



Wireless pH Sensor

P4504-PHK

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 pH sensor is a sensor that measures hydrogen ion concentration. It is a principle to determine the pH value from the potential difference between the glass electrode and the reference electrode with two standard solutions that know the pH value.

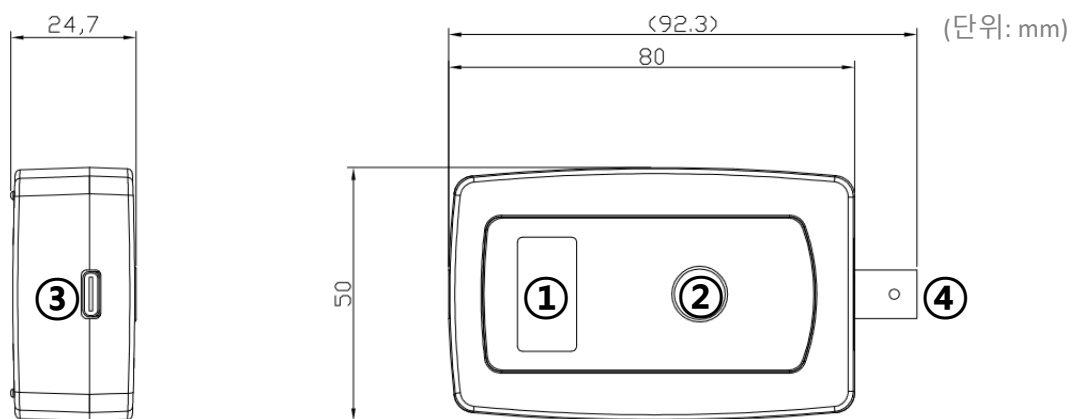
The Science Cube Wireless pH Sensor does not require a separate connection cable, so it can be easily used in complex experimental environments such as monitoring pH change during neutralization of acid-base, chemical reaction and checking pH in a water tank during photosynthesis. You can use this sensor for investigation of acid rain and water quality as well. Also, it is possible to connect up to 4 sensors at same time, so you can use it with other kinds of sensors together.

Composition & Usage

Composition

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

Picture

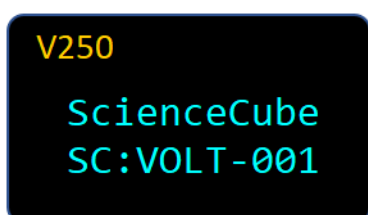


- ① OLED screen: Display for battery level and pH value
- ② Power button: Press for 5 seconds when power is off.
- ③ Charging and USB communication
- ④ Electrode insertion hole

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.

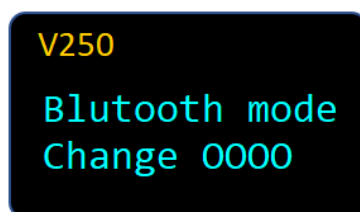
Start screen



V250 : Displays the sensor's firmware version.

SC: 0000-001 : When you search for a Bluetooth device, the device name will be displayed. (Sensor name and 3-digit serial number)

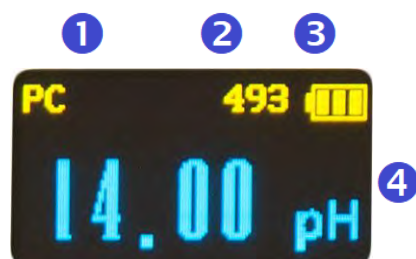
Mode change



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	Features: Used to measure the acidity or alkalinity of the liquid. Standard buffer solution pH 4.0, 7.0, 10.0 Electrode: composite electrode (reference electrode and glass electrode Ag / agcl)
Uses	Bluetooth classic, low energy support USB communication support Dedicated app (Science#) available

Detail

Contents	Detailed description
Max. Measurement	0pH ~ 14pH
Resolution	0.001pH
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) Li-Po Rechargeable Battery (700mAh)
Power	Bluetooth 4.2 or USB (Type-C) Operating time approximately 13 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.

How to use the sensor

1. How to store

- When not using the pH sensor, clean the electrode with distilled water, remove the water and immerse the electrode in the supplied 3.3M KCL storage container. (It can be stored in standard buffer (buffer) solution of pH 4.0 or 7.0 for a short time of about several hours, but **it must be stored in the supplied pH 4.0 3.3M KCL solution for long time storage.**

* If the electrode is left in a dry state due to carelessness, it should be immersed in the buffer for at least 2 hours before use.

If the pH value measured in the 3.3M KCL storage solution changes significantly or is slow, discard the electrode and replace it with a new one.

2. Calibration method

The pH sensor must be calibrated before the pH experiment.

- ① Put a proper amount of buffer solutions(pH 4.0, pH 7.0, and pH 10.0) into each beaker.
- ② Connect to Science# and press calibration button.



- ③ Take out the pH sensor from KCL container and wash the electrode with distilled water and gently remove the water with a filter paper (Be careful not to rub the glass electrode.)

1 Point calibration

Immerse the electrode in pH 4.0 solution and wait until the pH value approaches 4.0.

When the pH value stabilizes, press  button to perform 1 point calibration.

2 Point calibration

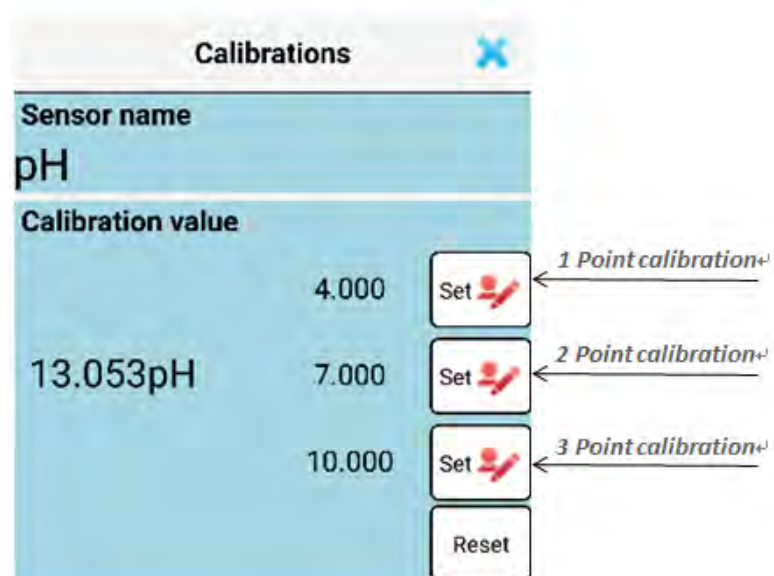
After washing the electrode with distilled water, remove the water with filter paper and soak it in pH 7.0 standard solution.

Wait until the pH value is close to 7.0. when the value becomes stable, press  button to perform 2 point calibration.

3 Point calibration

After washing the electrode with distilled water, remove the water with filter paper and immerse in pH 10.0 standard solution.

Wait until the pH value is close to 10.0. When the value becomes stable, press  button to complete 3 point calibration and press the close button to end calibration.



Guide for scientific experiments

<Scientific experiment activities by using pH Sensor>

Measuring the pH of various solutions

Acid-base neutralization reaction

<Example of test method>

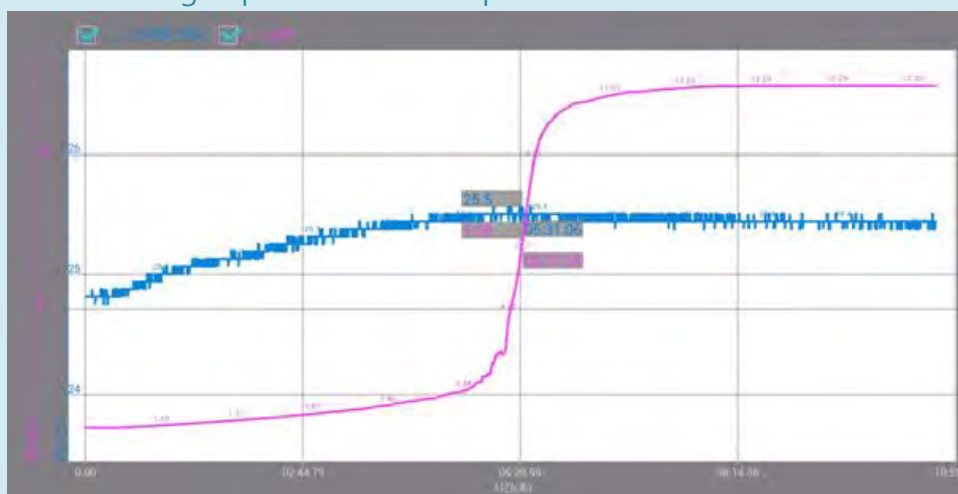
Acid-base neutralization reaction

Materials

Science# programs, Wireless pH sensor, Wireless Temperature Sensor, 0.1 M hydrochloric acid (50 mL), 0.1 M sodium hydroxide (60 mL), pH standard solutions (pH 4, pH 7, pH 10), 100 mL burette, stirrer, magnetic stirrer, 250 mL beaker, distilled water, syringe, filter paper, stand, clamp (3)

Experiment process

- ① Put 50 ml of hydrochloric acid aqueous solution (HCl) in the beaker and place it on the agitator.
- ② Add magnetic stirrer to beaker.
- ③ Fill the burette with 60 mL of sodium hydroxide and fix it on the stand.
- ④ Clean the electrode of the pH sensor with distilled water and gently remove water with filter paper.
- ⑤ Fix the pH sensor and temperature sensor on the stand so that it is immersed in hydrochloric acid.
- ⑥ Calibrate the pH sensor.
- ⑦ Start data collection.
- ⑧ Adjust the burette so that 3 to 5 drops per second.
- ⑨ Observe the changed pH value and temperature value.





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 **If the experiment exceeds the limit value for a long time, the sensor stability may deteriorate.** Experiment with acidic or basic solutions concentrated to a high concentration of 1.0 M or more may damage the electrodes. Also, it is not tested at temperatures outside the range of use.
- ④ **Do not allow mentor equipment and sensors to rise to extremes in extreme conditions and in a short time.** The input range may be permanently damaged. Be careful of direct exposure to sunlight.

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



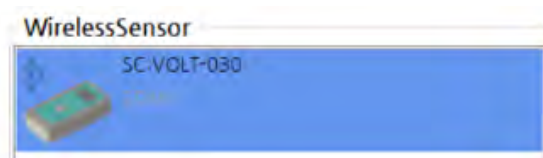
Features

- 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.

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