SOLUTIONS

MANUAL TRANSMITTER PH-200

PRODUCT OVERVIEW

This user manual describes the installation, use and maintenance of the on-line conductivity (salinity) analyzer, and introduces the basic measurement principle, instrument composition and characteristics of the product, so as to provide reference for technicians with relevant knowledge of operation and control of water quality analysis instruments.

If the user needs further information, please contact the company's technical service department.

WARRANTY AND MAINTENANCE

If the warranty period is exceeded or the following faults occur during the warranty period, the free warranty service will not be provided. The faults include but are not limited:

- Improper use of products
- Installation, operation or use not in accordance with this manual
- Failure to maintain the product as directed by the Company
- Unauthorized modification or disassembly of the product
- Repair products with parts not provided by our company

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DIRECTORY

1 INSTRUMENT INTRODUCTION

The online conductivity (salinity) analyzer consists of a controller and a conductivity sensor. The sensor outputs RS485 signal, and the anti-interference ability is stronger when applied in the field. The controller has analog, digital, switch and other output interfaces.

1.1 Measurement Principle

Conductivity is the ability of a solution to conduct electricity. The conductivity of a solution is proportional to its ion concentration, since the charge of the ions in the solution contributes to electrical conduction. 4 Conductive plate (flat head type) design of the conductivity electrode, the use of 1 reference voltage to compensate for the polarization of the disc, the reference voltage to ensure that the measured value accurately reflects the conductivity, without being affected by the state of the electrode, the measurement of pure water when the accuracy is higher.

Salinity is a unit-free measurement of the weight of the corresponding dissolved salts in seawater and can be calculated from conductivity.

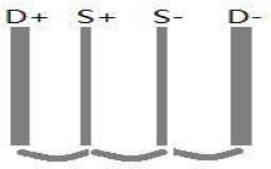

Figure 1-1 Schematic diagram of conductivity electrode

1.2 Technical indicators

Table 1-1 Technical Specifications of Sensors

Measurement parameters	Conductivity (salinity), temperature
Range	Conductivity:(0~500) mS/cm, salinity:(0~100) ppt Temperature:(0~60) ℃
Accuracy	≤ ± 1%
Repeatability	≤1%
Resolution	0.01μS/cm
Zero drift	≤± 1 % F. S
Span drift	≤± 1 % F. S
Response time	≤20s
Temperature compensation accuracy	≤± 1%
Calibration cycle	3 months
Protection level	IP68
Supply voltage	(12/24) V DC
Power consumption	<0.3W
Communication mode	RS485(Modbus RTU), maximum baud rate 115200 bps
Overall dimension	156mm × ϕ28mm
Weight	0.3kg
Material	POM

Table 1-2 Controller Technical Specifications

Display/Resolution	4 inch industrial color TFT display (800*480 resolution)
Controller size	144 mm * 144 mm * 115mm
Power supply	(85~265)V AC
Power consumption	2.5W
Storage temperature	(-20~70)℃
Working temperature	(-10~60)℃
Shell Material	ABS
Protection level	IP55
Analog output	2 (4~20)mA analog outputs, maximum load 500 ohms
Relay	3-way relay (120VAC,24VDC/1A)
Digital output	1 RS485 output, 1 RS232 output

1.3 Sensor size

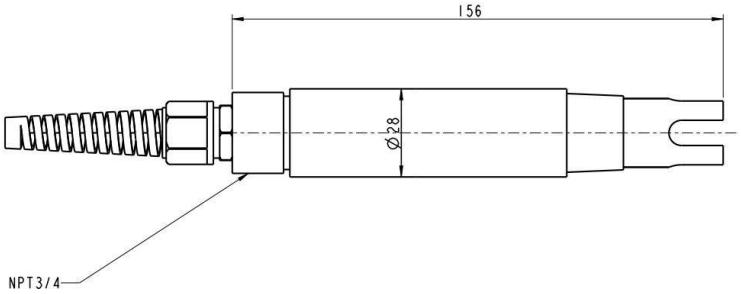

Figure 1-2 Sensor installation dimensions

1.4 Characteristics

- Integrated design, anti-electromagnetic interference.
- Industrial conductivity electrode, the electrode constant is stable, not affected by polarization and pollution.
- Built-in temperature sensor, real-time temperature compensation.
- IP68 waterproof grade, applicable to a variety of working conditions;
- RS485 signal output, standard Modbus protocol, easy to integrate and network.

1.5 Application Areas

- Water quality monitoring of sewage and industrial wastewater treatment process and discharge outlet.
- Water quality monitoring of drinking water intake and process treatment.
- Surface water and groundwater monitoring.

2 INSTALLATION

2.1 Unboxing of the instrument

After opening the package, carefully check whether the instrument has been damaged during transportation.

If there is any damage, record it and report the loss to the carrier or the company's agent and the company's customer service department.

2.2 Function check

The sensor has been tested in detail before leaving the factory, and only a short functional check needs to be performed before installation.

Connect the sensor to the controller and power on the controller. After the controller is powered on, the self- test will be completed soon and the measurement interface will be entered. If the display indicates that the sensor is operating normally, the functional check is complete.

Note: The sensor contains conductivity electrodes, please ensure that the sensor will not be subjected to any strong mechanical impact. There are no parts inside the sensor that need to be serviced by the user.

2.3 Connecting the sensor to the controller

2.3.1 Connect the conductivity sensor using hardware

2.3.1.1 If the power is on, please disconnect the power connection of the controller, unscrew the 4 screws on the controller panel, and open the panel.

2.3.1.2 Pass the cable through the locking connector of the controller and connect it with the internal terminal. Refer to Table 2-1 and Fig. 2-1.

2.3.1.3 Tighten the locking joint, close the panel and tighten the screws to fix the panel.

Figure 2-1 Controller Wiring Diagram

Table 2-1 Sensor Wiring Definition

Serial Number	Wire color	Wiring Definitions	Controller Interface
1	Red	S_12V,+12V power input	14
2	Brown	S_GND-, Power Input Ground	15
3	Grey	S_RS485 +,RS485 input_A	16
4	Yellow	S_RS485-,RS485 input_B	17

2.3.2 Controller Wiring

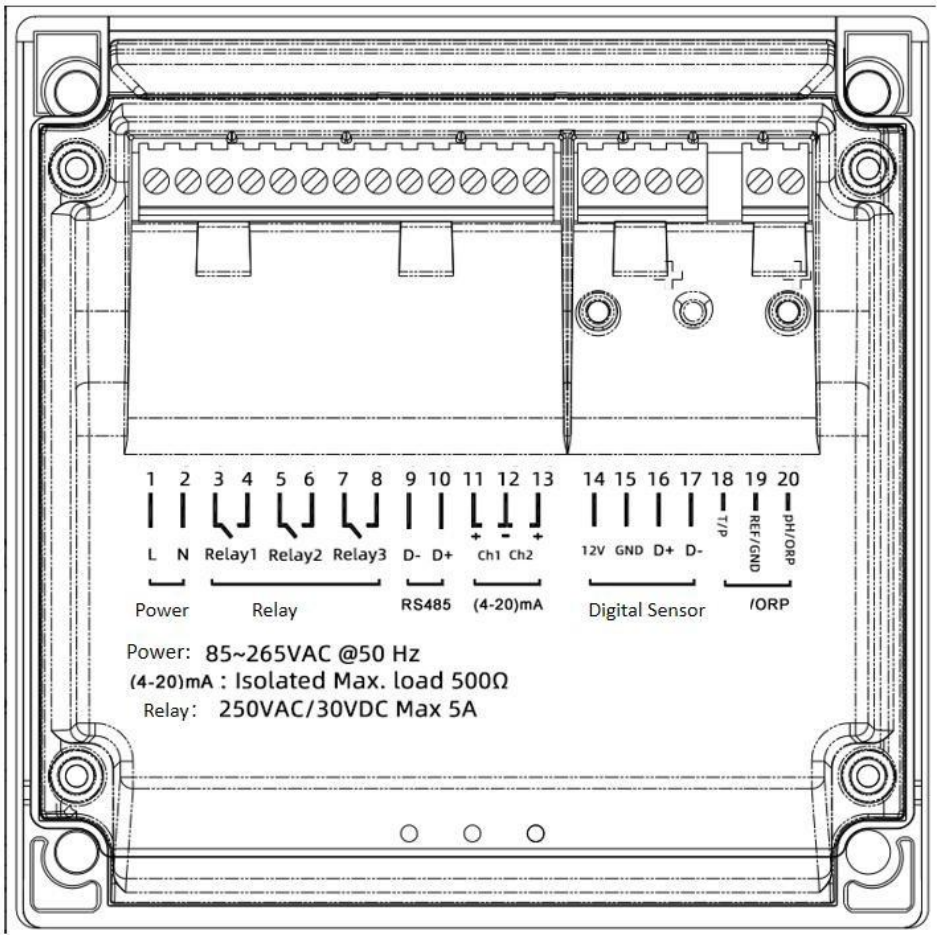

Figure 2-2 Schematic diagram of controller wiring Table 2-2 Controller Wiring Definition

2.4 Controller Installation

2.4.1 Wall Mounted Installation

The controller wall-mounted installation method is shown in Figure 2- 3.

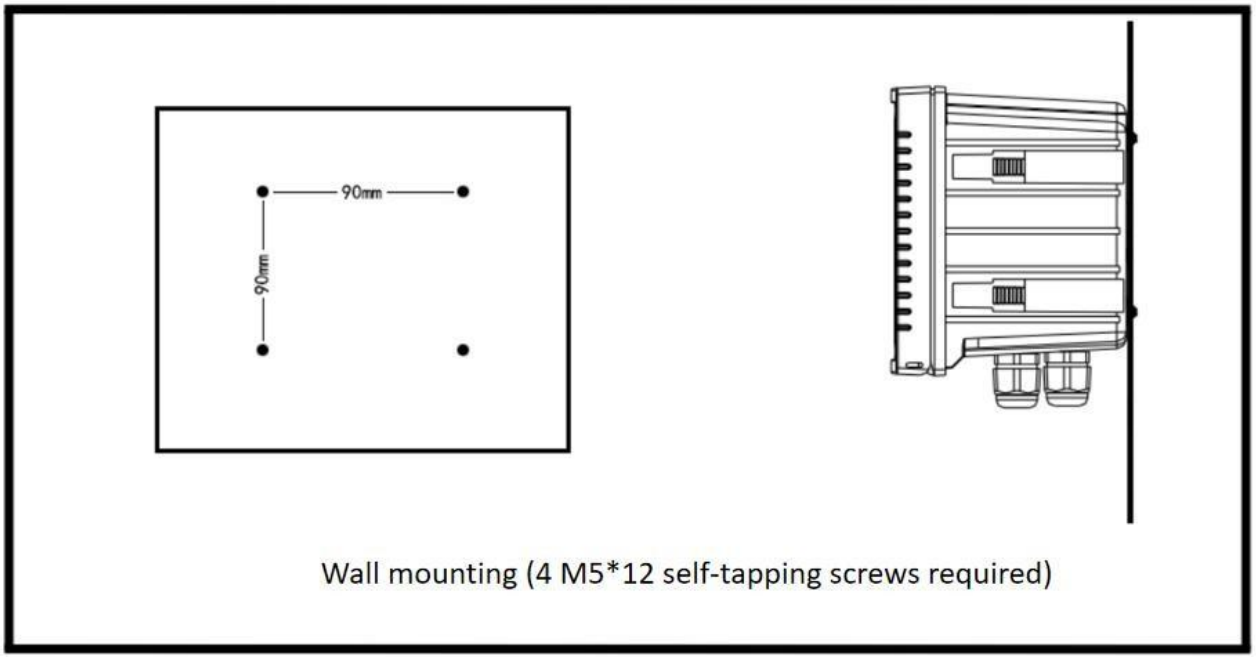

Figure 2-3 Controller wall-mounted installation

2.4.2 Embedded installation of the panel

For embedded installation of the panel, a hole shall be made in the panel, and an additional installation holder shall be provided, as shown in Figure 2-4.

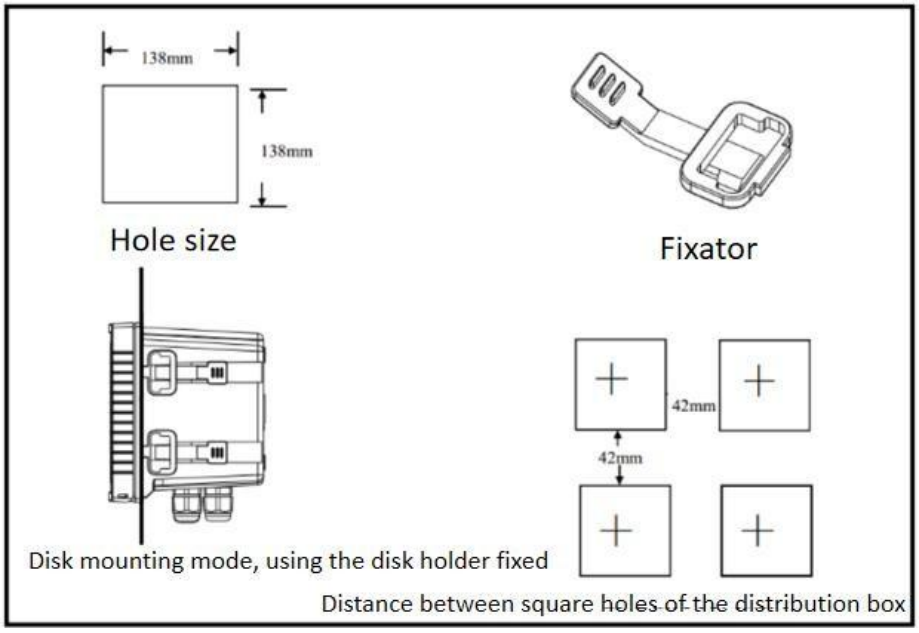

Figure 2-4 Embedded installation of controller panel

2.5 Sensor Installation

The tail of the sensor is equipped with an NPT3/4 threaded interface, which is suitable for a variety of applications, such as pipelines, pools, rivers and lakes, etc.

2.5.1 Pipeline Installation

There are two ways of pipe installation, 45-degree installation and 90-degree installation, as shown in Figure 2-5 and 2-6.

Fig. 2-5 45-degree pipe installation

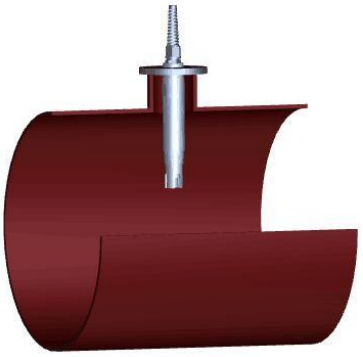

Fig. 2-6 90-degree pipe installation

In order to ensure more accurate and stable measurement, the following conditions should be met when installing the sensor in the pipeline:

- The sensor tail can be fixed by thread or flange tightly.
- Please install the sensor in a pipe with a diameter greater than or equal to 30cm.
- When installing pipes, please install the sensor to the upward flowing pipe, not to the downward flowing pipe.
- When the sensor is installed in a horizontal pipe, it is necessary to ensure that the 100mm part of the front end of the electrode is completely immersed in water.
- Install the sensor at least 1.5 meters or three times the pipe diameter downstream of the pump, valve, or pipe elbow.
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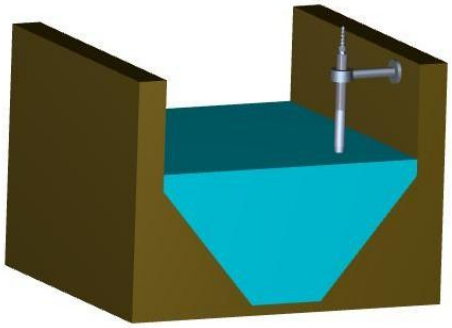
2.5.2 Installation of open channels and water tanks



When the open channel and pool are installed, a bracket is required to be fixed on the pool wall, as shown in Figure 2-7. The support shall be designed according to the specific conditions of the site.

Figure 2-7 Installation of Open Channel and Pool

In order to ensure more accurate and stable measurement, the following conditions should be met when installing sensors in rivers, open channels, etc:

- The bottom end of the sensor should be at least 10cm away from the bottom to reduce the impact of possible deposits at the bottom on the measurement;
- The sensor should be at least 5cm away from both sides
- When installing the sensor, pay attention to the direction of the sensor facing the water flow (downstream) to reduce the risk of collision;
- If there are large objects such as leaves in the water body, a protective net should be added around the sensor.

2.5.3 Installation of water tank

When the water tank is installed, a fixed bracket is required to fix it on the tank cover, as shown in Figure 2-8.

The bracket shall be designed according to the specific conditions of the site, and the opening of the water tank shall ensure that the sensor can pass through the fixed hole.

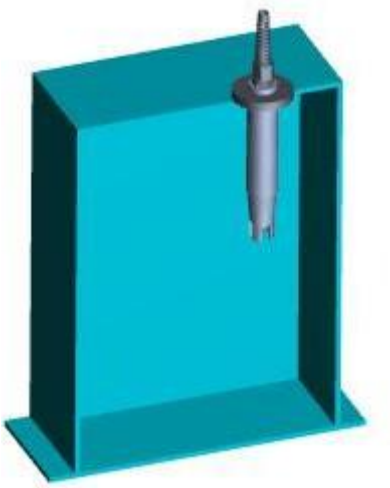


Figure 2-8 Installation of Water Tank

In order to ensure more accurate and stable measurement, the following conditions should be met when installing the sensor in the water tank:

- The bottom end of the sensor should be at least 10cm away from the bottom to reduce the impact of possible deposits at the bottom on the measurement;
- The sensor should be at least 5cm away from both sides.

3 CONTROLLER OPERATION

3.1 Controller Introduction

The controller has a perfect external interface, which can easily realize sensor networking, remote control, fault diagnosis and so on.

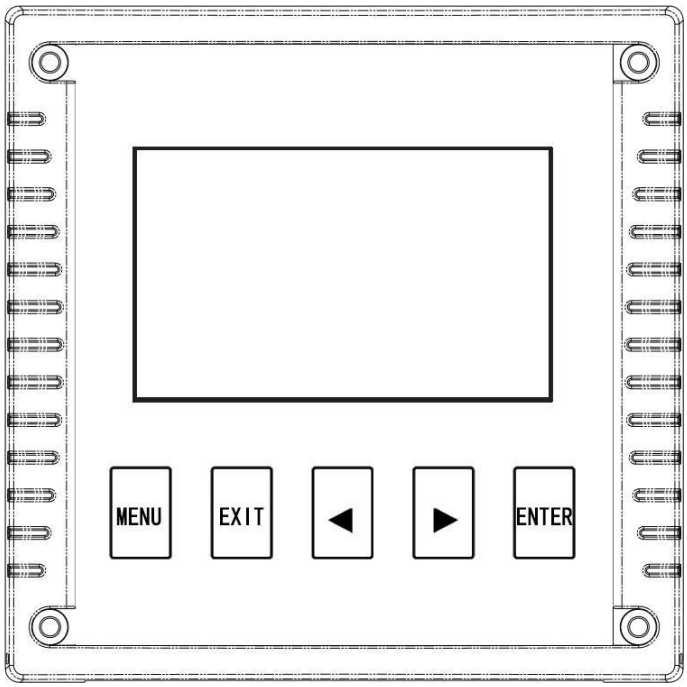


Fig. 3-1 Schematic Diagram of Key

Table 3-1 Key function introduction

Identification	Key Name	Function Description
MENU	Menu key	Enter the menu under "Measurement Interface"
EXIT	Return Key	Return to previous interface
◀	Left Displacement Key	"Menu Interface", select the relevant menu in a left cycle "Sub-menu interface", select relevant parameters cyclically to the left
▶	Right Displacement Key	"Menu Interface", cycle right to select the relevant menu "Sub-menu interface", select the relevant parameters to the right cycle
ENTER	Confirm Key	Enter the submenu under "Menu Interface" or confirm the modification.

3.2 Numerical display interface

The controller will enter the self-check interface after starting up. After waiting for about 15 seconds, the controller will display the numerical interface. We can see the sensor status, measurement data, relay status and other information.

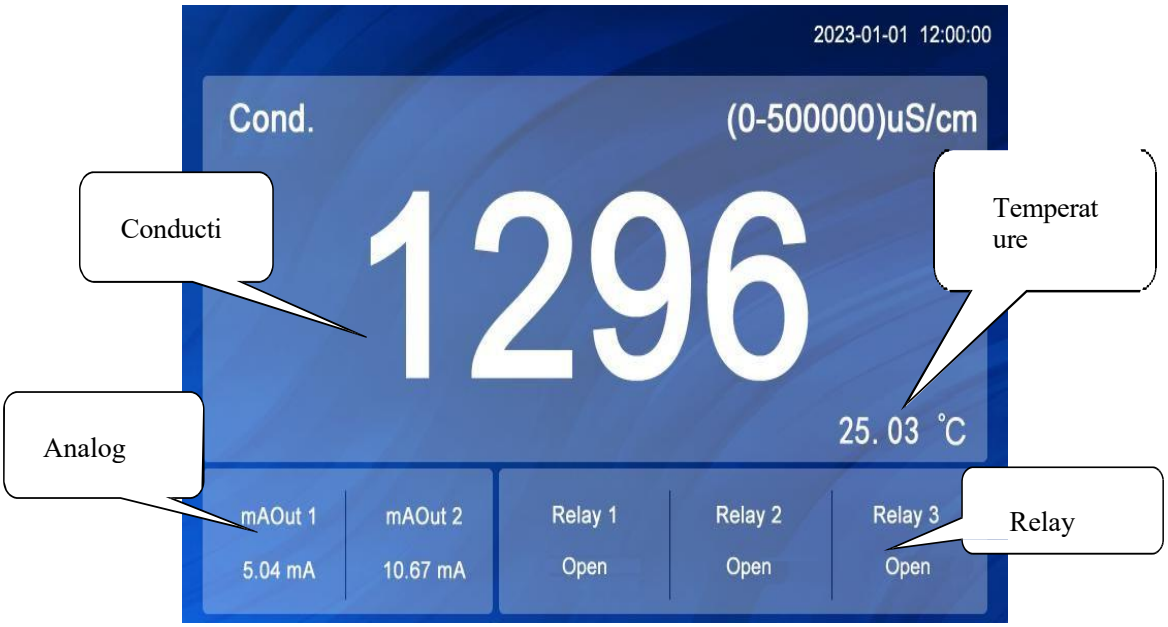


Figure 3-2 Display Interface

3.3 Controller settings

Click "MENU" in the numerical display interface to enter the controller menu interface. The user can select the corresponding sub-menu in the controller menu interface to set the parameters of the controller.

Figure 3-3 Controller menu interface

Table 3-2 Introduction of controller menu functions

Device Information	Displays controller and sensor related information, including device model, serial number, date of manufacture, hardware version, software version, etc.
Calibration	Calibrate the sensor (see 4.2).
Parameter setting	Set temperature compensation factor and unit
Analog quantity	Set the analog output parameters.
Relay	Set relay output parameters.
Storage Settings	Set whether the storage is enabled and set the storage time interval
History Log	View historical and calibration data
Time Settings	Set the controller internal RTC clock
Alarm Settings	Set the alarm upper and lower limit values.
Communication Settings	Set the external communication address and baud rate of the controller.

3.3.1 Parameter Setting

In the menu interface, press the left and right displacement keys to select "Parameter Setting", and click "ENTER" to enter the parameter setting sub-menu interface, as shown in the figure below.

a. According to the needs of the site adjust the display unit and temperature compensation coefficient (default value 0.02).

b. If the temperature compensation coefficient is modified, adjust it according to the temperature test results.

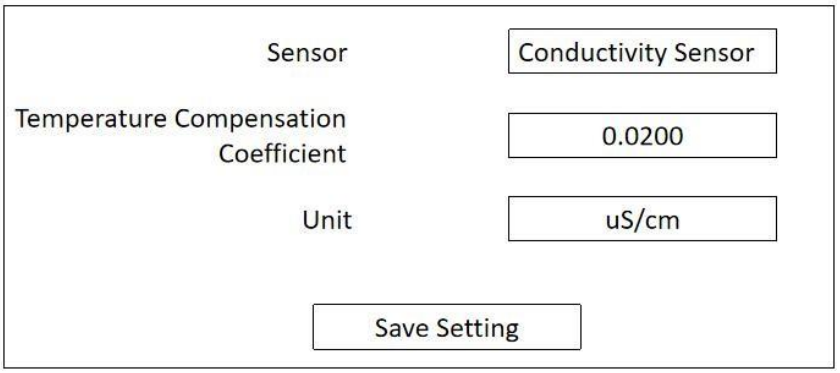
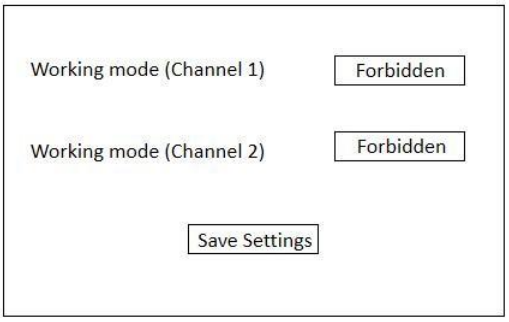


Figure 3-4 Parameter Setting

Analog quantity

In the menu interface, press the left and right displacement keys to select "analog quantity", click "ENTER" to select "analog quantity configuration" to enter the analog quantum menu interface, as shown in the following figure.

a. Select the working mode, "disable", "conductivity", "temperature (conductivity)" 3 one parameter.
b. According to the needs of the field, set the corresponding conductivity value or temperature value of 4mA and 20mA. Click "Save Settings.



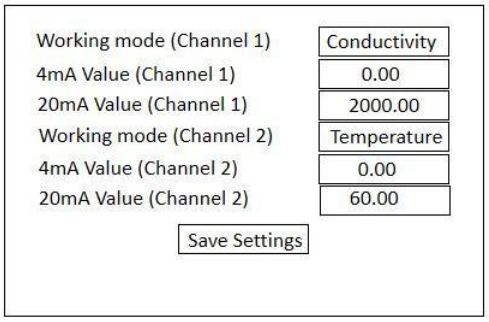
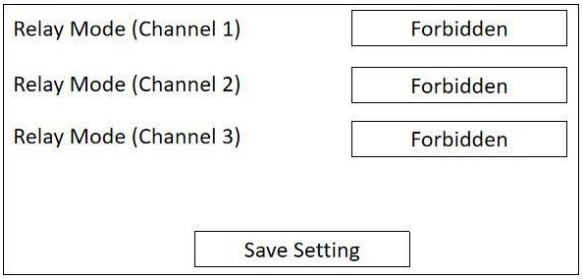


Figure 3-5 Analog Quantity Setting A Figure 3-5 Analog Quantity Setting B

Relay

In the menu interface, press the left and right displacement keys to select "Relay", and click "ENTER" to enter the relay sub-menu interface, as shown in the figure below.

a. Select the working mode, "disable", "fault", "upper limit", "lower limit", "upper limit" and "", a total of six modes;
b. According to the needs of the field, select the relay working mode and the corresponding parameters, and click "save settings.



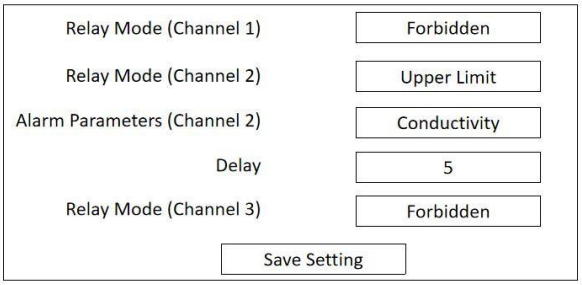


Figure 3-6 Relay Settings A Figure 3-6 Relay Settings B

Storage Settings

In the menu interface, press the left and right displacement keys to select "Storage Settings", and click "ENTER" to enter the storage settings sub-menu interface, as shown in the figure below. Set the storage status and interval time according to the on-site needs, and click "Save Settings.

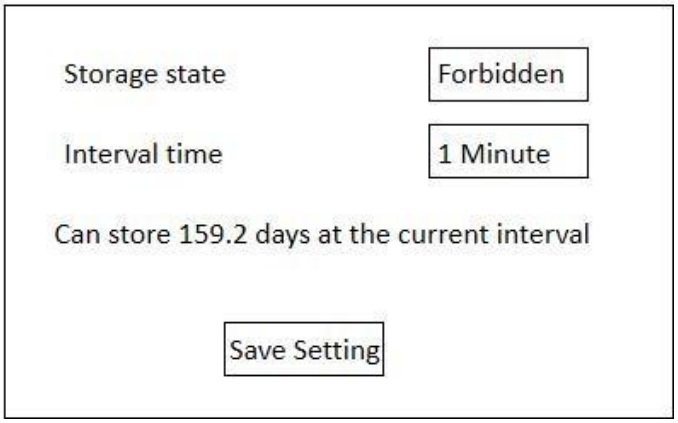


Figure 3-7 Storage Settings

History Log

In the menu interface, press the left and right displacement keys to select "History Log", click "ENTER" to enter the storage setting sub-menu interface, and you can choose to view data log and calibration log.

Time Settings

In the menu interface, press the left and right displacement keys to select "Time Setting", and click "ENTER" to enter the time setting sub-menu interface, as shown in the figure below. Set the internal RTC working time of the controller and click "Save Settings.

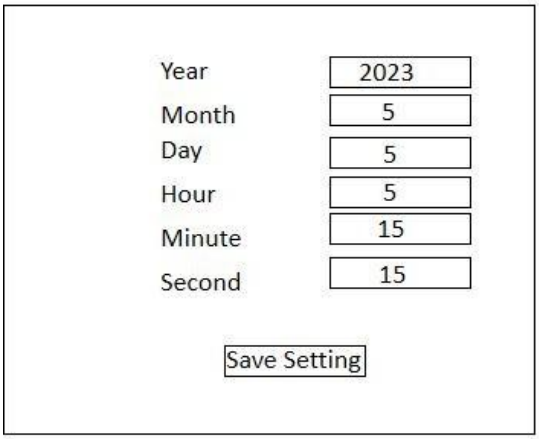


Fig. 3-8 Time Setting

Alarm Settings

In the menu interface, press the left and right displacement keys to select "Alarm Setting", and click "ENTER" to enter the alarm setting sub-menu interface, as shown in the figure below. Set the upper or lower alarm limit according to the needs of the site, and click "Save Settings.

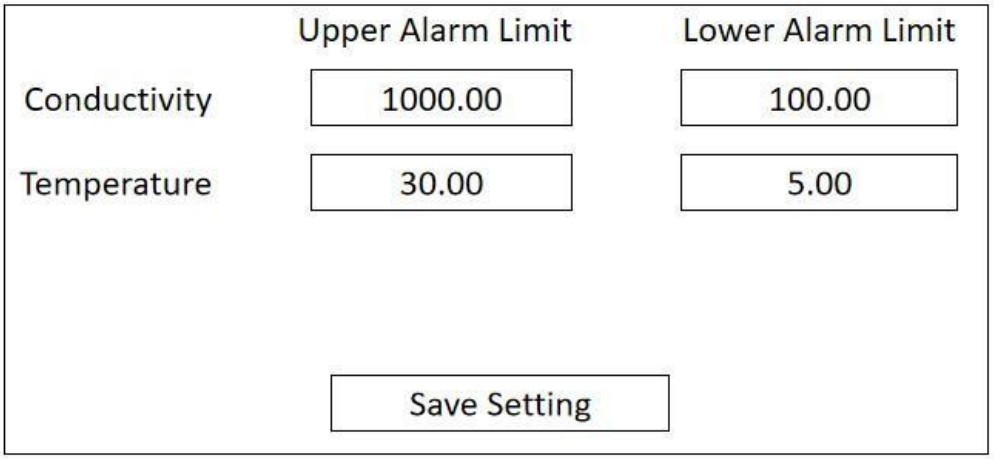


Fig. 3-9 Alarm Limit Setting

4 Maintenance and troubleshooting

4.1 Routine Maintenance

- Cable inspection: check whether all connected signal power cables are broken. If they are broken, the instrument will not work normally.
- Visual inspection: check the controller and sensor shell for damage and corrosion.
- Equipment cleaning: regularly clean the controller and sensor, use clean water to clean the electrode, do not use abrasive or sharp objects to scrub the electrode.

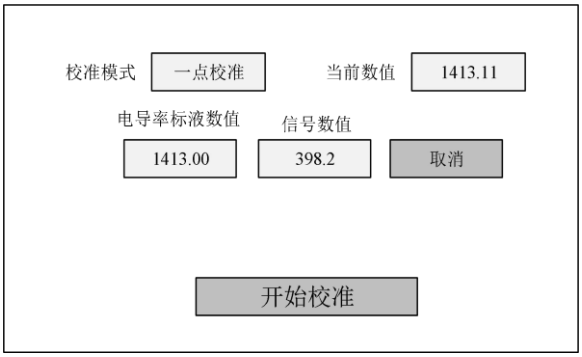
4.2 Calibration

The surface of the electrode will be polluted during the use of the conductivity sensor, and the electrode coefficient will also change, which will affect the measurement results. The sensor needs to be calibrated (the period can depend on the situation, and the surface water is generally 3 months).

Please use professional conductivity standard solution and put the conductivity sensor into the calibration solution to ensure that the signal value is stable and start the calibration operation.

- The first step, enter the calibration interface

In the measurement interface, click the "MENU" button to enter the menu interface, press the left and right displacement buttons to select "Calibration",



click "ENTER", and select "Conductivity" to enter the conductivity calibration interface, as shown in Figure 4-1.

Figure 4-1 Conductivity sensor calibration interface

Note: Conductivity sensors require only a little calibration

The "Conductivity Standard Solution Value" box is 1413 by default during calibration. It is recommended to use a standard solution with a concentration of 1413uS/cm for calibration. If a standard solution with different concentration is required, manual modification is required.

- The second step, calibration data acquisition

Please prepare the standard solution before data acquisition and then put the sensor into the prepared standard solution.

Fig. 4-2 Schematic diagram of calibration

Observe the display in "signal value", wait until the value is stable (the judgment standard is that the difference between the maximum value and the minimum value of the signal value within one minute is less than 1), click the corresponding "confirm" button at the back to stop refreshing the data, and then enter the conductivity value of the standard solution in the input box corresponding to "conductivity standard solution value", and the data collection and confirmation at this point are completed.

Fig. 4-2 Schematic diagram of calibration

Observe the display in "signal value", wait until the value is stable (the judgment standard is that the difference between the maximum value and the minimum value of the signal value within one minute is less than 1), click the corresponding "confirm" button at the back to stop refreshing the data, and then enter the conductivity value of the standard solution in the input box corresponding to "conductivity standard solution value", and the data collection and confirmation at this point are completed.

- Step 3, Calibration Confirmation

After confirming that the signal values are normal and the collection is completed, click "Start Calibration" to complete this calibration. The calibration values will be stored in the sensor and the real-time temperature data during calibration will be stored at the same time, so there is no need to pay additional attention to the temperature data during calibration.

Observe whether the signal value is correct. When measuring 1413 μs/cm standard solution at
25 ℃, the conductivity electrode signal value is usually around 400. The lower the temperature, the greater the signal value.

Temperature Calibration

In the measurement interface, click the "MENU" key to enter the menu interface, press the left and right displacement keys to select "Calibration", click "ENTER" and select "Temperature (Conductivity)" to enter the conductivity temperature calibration interface, as shown in Figure 4-3. Just put the sensor into the aqueous solution, and after the temperature indication is stable, click the "Confirm" button on the right side of the signal value, enter the standard temperature value of the aqueous solution in the temperature value box, and then click the "Start Calibration" button below to complete the calibration operation. The "temperature value" box defaults to 25 during calibration, and the value needs to be modified according to the actual water temperature.

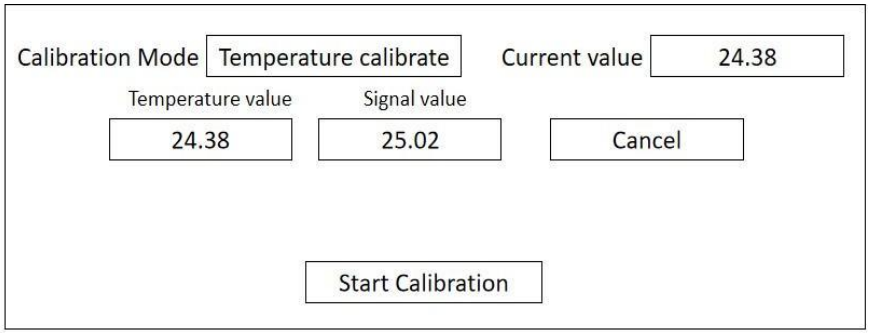


Fig. 4-3 Temperature Calibration

4.3 Electrode cleaning and preservation

Periodically inspect the electrodes for contaminants. If there are contaminants, rinse with clean water, and do not use hands or other hard objects to wipe the electrode end face. In case of long-term non-use, please rinse with clean water, dry and seal for storage.

4.4 Fault handling

- Problem 1: abnormal communication

  Possible causes: power supply or cable connection problems, baud rate mismatch.

  Processing method: check the power supply, check whether the RS485 connection is correct, and confirm whether the baud rate is correct.

- Problem 2: Numerical instability

  Possible causes: the electrode is out of service life, there are bubbles in the measured solution, calibration error, signal interference.

Treatment method: clean the electrode and put it into the standard solution for detection. If there is still a problem with recalibration, check whether the power supply is faulty, whether the shielded wire is connected correctly, or contact after-sales service

5 REAGENT FORMULA

1. Zero-point standard solution

Pure water. Conductivity less than 1

µS/cm. 2.0.0100 mol/L KCL standard

solution

0.7456g of KCL dried at 105°C for 2h and cooled was weighed and dissolved in pure water. The volume is

set to 1000mL at 25 ℃, and the conductivity of this solution is 1413 µS/cm at 25 ℃.

Above reagent room temperature sealed storage, validity: 3 months.

6 Controller Modbus communication protocol

Register address	Message address	Data Type	Read and write	Lengt h	Description
40001	0x0000	float	R	2	Conductivity data
40003	0x0002	float	R	2	Temperature data