or tap on ☒ to close the window.

When you have finished using the Temperature sensor select Devices and Disconnect.
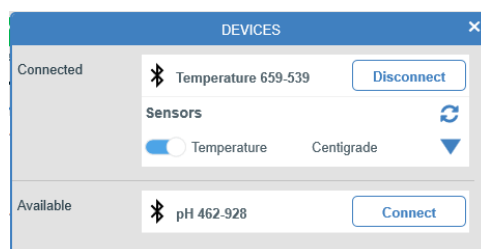
To add another data logger or smart wireless sensor

USB connected devices will be added automatically.

For Bluetooth and Wi-Fi devices select the Devices icon (top left of screen) then the Connect button for the device from the list of those available.

Troubleshooting

If the sensor loses Bluetooth connection and will not reconnect try:

1. Closing and reopening the EasySense2 software

2. Close the EasySense2 software. Switch the sensor Off and then On again. (**To switch off**: Press and hold down the On/Off switch for about 2 seconds until the white light is lit solidly then release. **To switch back on:** Press the On/Off switch (blue LED will flash). Reopen the EasySense2 software.

3. If you are using a Bluetooth Smart USB Adaptor unplug the adaptor, plug back in again and try to reconnect.

4. Hard reset the sensor and then try to reconnect.

Practical information

- It is the very tip of the metal tube that is sensitive to temperature. Lay the sensor on its side, not its end, when measuring a surface temperature.

- Temperatures higher than 150˚C (302˚F) may damage the sensor.

- Do **not** put any part of the sensor in a direct flame or on a hot plate.

- The electronics in Smart Wireless module of the sensor have a working range of 0 to 40˚C, so cannot be subjected to the same extremes of temperature as the stainless steel portion. Position the sensor so this part of the sensor is kept away from the source of heat. Take steps to protect against excessive steam.

- The Smart Wireless module is not waterproof, it has an operating range of 0 to 95% RH (non-condensing). Do not place the sensor in an environment in which high humidity levels are possible as this may result in damage or malfunction.

- Do not submerge the sensor beyond the stainless steel portion.

- The metal tube section can be washed after use. Clean the Smart Wireless module using a damp cloth, do not immerse in water or detergent.

- If the sensor has been left in the cold, let it warm to near room temperature before waking it from sleep.

- The boiling point of water will vary with changes in air pressure. At one atmosphere of pressure (101.3 kPa, 1013 mBar), pure water boils at 100˚C (212˚F). Water boils when the vapour pressure of water equals the pressure of the gases above water, so if the pressure changes, then the temperature that the water boils at will also change.

E.g. Boiling Point of Water vs. Pressure

Pressure in kPA	Pressure in mBar	Temperature in $^\circ$C	Temperature in $^\circ$F
101.3	1013	100.0	212
99.5	995	99.5	211.1
97.8	978	99.0	210.2
96.0	960	98.5	209.3
94.4	944	98.0	208.4
92.7	927	97.5	207.5

- AISI 316 stainless steel has a high resistance to corrosion from a wide variety of weak acid and alkali. Some environments e.g. saltwater, may cause some discolouration to the stainless steel tube but this will have no effect on the sensor's performance.

  The sensor can be left in an alkaline solution such as Sodium Hydroxide (NaOH) for up to 48 hours, with only minor discolouration. We do not recommend use in a solution whose concentration is greater than 3 mol dm^{-3}.

  The maximum length of time recommended for exposure to an acid is dependent on the acid's concentration. In general, we do not recommend that Temperature sensors be left to soak in acids of between 1 to 3 mol dm^{-3} concentrations for longer than 48 hours. The exceptions to this rule are Hydrochloric acid (HCl), and Sulfuric acid (H_2SO_4).

  The maximum recommended times for exposure are:

Concentration of Hydrochloric acid	Maximum exposure
1 mol dm^{-3}	20 minutes
2 mol dm^{-3}	10 minutes
3 mol dm^{-3}	5 minutes

Concentration of Sulfuric acid	Maximum exposure
1 mol dm^{-3}	48 hours
2 mol dm^{-3}	20 minutes
3 mol dm^{-3}	10 minutes

To set the range

The Smart Wireless Temperature sensor has 2 ranges, Centigrade and Fahrenheit. The sensors are supplied calibrated, with Centigrade as the default range.

To alter the range in the EasySense2 software:

1) Either select the Devices icon [🔗] or the Setup icon (bottom left of screen), line 1: Sensors and select the edit symbol.

Edit symbol

2)

Tap or click the down arrow and select the wanted range from the list.

Current range highlighted
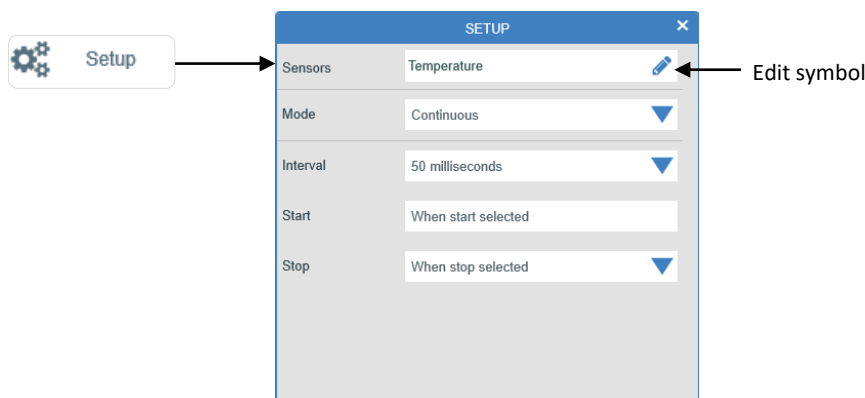
The range setting will be retained until changed by the user.

Specifications

Two ranges: -40˚C to 125˚C and Fahrenheit: -40˚F to 257˚F
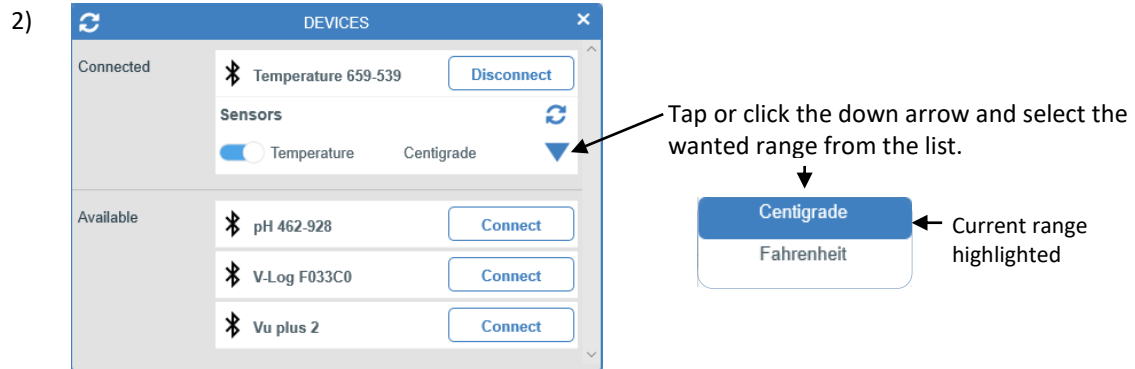
Accuracy: ±0.3˚C (0.5˚F) at 0 - 70˚C, rising to ±0.6˚C (1.1˚F) at extremes of range

Resolution: 0.1˚C (0.1˚F)

Connectivity: USB or Bluetooth

Fastest logging speed: 50 samples per second [20 ms]

Power specifications: 5 V at 500 mA

Battery: rechargeable internal lithium-ion 3.7 V, 1300 mAh (factory replaceable)

Operating range of Smart Wireless module: 0 - 40˚C and 0 to 95% RH (non-condensing)

Operating range of stainless steel rod: -40˚C to 125˚C

Memory: Last log, up to 10,000 samples

Weight of Sensor: approx. 80 g

External dimensions of Smart Wireless module only: approx. height 33 mm x width 50 mm x length 90 mm. Stainless steel rod: 3 mm x 160 mm

Bluetooth

- Bluetooth 4.2 low energy radio, single mode compliant
- Transmit (TX) power: 0 dBm
- Receiver (RX) sensitivity: - 90 dBm
- Usable transmission range: up to 10 m in open air
- Frequency Range: 2.402 to 2.480 GHz operation

Batteries

The Smart Wireless Temperature sensor is fitted with a rechargeable lithium-ion battery. Whenever the Temperature sensor is connected to the USB port on the computer or to a USB mains charger (output 5 V at 500 mA or more), it will automatically re-charge the battery (LED status flashing white).

The Temperature sensor will stay awake for 60 mins when Bluetooth advertising (LED status flashing blue).

Once connected to the EasySense 2 software (LED status flashing green) the Temperature sensor will stay awake until the battery loses charge.

To switch Off: Press and hold down the On/Off switch for about 2 seconds until the white light is lit solidly then release.

Lithium-ion batteries are 'memory-free' and prefer a partial rather than a full discharge. Constant partial discharges with frequent recharges will not cause any harm. Frequent full discharges should be avoided whenever possible. Ideally the sensor should be stored at about 40% or more charge.

The speed at which a lithium-ion battery will age is governed by both its storage temperature (preferably less than 40°C) and state-of-charge. Eventually the battery will no longer deliver the stored energy and will need to be replaced. A fully charged battery that loses its charge quickly will demonstrate the need for replacement. When this happens, contact Data Harvest.

Updating the Firmware

Occasionally Data Harvest may release updated firmware which will contain improvements or new features. Updates will be made available from the product specific page on the Data Harvest website.

Hard Reset

If the Smart Wireless Temperature sensor fails to respond to the computer carry out a hard reset.

- If necessary attach the Temperature sensor to power.
- Press and hold down the On/Off button for at least 8 seconds until the status LED gives a flash of blue light then release.

Release when LED gives a flash of **BLUE** light

Press and hold down the On/Off button for at least 8 seconds

If the sensor still fails to respond contact Product Support at Data Harvest.

Please provide details of:

- The computer platform it is being used with and the EasySense2 software's version number.
- A description of the problem being encountered

If possible, telephone from a location where you can operate the sensor with the computer.

Investigations

- *Monitoring indoor and outdoor temperature*
- *Weather studies*
- *Insulation studies*
- *Solar homes*
- *Monitoring endothermic and exothermic reactions*
- *Solubility of salts*
- *Studying freezing and boiling points*
- *Cooling rates*
- *Evaporation, radiation, conduction and convection investigations*
- *Energy content of fuels and foods*
- *Heat of fusion investigations*

Limited warranty

For information about the terms of the product warranty, see the Data Harvest website at: https://data-harvest.co.uk/warranty.

> **Note:** Data Harvest products are designed for **educational** use and are not intended for use in industrial, medical or commercial applications.

WEEE (**W**aste **E**lectrical and **E**lectronic **E**quipment) Legislation

Data Harvest Group Ltd is fully compliant with WEEE legislation and is pleased to provide a disposal service for any of our products when their life expires. Simply return them to us clearly identified as 'life expired' and we will dispose of them for you.

FCC Details

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.