# USER MANUAL

## WATER QUALITY SENSOR

PCE-WQS 20 / 40

ENGLISH




User manuals in various languages (français, italiano, español, português, nederlands, türk, polski) can be found via our product search on:
www.pce-instruments.com

## FEATURES

- Internal use of axial capacitance filtering, 100MΩ resistor to increase impedance and enhance stability.
- Small size, low power consumption, and easy to carry
- Truly achieving low cost, low price, and high performance.
- High integration, long lifespan, and high reliability.
- Up to four isolation points, able to resist complex interference situations on site, with a waterproof grade of IP68.
- The electrode adopts high-quality low noise cable, which can make the signal output length reach over 20 meters.
- Waterproof, rail, PLC, Adam and other appearances, suitable for various installation environments.

## TECHNICAL PARAMETERS

| | **Range** | **Accuracy** | **Resolution** |
|---|---|---|---|
| Water pH | 0 ... 14 pH | ±0.1 pH | 0.01 pH |
| Water Conductivity (EC) | 0 ... 5000 µS/cm | ±1.5%FS | 0.1 µS/cm |
| Water Temperature | 0 ... 60°C | ±0.2°C | 0.1°C |
| Working Environment | 0 ... 60°C; ≤100%RH | | |
| Power Supply | DC7 ... 24V | | |
| Response Time | <45s | | |
| Power Consumption | 25mA (@DC12V) | | |
| Output | RS485 Modbus-RTU, 4 ... 20mA, 0 ... 5V | | |
| Cable Length | PH probe: 5m<br>EC probe: 5m<br>Transmitter: 2m | | |

## WIRING DEFINITION

For RS485 output, cable is a 4-core wire, and the wire sequence definition:

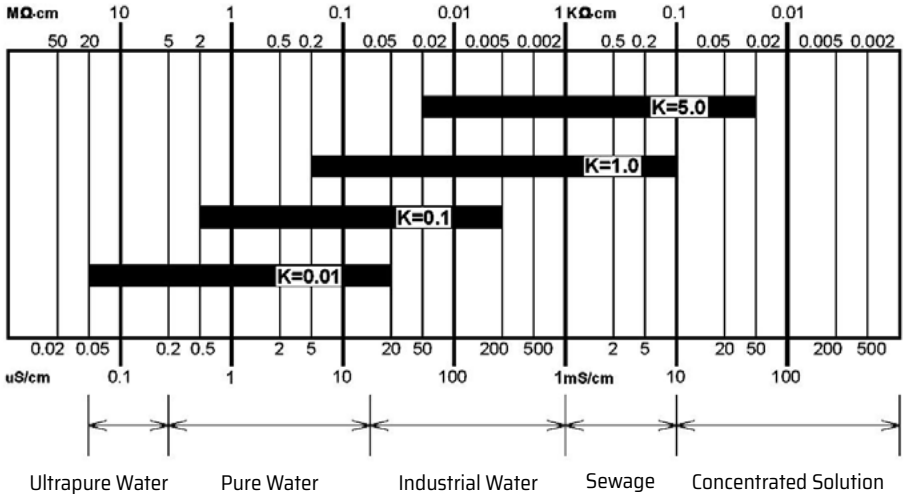
| RED | BLACK | YELLOW | GREEN |
|---|---|---|---|
| Power+(DC5~24V) | GND | RS485_A | RS485_B |

For 4~20mA/0~5V output, cable is a 6-core wire, and the wire sequence definition:

| RED | BLACK | YELLOW | GREEN | BROWN | WHITE |
|---|---|---|---|---|---|
| Power+(DC5~24V) | GND | RS485_A | RS485_B | PH Signal+ | EC Signal+ |

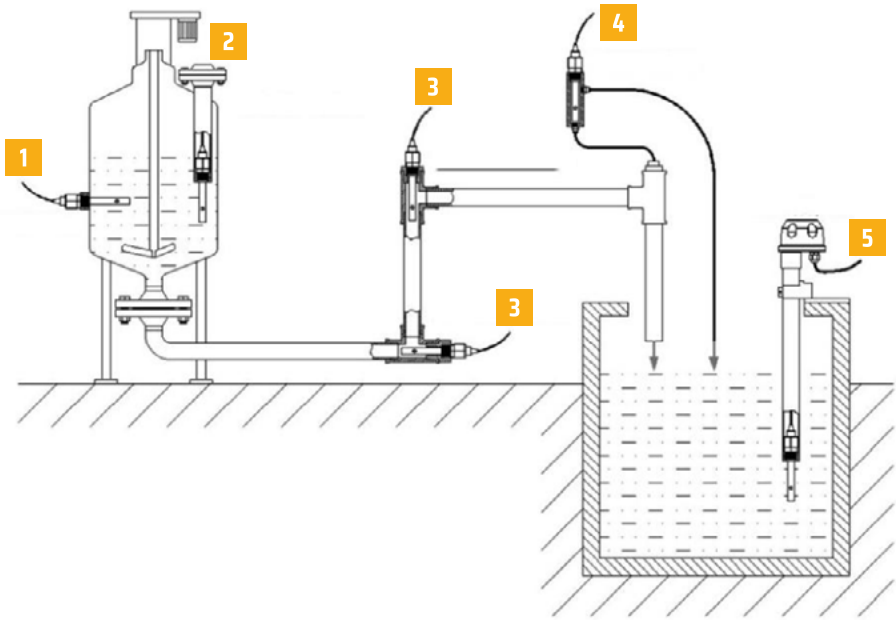
## ELECTRODE INSTALLATION

**Selection of matching conductivity electrode constants**



**Electrode installation guidance**

1 - Side wall installation
2 - Top flange installation
3 - Pipe installation
4 - Flow cell installation
5 - Immersion installation

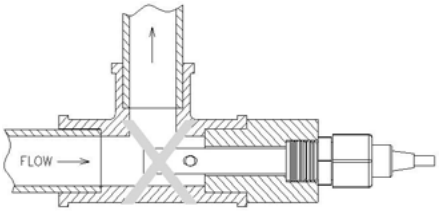


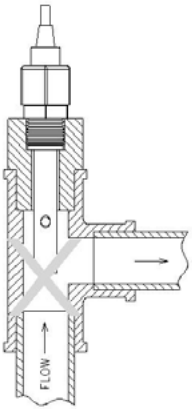
**Several common installation methods for electrode**

When installing sensors on site, you should be strictly installed in the correct way as shown in the following pictures. Incorrect installation methods may cause data deviation.

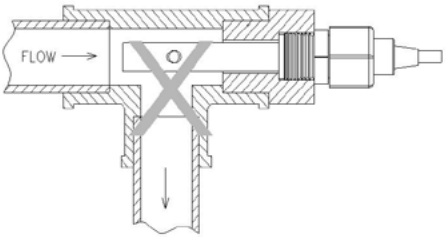
**Several common wrong installation methods**

Error reason: The electrode joint is too long and the inserted part is too short, which can easily form a dead cavity inside the sensor and cause measurement errors.

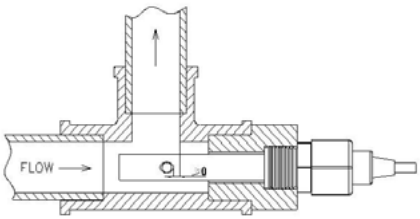


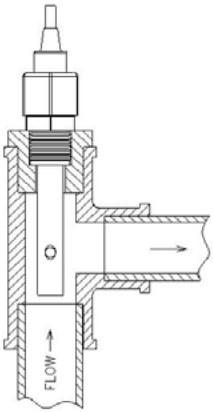




Error reason: Measurement errors or instability may occur due to insufficient water flow to ensure full pipe or gas accumulation at high altitudes.




**Correct installation method**



## MODBUS COMMUNICATION PROTOCOL

| Slave Address (Default) | Baud Rate | Data Bit | Stop Bit | Parity |
|---|---|---|---|---|
| 1 | 9600 | 8 | 1 | None |

**Modify Address**
For example, changing the address of a sensor with address 1 to address 2, host > slave

| Device Address | Function Code | Register Address (H) | Register Address (L) | Data (H) | Data (L) | CRC16 (L) | CRC16 (H) |
|---|---|---|---|---|---|---|---|
| 0X01 | 0X06 | 0X00 | 0X30 | 0X00 | 0X02 | 0X08 | 0X04 |

If the sensor receives correctly, the data will be returned in the original path
**Note:** If you forget the original address of the sensor, you can use the broadcast address 0XFE instead. When using 0XFE, the host can only connect to one slave, and the return address is still the original address, which can be used as a method of address query.

**Query Data**
Query the data of the sensor (address 1) (water pH,EC,temperature value), host > slave

| Device Address | Function Code | Register Address (H) | Register Address (L) | Register Quantity (H) | Register Quantity (L) | CRC16 (L) | CRC16 (H) |
|---|---|---|---|---|---|---|---|
| 0X01 | 0X03 | 0X00 | 0X00 | 0X00 | 0X03 | 0X05 | 0XCB |

| If the sensor receives correctly, the following data is returned, host > slave | | |
|---|---|---|
| Device Address | 0X01 | |
| Function Code | 0X03 | |
| Byte Quantity | 0X06 | |
| Register 0 Data (H) | 0X04 | pH value: 11.92pH<br>**Notice:**<br>pH resolution 0.01pH, Register 0 Data (L) 0XA8 2 decimal places |
| Register 0 Data (L) | 0XA8 | |
| Register 1 Data (H) | 0X0B | EC value after temperature compensation: 288.8 µS/cm<br>**Notice:**<br>0 ... 200µS/cm range, 0.01µS/cm resolution, 2 decimal places<br>0 ... 2000µS/cm range, 0.1µS/cm resolution, 1 decimal places<br>0 ... 20000µS/cm range, 0.1µS/cm resolution, 0 decimal places |
| Register 1 Data (L) | 0X48 | |
| Register 2 Data (H) | 0X00 | Temperature value: 20.9°C<br>**Notice:** Temp. resolution 0.1°C, 1 decimal places |
| Register 2 Data (L) | 0XD1 | |
| CRC16 (L) | 0X0 | |
| CRC16 (H) | 0X00 | |

## CALIBRATION INSTRUCTIONS

**pH Calibration Instructions**
The calibration of PH should first select the corresponding calibration channel, and then calibrate the three different solutions in sequence

» Select pH calibration channel

Send command: 01 06 00 6F 00 00 B9 D7
Return data: 01 06 00 6F 00 00 B9 D7

» Select the calibration solution as PH4.00 for calibration

Send command: 01 06 00 69 00 01 98 16
Return data: 01 06 00 69 00 01 98 16 (waiting for 8 seconds)
Return data indicates successful calibration.

» Select the calibration solution as PH6.68 for calibration

Send command: 01 06 00 69 00 02 D8 17
Return data: 01 06 00 69 00 02 D8 17 (waiting for 8 seconds)
Return data indicates successful calibration.

» Select the calibration solution as PH9.18 for calibration

Send command: 01 06 00 69 00 03 19 D7
Return data: 01 06 00 69 00 03 19 D7 (waiting for 8 seconds)

Return data indicates successful calibration.
**Note:** When there is no returned data, it means that the calibration has failed, and the command needs to be sent again.

**EC correction instructions**

» Select EC channel

Sending command: 01 06 00 6F 00 01 78 17
Return data: 01 06 00 6F 00 01 78 17
Waiting for a return indicates successful transmission (this data needs to wait for a long time to be returned).

» Set the EC electrode type (default value 0x0001, corresponding to a resolution of 0.1 electrode, which can also be skipped when using this electrode).

For example, the current electrode is set to a resolution of 0.1 probe. The instruction data is 0x0001
Send command: 01 06 00 5E 00 01 29 D8
Returned data: 01 06 00 5E 00 01 29 D8
Waiting for a return indicates successful transmission (this data needs to wait for a long time to be returned).

» Set the EC electrode constant Electrode constant data=constant value of the probe * 1000.

For example, if the current probe k=0.998, write the hexadecimal number 0x03DC with data of 988.
Send command: 01 06 00 5F 03 DC B8 B1
Returned data: 01 06 00 5F 03 DC B8 B1
Waiting for a return indicates successful transmission (this data needs to wait for a long time to be returned).

» Set the EC compensation value (K value), place the probe in the standard EC solution, and read the current EC value.

According to the comparison between the standard solution value and the reading value, the difference is written in the primary coefficient K.
Calculate the hexadecimal number of compensation data=(compensation*10), for example, to compensate 200, calculate the compensation data as 0X07D0
Send command: 01 06 00 54 07 D0 CB B6
Returned data: 01 06 00 54 07 D0 CB B6

Waiting for a return indicates successful transmission (this data needs to wait for a long time to be returned).

## ATTENTION IN USE

- To ensure correct measurement of the electrode on the pipeline, it is necessary to avoid data inaccuracy caused by bubbles between the measuring cells.
- Please check if the packaging is intact and verify if the product model matches the selection.
- Do not connect live wires. After the wiring is completed and checked to be correct, power can only be applied.
- Do not arbitrarily modify the components or wires that have been welded before the product leaves the factory during use.
- Sensor is a precision device, the user when in use, please do not disassemble, with sharp objects or corrosive liquid contact with the sensor surface, so as not to damage the product;

## DISPOSAL

For the disposal of batteries in the EU, the (EU) 2023/1542 directive of the European Parliament applies. Due to the contained pollutants, batteries must not be disposed of as household waste. They must be given to collection points designed for that purpose. In order to comply with the EU directive 2012/19/EU we take our devices back. We either re-use them or give them to a recycling company which disposes of the devices in line with law. For countries outside the EU, batteries and devices should be disposed of in accordance with your local waste regulations. If you have any questions, please contact PCE Instruments.

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