



Wireless Temperature Sensor

P4500-TL

User manual



Rev.01 (Mar. 09, 2019)

This product is to be used for educational purposes only. It is not appropriate for industrial, medical, research, or commercial applications.

Introduction

This Wireless Temperature Sensor measures the temperature of the gas or liquid. This sensor measures temperature by using temperature dependence of resistance.

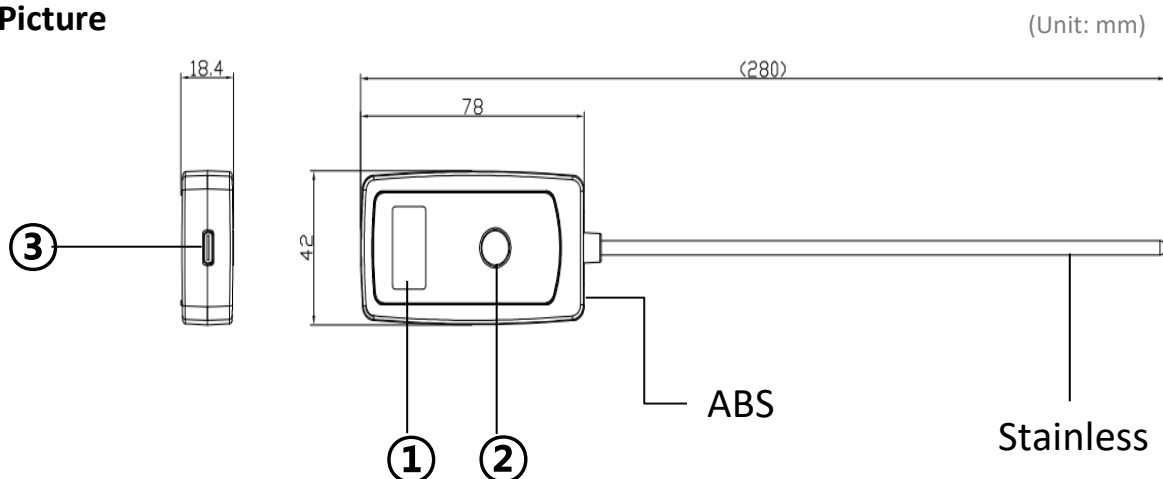
The sensing part is inserted into the stainless steel end of the thermometer so it is possible to measure the temperature more precisely because there is less error in the output process than the analog type of temperature sensors.

Composition & Usage

Composition

1. Wireless Temperature Sensor
2. USB-A/C cable
3. User manual

Picture

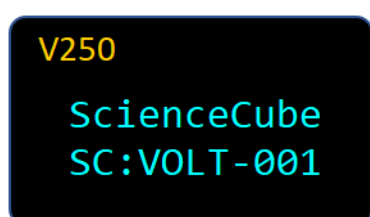


- ① OLED screen: Display the battery level and temperature
- ② Power button: Press for 5 seconds when power is off.
- ③ Place to connect the cable

Power/Function Button

Status	Turn	Action	Description
When the power is off	Click once	■	A short press turns the sensor on.
	Long click	■■■■■	A long press changes the mode and turns on the sensor.
When it's on	Long click	■■■■■	Turns off.

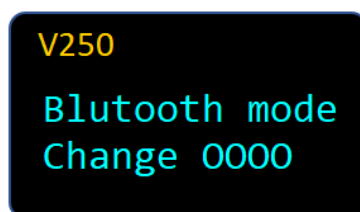
Start screen



V250 : Displays the sensor's firmware version.

SC: OOOO-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

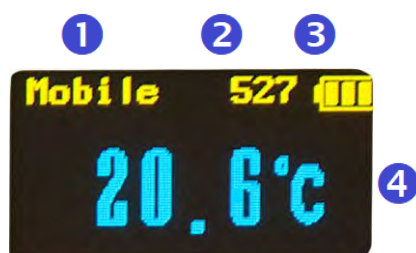
Mode change



When you press and hold the power button and turn it on, the Bluetooth connection mode changes to **Mobile** or **PC** with the following message.

See last page for more information.

Measurement screen



① Connection mode	Mobile : Connecting Android or iOS PC : Connecting to Windows PC  : Connected via USB cable ※ A long press changes the mode and turns on the sensor.
② Sensor-ID	This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.
③ Battery	Check the battery status, and when charging via USB, the display will change to charging.
④ Value	Displays sensor measurement values and units in real time.

Features and Detail

Features

Contents	Detailed description
Features	Measures temperature in °C or °F This wireless sensor is consists of a handle and a stainless steel sensor. The sensing element is located inside the end of the sensor and the diameter of the stainless steel is less than or equal to 3.96 mm. Connect up to 4 sensors simultaneously
Uses	This sensor can be used in weakly acidic substances or liquids only. Support all Bluetooth Classic, Low Energy Available in dedicated apps (Science#)

Detail

Contents	Detailed description
Max. Measurement	-40°C ~ 125°C
Resolution	±0.0625°C
Uncertainty	Typical ±0.25°C (in -40°C to 125°C), Max ±1.0°C
Sampling Rate	Max. 100 samples/second
Interface	Windows PC (USB or Bluetooth) Android Device (Bluetooth)
Application	Science#
Operating Environment	-40 ~ 60°C, Max 85%RH
Connection	Bluetooth 4.2 or USB (Type-C)
Power	Li-Po Rechargeable Battery (700mAh) Operating time approximately 14 hours when the battery is fully charged. (Depends on conditions of use.)

CAUTION: Do not use the instrument beyond the measurement range or in conditions that exceed the short-term exposure limits. Prolonged exposure beyond the maximum permissible range can cause serious damage to the sensor.

Guide for scientific experiments

<Scientific experiment activities by using Temperature Sensor>

Heat conduction
Adiabatic effect

Photosynthesis
Food calorimetry

Supercooling phenomenon
Thermal balance
specific heat
Boiling point, Freezing point
Evaporation
Endothermic reaction,
Exothermic reaction

Radial balance
Temperature of the air according to height
Convection
Sea breeze

<Example of test method>

Temperature changes in cold and hot water,
Display thermal balance graph

Compare and measure the temperature from
several places

Materials

Science# program, wireless temperature sensor (2), empty styrofoam cylinder, graduation cylinder, stand, hot water, ice water, rubber stopper

Experimental Method

1. Add 100 ml of hot water at 45 ° C to the styrofoam cylinder.
2. In the graduated cylinder, add 100 ml of cold water at 15 ° C and insert a rubber stopper with a hole.
3. Insert a temperature sensor into the rubber stopper hole and block the graduation cylinder inlet.
4. Fix another temperature sensor to the stand for measurement of the water temperature inside of the styrofoam cylinder.
5. Place the graduation cylinder in the styrofoam cylinder to analyze it after data collection.

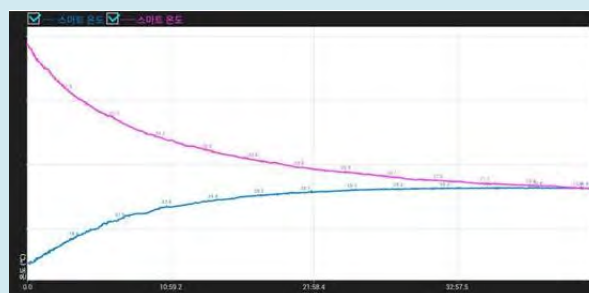
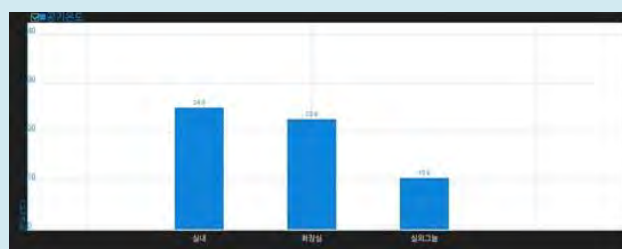


Materials

Science# program, wireless temperature sensor

Experimental Method

1. Enter the experiment settings and set [Event-based] - [Bar] - [Text] and press START to collect the temperatures of several places.
2. Create your own graphs and consider why the temperatures at each location are different.





Safety Warnings

All data, analyzes and derivative works obtained with this product may be used only for the purpose of scientific experiment education and not for other purposes such as professional research or commercial purposes.

The safety precautions are intended to prevent accidents and risks by using the product safely and correctly.

Please note that this product does not have any legal liability for accidental accidents caused by user's negligence during the scientific experiment activities or for the use of other uses.

- ① **Never separate or modify the sensor except for a professional technician.** Permanent damage to the unit may result. The sensor is permanently sealed in the process and cannot be disassembled for any purpose. In addition, please use customer support center for inspection, adjustment and repair.
- ② Experiment safety rules must be observed and parents should be fully informed about the risk of safety accidents according to the contents of the experiment. For more information about the experiment, please contact your science experiment teacher or the author of the experiment.
- ③ **Do not try to open it in a place with high humidity or splashing water.** If water enters the main body, cable or power supply unit, it may occur electric shock, fire, malfunction or deformation.
- ④ **Do not conduct experiments where heat or smoke (gas) is generated in an enclosed space.** Experimentation in an enclosed space may cause suffocation and fire. Be sure to follow the safety instructions in the well-ventilated area.
- ⑤ **When contacting the temperature sensor with strongly acidic, alkaline or other liquids, be sure to check the compatibility of the temperature sensor stainless steel and the solution you want to use.**
- ⑥ **Do not use the unit beyond the operating limits or exceeding the short-term exposure limits.** If the exposure exceeds the maximum allowable range, the reliability of the sensor may be lowered.

Experimental Safety Precautions

1. Please be careful of electrical safety accidents such as electric shock and fire during the experiment.
2. Turn off the power when not doing the experiment.
3. Do not experiment with wet hands.
4. Do not mess around with sensors
5. Keep out of the reach of children

How to install Science#

● Install Windows PC version

Online installation file (approximately 39MB)

<http://www.koreadigital.com/url/updates/sciencesharppc/setup.exe>

* Internet connection is required during installation

Offline installation file (approximately 340MB)

http://www.koreadigital.com/url/updates/sciencesharppc/setup_full.exe

* Installation does not require an Internet connection, but contains large content

● Install from a mobile smart device (Smartphone or Tablet PC)

1. Download Science# to your smart device (Refer to QR codes below)
2. Connect using Bluetooth (See Science# documentation or refer to next page)
3. Run Science#
4. When you connect the sensor, the measurement is displayed on the Science# screen



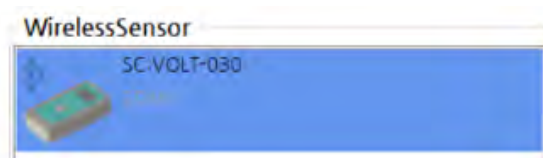
Features

- Up to four wireless sensors can be connected to a PC or smart device at the same time.
- It supports dual-mode Bluetooth, allowing you to connect not only smart devices but also desktop and laptop PCs to conduct experiments using the **Science#** application.
- It can be connected to a PC through a USB port and experiments can be performed using the **Science#** program.

How to connect Wireless Sensor to Science# program

● Windows PC

1. Install and run Science# (Refer to previous page for installation method)
2. Power on the sensor
3. Click the  [Connect] icon and select [Bluetooth Interface] from [Select Interface]
4. [Add Bluetooth or other device] → [Bluetooth] → Add sensor number after checking the number on the backside of sensor
5. When you see like the picture, click on Wireless Sensor and connect



● Android or iOS (Smartphone or Tablet PC)

1. Install and run Science# (Refer to previous page for installation method)
2. Power on the sensor
3. Click the  [Connect] icon and select [Bluetooth Interface]
4. After selecting the device search, check the sensor number on the backside and connect



If you experience any connection issues, check Bluetooth mode on the sensor. Please refer to the next page for instructions on how to change it.

How to switch to Bluetooth mode for Android and iOS

For mobile devices (Android, iOS) Bluetooth Low Energy technology is used for wireless communication. For these devices do not pair the sensor just use it directly in the software.

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 that Bluetooth Low Energy is used.

How to switch to Bluetooth mode for Windows

For Windows computers, Bluetooth Classic technology is used for wireless communication. Before you start to use the sensor for measurement you have to pair it. If you are asked for a PIN, enter either "1234" or "0000".

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.

Rev.01 (Mar. 09, 2019)

Copyright (c) Korea Science Digital Co., Ltd. All rights reserved. The contents of this manual are for informational purposes only and we cannot be held responsible for errors or misleading information that may appear in this manual. The specifications and functions of the product are subject to change without prior notice.



and ScienceCube are registered trademark of Korea Digital Co., Ltd.

Science Cube Light, Science Cube Pro, Free Linker, and Max are trademarks of Korea Digital Co., Ltd.

Windows and Excel are registered trademarks or trademarks of MicroSoft.

All other trademarks are the property of their respective owners.



www.ntl.at