



User Manual

Online pH/ORP Controller

pH/ORP-510



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1. General

1.1. Overview

PH / ORP-510 pH /ORP controller is a general-purpose, cost-effective online monitoring instrument, which can be equipped with a variety of specifications of two or three composite PH electrodes or ORP electrodes. , Anti-interference, easy installation and simple operation.

- The enlarged LCD screen can display multiple parameters on the same screen;
- pH controller is with dual-mode three-point calibration, qualified with international standards, 4.00 /6.86 /9.18 or 4.01 /7.00 /10.01;
- pH controller supports offline calibration and online calibration;
- Support manual correction of measured values: (manual compensation via PH0 or ORP0)
- 4 ~ 20mA output current, support instrument / transmission dual mode, meet the interface of all (4 ~ 20) mA receiving units;
- Dual relay output control and delay control to meet the PH or ORP interval control and adjustment, which can be easily connected with the dosing pump.

1.2. Measuring principle

When the electrode is immersed in the solution, H⁺ charge, etc. acts on the sensor, which generates a weak voltage change. The changed value is transmitted to the transmitter through the cable. The transmitter converts the measured pH / ORP and temperature signals, calculates and displays the output ;

1.3. Application

This series of meters are suitable for pH / ORP online monitoring in environmental protection engineering, water treatment purification, industrial process monitoring, aquaculture, and other industries.



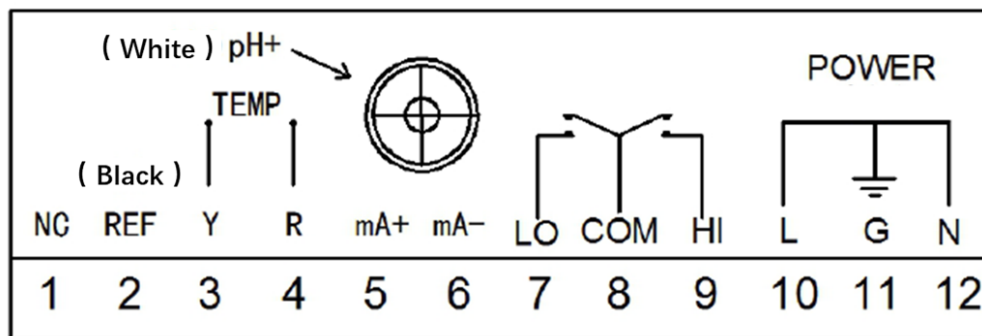
2. Technique specification:

Product Name		PH / ORP-510 pH /ORP transmitter controller
Range:	PH	0.00 ~ 14.00
	ORP	-2000mV ~ 2000mV
	Temperature	0.0 ~ 50.0 °C (NTC 10K)
Resolution:	PH	0.01
	ORP	1mV
	Temperature	0.1°C
Accuracy:	PH	0.1 level
	ORP	$\leq \pm 5\text{mV}$ (Electronic unit)
	Temperature	$\leq \pm 0.5\text{ }^{\circ}\text{C}$
Signal input impedance		$3 \times 10^{11} \Omega$
Calibration standard		pH value: 4.00 /6.86 /9.18 or 4.01 /7.00 /10.01;
Temp. Compensation range		0~ 100.0 °C (On basis of 25°C) Manual or Auto temp. Compensation
Power supply		AC 220V or AC 110V or DC24V
4~ 20mA	Technical feature	Isolated, fully adjustable, reversible, instrumentation / transmission dual mode
	Loop resistance	500Ω max, DC 24V
	Transmit accuracy	$\leq \pm 0.1\text{ mA}$
RS485 communication (optional)		Modbus RTU protocol (Add.: 6-99) (Either RS485 or 4-20mA output)
Control mode	Electrical contacts	Two group relays (Single contact ON/OFF), return difference
	Load capacity	AC220V /AC110V 3A (max limit value)
Power consumption		< 3w
Working environment	Working temp.	0.~ 50°C
	Relative humidity	$\leq 85\%$ (Non-condensing)
Storage environment		Temp.: -200.~ 60°C RH: $\leq 85\%$ (Non-condensing)
Overall dimensions		48×96×100mm (H X W X D))
Hole Size		45×92mm (H X W)
Installation Mode		Panel Mounted (Embedded)



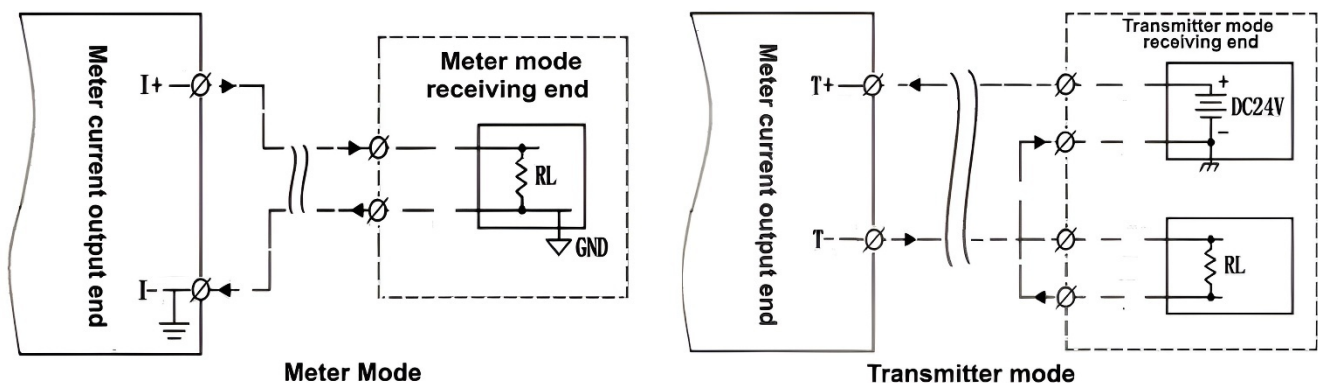
3. Electrical connections:

3.1. Back wire connection:

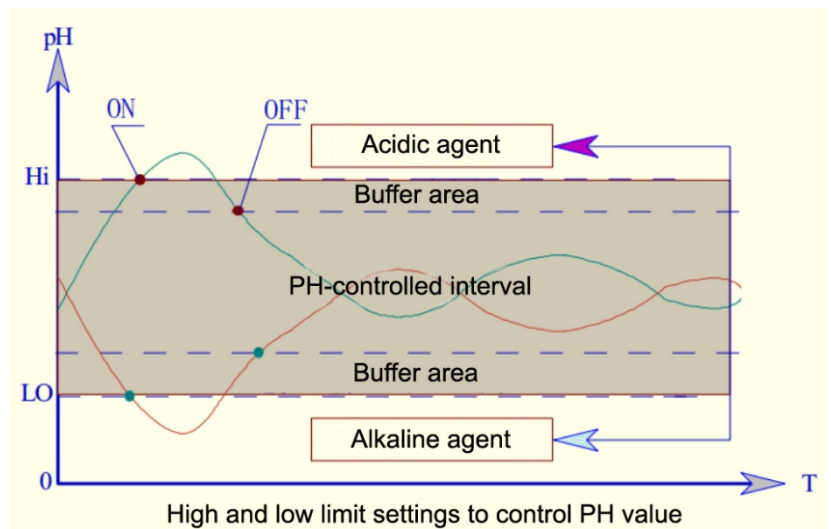
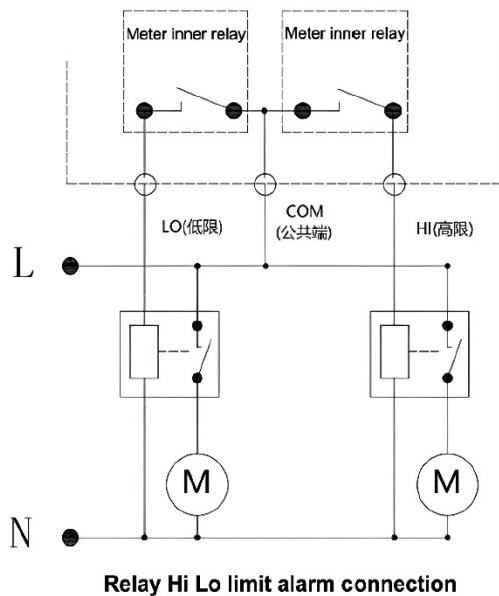


Wiring Position	Notes
1	NC (no connection)
2	PH/ORP Sensor signal REF (Black)
3,4	NTC 10K temp. resistance
5,6	4-20mA output (meter mode), mA+ / mA-
	4-20mA output (transmitter mode) T- /T+
	RS-485 communication A+ B-
7,8	Low limit alarm relay contact (No source, open normally)
8,9	High limit alarm relay contact (No source, open normally)
10,12	Power supply (standard: AC 220V), (110V/ DC24V optional)
11	Equipment ground wire

3.2. 4-20mA wire diagram

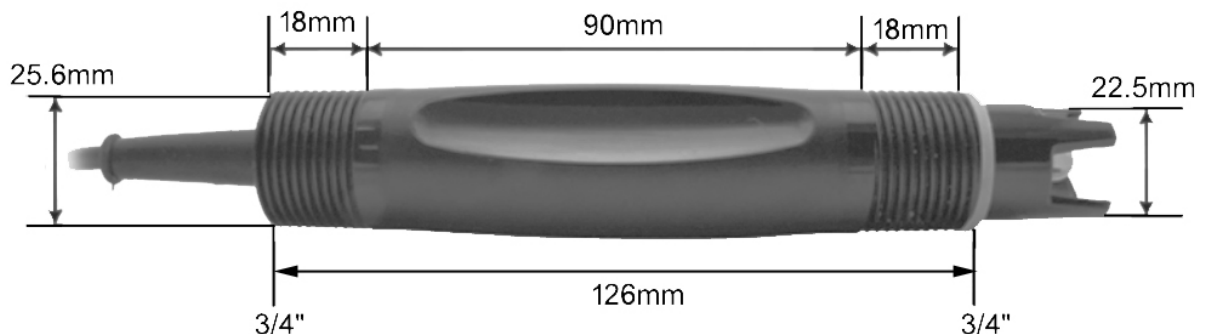


3.3. Relay control output connection diagram



4. PH,ORP sensor (Standard version)

4.1. Technique specification:



Measuring parameter: PH or ORP (temp. Compensation optional)

Sensor cable length: 5m standard (10/15 m optional)

Working pressure: 0.6MPa (6bar)

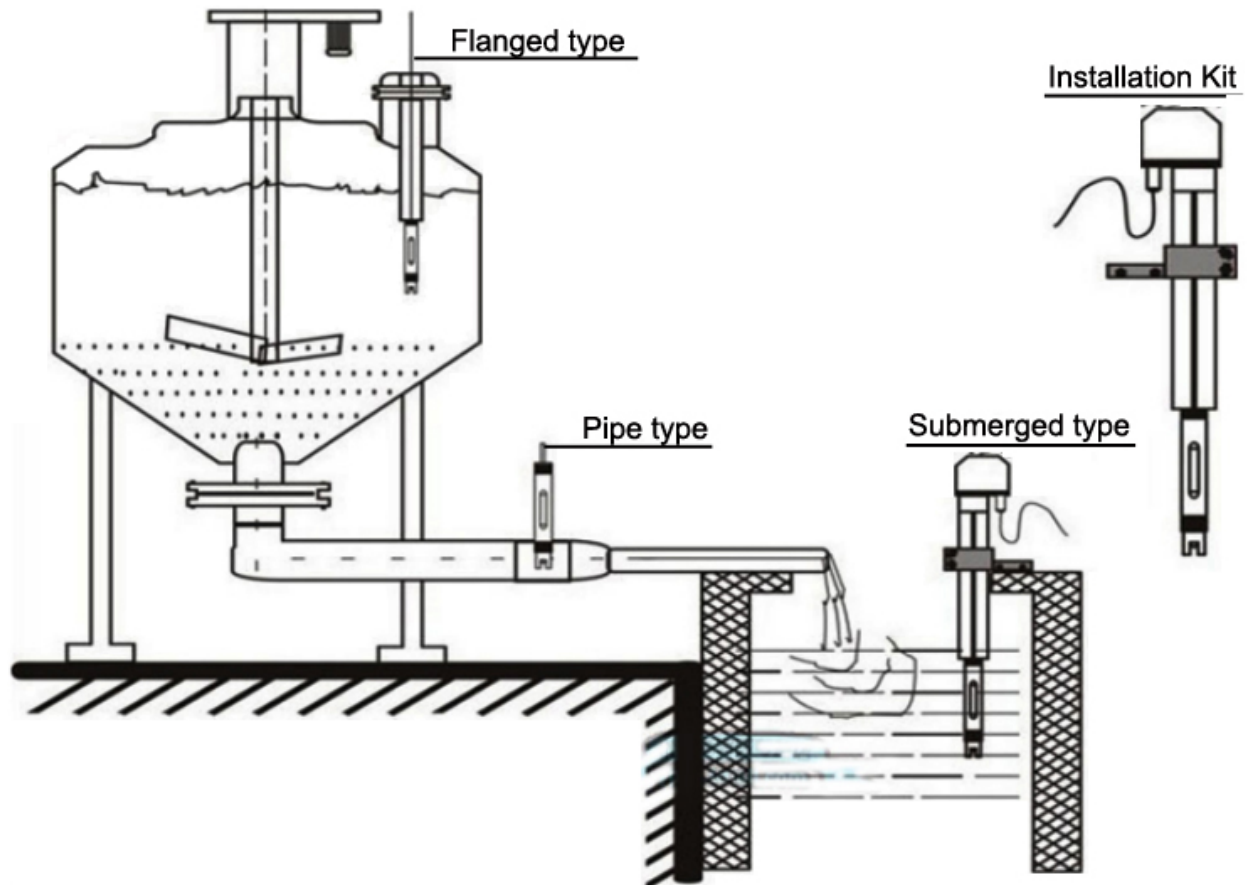
Installation thread size: 3/4" BSP

Material: PS

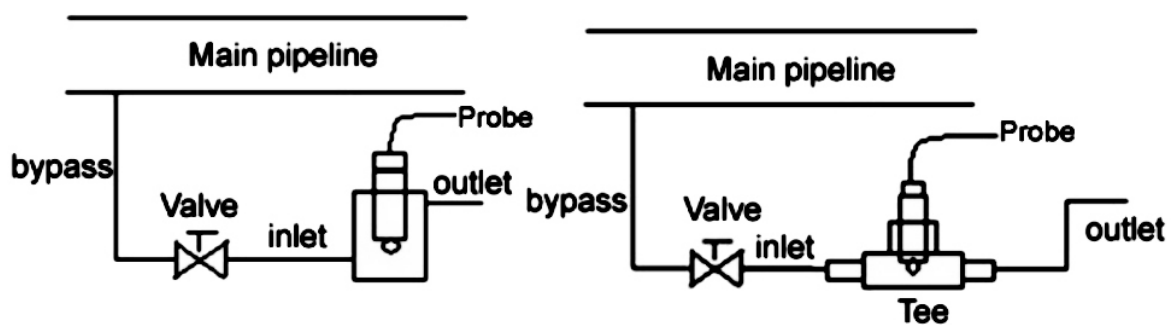
Connection way: Low noise cable pin head



1.1 Sensor installation type:



In order to make sure the probe measure the real value on the pipe, bubbles should be avoided ,otherwise the value will be not accurate, please install according to the following chart:



- Note:
- (1) The electrode should be installed in a bypass line adjacent to the main pipeline. A valve must be installed upstream to control the flow rate, which should be minimized—typically, a steady drip at the outlet is sufficient. The electrode must be mounted vertically and immersed in the active water flow. The outlet should be positioned higher than the inlet to ensure the electrode remains fully submerged in the solution.
 - (2) The probe should be calibrated before installation.
 - (3) The measurement signal is a weak electrical signal. Its cable must be routed independently and is prohibited from being connected to the same set of cable connectors



or terminal blocks as power lines or control lines, to avoid interference or damage to the measuring instrument.

(4) For extended cable requirements beyond standard length, consult the supplier during order placement. Maximum extension: 30m

5. Operation

The instrument and sensors must be physically and electrically installed and connected as required before proceeding to the debugging phase. After powering on, the instrument operates in measurement mode, and the display shows the measured pH/ORP values. To adapt the instrument for practical application, you must enter the setup mode during initial use to verify and configure these data parameters.



Note:

The main interface measurement mode can simultaneously display on the same screen: pH/ORP value, current 4-20mA output value, and current temperature value.

H: 25.0°C: H: Manual temperature mode
A: Automatic temperature mode;

Key Description:

Key	Name	Main interface	Menu options	Parameter set
	Right Shift key	Shift to display PH or mV value	Next item, user parameter select	Select Thousands, Hundreds, Tens, and Units
	Up key	Under pH mode, quick enter into manual temp. Value setting	Invalid	Selected bits, numbers are incremented 0-9
	Enter key	Enter into CODE Password input interface	Enter into	Confirm



User Menu setup instructions

No.	Code	Function description	Set Range
1	CELL	PH or ORP sensor	PH /ORP
2	CON	Correction of error coefficient	0.000-9.999
3	Hi ON	High limit alarm relay pull-in value	Full range
4	Hi OFF	High limit alarm relay off value	Full range
5	Lo ON	Low limit alarm relay pull-in value	Full range
6	Lo OFF	Low limit alarm relay disconnect value	Full range
7	a 4	4mA output correspond measuring value	Full range
8	a 2 0	20mA output correspond measuring value	Full range
9	a l a	Buzzer alarm switch	ON/OFF
10	Dly	Alarm delay (alarm after X seconds)	0-99 Second
11	PH-T	pH temp. Compensation mode (Manual:H, Automatic: A)	A /H
12	PH-3	pH three points calibration mode: 6.86: is 4.00、 6.86、 9.18; 7.00: is 4.01、 7.00、 10.00;	6.86 /7.00
13	A.C AL	pH three points calibration (online)	
14	H.C AL	pH three points calibration (offline)	
15	PH 0	pH value compensation by Manual Description: Current pH value + PH0 setting value = final display value	-14.00~+14.00
16	ORP 0	ORP value compensation by manual (ORP mode) Description: Current ORP value + ORP0 setting value = final display value	-1999~+1999
17	485	RS485 Communication set ADDR:Communication address set 1-99 (Add.: 1-5: Adaptation dedicated communication test software) (Add.: 6-99: RTU Protocol);	
		BPS:Communication baud rate setting (1520: is 115200)	1200/2400/4800/9600/115200
18	Code	User password modification	0000-9999



6. Sensor calibration details:

6.1. Preparation before calibration:

A pH sensor is an electrochemical sensor whose sensitivity undergoes a gradual attenuation over time and is influenced by the measured solution, which is determined by its characteristics.

To maintain a high measurement accuracy, it is necessary to regularly calibrate the sensor slope of the instrument. The calibration frequency is subject to the impact of the measured solution to the sensor.

- This meter has built-in dual mode buffer calibration 4.00 / 6.86 / 9.18 or 4.01 / 7.00 / 10.00 for selection;
- Two-point slope calibration can be selected when the measured medium operates solely in either an acidic or alkaline state;
- Please configure the buffer solution according to relevant standards before calibration. The correct preparation of the buffer is the key to calibration;
- This meter also provides an offline calibration method for directly inputting the mV value of the pH sensor. For details, refer to the **manual calibration operation** section;
- For pH sensor that has been stocked for a long time, it must be immersed in water or KCl solution for 12 hours before calibration.

6.2. Buffer solution calibration

- Follow the instructions, select the buffer substance per relevant the measurement range, and prepare the buffer solutio;
- Under the pH measurement main interface, press Enter Key  to display CODE, press  again to go to user password interface and the display shows "0000", then input the default user password "1000", then go into the setting menu. It shows "ERR" for wrong user password;
- Press the Right Shift Key , and then Enter Key  to set each paramter. Keep these steps until "END" is displayed and all parameters are saved and stored;
- If select the setting of PH-3, we shall choose the matching buffer solution, for example: 6.86;

If the pH electrode is a 2-wire system (without temperature measurement), set **PH-T** to **H** (manual temperature compensation) and enter the manual temperature value to match that of the buffer solution. If the pH electrode is a 4-wire system, set **PH-T** to **A** (automatic temperature compensation).



Start calibration:

- e. Select **A.CAL** to enter the pH three-point calibration interface; and the display would show 4.00;
- f. Put the sensor in distilled water and clean it, then put the sensor into 4.00 buffer solution, press **Enter Key**  to enter the mV value interface in accordance with 4.00, wait for **1 to 5 minutes**; when the mV value is stable, press **Enter Key**  to save;

If it goes well, it will display ---- **YES**. If the operation is wrong, or the sensor fails, or the buffer configuration is incorrect, **ERR** will be displayed. You now need to check whether the buffer solution is correctly prepared, and then re-calibrate.

- g. After the **4.00 calibration** is completed, clean the sensor again; and then put it in the 6.86 buffer solution. The calibration method is the same as that for 4.00. Repeat these steps until 9.18 calibration is completed.
- h. After the whole calibration is done, clean the sensors, put them into these buffer solution again, and check whether the PH display value is consistent with the current buffer value. If they show a big difference, you need to re-calibrate;

Note:

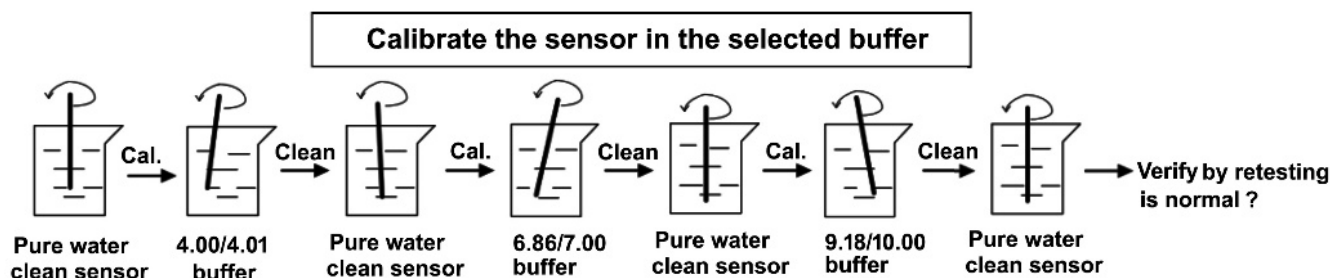
Before putting the sensor into the buffer solution, the sensor must be washed with distilled water, so as to prevent the liquid remaining on the sensor from causing errors to the buffer solution;

1: Set PH-3

(Three-point calibration mode selection)

2: Set PH-T

(Set the temperature to the same as the buffer temperature)



7. Offline calibration

When on-site calibration is impractical, the sensor slope can be offline-calibrated using laboratory instruments and matching buffer solutions. This method involves recording the mV values of the sensor corresponding to buffer solution options at room temperature and manually entering these recorded values into the offline calibration menu, which is termed "Manual Input Calibration."

Select **H.CAL** in the user menu, input the corresponding **mV values** of the corresponding sensors in buffer solutions, and press Enter Key  to save.

Note: After modifying the parameters in the user menu, press Enter Key  to save, and then press Right Shift Key . It shows "END" when all parameters are set. The instrument saves all parameters and then go back to main interface;

8. Sensor maintenance

1. The pH sensor must not be stored dry. For long-term storage, it should be cleaned thoroughly and immersed in a protective sleeve filled with 3.0 mol/L potassium chloride (KCl) solution;
2. It is recommended to periodically clean the sensor according to the condition of the measurement medium and calibrate it with the matching instrument;
3. If the sensor is attached to suspended matter, we shall wash it with **0.01mol/L HCl** or **NaOH** solution, and then wash with pure water;
4. If the calibration cannot be completed well even with all the above methods, it means the sensor is no longer workable and a new sensor is needed;
5. For ORP sensor, the surface of its platinum ring is normally bright, and the suspended matter on the surface will affect the measurement accuracy. We shall wash it with **0.01mol/L HCl** or **NaOH** solution, and then wash with pure water; but the surface gets rough due to strong oxidation or reduction, and this affects the response potential. Toothpaste can be used to polish the platinum surface, followed by thorough rinsing with purified water;
6. After the sensor is cleaned well, it is recommended to immerse the sensor in **3.0mol/L potassium chloride (KCL)** solution for **6 hours**.
7. The calibration buffer solution for the pH sensor and meter must be performed at room temperature (about 25°C).



9. Precautions for sensor use

1. The pH / ORP sensor is a consumable sensor. It will naturally fail if it is stored for too long. It is recommended to use it immediately, and do not store it for a long time.
2. The sensitive glass films (glass bulbs) is prohibited to use in environments containing hydrofluoric acid, fluoride ions and high concentrations of sulfur ions;
3. The PH/ORP sensor is strictly forbidden to measure the organic solution (such as carbon tetrachloride, trichloroethylene, tetrahydrofuran, etc.) that can dissolve PC and ABS with the standard pH / ORP sensor, otherwise the sensor will be damaged;
4. The chemical part of the sensor is glass, please pay attention to vibration prevention during operation, storage and transportation;
5. Please use cotton swabs and neutral mild detergents to clean the surface of glass bulbs and liquid junctions. Do not use acidic or corrosive solutions or abrasives to clean them.
6. High temperature pH glass sensor is recommended for biopharmaceuticals and autoclaving, and it should be used with a pressurized protective sheath.
7. The pH signal is a weak potential signal, and its collection cable should be routed independently. It is forbidden to run through the tube with strong electricity or wiring.
8. The sensor lead is a low-noise dedicated cable, and non-professionals cannot cut or extend it without permission;
9. When measured liquids containing small particles, need to install a filter in front of the measuring sensor to prevent particles the impact of pellets on pH glass bulbs.



10. Common Issues and solutions

Symptom	Possible causes	Recommended solutions
No display after powered on	A: Power is not well connected B: Meter fault	A: Check the meter power supply terminals whether there is voltage. B: Pls professional maintenance personnel .
Display is not stable	A: Sensor connection wrong, B: Flow rate too fast C: Water quality is not stable D: Bad connector connect	A: Change sensor installation way as per operation manual, B: Install a flow device to slow down the flow rate C: Exclude the meter problem by stable water sources D: Check connectors and ensure good contact
Measuring value deviation is large	A: Sensor failure, B: Cable is damaged C: Sensor is installed in dead angle D: Incorrect meter settings	A: Disconnect the sensor from the tubing and calibrate with buffer, B: Check cables and replace sensors that cannot be calibrated, C: Change measurement points or use flow devices D: re-set meter parameter
Inconsistent transmission and display	A: loop resistance too big B: Wrong connection mode C: Abnormal feed voltage D: Secondary migration error	A: Replace signal loop cables to reduce loop resistance B: Check if meter or transmission mode connection is correct C: Supply power according to feed standard D: Reset the migration correspondence



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