ScienceCube

Wireless ORP (WLORP)

User Guide

Rev. WLORP-12-2023

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

KOREADIGITAL

The Science Cube wireless ORP sensor can measure the ability of a solution to act as an oxidizing or reducing agent.

The wireless ORP sensor measures the ability of a solution to act as an oxidizing or reducing agent. ORP stands for oxidation-reduction potential also known as Redox Potential. The ORP sensor consists of an **ORP electrode** and an **Wireless Electrode Amplifier** (WL114EA). Redox reactions control the behavior of many chemical constituents in drinking water, wastewater, and aquatic environments.
You can measure by remotely connecting to a smart device or PC wirelessly or wired.

Suggested experiments

- Comparison on Redox of surrounded environment like in rainwater, lake, etc.
- Optimal potential difference
- Comparison for the redox on drinking water
- Equilibrium point finding

Composition

The ScienceCube wireless ORP sensor *consists of the following.*

- ORP Electrode(WL ORP)
- Wireless Electrode Amplifier(WL114EA)
- USB-A/C cable
- Booklet

Feature

- Up to four Science Cube 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.

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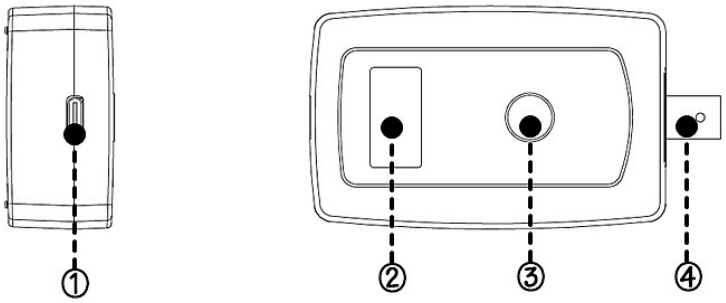
Function of wireless sensor

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/Function Button : It has functions such as power ON/OFF, measurement sensor change and calibration, etc.

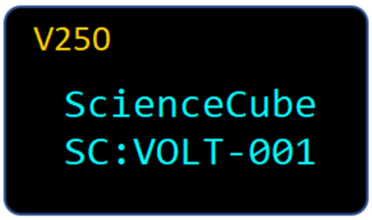
④ Sensing part : Redox is measured by connecting an ORP electrode to a BNC connector.

Caution : Do not use the sensor near fire or explosive gases. High concentrations of contaminants can permanently damage the sensor.

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	Double click	■■	1) Zero point setting (For sensors with zero point function) 2) A user calibration (if the sensor has a calibration function) is performed and **U0** or **UC** is displayed above the device.
	Long click	■■■■■	Turns off.

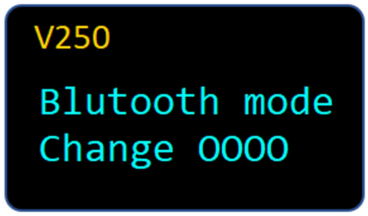
Start screen



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.

Measurement screen

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

ORP Electrode

The ORP (combination) electrode has two components: a measuring half-cell comprised of platinum metal immersed in the test solution in which the redox reaction is taking place, and a reference half cell (sealed gel-filled Ag/AgCl) surround by salt solution. The measuring platinum electrode serves as an electron donor or electron acceptor depending upon the test solution and the reference electrode is used to supply a constant stable output for comparison. The ORP electrode measures the redox potential (difference in the voltage generated by the platinum measuring electrode and the voltage produced by the reference electrode) in the range of -450 to +1100 mV. Readings toward the positive region of this range indicate a strong oxidizing agent, while readings toward the negative region indicate a strong reducing agent.

The ORP electrode has been built into a long plastic tube with an opening at the bottom side and is supplied with a storage bottle containing a protective solution. When the ORP electrode is not being used, it must be kept in the storage bottle. During measurements the electrode must be dipped in the solution for roughly 1 cm.
The electrode is connected to the wireless electrode amplifier by means of a coaxial cable and a BNC connector.

Suggested experiments

Redox reactions control the behavior of many chemical constituents in drinking water, wastewater, and aquatic environments. The reactivity and solubility of critical elements in living systems are strongly dependent on redox conditions. ORP values are used much like pH values to determine water quality. For example for swimming pools at a normal pH value between 7.2 and 7.6, the ORP value must be kept above 700 mV to kill unwanted organisms. In contrast, natural waters need a much lower value to support life. Generally ORP values above 400 mV are harmful to aquatic life.
The ORP sensor can also be used for redox titration to determine the equivalence point in an oxidation-reduction reaction.

Calibration

The output of the ORP sensor is linear with respect to redox potential. In most experiments with the ORP Sensor the precise potential in mV is not critical.
If you are doing water quality testing or performing a chemistry experiment that requires a very accurate calibration, you will need to obtain two commercial ORP standards. Using these standards, perform the following 2-point calibration:
1) For the first calibration point, rinse the tip of the electrode with distilled water, and place the electrode into the first standard. When the voltage reading displayed by the data-collection program stabilizes, enter the ORP value (mV) of the first ORP standard.
2) For the second calibration point, remove the electrode from the first standard, rinse it with distilled water, and place it into the second standard. When the displayed voltage reading stabilizes, enter the ORP value (mV) of the second standard.
3) Rinse the electrode with distilled water and place it into the sample to be measured.
You are now ready to take measurements with the calibrated ORP Sensor.
In this way the sensor can have its own, precise calibration.

Storage and maintenance

- When not using the ORP electrode, 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 electrode value measured in the 3.3M KCL storage solution changes significantly or is slow, discard the electrode and replace it with a new one.

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.

Specifications

ORP Electrode

Contents	Description
Type	Sealed, gel-filled, epoxy body, Ag/AgCl reference
Storage solution	pH-4/KCl solution (10 g KCl in 100 mL buffer pH-4 solution)
Temperature range	0-60℃
Impedance	~20 kΩ at 25℃
ORP element	99% pure platinum band sealed on a glass stem
Connection	BNC connector

Wireless Electrode Amplifier (WL114EA)

Item	Description
Range	-450 mV to 1100 mV
Resolution	0.1 mV
Sampling Time	Max. 100Hz (0.01 sec.), (Typical 1Hz)
Condition	0 ~ 60℃, ~85%RH
Wireless Connection	Bluetooth 5.0 or Classic 2.1
Wired Connection	USB-C
Battery	700mAh Li-Polymer rechargeable
Charging Time	within 2 hours
Operating Time	Approximately 8 hours after full charge
	(depending on usage conditions)
EMC	CE : EN 61326-1, EN 55011, EN 55032, EN 301

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- The contents of this manual are provided for informational purposes only, and product specifications and functions may be changed without prior notice to improve performance.
- This product is designed for science education. No warranty is provided and no liability is assumed for errors in industrial testing or manufacturing process controls, medical analysis or controls, or commercial design applications.

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