



## **Industrial on-line pH/ORP - 9900 controller**

### **Operating manual**



**Initial password: 0000**

Note: please read the manual carefully before use.

## 1. Applicable occasions

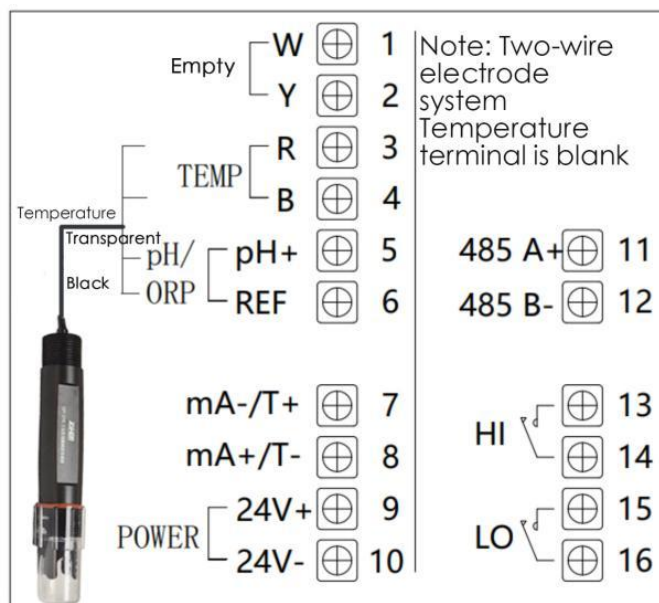
This product is widely used in: water treatment equipment, environmental engineering, pharmaceuticals, electronics, chemical industry, agricultural planting, aquaculture, scientific research institutes, electroplating, metallurgical manufacturing, mechanical processing and other industries.

## 2. Technical performance

| Product Name                        |                       | pH/ORP-9900                                                                                                  |
|-------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------|
| Range                               | pH                    | 0.00~14.00 pH                                                                                                |
|                                     | ORP                   | -2000mV~2000mV                                                                                               |
|                                     | Temperature           | 0.0~50.0°C (temperature element: NTC10K)                                                                     |
| Resolution                          | pH                    | 0.01                                                                                                         |
|                                     | ORP                   | 1mV                                                                                                          |
|                                     | Temperature           | 0.1°C                                                                                                        |
| Accuracy                            | pH                    | 0.1Level                                                                                                     |
|                                     | ORP                   | ≤±5mV (electronic unit)                                                                                      |
|                                     | Temperature           | ±0.5°C                                                                                                       |
| Signal input Impedance              |                       | 3×10 <sup>11</sup> Ω                                                                                         |
| Support buffer solution             |                       | pH:4.00/6.86/9.18 or 4.01/7.00/10.00                                                                         |
| Medium temperature compensaionrange |                       | 0~100°C(With 25 degrees uncompensated base)<br>Manual and automatic temperature compensation can be selected |
| (4~20)mA                            | Technical Features    | Isolated, fully adjustable, reversible, meter/transmitter dual mode                                          |
|                                     | Loop resistance       | 500Ω(max), DC24V                                                                                             |
|                                     | Transmission accuracy | ≤±0.1mA                                                                                                      |
| RS485 Communicat(onoptional)        |                       | ModbusRTU protocol (addresses 1-99);                                                                         |
| Control node                        | Electrical contact    | Double relay (single contact ON/OFF), return differential type                                               |
|                                     | Load capacity         | AC220V/AC110V3A(max limit value)                                                                             |
| Power interface                     |                       | AC220V(±10V);optional AC110V or DC24V                                                                        |
| Environmental requirement           | Operating temperature | 0~50°C                                                                                                       |
|                                     | Relative humidity     | ≤85%RH(no condensation)                                                                                      |
| storage environment                 |                       | Temperature :(-20~60) °C; Relative humidity :≤85%RH(non-condensing)                                          |
| boundary dimension                  |                       | 96*96*72 mm (Length * width * depth)                                                                         |
| hole size                           |                       | 92*92(Length * width)                                                                                        |
| Installation method                 |                       | Tray loading                                                                                                 |



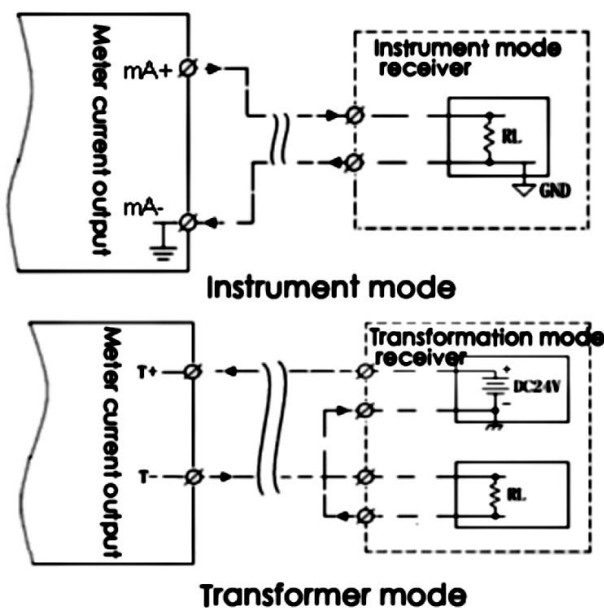
### 3. Electrical connections



Rear Terminal Board Diagram

- 1.2 Empty
- 3.4 Red line R and black line B at the temperature measurement end
- 5.6 PH+ REF (PH/ORP electrode input, REF internal ground)
- 7.8 (T-, T+) 4-20mA output Variable transmission mode
- 7. 8 (mA+, mA-) 4-20mA output Meter mode
- 9. 10 DC24V power input
- 11.12 RS485 communication port
- 13. 14 Relay High Limit Node (Passive Normally Open)
- 15. 16 Relay Low Limit Node (Passive Normally Open)

#### Attachment: 4-20mA output transmission connection diagram



## 4. Instrument operation



“↑”Number increment key

“↓”Number decrease key

“→”Cursor Right Key

“OK”Confirm Key

Tip.

Main interface measurement mode can be displayed on the same screen: PH /ORP value, current 4-20mA output value, current temperature value.

### 1 Instrument parameter setting instructions:

| Name             | Main interface                                                 | User Menu Options                              | Parameter settings                                                              |
|------------------|----------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------------------------------|
| Incremental bond | When in pH mode, quickly enter Manual temperature setting;     | Invalid                                        | The selected bit is incremented by 0-9                                          |
| Descending key   | When in pH mode, quickly enter Manual temperature setting;     | Invalid                                        | The selected bit is incremented by 0-9                                          |
| Right shift key  | Switch between displaying pH values and Corresponding mV value | Flip page, next item, User parameter selection | Select the thousands, hundreds, tens, or digits of the value you want to modify |
| ENTER            | Enter CODE Password input interface                            | Enter this item                                | confirm                                                                         |

### 2 User Parameter Setting Menu Description

| No. | Parameter Code | Function Description                                                                                                                    | Set range     |
|-----|----------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------|
| 1   | C E L L        | Selection of electrode type; PH or ORP                                                                                                  | PH /ORP       |
| 2   | C O N          | Error coefficient correction                                                                                                            | 0.000-9.999   |
| 3   | H I O N        | High limit alarm relay engagement value                                                                                                 | Full Range    |
| 4   | H I O F        | High limit alarm relay disconnection value                                                                                              | Full Range    |
| 5   | L o o n        | Low limit alarm relay engagement value                                                                                                  | Full Range    |
| 6   | L o o f        | Low limit alarm relay disconnection value                                                                                               | Full Range    |
| 7   | a 4            | Range value corresponding to 4mA output                                                                                                 | Full Range    |
| 8   | a 2 0          | Range value corresponding to 20mA output                                                                                                | Full Range    |
| 9   | a l a          | Buzzer alarm switch                                                                                                                     | ON/OFF        |
| 10  | D l y          | Alarm delay (alarm after X seconds delay)                                                                                               | 0-99 seconds  |
| 11  | P H - T        | PH temperature compensation mode (manual: H, automatic: A)                                                                              | A /H          |
| 12  | P H - 3        | PH three-point calibration mode selection: 6.86: represents 4.00, 6.86, 9.18; 7.00: represents 4.01, 7.00, 10.00;                       | 6.86 /7.00    |
| 13  | A.C A L        | PH triple calibration (online calibration)                                                                                              |               |
| 14  | H.C A L        | PH triple calibration (offline calibration)                                                                                             |               |
| 15  | P H 0          | Manual pH compensation<br>Function description: Current pH value+PH0 set value=final displayed value.                                   | -14.00~+14.00 |
| 16  | O R P 0        | Manual compensation of ORP value (displayed in ORP mode)<br>Function description: Current ORP value+ORP0 set value=Final display value. | -1999~+1999   |
| 17  | 4 8 5          | RS485 communication settings<br>ADDR: Communication address setting 1-99<br>(Address 1-5: Adapt to dedicated                            |               |



|    |         |                                                                                                                                  |              |
|----|---------|----------------------------------------------------------------------------------------------------------------------------------|--------------|
|    |         | communication testing software)<br>(Address 6-99: Modbus RTU protocol;<br>BPS: Communication Baud Rate Setting<br>(1520: 115200) | 1200--115200 |
| 18 | C O D E | User password modification                                                                                                       | 0000-9999    |

### 3 Matching and calibration of sensors

PH sensor is an electrochemical sensor whose sensitivity decays with time and the influence of the measured medium, which is determined by the characteristics of the sensor. To maintain accurate measurement data, it is necessary to regularly calibrate the sensor slope of the instrument, and the calibration period is determined by the degree of influence of the measured medium on the sensor.

- ① This instrument is equipped with dual mode buffer calibration 4.00/6.86/9.18 or 4.01/7.00/1.00 for selection;
- ② When the measuring medium operates in a single state of acidity or alkalinity, two point slope calibration can be selected;
- ③ Before calibration, please configure the buffer according to the standard. Correct preparation of the buffer is the key to calibration;
- ④ This instrument also provides an offline calibration method for directly inputting the mV value of the pH sensor, as detailed in the manual calibration operation;
- ⑤ PH sensors that have been placed for a long time must be immersed in water or KCl solution for 12 hours before calibration.

### 4 Buffer calibration

- ① Select buffer substances based on the measurement range and prepare the buffer solution correctly according to the instructions;

② Under the main interface of. pH measurement, press the Enter key to display CODE. Press the Enter key again to display 0000. In the user password input interface, enter the user password with a default value of 1000. After entering the correct password, enter the user parameter setting menu. If the password input is incorrect, it will display ERR and need to be re-entered;

Preparation before calibration:

- ③ Press the → key, select the parameter name to be set, press the Enter key to enter the setting, and press the Enter key to confirm after the setting is completed; Press the → key until "END" is displayed, and all parameters are saved and stored.

- ④ Select the setting option for PH-3, which should be consistent with the buffer used; For example: 6.86

If the PH electrode is a two wire system (without temperature measurement), it is necessary to change PH-T to H manual temperature compensation and set the manual temperature value to be consistent with the buffer solution; If the PH electrode is a 4-wire system, it is necessary to change PH-T to A;

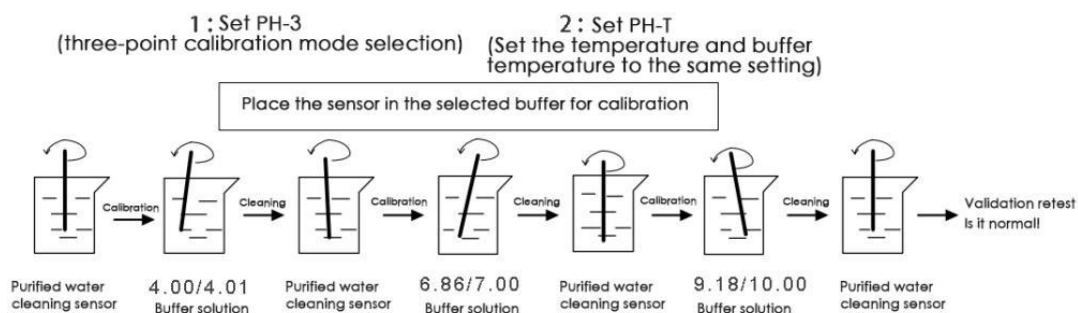
Start calibration:

- ⑤ Select A.CAL to enter the pH three-point calibration interface; Display 4.00 after entering

- ⑥ Clean the electrode in distilled water, then place the sensor in 4.00 buffer solution, press Enter to enter the mV value display interface corresponding to 4.00, and wait for 1-5 minutes; When the mV value stabilizes, press the Enter key to save; If it is normal, it will display - YES. If there is an operation error, electrode failure, or buffer configuration issue, it will display ERR. It is necessary to check whether the buffer solution is properly prepared and recalibrate.

After the calibration is completed at 4.00, clean the electrode again and place it in a 6.86 buffer solution. The calibration method is the same as at 4.00 until the calibration is completed on 9.18.

After the electrode calibration is completed, clean the electrode and place it in the buffer solution in turn. Check whether the pH display value is consistent with the current buffer solution value. If the error is significant, recalibration is necessary; Note: Before inserting the electrode into the buffer solution, the electrode must be cleaned with distilled water to avoid any errors caused by the liquid remaining on the electrode in the buffer solution;



## 5 Offline calibration

When on-site calibration is inconvenient, laboratory instruments and supporting buffer solutions can be used to calibrate the slope of the sensor offline. The mV value of the corresponding buffer solution option for the sensor at room temperature can be recorded, and the method of inputting this recorded value into the offline calibration option is called manual input calibration.

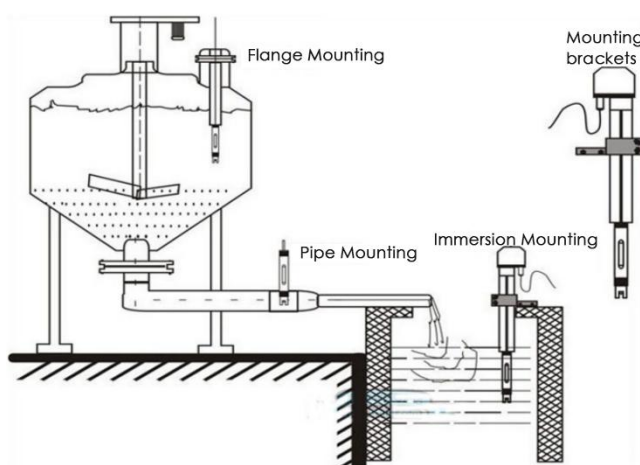
Select H.CAL from the user menu, enter the corresponding mV values of the matching sensors in different standard buffer solutions, and press the "Enter" key to save.

Note: After modifying the parameters in the user menu, press the Enter key to save, and then press the → key until "END" is displayed. After that, the instrument will save all parameters and store them in the memory;

Sensor maintenance

- ① The pH sensor should not be stored dry, and should be cleaned and soaked in a protective sleeve of 3.0mol/L potassium chloride solution when not in use for a long time;
- ② It is recommended to regularly clean the sensor according to the condition of the measuring medium and calibrate it with supporting instruments;
- ③ If the sensor is attached to suspended solids, it can be rinsed with 0.01mol/L HCl or NaOH solution, and then washed clean with pure water;
- ④ If the above methods are used to maintain and maintain the sensor, but the instrument calibration cannot be completed, it indicates that the sensor is no longer usable and needs to be replaced with a new chemical sensor;
- ⑤ The surface of the ORP sensor platinum ring is normally bright, and the adhesion of suspended solids on the surface can affect the measurement. It can be cleaned with 0.01mol/L HCl or NaOH solution, and then cleaned with pure water; The surface roughness caused by strong oxidation or reduction can affect the response potential of the sensor. Toothpaste can be used to profile the platinum surface and then clean it with pure water;
- ⑥ It is recommended to immerse the cleaned sensor in a 3.0mol/L potassium chloride solution and hydrate for 6 hours before use;
- ⑦ When calibrating the pH sensor and instrument, the buffer solution must be tested at room temperature (around 25 °C).

## 5.Installation (electrode installation)



Note:

1: The electrode should be installed in the bypass beside the main road, and a valve should be installed in the front section to control the flow rate and minimize the flow rate as much as possible. Generally, as long as there is a stable water solution dripping out of the outlet, it is sufficient. The electrode should be installed vertically and deeply into the active water body, and the outlet should be higher than the inlet to ensure that the electrode is completely immersed in the solution.

2: The electrode has been calibrated before leaving the factory. If measurement errors occur, users can calibrate the electrode again or manually correct it.

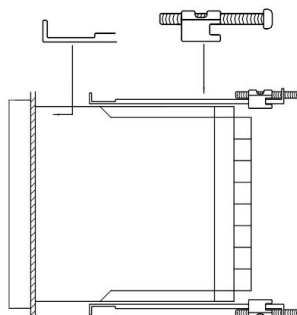
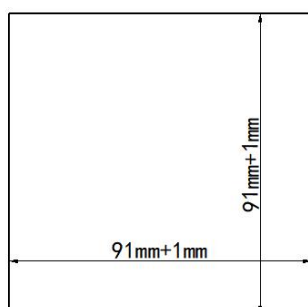
3: Measurement signals belong to weak electrical signals, and their signal cables should be routed independently. It is prohibited to connect them to the same group of cable connectors or terminal boards as power and control lines to avoid interference or breakdown of the measurement instrument.

4: When measuring cables that need to be extended, please contact the supplier and agree before supply (usually no more than 30 meters).



## Instrument installation

1. Make a rectangular incision on the instrument cabinet or installation panel.
2. Insert the instrument into the instrument cabinet and tighten the locking strip.



## 6. Precautions for using sensors

1. pH/ORP sensors are consumable sensors that will naturally fail if stored for too long. It is recommended to buy and use them immediately, rather than storing them for a long time;
  2. It is prohibited to use sensitive glass film (glass bulb) in environments containing hydrofluoric acid, fluoride ions, and high concentrations of sulfur ions;
  3. It is strictly prohibited to use standard pH/ORP sensors to measure organic solutions that can dissolve PC and ABS (such as carbon tetrachloride, trichloroethylene, tetrahydrofuran, etc.), otherwise the sensor will be damaged;
  4. The chemical part of the sensor is a glass body, please pay attention to vibration prevention during operation, storage, and transportation;
  5. Please use cotton swabs and neutral mild cleaning agents to clean the glass bulb and liquid interface surface, and do not use acidic, corrosive or other strong solutions or abrasives to clean;
  6. For biopharmaceuticals and high-pressure sterilization, it is recommended to use high-temperature pH glass sensors with pressure jackets;
  7. The pH signal is a weak potential signal, and its collection cable should be routed independently. It is prohibited to run the tube together with strong electricity
- Or wiring;
8. The sensor lead wire is a low noise specialized cable, and non professionals are not allowed to cut or extend it without permission;
  9. When measuring the pH of a fluid containing small particles, a filter should be installed in front of the measuring sensor to prevent particles
- Impact of particles on pH glass bubbles.

## 7. Common Questions:

| phenomenon                                     | Possible factor                                                                                                                                                       | Judgment analysis and processing                                                                                                                                                                                                                                        |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The meter has no display after power-on        | A. The power supply is faulty<br>B. The instrument is faulty                                                                                                          | A. Check whether the power terminal of the instrument has voltage<br>B. Ask for professional maintenance                                                                                                                                                                |
| Display instability                            | A. The sensor is incorrectly installed<br>B. The flow rate is too high<br>C. The water quality is unstable<br>D. The connector is in poor contact                     | A. Rectify the sensor installation according to the standard<br>B. Install circulation devices to slow down the flow rate<br>C. Use a stable water source to remove the meter cause<br>D. Check the connectors and ensure that they are in good contact                 |
| The deviation of the measurement data is large | A. The sensor is faulty<br>B. The cable is damaged<br>C. Dead corners exist in the installation<br>D. The instrument is incorrectly set                               | A. Remove the sensor from the pipe and calibrate it with buffer solution<br>B. Check the cables and replace the sensor that cannot be calibrated<br>C. Analysis and improvement of measuring points or use of circulation devices<br>D. Reset the instrument parameters |
| The transmission and display are inconsistent  | A. The circuit resistance is too large<br>B. The connection mode is incorrect<br>C. The feed voltage is abnormal<br>D. The amount of secondary migration is incorrect | A. Replace the signal circuit cable to reduce the circuit resistance<br>B. Check whether the meter or transmission mode is correctly connected<br>C. Supply power according to the feed standard<br>D. Reset the mapping relationship between migration volumes         |



## 8. Maintenance:

1. The measuring electrode is a precision component that cannot be disassembled and cannot change the shape and size of the electrode;
2. The measuring cable is a dedicated cable and cannot be replaced arbitrarily.
3. The instrument should be placed in a dry environment or control box to avoid being caused by water droplets splashing or moisture inaccurate measurement or leakage of the meter.

## 9. Product completeness

- 1 transmission controller host (one pair of fixed clamps for the instrument host)
- 1 operating manual
- 1 matching electrode (electrode specifications need to be determined before ordering)