



Wireless Vertical Temperature (P4532-TD) User manual



Rev. WL132T-11-2024

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

The **Wireless Vertical Temperature Sensor** is designed to measure how water temperature changes at different depths at the same time.

Its probe contains **four independent temperature sensors placed 4 cm apart**, allowing you to easily compare temperatures from the upper and lower parts of the water column, which is especially helpful when planning experiments.

The main unit displays temperature readings collected from up to four connected probes. Each temperature element is protected by a thin, transparent coating, making the probe **waterproof** and sensitive enough to detect even small and rapid temperature changes.

The sensor is intended for use in **neutral liquid environments**, making it suitable for water-tank experiments, aquatic studies, and various laboratory applications.

If needed, you can connect up to four temperature probes at the same time, allowing you to measure a wider range of depths. Wireless communication supports both Bluetooth Classic and BLE, so the device can easily connect to smartphones, tablets, and other smart devices. It can also be connected to a PC through USB for wired operation. When used together with the dedicated **Science# app**, you can conveniently view graphs, store measurement data, and manage multiple sensors, making experimentation and analysis much easier.

Caution : Long-term measurements are not recommended for experiments using chemical solutions. When measuring professional chemical tests, protect the probe with a tube made of chemical-resistant or corrosion-resistant material (Teflon, etc.).

Suggested experiments

- Water temperature changes according to tank depth for radiation heat survey
- Measurement of vertical distribution of water temperature according to depth
- Temperature distribution according to height
- Observation of water convection phenomenon

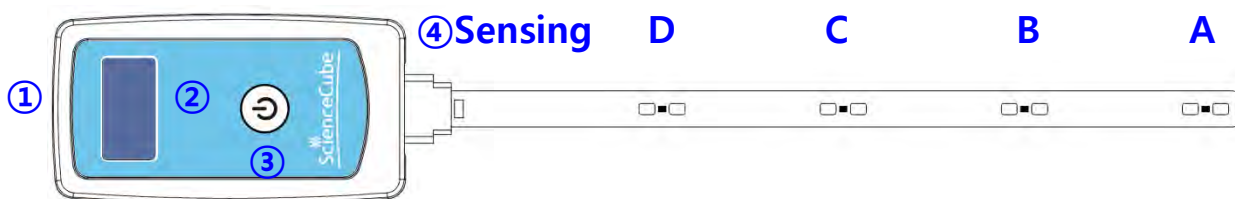
Composition

The wireless vertical temperature sensor consists of the following.

- Wireless vertical temperature sensor (P4532-TD)
- USB-A/C cable
- Booklet

Function of wireless sensor

Structure



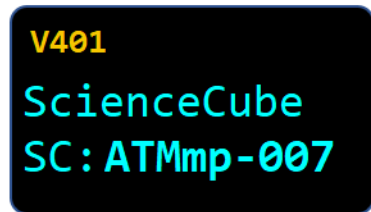
- ① USB port : Connect the sensor to a PC and use it for experiments or charging.
- ② OLED Display : Displays measured sensor values, sensor type, sensor ID, and remaining battery level.
- ③ Power Button : It has functions such as power ON/OFF.
- ④ Sensing part : A total of 4 temperature detection sensors are placed at 4cm intervals and are protected with a transparent coating.

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

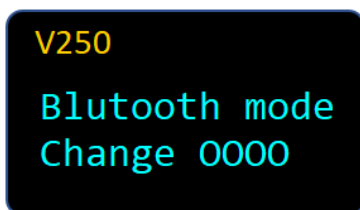
When you turn it on, the following initial screen appears.



V401 : Displays the sensor's firmware version.

SC:ATMmp-007 : 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

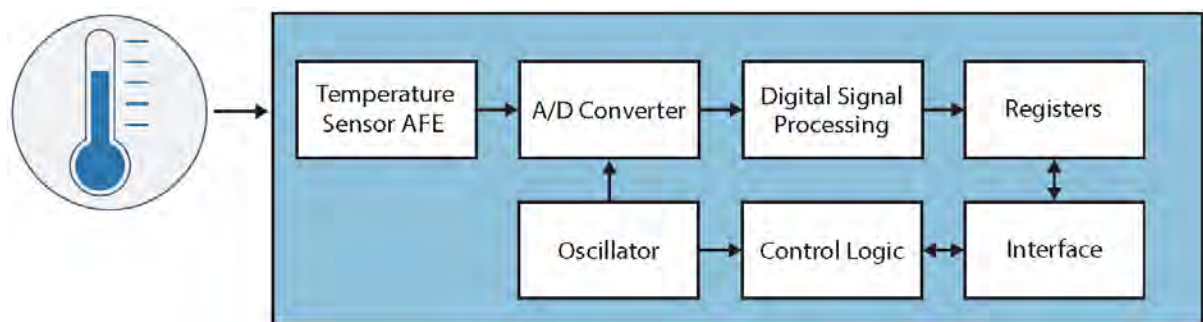


① Connection mode	Mobile : Connecting Android or iOS PC : Connecting to Windows PC 🔌 : Linked via a USB cable. ※ A long press changes the mode and turns on the sensor.
② Sensor-ID	This is the sensor's unique number and is displayed along with the sensor name in the device name when connected via Bluetooth.
③ Battery	Check the battery status, and when charging via USB, the display will change to charging.
④ Value	1) Displays sensor measurement values and units in real time. 2) If user calibration is used, U0 or UC will be displayed above the units.

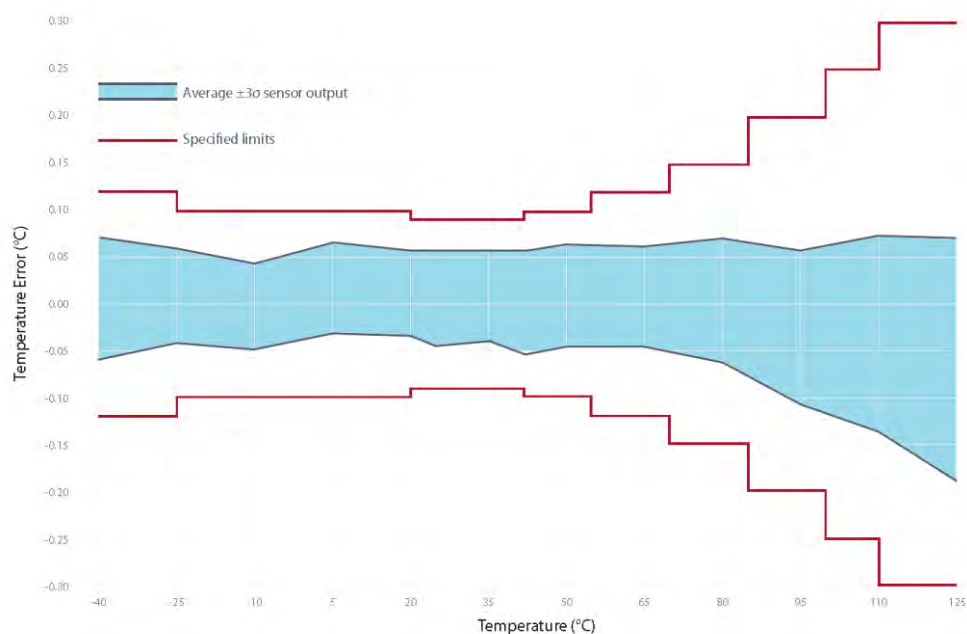
How it Works

Science Cube wireless vertical temperature sensor uses a state-of-the-art semiconductor digital temperature sensor.

According to the electrical properties of semiconductors, the internal PN junction exhibits constant voltage or current characteristics depending on temperature changes. Using this principle, electrical signals can be converted to temperature using an A/D converter and digital signal processor (DSP).



In addition, ultra-precise digital temperature implementation is possible through very precise calibration and compensation according to distribution. This shows the variation with temperature over the following range:



Using the Sensor

The Wireless temperature sensor can be measured in the following ways:

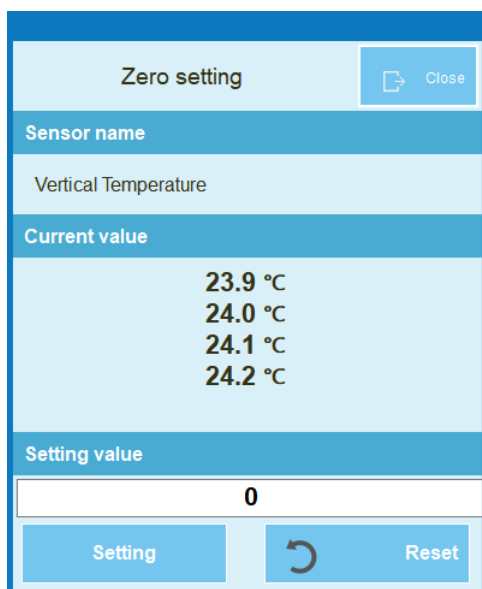
1. Run '**Science#**' and connect the sensor wirelessly or wired.
2. Set the **Data Collection Interval** and **Experiment by time** in [SETTING].
4. Click [START] to start the experiment.

For more information on how to use the **Science#**  application, see the help.

Calibration

All wireless temperature sensors are precisely calibrated using standard equipment during the manufacturing process before being delivered and are ready for immediate use. No separate calibration process is required.

[Zero point setting]



The screenshot shows a 'Zero setting' dialog box with a 'Close' button. It displays the 'Sensor name' as 'Vertical Temperature'. Under 'Current value', four temperature readings are listed: 23.9 °C, 24.0 °C, 24.1 °C, and 24.2 °C. The 'Setting value' is shown as '0' in a text input field. At the bottom, there are 'Setting' and 'Reset' buttons.

If you want to see changes according to a random temperature set by the user, you can measure using the zero point setting. Measurements are made assuming an arbitrary temperature of '0 degrees', and the sensor's measurement range can be as small as the arbitrary temperature setting.

Only the values collected by the **Science#** program are reflected, and the temperature value displayed on the sensor does not change.

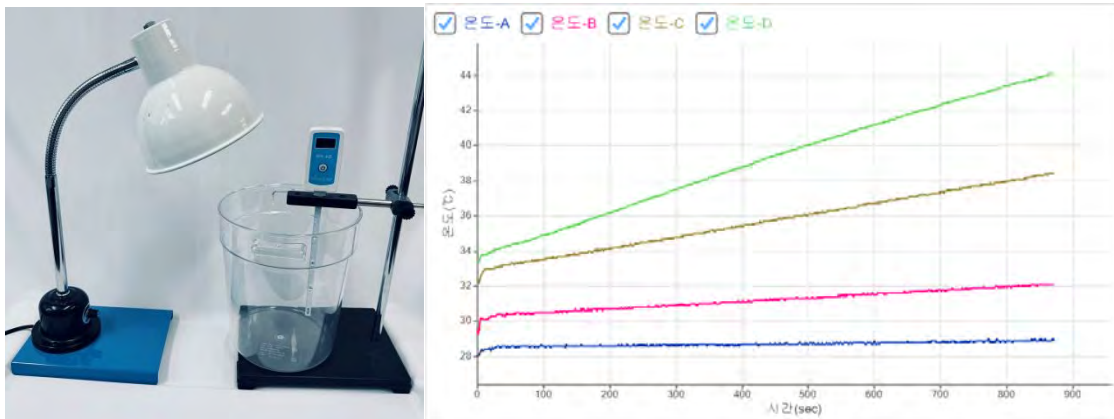
Experiment example

<Observing Temperature Changes at Different Water Depths Under Simulated Sunlight>

- ① Prepare a water tank (aquarium) and fill it with clean water to the desired depth at least 20cm.
- ② Place the Wireless Vertical Temperature Sensor vertically in the center of the tank so that all four sensors are fully submerged.
- ③ Secure the probe using a stand or holder to prevent movement during the experiment.

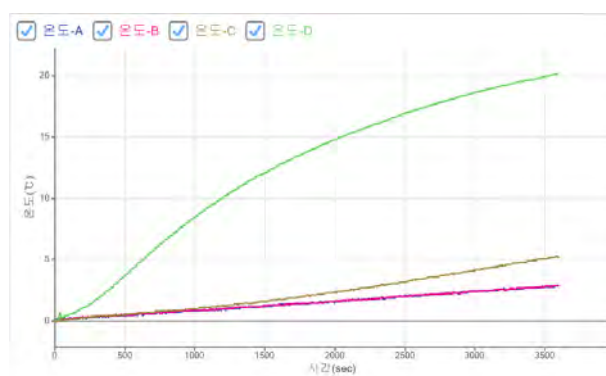
(Caution: Only the probe should be immersed in the tank, the sensor body should not touch the water.)

- ④ Launch the *Science#* app, turn on the sensor, and connect it via Bluetooth.
- ⑤ **SETTING** the **Data Collection Interval** (e.g., 1 Hz or 0.5 Hz) and the total **Experiment by time** (e.g., 20–30 minutes).
- ⑥ Illuminate one side of the tank with a light source such as an incandescent lamp or LED to simulate sunlight.
- ⑦ Immediately after turning on the light, **START** data recording in the app.
- ⑧ Observe how temperatures at different depths change over time, and monitor the real-time graphs in the app.
- ⑨ After the preset duration, stop the experiment and analyze the recorded data to compare temperature differences by depth.



<Observing Convection in a Liquid>

- ① Prepare a clean test tube and fill it about two-thirds full with water.
- ② Secure the test tube on a stand and tilt it at an angle of about 45 degrees.
- ③ Place the Wireless Vertical Temperature Sensor into the test tube so that all four sensing points are fully submerged. Ensure the probe does not touch the inner walls by positioning it near the center or securing it lightly with a holder.
- ④ Open the **Science#** app, turn on the sensor, and connect it via Bluetooth.
- ⑤ Set the **data collection interval** (e.g., 1 Hz) and measurement duration (e.g., 5–10 minutes).
- ⑥ Begin heating the upper portion of the test tube with an alcohol lamp, applying heat gradually. (**Caution: Stop the experiment at the appropriate temperature to prevent the water from boiling.**)
- ⑦ Start data recording in the app as soon as heating begins.
- ⑧ Observe how temperature changes develop from the top to the bottom, and identify the convection pattern forming in the water.
- ⑨ After the measurement period, stop the experiment and analyze the recorded data to examine temperature differences caused by convection.



*For detailed experiment details, please refer to contents included in '**Science#**'.

Specifications

Item	Description
Range	-40°C ~ 125 °C (-40 ~ 257°F)
Resolution	0.1°C
Sampling Time	Max. 100Hz (0.01 sec.)
Detection Space	4 sensors placed at 4 cm intervals
Condition	-20 ~ 60°C, Max. 85%RH
Wireless Connection	Bluetooth 5.0 or Classic 2.1
Wired Connection	USB 2.0 (Type-C)
Battery	700mAh Li-Polymer rechargeable
Charging Time	within 2 hours
Operating Time	Approximately 12 hours after full charge (depending on usage conditions)
EMC	CE : EN 61326-1, EN 55011, EN 55032, EN 301

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.

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



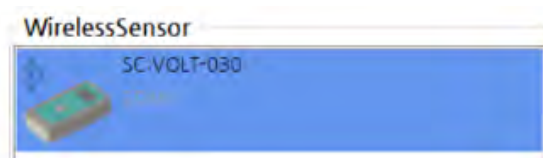
Features

- 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.

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