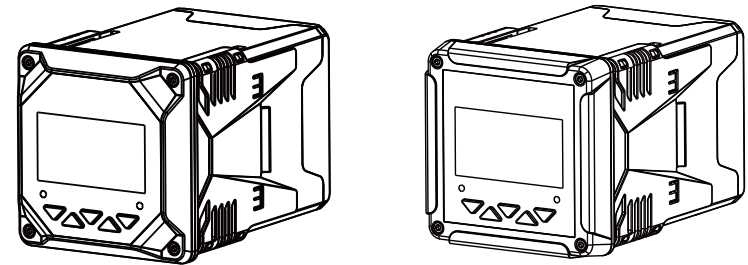


User Manual

pH/ORP Controller

U-8.6HP/5.6HP-EN6



Preface

Thank you for purchasing pH/ORP controller. Please read this manual carefully before operating and using it correctly to avoid unnecessary losses caused by false operation.

Note

- Modification of this manual's contents will not be notified as a result of some factors, such as function upgrading.
- We try our best to guarantee that the manual content is accurate, if you find something wrong or incorrect, please contact us.
- This product is forbidden to use in explosion-proof occasions.

Version

U-8.6HP/5.6HP-EN6

Safety Precautions

In order to use this product safely, be sure to follow the safety precautions described.

About this manual

- Please submit this manual to the operator for reading.
- Please read the operation manual carefully before applying the instrument. On the precondition of full understanding.
- This manual only describes the functions of the product. The company does not guarantee that the product will be suitable for a particular use by the user.

Precautions for protection, safety and modification of this product

- To ensure safe use of this product and the systems it controls, Please read carefully the operation manual and understand the correct application methods before putting into operation, to avoid unnecessary losses due to operation mistakes. If the instrument is operated in other ways not described in the manual, the protections that the instrument give may be destroyed, and the failures and accidents incurred due to violation of precautions shall not be borne by our company.
- When installing lightning protection devices for this product and its control system, or designing and installing separate safety protection circuits for this product and its control system, it needs to be implemented by other devices.
- If you need to replace parts of the product, please use the model specifications specified by the company.
- This product is not intended for use in systems that are directly related to personal safety. Such as nuclear power equipment, equipment using radioactivity, railway systems, aviation equipment, marine equipment, aviation equipment and medical equipment. If applied, it is the responsibility of the user to use additional equipment or systems to ensure personal safety.

-
- Do not modify this product.
 - The following safety signs are used in this manual:



Hazard, if not taken with appropriate precautions, will result in serious personal injury, product damage or major property damage.



Warning: Pay special attention to the important information linked to product or particular part in the operation manual.



- Confirm if the supply voltage is in consistent with the rated voltage before operation.
- Don't use the instrument in a flammable and combustible or steam area.
- To prevent from electric shock, operation mistake, a good grounding protection must be made.
- Thunder prevention engineering facilities must be well managed: the shared grounding network shall be grounded at is-electric level, shielded, wires shall be located rationally, SPD surge protector shall be applied properly.
- Some inner parts may carry high voltage. Do not open the square panel in the front except our company personnel or maintenance personnel acknowledged by our company, to avoid electric shock.
- Cut off electric powers before making any checks, to avoid electric shock.
- Check the condition of the terminal screws regularly. If it is loose, please tighten it before use.
- It is not allowed to disassemble, process, modify or repair the product without authorization, otherwise it may cause abnormal operation, electric shock or fire accident.
- Wipe the product with a dry cotton cloth. Do not use alcohol, benzine or other organic solvents. Prevent all kinds of liquid from splashing on the product. If the product falls into the water, please cut off the power

immediately, otherwise there will be leakage, electric shock or even a fire accident.

- Please check the grounding protection status regularly. Do not operate if you think that the protection measures such as grounding protection and fuses are not perfect.
- Ventilation holes on the product housing must be kept clear to avoid malfunctions due to high temperatures, abnormal operation, shortened life and fire.
- Please strictly follow the instructions in this manual, otherwise the product's protective device may be damaged.



- Don't use the instrument if it is found damaged or deformed at opening of package.
- Prevent dust, wire end, iron fines or other objects from entering the instrument during installation, otherwise, it will cause abnormal movement or failure.
- During operation, to modify configuration, signal output, startup, stop, operation safety shall be fully considered. Operation mistakes may lead to failure and even destruction of the instrument and controlled equipment.
- Each part of the instrument has a certain lifetime, which must be maintained and repaired on a regular basis for long-time use.
- The product shall be scrapped as industrial wastes, to prevent environment pollution.
- When not using this product, be sure to turn off the power switch.
- If you find smoke from the product, smell odor, abnormal noise, etc., please turn off the power switch immediately and contact the company in time.

Disclaimer

- The company does not make any guarantees for the terms outside the scope of this product warranty.
- This company is not responsible for damage to the instrument or loss of parts or unpredictable damage caused directly or indirectly by improper operation of the user.

No.	Name	Quantity	Note
1	pH/ORP Controller	1	
2	Manual	1	
3	Certificate	1	

After opening the box, please confirm the package contents before starting the operation. If you find that the model and quantity are incorrect or there is physical damage in appearance, please contact us.

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Chapter 1 Introduction

Independent research and development of electronic online monitoring pH / ORP value, through the RS485 or current transmission remote access to the monitoring room for record and save.

pH / ORP meter is one of the intelligent online chemical analysis equipment, is a widely used in thermal power, chemical fertilizer, metallurgy, environmental protection, Pharmaceutical, biochemical, food and tap water solution pH value or ORP value and temperature of the continuous monitor.

Continuous monitoring data through the transmission output connection recorder to achieve remote monitoring and recording, you can also connect the RS485 interface through the MODBUS-RTU protocol can be easily connected to the computer to achieve monitoring and recording.

1.1 Characteristics

- Design of board card modularity, for convenience of assembly and configuration.
- 2.4 inches 128*64 lattice screen.
- Isolating transmitting output, with little interference.
- Isolating RS485 communication.
- Can be pH / ORP measurement, temperature measurement, upper and lower limit control, transmission output, RS485 communication.
- Configurable manual and auto temperature offset function.
- Configurable upper/lower limit warning and delay.
- Configurable hummer and LCD backlight switch.

1.2 Parameter

Table1

Screen size	2.8 inch monochrome LCD with a resolution of 128*64
Overall dimension	PH6.5: 100mm×100mm×150mm PH6.8: 100mm×100mm×150.5mm
Cutout dimension	92.5mm×92.5mm
Weight	0.58kg
Ingress protection	IP5X
Measure variables	pH/ORP
Measure range	pH: (0.00 ~ 14.00) pH ORP:(-2000 ~ 2000) mV
Accuracy	pH: ±0.02pH ORP: (-2000 ~ -1000) mV, ±2mV (-1000 ~ 1000) mV, ±1mV (1000 ~ 2000) mV, ±2mV
Input resistance	≥10 ¹² Ω
Temperature compensation	NTC10K: (-10~60) °C Accuracy ±0.3°C (60~130) °C Accuracy ±2°C Pt1000 , Pt100(Customized): Accuracy ±0.3°C Range: (-10 ~130)°C manual/automatic
Output	(4~20) mA output, maximum loop is 750Ω, ±0.2%FS
RS485 output	Isolated, Modbus-RTU RS485
Relay	2channels, Pickup/Breakaway AC250V/3A
Relative humidity	10%~85% (No condensation)
Working temperature	(0~60) °C
Power supply	AC: 220V±10%, 50Hz/60Hz 110V±10% DC: 24V±10%, input power≥6W
Storage conditions	Temperature: (-15~65) °C Relative humidity: 5%~95%(No condensation) Altitude: <2000m

Chapter 2 Installation

2.1 Instrument installation

Please read the instruction of installation location and method of instrument as described during installation.

2.1.1 Installation precautions

- This product is tray mounted.
- Please install it indoors, avoiding wind, rain and direct sunlight.
- In order to prevent the internal temperature of this product from rising, please install it in a well-ventilated place.
- When installing this product, please do not tilt it to the left and right, try to install it horizontally (it can be tilted back $<30^{\circ}$).

2.1.2 Installation should be kept away from the following site

- In direct exposure to sunlight and near thermal equipment.
- With ambient temperature over 60 degrees in operation.
- With humidity over 85% in operation.
- Nearby electromagnetic source.
- In strong mechanical vibration.
- With varying temperature and dew condensation.
- With oil smoke, steam, humidity, dust and corrosive gases.

2.1.3 Installation methods

Install a 92.5 * 92.5 mounting hole on the instrument cabinet or mounting panel,
The thickness of the installation panel is 1.5mm~13mm.

Dimension of PH6.5

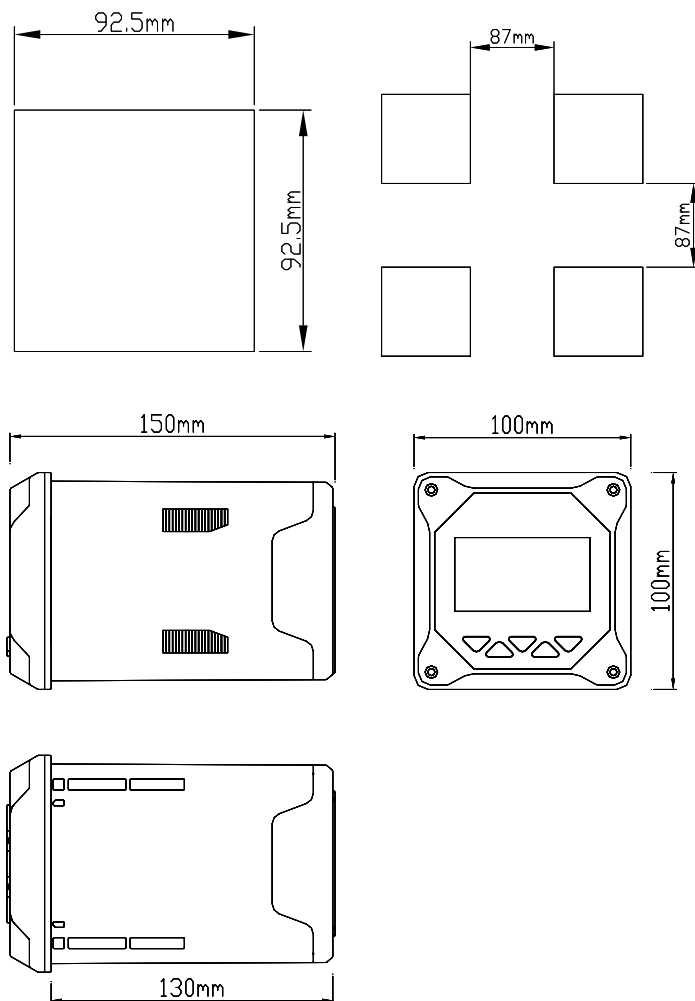


Fig.1 Dimension of PH6.5

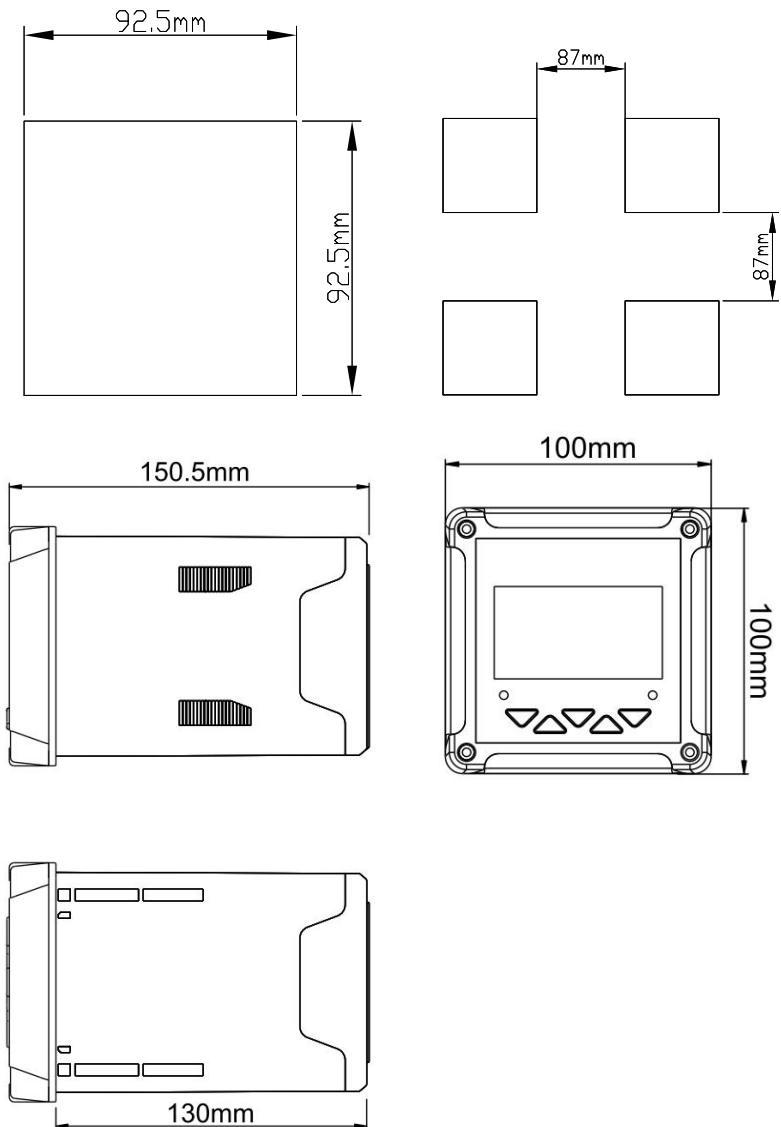
Dimension of PH6.8

Fig.2 Dimension of PH6.8

The instrument into the mounting hole and then buckle on the Snap, as shown below

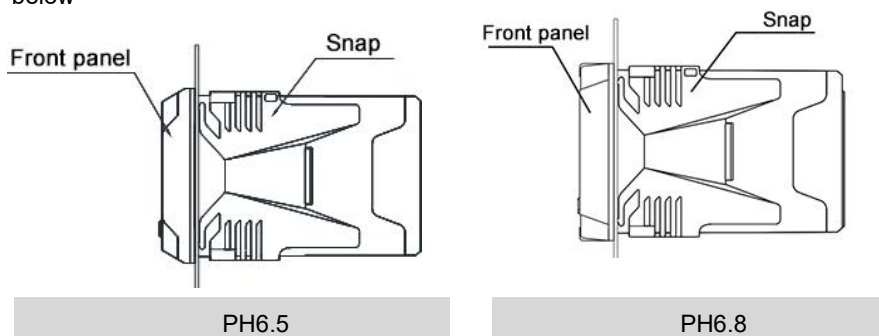


Fig.3

2.2 Electrode installation

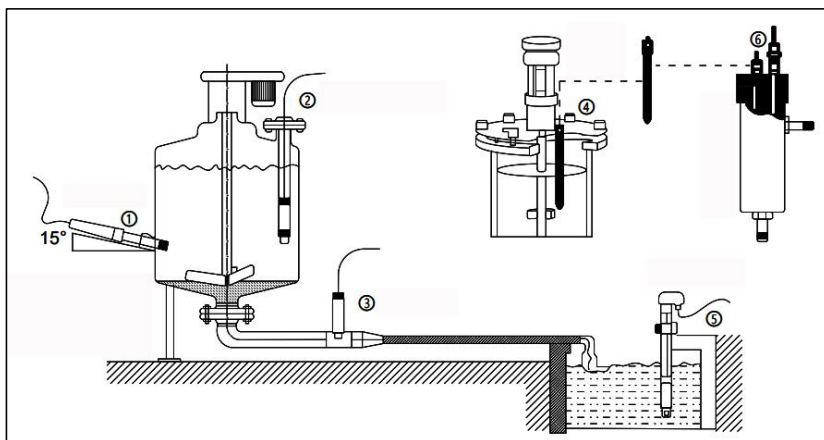


Fig.4 Schematic diagram of common installation method

①Side wall installation②Flange mounted at the top③Pipe installation④Top installation⑤Submersible installation⑥Flow-through installation

The interface must be in 15°oblique angle, or it will affect the normal test and use of the electrode.We won't be responsible for any results due to this.

2.3 Wiring

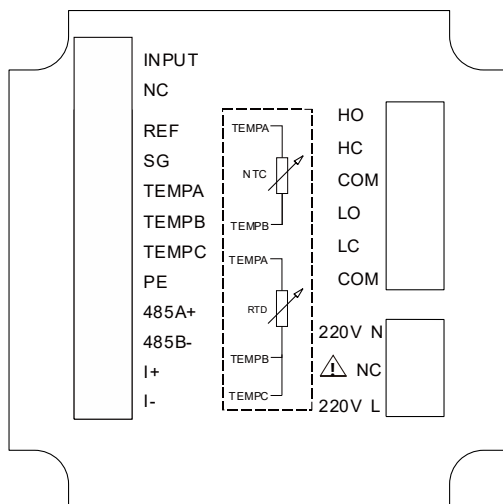


Fig.5 220V wiring diagram

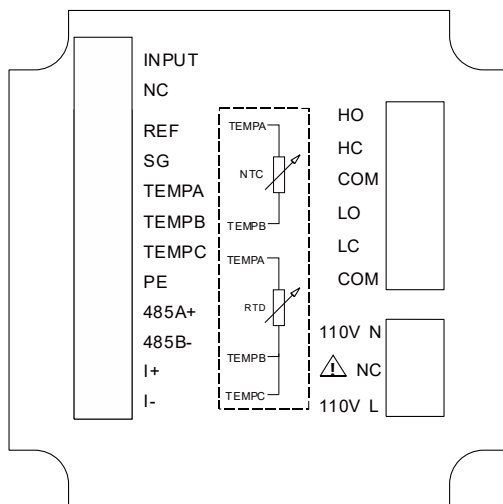


Fig.6 110V wiring diagram

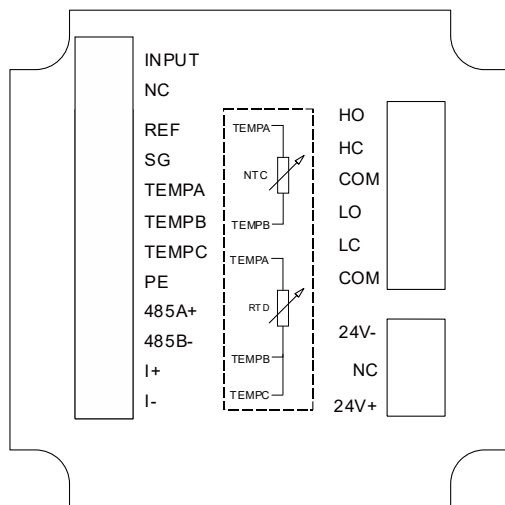


Fig.7 24V wiring diagram

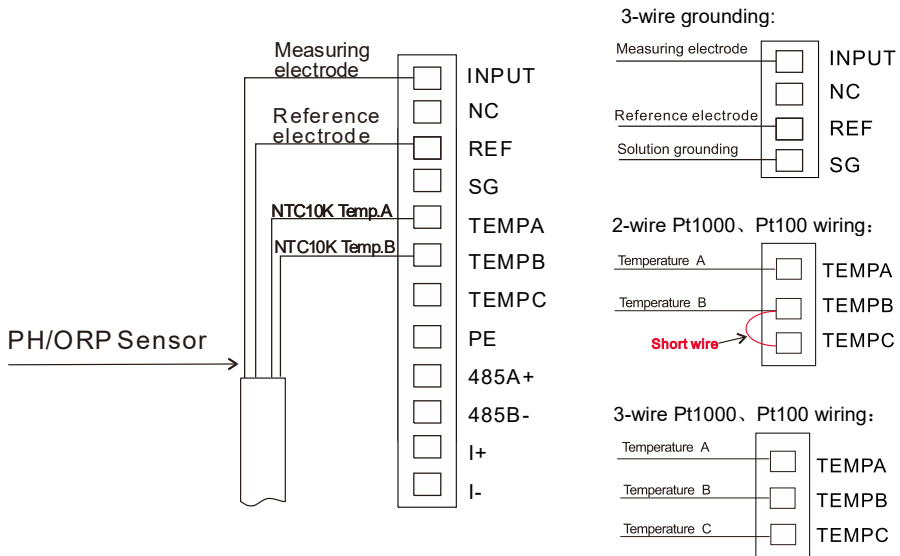
2.3.1 Identification of terminal

- INPUT: Measuring terminal of the electrode
- NC: Unidentified
- REF: Reference terminal of the electrode
- SG: Grounding terminal of the electrode
- TEMP A: Temperature compensation terminal A, NTC10K and Pt1000/Pt100 connect here
- TEMP B: Temperature compensation terminal B, NTC10K and Pt1000/Pt100 connect here
- TEMP C: Temperature compensation terminal C, Pt1000/Pt100 three-wire temperature grounding, Pt1000/Pt100 two-wire need to be connected to TEMP B, When connected to NTC10K, C terminal is not connected.
- PE: Grounding terminal of the Instrument
- 485 A +: RS485 communication interface A +
- 485 B -: RS485 communication interface B -
- I +: (4~20) mA output

- I -: (4~20) mA output
- 220V L: AC220V live wire
- 220V N: AC220V neutral wire
- HO: High alarm normally open relay
- HC: High alarm normally closed relay
- LO: Low alarm normally open relay
- LC: Low alarm normally closed relay
- COM: Common
- 110V L : AC110V live wire
- 110V N : AC110V neutral wire
- 24V+: DC24V+
- 24V-: DC24V-

2.3.2 Sensor wiring

The conventional sensor wiring is shown in following figure; If a controller with solution grounding function is selected, the sensor solution grounding wire needs to be connected to the SG ; If the temperature electrode is a two-wire Pt1000 or Pt100, TEMPB and TEMPC need to be short circuited.



Chapter 3 Navigation keys

3.1 Button display

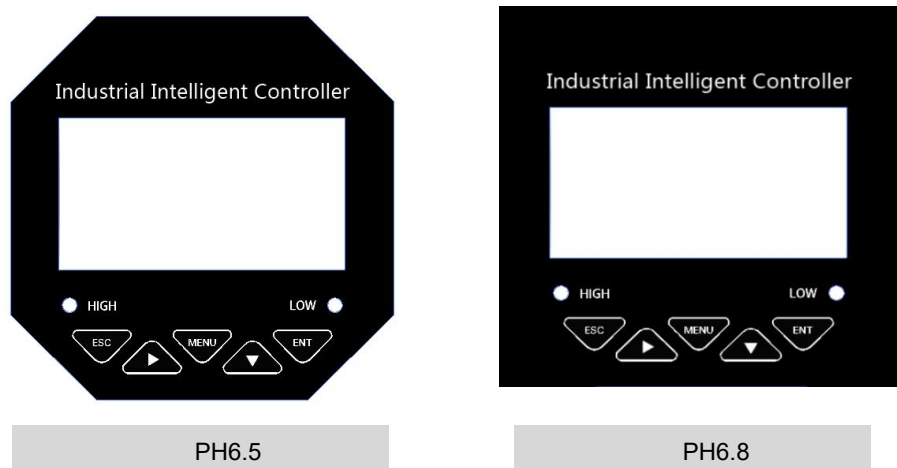


Fig.8 Display diagram

3.1.1 Definition of buttons

Table 2

Sign	Button name	Key function
	ESC	Under "Monitoring page" - Alarm view Under "Menu page" - Return to the previous page Under "Calibration page" - Skip this item
	RIGHT	Make a recurrent selection of digit of parameters modify the original indication value
	MENU	Under "Monitoring page" - Enter the MENU Under "Menu page" - Exit the MENU
	DOWN	Under "Menu page" - Select the related menu Modify the values in the configuration state
	ENTER	Under "Menu page" - Enter the sub-menu or confirm modification

Chapter 4 System menu & operating

4.1 Monitoring page

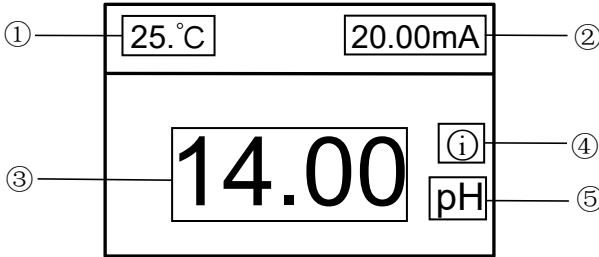


Fig.9 Monitoring page

- ①:Temperature
- ②:Output current
- ③:Measured value
- ④:Fixed output
- ⑤:Unit

4.2 Alarm inquiry page

Push [ESC] to enter alarm inquiry page, to inquire the current warning configuration information

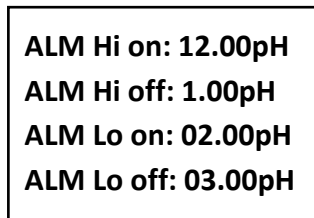


Fig.10 Alarm inquiry page

4.3 Password verification page

Push [MENU] to enter password verification page;

----User Password----

Password: 0000

Fig.11 Password verification page

- Input password and push [ENTER] to enter home page.
- Initial password is 0000, which can be modified via password modification function.
- Please contact us if you forget your password.

4.4 Main menu

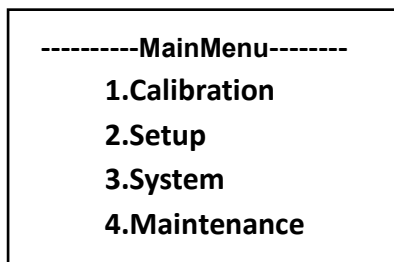


Fig.12 Main menu

Calibration: Sensor calibration, temperature offset, calibration parameters and historical parameters.

Setup: Sensor type, temperature compensation, communication, analog output, alarm and damping time setting.

System: Language, buzzer, backlight, password reset, recall default and device information

Maintenance: Fixed output state setting.

Chapter 5 Setting

5.1 Calibration

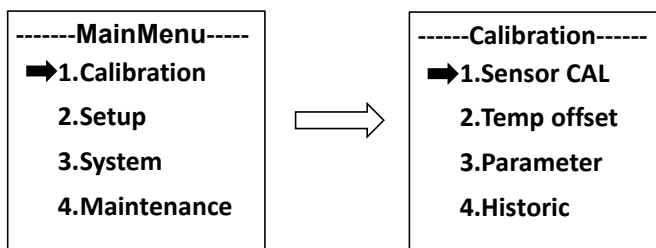


Fig.13 Calibration interface

(1) Sensor calibration

● pH calibration

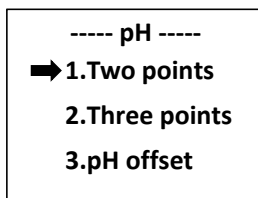


Fig.14 pH calibration interface

2 points calibration : Select two corresponding standard solutions according to the acid-base condition of the test solution.

- (1) Clean the electrode with distilled water and dry the water stains.
- (2) Put the pH electrode in the 6.86pH/7.00pH standard solution and let it stand for a while. After the displayed value is stable, press the [ENT] button;
- (3) Wash the electrode with distilled water and dry the water stains.
- (4) Put the pH electrode into the 4.00pH/4.01pH (acidic) or 9.18pH/10.01pH (alkaline) standard solution, and let it stand for a while. After the displayed value is stable, press the [ENT] button.
- (5) After the calibration is successful, The pH calibration process ends.

3 points calibration :

- (1) After entering the pH calibration interface, first put the pH electrode into the 4.00pH/4.01pH standard solution and let it stand for a while. After the displayed value is stable, press the [ENT] button;
- (2) Wash the electrode with distilled water and dry the water. Then put the pH electrode into the 6.86pH/7.00pH standard solution, let it stand for a while, and press the [ENT] button after the displayed value is stable;
- (3) Wash the electrode with distilled water, dry the water stains, and finally put the pH electrode into 9.18pH /10.01pH standard solution, let it stand for a while, after the displayed value is stable, press the [ENT] button.
- (4) After the calibration is displayed successfully, the pH calibration process is over.

pH offset : Use a buffer solution or directly use sample water for measurement. Buffer and sample values are required for each calibration. The zero point deviation range is $\pm 2\text{pH}$.

NOTE : Offset is only performed during zero drift.

● ORP Calibration

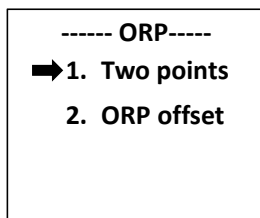


Fig.15 ORP calibration interface

2 points calibration :

- (1) After entering the ORP calibration interface, first put the ORP electrode into the 86mV standard solution, and let it stand for a while. After the displayed value is stable, press the [ENT] button.

(2) Clean the electrode with distilled water, dry the water stains, and then set the ORP. Put the electrode into the 256mV standard solution and let it stand for a while. After the displayed value is stable, press the [ENT] button.

(3) After the calibration is successful, the ORP calibration process ends.

ORP offset : The measured ORP can be corrected, and the correction range is $\pm 300\text{mV}$.

(2) Temperature offset

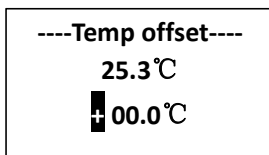


Fig.16 Temperature offset

The temperature value of automatic temperature compensation can be corrected, and the correction range is $\pm 20.0^{\circ}\text{C}$.

Note: Unable to enter this interface during manual temperature compensation

(3) Parameter

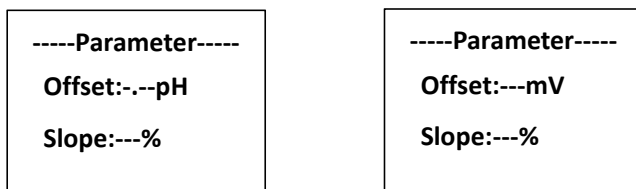


Fig.17 Parameter calibration parameter interface

It can display the zero point and slope of calibration.

(4) Historical parameters

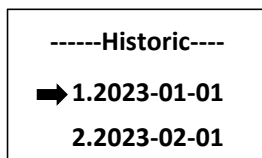


Fig.18 Historical parameter interface

After the instrument is calibrated, the latest two calibration data are automatically

stored, and the historical parameters can be viewed by selecting the calibration date.

5.2 Setup

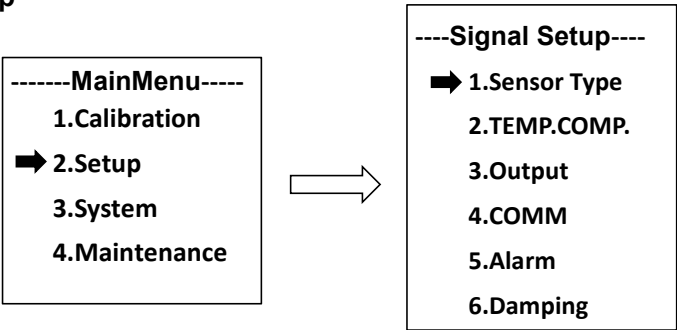


Fig.19 Setting interface

(1) Sensor Type

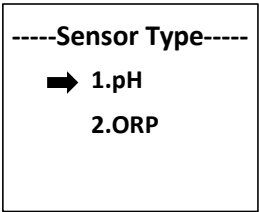


Fig.20 Sensor Type

Set the type of electrode, two types of pH electrode and ORP electrode can be set.

(2) Temperature compensation

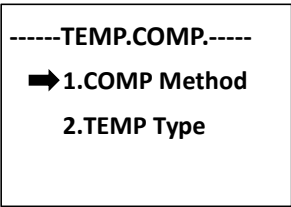


Fig.21 Temperature compensation

Compensation method: automatic temperature compensation or manual

temperature compensation can be set. Automatic temperature compensation, temperature electrode NTC 10K, Pt1000 or Pt100 can be set. Manual temperature compensation: temperature setting range (-10~130) °C.

Compensation type: linear compensation, acid compensation or alkali compensation can be set.

(3) Output

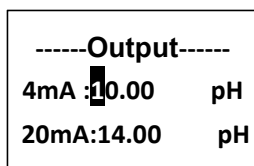


Fig.21 Analog Output

The channel setting can set the parameters of the transmission output of this channel, and each parameter can set the corresponding value of 4mA and 20mA of (4~20)mA output.

(4) Communication

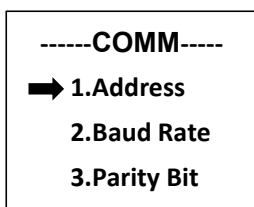


Fig.23 Communication

The address (1~247) , baud rate (2400bps, 4800bps, 9600bps, 19200bps or 38400bps) and parity bit (N81, N82, E81, O81) of RS485 communication can be set.

(5) Alarm

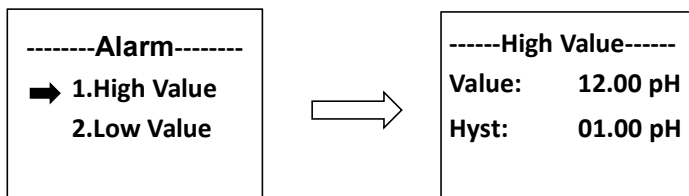


Fig.24 Alarm Setup

High Value: When the measured value is greater than the high alarm pull-in value, the high alarm relay pulls in, and when the measured value is less than the high alarm cut-off value, the high alarm relay is disconnected.

Low Value: When the measured value is less than the low alarm pull-in value, the low alarm relay is closed, and when the measured value is greater than the low alarm cut-off value, the low alarm relay is disconnected.

Hyst: Hysteresis prevents repeated alarm when the measures date fluctuates from the alarm point. The high or low alarm and hysteresis figure is showed in Figure 23. At high alarm, when the actual measurement value is larger than or equal to the alarm value, the controller enters into the alarm state. When the input is reduced, the actual measurement value is less than the alarm value, but the recorder will not exit the alarm state immediately. Until the actual measurement value is less than the alarm value and Hysteresis value, will the controller exit the alarm state. The same is for low alarm.

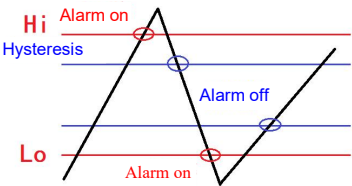


Fig.25 High- or low-level alarm and Hysteresis

(6) Damping

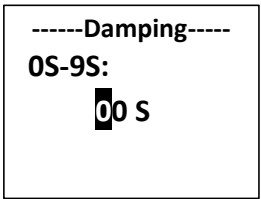


Fig.26 Damping

Measurement and transmission damping time (0s~9s) can be set, the greater the damping time, the slower the change of measurement and output value.

5.3 System

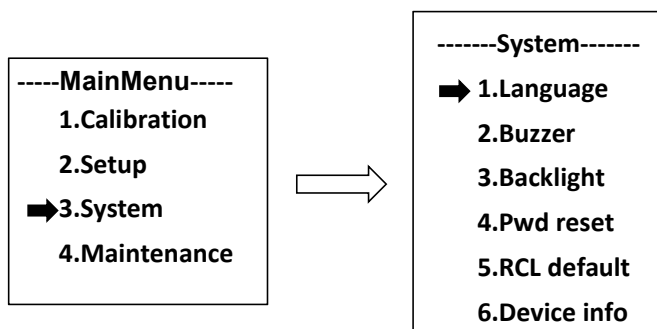


Fig.27 System menu

(1) Language

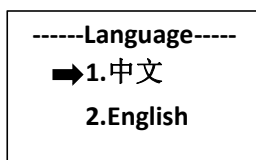


Fig.28 Language

Set the type of language, Chinese and English can be set.

(2) Buzzer

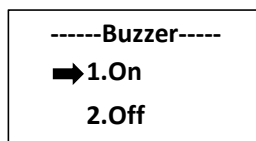


Fig.29 Buzzer

Set the switch of the buzzer when alarming.

(3) Backlight

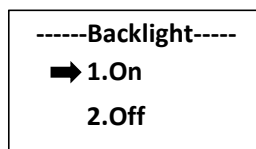


Fig.30 Backlight

Set the backlight on and off.

(5) Password reset

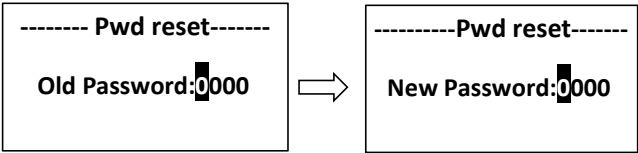


Fig.31 Password reset

Change the password and log in with the new password.

(4) Recall default

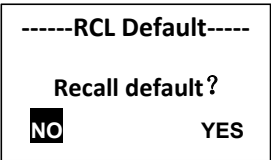


Fig.32 Recall default

Restore to factory settings

(5) Device information

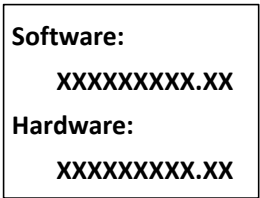


Fig.33 Information Inquiry

Query the current hardware and software version.

5.4 Maintenance

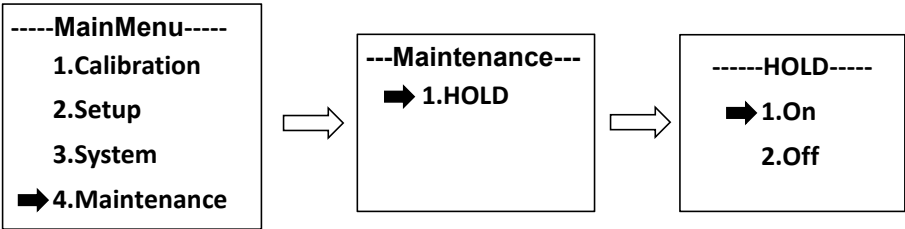


Fig.34 Maintenance

Before the instrument is about to perform maintenance work (such as calibration work, electrode replacement, maintenance work, etc.), this operation can keep the current output current constant, so as to avoid false alarms caused by signal changes during maintenance work and interfere with the operation of downstream chain equipment. There are symbol ⓘ prompts, as shown in the figure:

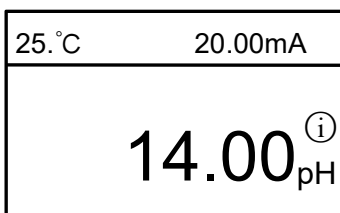


Fig.35 Output hold

Chapter 6 Communication

The instrument is provided with standard RS485 series communication interface, in accordance with international universal standard Modbus-RTU communication protocol, supporting No.03 register reading and holding command.

Communication data and register address.

Table 3

Name	Register address	Function code	Data type	Access Type	Description
pH value	0x2001	0x03	short	R	Range: 0 ~ 1400
Decimals and units	0x2002	0x03	short	R	Decimal Places: 2 Unit: pH
Temperature value	0x2003	0x03/0x06	short	W/R	Range:-100~1300
Decimals and units	0x2004	0x03	short	R	Decimal Places: 1 Unit: °C
PH sensor voltage value	0x2005	0x03	short	R	Range: -500~ 500mV
Decimals and units	0x2006	0x03	short	R	Decimal Places: 0 Unit: mV
ORP value	0x2007	0x03	short	R	Range: -2000 ~ 2000mV
Decimals and units	0x2008	0x03	short	R	Decimal Places: 0 Unit: mV

Communication case:

The computer sends: 01 03 20 01 00 01 DE 0A

pH / ORP Table Returns: 01 03 02 02 AE 38 98

Return command comment:

01 is RS485 communication address;

03 is the function code;

02 is the data length of the return pH value: 2 bytes;

02 for the return of the pH value of 686 (hex high byte);

AE for the return of the pH value of 686 (hex low byte);

38 98 is the CRC check value;

Chapter 7 Maintenance

1. The storage of pH glass electrode, short-term:

stored in the pH = 4 buffer solution;

long-term: stored in the pH = 7 buffer solution.

2. pH glass electrode cleaning

pH glass electrode cleaning glass electrode bulb contamination may make the electrode response time longer. CCl₄ or soap can be used to wipe the dirt, and then immersed in distilled water a day and night to continue to use. When the pollution is serious, can be 5% HF solution for 10 to 20 minutes, immediately rinse with water, and then immersed in 0.1N HCl solution for a day and night to continue to use.

3. Glass electrode aging treatment

The aging of the glass electrode and the gradual change in the structure of the glue layer. Old electrode response is slow, film resistance is high, slope is low. Exfoliation of the outer layer with hydrofluoric acid can often improve electrode performance. If this method can be used to regularly remove the inner and outer layers, the electrode life is almost unlimited.

4. The storage of the reference electrode

Silver - silver chloride electrode The best storage solution is saturated potassium chloride solution, high concentration of potassium chloride solution can prevent the silver chloride in the liquid junction precipitation, and maintain the liquid junction in the work status. This method also applies to the storage of composite electrodes.

5. Regeneration of reference electrode

The reference electrode regeneration reference electrode problems caused by the vast majority of liquid junction caused by blockage, the following methods can be resolved:

- Soaking fluid interface: 10% saturated potassium chloride solution and 90% distilled water mixture, heated to 60 ~ 70 °C, the electrode immersed in about 5cm, soak for 20 minutes to 1 hour. This method dissolves the crystallization of the electrode tip.

- Ammonia Soaking: When the liquid interface is blocked by silver chloride can be leaching with concentrated ammonia. The specific method is to clean the electrode, the liquid vent after immersion in ammonia 10 to 20 minutes, but do not let ammonia into the electrode inside. Remove the electrode with distilled water to wash, re-add the internal liquid and continue to use.
- Vacuum method: the hose to match the reference electrode fluid interface, the use of water suction pump, suction part of the liquid through the fluid interface, remove the mechanical blockage.
- Boiling fluid junction: silver - silver chloride reference electrode liquid interface immersed in boiling water for 10 to 20 seconds. Note that the next time you boil, the electrode should be cooled to room temperature.
- When the above methods are invalid, sandpaper grinding can be used to remove the mechanical method of grinding. This method may cause the sand under the grinding into the liquid interface. Causing permanent clogging.

Chapter 8 Troubleshooting

- No display on controller?
A: Check if the power cable is correctly connected, power is on.
- Number in display is jumping up and down?
A: Check if there is any interference equipment such as frequency converter is nearby. The instrument should be kept away from such interference equipment or protected with good shielding measures.
- Conductivity instrument can not be calibrated?
A: The standard solution is not mixed in a correct way or the electrode is damaged.
- The instrument can not measure accurately after calibration with a standard solution of conductivity of 1413us/cm?
A: Check if the standard solution is polluted. Replace the solution and calibrate again.
- The response of number is slow?
A: If the electrode is covered by dirt, the response would be slow. Clean the pollutant in a corresponding method. A slow response is normal in winter.

Chapter 9 Warranty & After-sales Service

We promise to the customer that the hardware accessories provided during the supply of the instrument have no defects in material and manufacturing process.

From the date of the purchase, if the user's notice of such defects is received during the warranty period, the company will unconditionally maintain or replace the defective products without charge, and all non customized products are guaranteed to be returned and replaced within 7 days.

Disclaimers:

- During the warranty period, product faults caused by the following reasons are not in the scope of Three Guarantees service
- Product faults caused by improper use by customers.
- Product faults caused by disassembling, repairing and refitting the product.