# Dissolved oxygen controller

# Basic User Manual
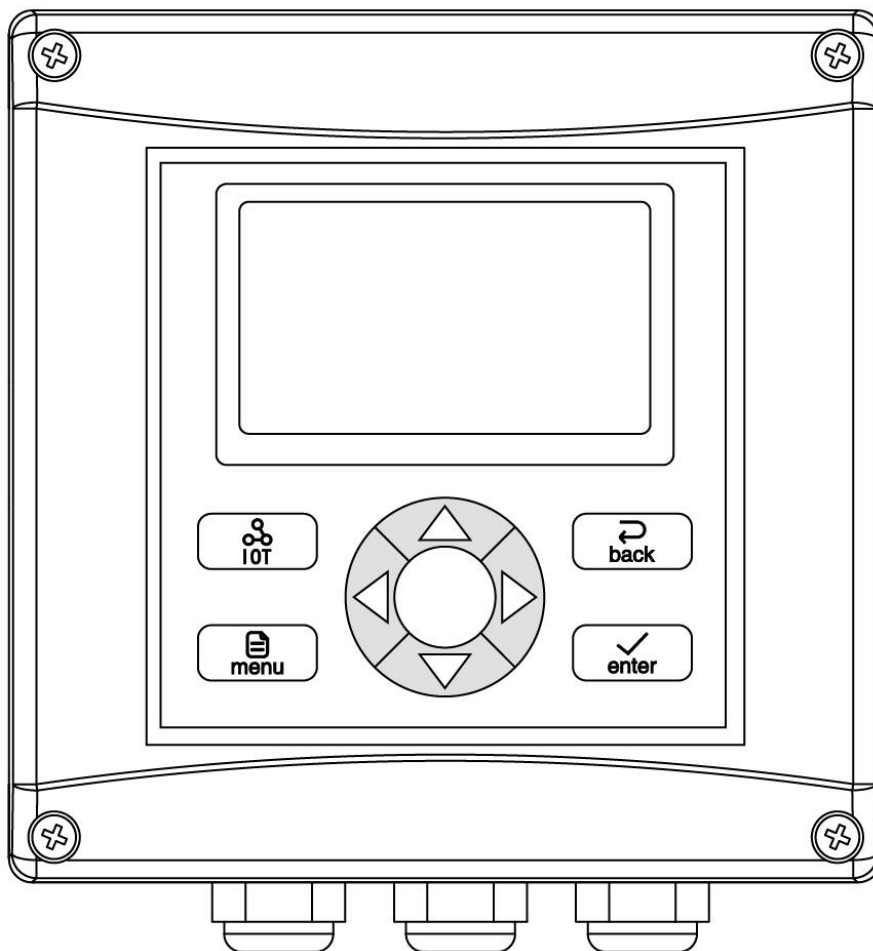
# Table Of Contents

## Appendix

This manual is suitable for products produced by our company L3XXXXXXXXXX Series of digital universal controllers.

The parameters and functions supported by different series of meters can be identified and judged by referring to the "single machine code" label of the fuselage.

➢ Each qualified instrument and equipment has an independent body "single machine code" label, the serial number of the code is unique, please do not tear the label, otherwise the quality guarantee will be lost.

**"Single machine code" label of the fuselage:**
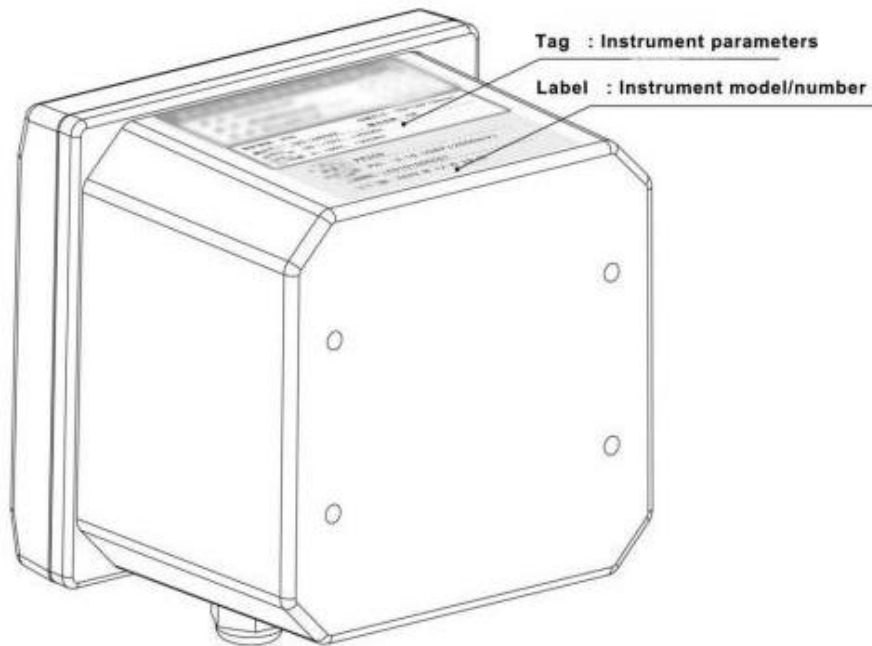


**The meaning of the label:**
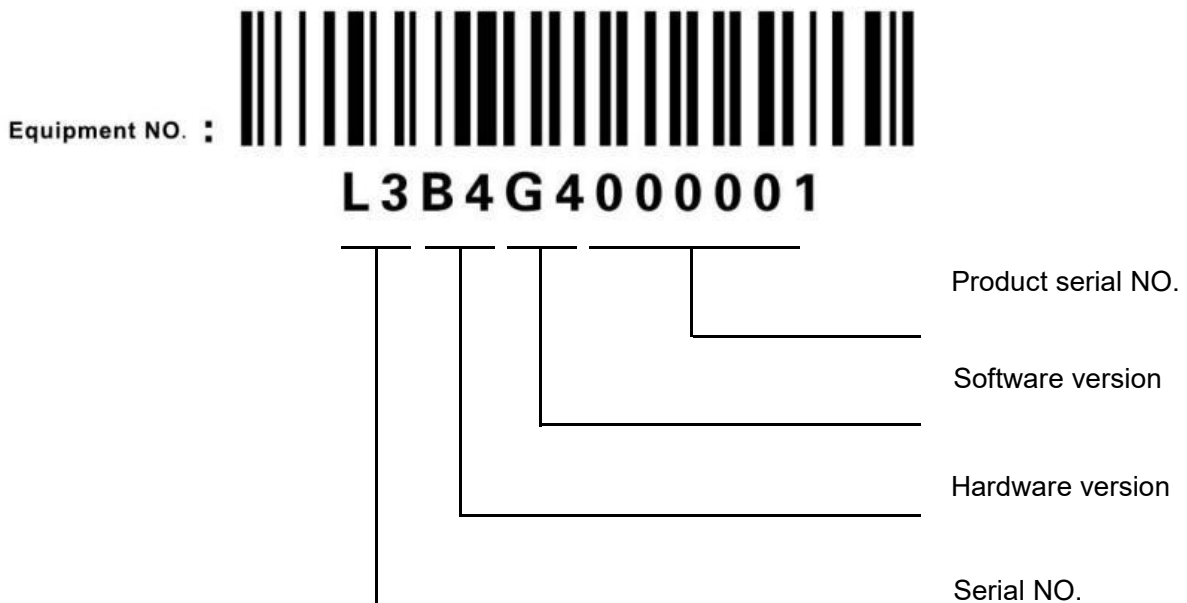
**Important Safety Information**

**Please read and observe the following:**

Please read this entire manual before unpacking, installation and operation, with particular attention to all danger warnings and precautions. Failure to do so may result in damage to the instrument or personal injury to the operator due to misuse. Do not install or use the instrument by any means other than those specified in this manual.

•After opening the analyzer case, the user may touch the instrument supply voltage.Please make sure to disconnect the power, before you open the analyzer cases. Analyzer housing assembly only low voltage, the operation is safe.

•The analyzer must be installed in accordance with relevant local codes and the professional and technical personnel, to comply with the analyzer's technical specifications and input ratings. If you are not sure which of the main power lines is the neutral line, use a double-pole switch to power off the analyzer.

• As soon as a problem occurs with the analyzer, disconnect the analyzer from power to prevent any unintentional operation that could result in damage to the instrument. For example, it may be in an unsafe state when the following situations occur:

(1) The analyzer appears visibly damaged;

(2)Analyzer fails to operate properly or provide the intended measurements;

(3)Analyzer has been stored for a long period of time at temperatures over 70°C environment.

• Wiring or repair should be done by professionals, and only the power-off analyzer should be operated.

# Power Wiring Note

1. Please install voltage stabilization and surge protection equipment that meets the instrument parameters at the power supply terminal to ensure that the power supply provided by the instrument is stable and reliable and meets the standards, otherwise the instrument will be irreversibly damaged due to poor power supply.

2. Damage caused by incorrect power supply is not covered by our quality guarantee.

3. Detailed parameters see the technical parameters.

# Useful signs

In add it ion to installation and operation information, the manual also includes warning signs related to user safety, caution signs related to possible instrument failure, and note signs related to important and useful operating instructions.

| Warning: |
|---|

The warning sign is shown above, which warns the user might get hurt

| Caution: |
|---|

☞ The caution sign is shown above, it reminds the user that the instrument may malfunction or be damaged.

The note sign is shown on the left, warns the user of important information about operation.

**Guarantee**

Our company warrants the instrument for one year (12 months) from the date of delivery. Consumables and consumable parts in the equipment are not covered by the warranty.

The terms of this warranty shall not apply if damage to the instrument occurs beyond the warranty period, or in the opinion of the company, the breakage or destruction of the instrument is due to improper use, lack of maintenance, improper installation, improper modification, abnormal environmental conditions, etc.

The Company's obligation under this warranty is limited to providing replacement or repair of this product, as the case may be. The product must be thoroughly cleaned to remove any contaminated chemicals before it is accepted for replacement or repair. Our obligations shall not exceed the price of the product itself. In no event shall the company beliable for damage caused by incidental or consequential damages, whether to persons or objects. The Company shall not beliable for any other loss, damage or expense of any kind, including economic loss resulting from the installation, use or improper use of the product.

- For details, please refer to the product's quality promise with  the product, and keep this manual and the quality promise properly.

## Part 1 Introduction

### ━ ━ ━ **Chapter 1** ━ ━ ━

### Overview

This product is a digital analytical instrument. According to the measurement object, it is connected to a digital electrode to measure various material parameters. The instrument supports two current outputs, one digital communication output and two control relays with configurable functions.

**1.1 Technical parameters**

Relay control: Number of channels: 2
Control type: high and low alarm/cleaning control/ambient temperature alarm
Contact type: SPST
Contact capacity: 3A 250VAC

Current output: Number of channels: 2
Output type: active 4～20mA or 0～20mA
Maximum load: 1000Ω

Communication interface: RS485 MODBUS-RTU

Memory backup: All user settings are kept in EEPROM indefinitely

Historical data: 14000 storage points, record interval can be set

Operating environment: 0 ～ +60℃, 0 ～ 95% relative humidity, non-condensing

Storage environment: -20 ～ +70℃, 0 ～ 95% relative humidity, non-condensing

Power requirements: 100～240VAC or 18～36VDC, 24W MAX

Installation method: Panel/ wall/ Pipe installation

Instrument size: 144*144*120 (unit mm)

Protection level: IP66

| Part 2  Installation |
| --- |

— — —  **Chapter 2** — — —

**Unboxing**

After unpacking, it is recommended to save the shipped cardboard box and packaging materials in case the instrument needs to be stored or re-shipped. Check the equipment and packaging materials for signs of damage during transportation. If there are signs of damage, notify the person transporting the goods immediately.

— — —  **Chapter 3** — — —

**Mechanical installation**

**3.1 Installation location**

The installation location of the instrument is:
Not affected by weather (rain, snow, ice, dust, etc.)
• Clean, dry and with little or no vibration
• Keep away from corrosive liquids
• Within the limit of ambient temperature (32～140°F  or 0～60°C)

| **Be careful:**<br>The analyzer is directly exposed to sunlight,<br>Its operating temperature may exceed its specified limit temperature,<br>And will reduce the visibility of the display. |
| --- |

☞

**Note: Please read this operation manual carefully before installation to avoid damage to the instrument due to incorrect wiring.**

• Please choose a well-ventilated location to install the instrument to avoid direct sunlight.
• Electrode signal transmission must use specific cables or cables provided by our company, and cannot be replaced by wires.
• When using AC220V power supply, you should avoid using three-phase power supply to avoid power spike interference (if power spike interference occurs, you can separate the power supply of the controller from the power supply of the control device, so that the controller uses the power supply alone, or The coil ends of all electromagnetic switches and power control devices are connected to spike absorbers to eliminate spikes, such as dosing machines, mixers, etc.).
• It is generally recommended that the controller be installed as close to the electrode as possible.
• Avoid corrosive liquids, or need to protect and isolate the environment.

## 3.2 External dimensions of the instrument
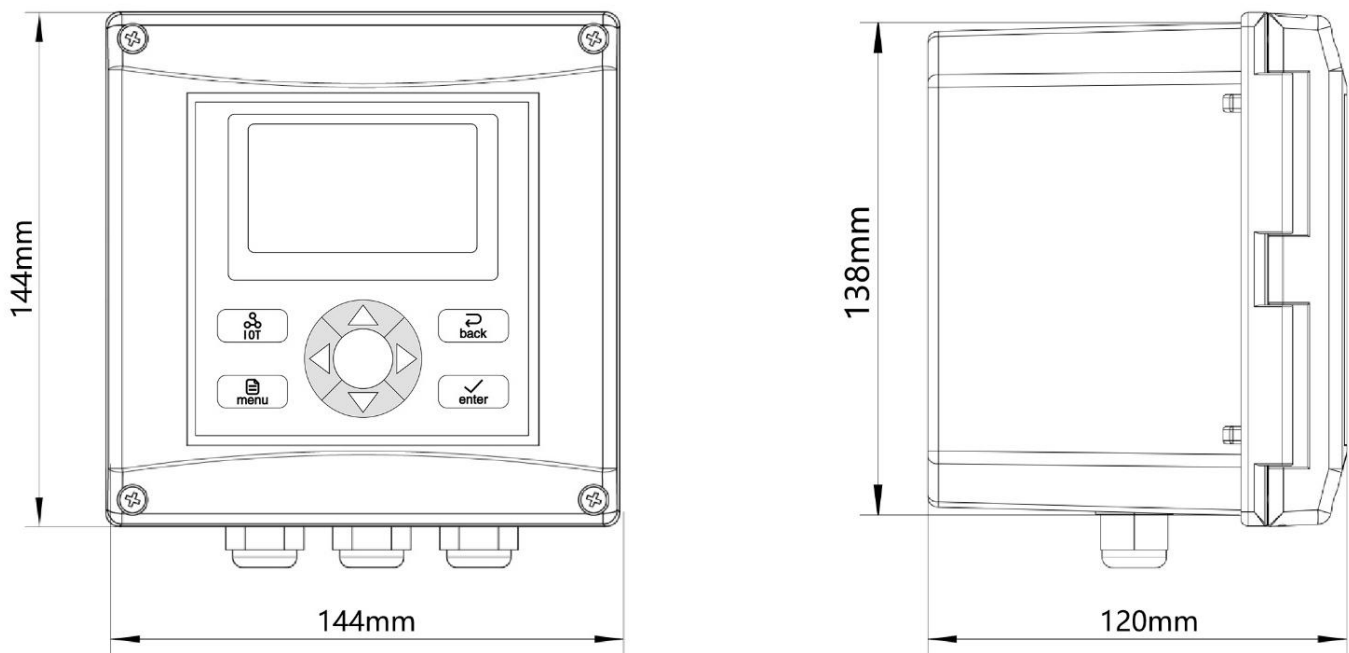


Figure 3-1 Schematic diagram of the appearance and dimensions of the instrument

## 3.3 Panel cabinet installation

When the instrument is installed in the panel cabinet type, use two fixing brackets to fix the instrument. The installation diagram is as follows:



1. 2 fixed brackets

2. Four M6*8 screws
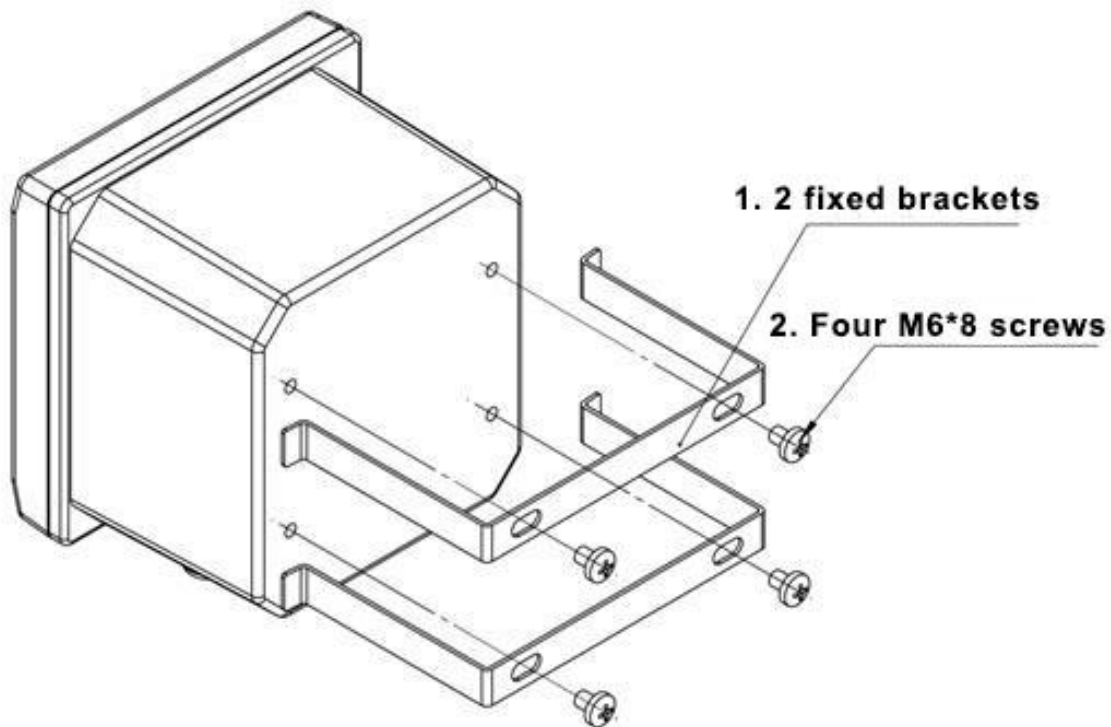
Figure 3-2 Schematic diagram of panel installation

**3.4 Wall mount**

Connect the gray back panel to the instrument, and then install it on the box or the side wall of the wall. The installation dimensions and schematic diagram are as follows:



Figure 3-3 Schematic diagram of wall-mounted installation
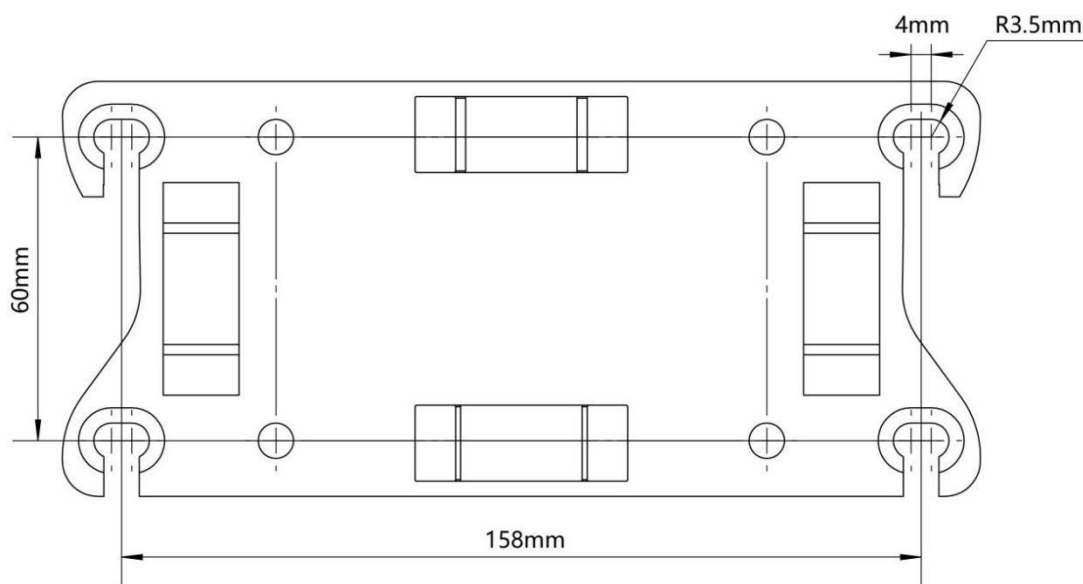


Figure 3-4 Wall-mounted installation hole size diagram

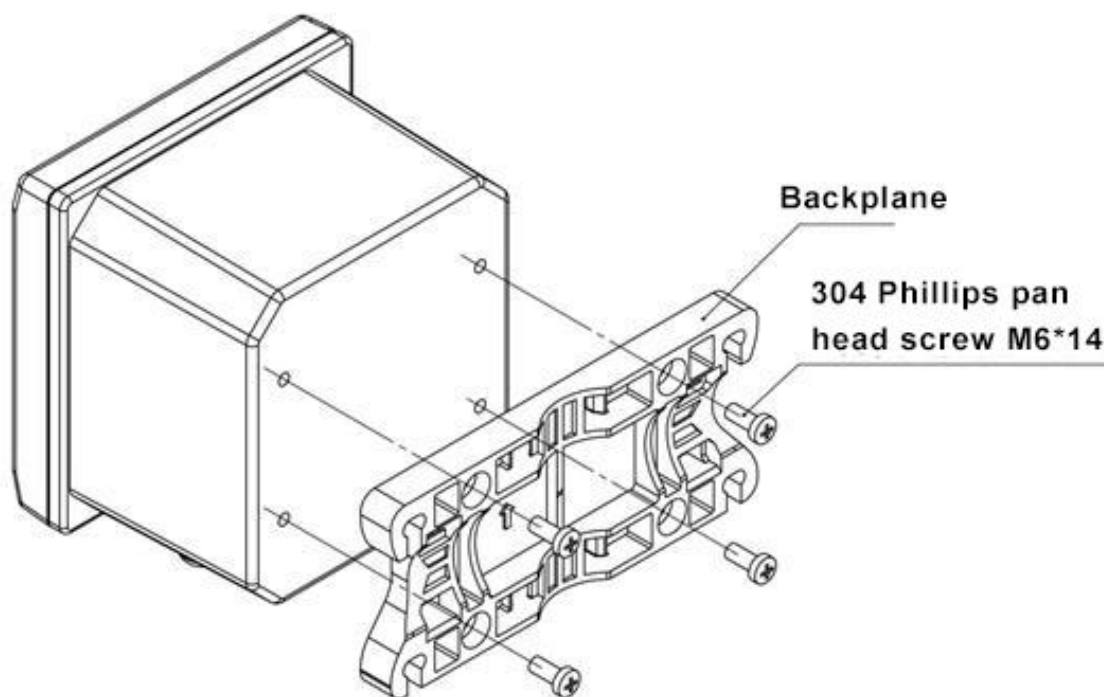**3.5 Pipeline installation** | Connect the gray backplane to the instrument, and then fix the backplane to the horizontal pipe or vertical pipe with a clamp. The installation diagram is as follows:
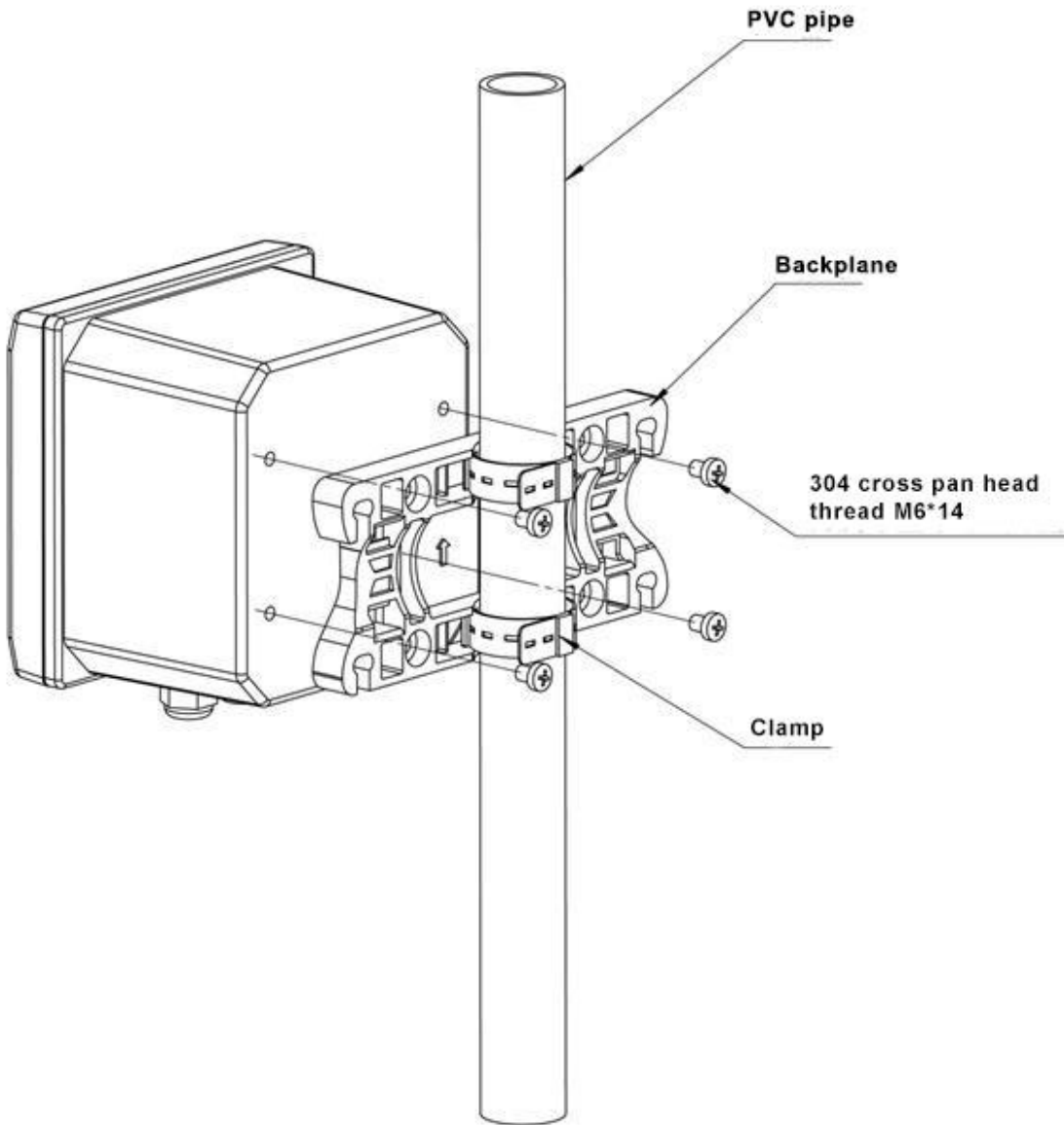


Figure 3-5 Schematic diagram of pipeline installation

— — — **Chapter 4** — — —

**Electrical Installation**

**4.1 Power connection**

☞

Two power supply modes: AC power supply 100～240VAC and DC power supply 18～36VDC.

After unscrewing the screws on the front cover of the instrument, open the cover and you can see the wiring terminals.

Figure 4-1 shows the locations and names of the access terminals of the two power sources.

**Note: Before connecting the AC power supply, be sure to cut off the power supply first, and only operate when the power is off!**
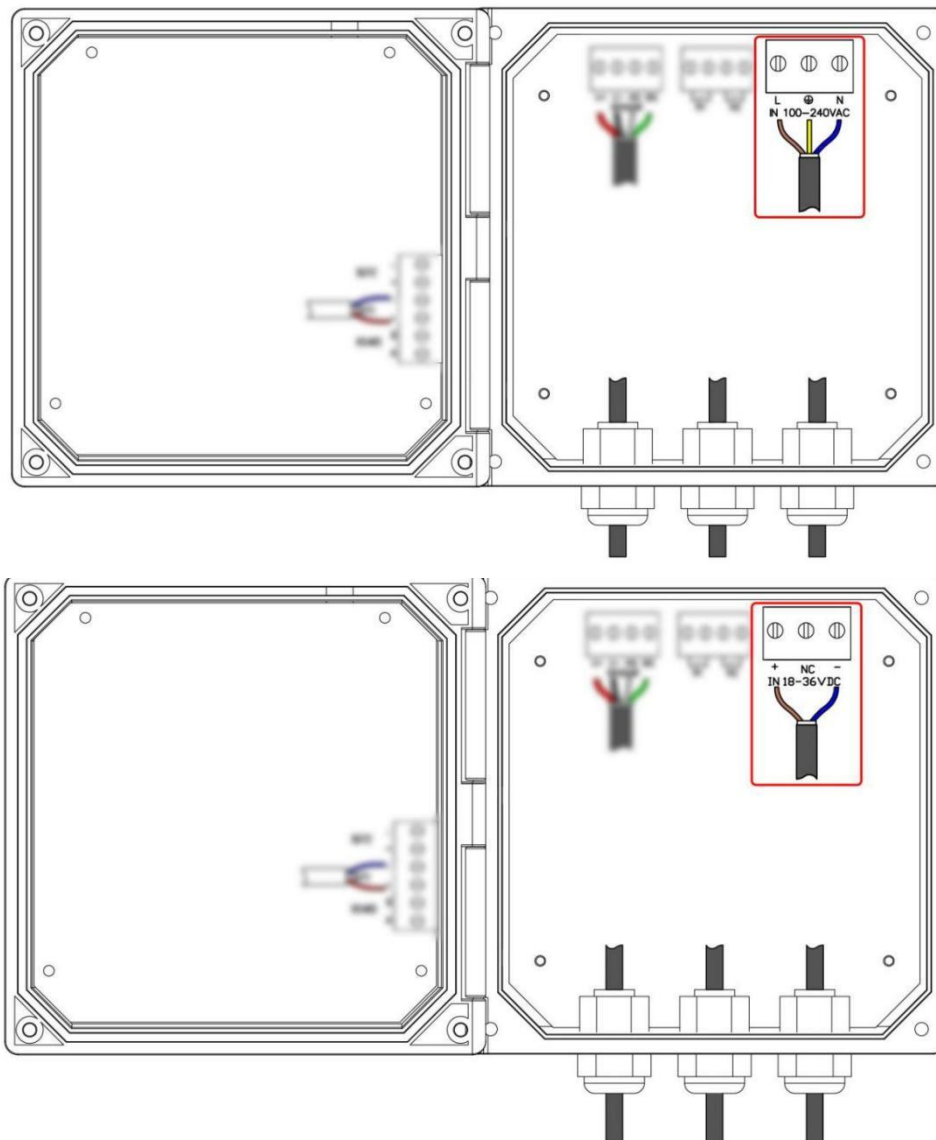
Figure 4-1 Two power supply terminals

The following table shows the definition of two power supply terminals:

| POWER<br>AC  IN<br>100-240V | L | AC power live wire input | POWER<br>DC  IN<br>18-36V | + | DC power supply positive |
|---|---|---|---|---|---|
| | ⏚ | AC power ground wire | | NC | Floating terminal |
| | N | AC power neutral input terminal | | - | DC power supply negative |

**4.2 Wiring terminal definition** | The terminal location and name are shown in the figure below:
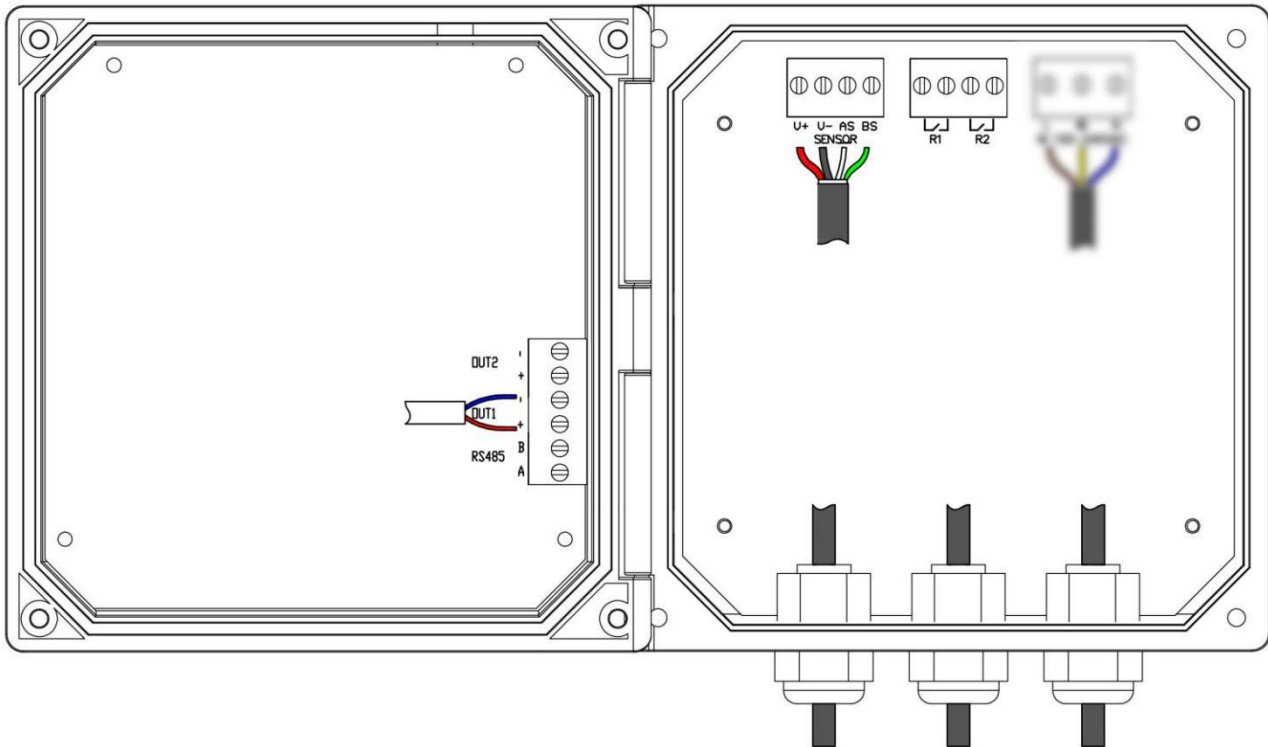


The following table is the definition of wiring terminals:

| OUT2 | + | Current two output positive | V- | Electrode power-terminal |
|---|---|---|---|---|
| | - | Current two output negative | V+ | Electrode power + terminal |
| OUT1 | + | Current one output positive | BS | Electrode communication terminal B |
| | - | Current one output negative | R1 | Relay one contact |
| RS485 | A | RS485 signal D+(A) end | | Relay one contact |
| | B | RS485 signal D-(B) end | R2 Electrode communication terminal A | Relay two contacts |
| AS | | Electrode communication terminal A | | Relay two contacts |

Part Three Operation

— — — Chapter 5 — — —

User Interface

The instrument panel consists of a display screen and eight buttons, namely IOT (Internet of Things) button, menu (menu) button, back (return) button, enter (confirm) button, four up, down, left and right Arrow keys.
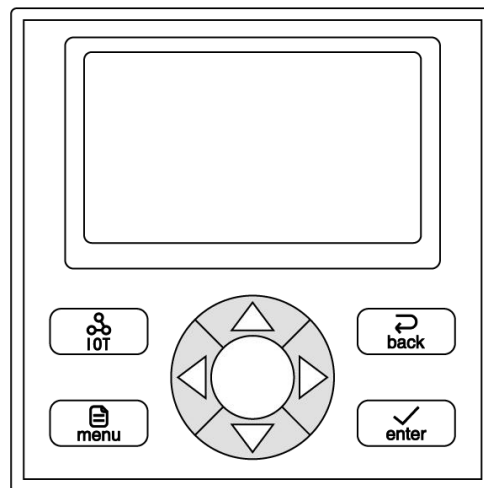


## 5.1 Panel keys
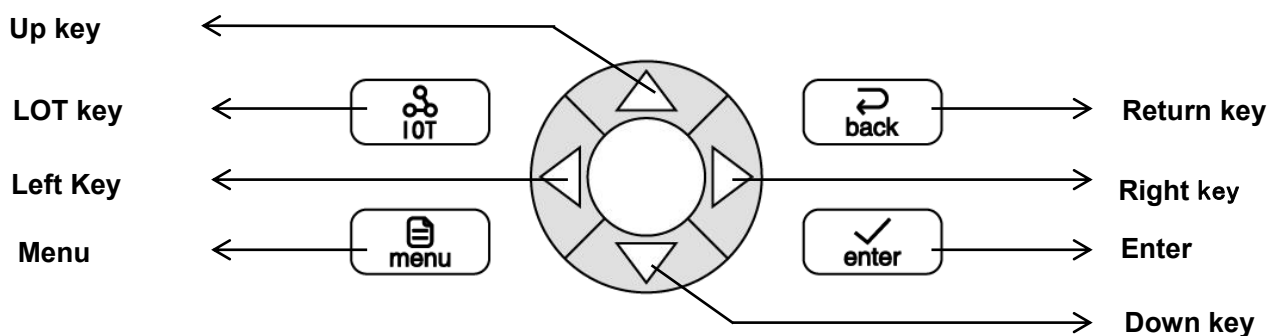


**Up key:** Press this key in the menu option interface to move the cursor up; press this key in the parameter setting interface to increase the data by 1 (change in the order of 0, 1, 2,... 9, 0).

**Down Key:** Press this key in the menu option interface to move the cursor down; press this key in the parameter setting interface to reduce the data by 1 (changes in the order of 9, 8, 7... 0, 9); in the measurement interface, press This key can switch three kinds of secondary displays in cycles: "Temperature & Electrode Connection Status" ➔ "Relay Status" ➔ "Two Currents".

**Left key:** In the parameter setting interface, press this key to move the cursor to the left. In the menu interface, press this key to return to the previous menu.

**Right key:** In the parameter setting interface, press this key to move the cursor to the right.

**LOT key**：Short press this key in the measurement interface to turn on or off the Internet of Things function, and long press to enter the Internet of Things setting menu.and long press to enter the Internet of Things setting menu.

☞ **Note: The LOT key function can only be used in the instrument with hardware version C0 or higher.**

**Menu key:** Press this key in the measurement interface to enter the menu interface, press this key in the menu option interface to directly return to the measurement state, and press this key in the parameter setting interface to return to the previous menu.

**Enter key:** In the menu option interface, press this key to select the option; in the parameter setting interface, press this key to confirm and return to the previous menu.

**Return key:** Press this key to return to the previous menu. For example, in the parameter setting interface, press this key to abandon the modification and return to the previous menu.

**5.2 Display**

The meter normally displays the measurement interface after power-on, and the specific information is as follows:
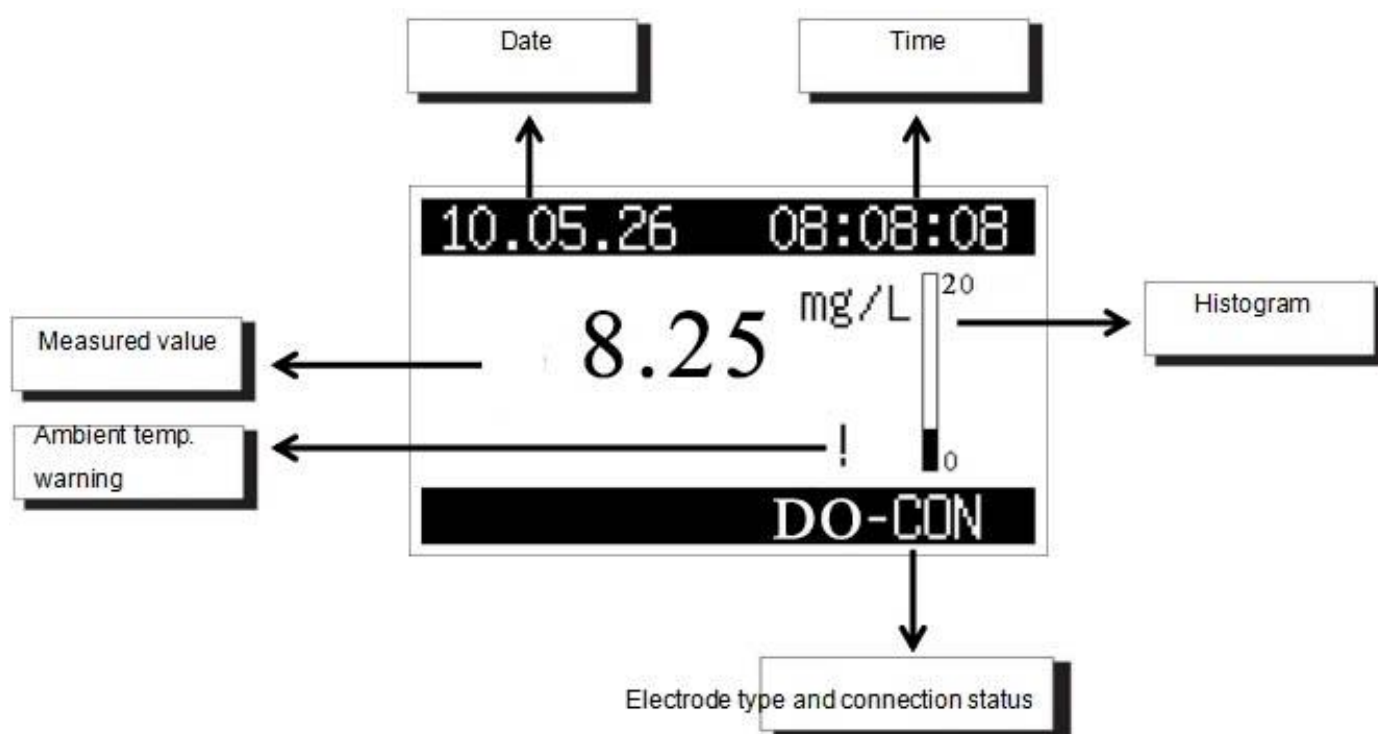


**Date and time:** Display current date and time information.

**Measurement value:** Display the current measurement value, the unit changes according to the measurement object.

When "<" appears in front of the measured value, it means that the current measured value is lower than the zero point, and zero point calibration is required.

When "＞" appears in front of the measured value, it means that the current measured value is out of the display range of the meter.

**Histogram:** indicates the ratio of the current measurement value to the electrode range.

**Temperature warning:** When the operating environment temperature exceeds 50°C, a "!" will appear on the screen, indicating that the operating environment temperature of the instrument is too high, and heat dissipation measures need to be added.

**Electrode connection status: Display the current electrode connection status.**
**No electrode connection: XX-NC**
**Electrode connection: XX-CON**
**Analog measurement: XX EMLUATOR (flashing)**

| | — — — Chapter 6 — — — |
| System default setting value |

| Setting type | Setting Options | | Initial value |
|---|---|---|---|
| **Alarm Set** | Relay I | Function Set | Main Value Control |
| | Relay II | Function Set | Main Value Control |
| **Current Set** | Current I | Output Type | 4-20mA |
| | Current II | Output Type | 4-20mA |
| **Comm. Set** | Net Address | | 001 |
| | Baud Rate | | 9600 |
| | Verify Bit | | NONE |
| | Stop Bit | | 1 bit |
| **System Set** | Display Speed | | Buffers 8 |
| | Backlight | | Scanty Power 01 Minute |
| | Contrast Set | | 25 |
| | Password | | 000000 |
| **History Logs** | Set Interval | | 5min |
| **Servings** | Measure Mode | | Probe Measure |
| | ETMP Calibrate | | 25°C |
| | ETEMP Alarm | | OFF |

```
— — — Chapter 7 — — —
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**Menu description**

When the meter is in the measuring state, long press the key ⬚menu to enter the main menu. This chapter will introduce the contents of the menu directory.

| | |
|---|---|
| **7.1 Probe set** | According to the measurement object, the meter is connected to different electrodes, and the menu items are set according to the electrode type. For details, please refer to the "Digital Universal Controller Electrode Setting Instructions". |
| **7.2 Alarm set** | The instrument provides two completely independent relay output contacts, corresponding to the "Relay 1" and "Relay 2" menus respectively. Users can set the functions and parameters of the two relays respectively. |
| **7.2.1 Control function** | When the "Main Menu" -> "Alarm Settings" -> "Relay X" -> "Function Settings" menu selects "Main Measurement Control" or "Temperature Control", this relay is a control output relay. When "Main Measurement Control" is selected, the relay state is controlled by the main measurement value; when "Temperature Control" is selected, the relay is controlled by the temperature measurement value. |

When the "closed value"> "open value" is set in the menu, the relay is in high alarm control
When the "closed value" <"open value" is set in the menu, the relay is under low alarm control



High alarm control    Low alarm control
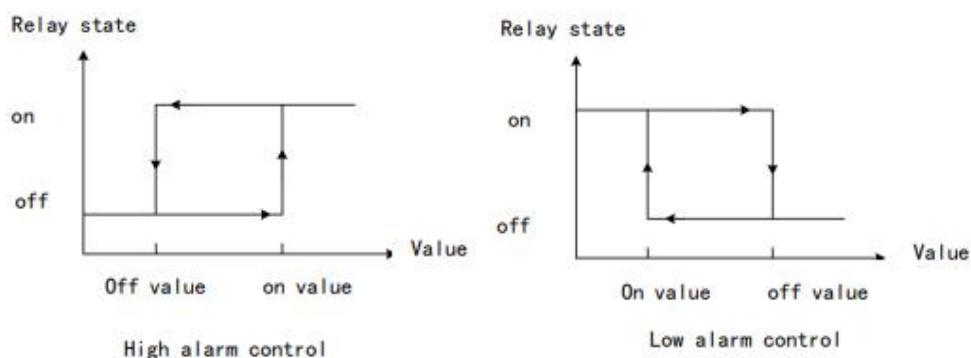
| | |
|---|---|
| **7.2.2 Cleaning output** | When "Cleaning Output" is selected in the "Main Menu" -> "Alarm Settings" -> "Relay X" -> "Function Settings" menu, the relay is in the cleaning output state, and the relay can be closed periodically for cleaning control. |



Cleaning time Cleaning interval Cleaning Time Cleaning interval Cleaning Time
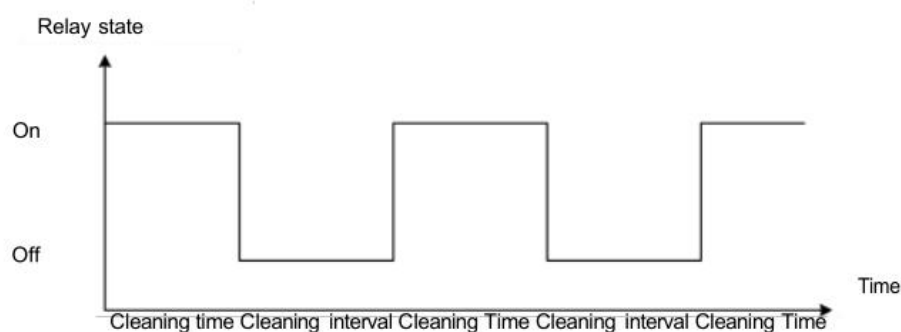
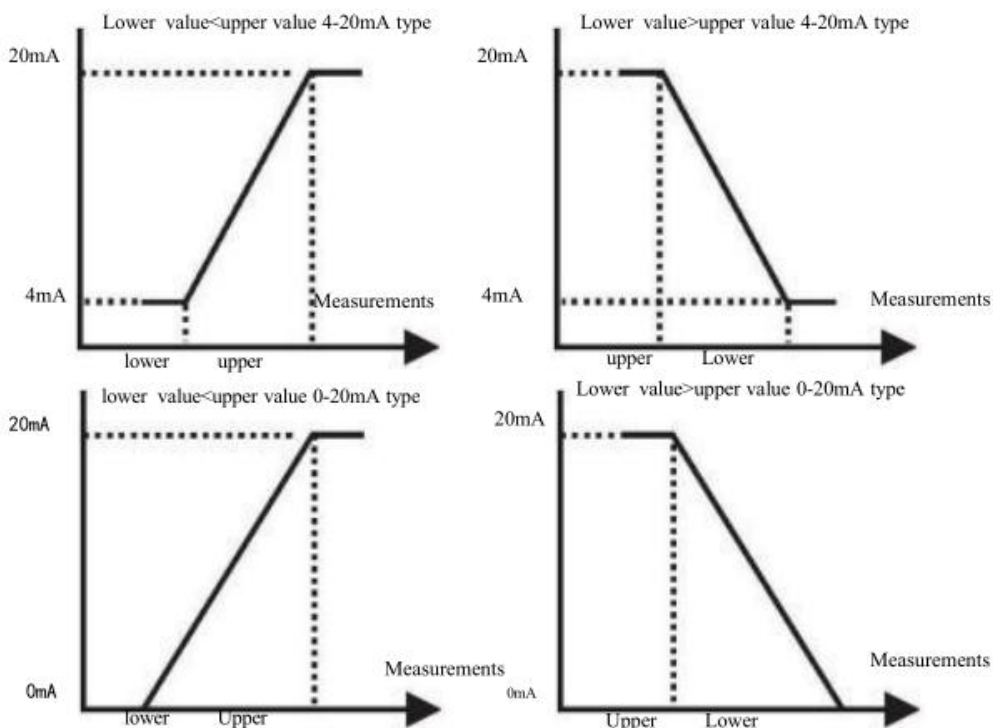| | |
|---|---|
| **7.2.3 Cleaning status** | Select the measurement value status during cleaning.<br>After selecting "Keep", when cleaning, the measured and displayed value maintains the value before the relay action.<br>After selecting "Continuous", the measured value is the real-time value of continuous measurement. |
| **7.2.4 Ambient temp. alarm** | When "Ambient Temperature Alarm" is selected in the "Main Menu" -> "Alarm Settings" -> "Relay X" -> "Function Settings" menu, the relay is in the alarm control output state. The relay status is controlled by the working environment temperature of the instrument. When the environment temperature exceeds 50°C, the relay is closed. |
| **7.3 Current setting** | The meter provides two current signal outputs with independent parameters that can be set, corresponding to the "Current 1" and "Current 2" menus respectively. The user can set the corresponding channels and upper and lower limits of the two currents respectively. |



| | |
|---|---|
| **7.3.1 Output type** | The output current type can be selected as "4-20mA" or "0-20mA". |
| **7.3.2 Channel selection** | The measurement value corresponding to the current can be designated as the "main measurement channel" or "temperature channel". |
| **7.3.3 Upper limit** | Specify the measured value corresponding to the maximum output current. |
| **7.3.4 Lower limit** | Specify the measured value corresponding to the minimum output current. |

| | |
|---|---|
| **7.4 Comm. Set** | The instrument provides a digital communication interface, this menu can set the communication interface parameters. |
| **7.4.1 Slave ID** | Set the slave ID used by the instrument in the communication network. |
| **7.4.2 Baud Bate** | Select the baud rate used by the communication interface. |
| **7.4.3 Verify Bit** | Select the verification method, the default is "no verification". |
| **7.4.4 Stop Bit** | Select the number of stop bits, the default is "one bit". |
| **7.5 System set** | |
| **7.5.1 Time setting** | Set the system time "year, month, day" and "hour, minute, second". |
| **7.5.2 Display Speed** | Adjust the rate of change of the measured display value. The display rate from fast to slow is "buffer level 2", "buffer level 4", "buffer level 8", "buffer level 16", "buffer level 32". |
| **7.5.3 Backlight** | Set the LCD backlight working mode. If it is set to "Energy-saving" mode, the indicator will automatically turn off if there is no key operation within the set time. |
| **7.5.4 Contrast set** | Set the contrast of the LCD display, press the key button ◁ on the panel to decrease the contrast, and press the key button ▷ on the panel to increase the contrast. |
| **7.5.5 Version Info.** | View program version information. |
| **7.5.6 password set** | It is used to set the verification password entered when entering the menu in the measurement mode. The password is set to "000000" when leaving the factory, and you can directly enter the menu without a password in the measurement mode. If the user sets other passwords, he will be prompted to enter the password when entering, and the menu can only be entered after the password is verified. |
| **7.6 History** | |
| **7.6.1 Memory information** | View meter history storage information. |
| **7.6.2 Recording interval** | Set the interval time for the meter to record measurement data. The setting range is 0~999min. When the recording interval is set to 0, it means that the recording function is turned off. |
| **7.6.3 Data query** | After entering the menu, you can enter the query date, and press the key [enter] to display the latest historical data to the query point. |

**7.7 Test maintenance**

**7.7.1 Current calibration**

To calibrate the current output value, take the calibration current 20mA as an example. First connect the ammeter to the current output terminal and enter the menu "Test Maintenance" -> "Current Calibration" -> "Current 1" -> "Calibrate 20mA". Press the key to increase or decrease the value displayed on the screen until the ammeter reads 20mA, press the key ⎛ ✓ enter ⎞ to save the calibration result.

☞ **Note: When performing current calibration operation, for each current output, two points (4mA and 20mA) need to be calibrated to achieve the calibration effect.**

**7.7.2 Relay test**

The two sets of relays can be tested on and off.
After entering, select "close" or "open", and the corresponding relay will make an opening action.

**7.7.3 Current test**

The two current outputs can be tested. First connect the ammeter to the current output terminal that needs to be tested. After entering the menu, press the button to change the output current value, and verify whether the current output of the meter is correct through the ammeter reading.

**7.7.4 Measuring**

The displayed measurement value can be set to "electrode measurement" or "analog measurement".
Electrode measurement: The measured value displayed on the screen is the value measured by the electrode.
Analog measurement: The measured value displayed on the screen is the input value set by the user.

**7.7.5 Ambient temp.**

Ambient temperature value: Display the current ambient temperature value.
Ambient temperature calibration: calibrate the measured value of the ambient temperature of the instrument.
Buzzer alarm: Set whether the buzzer will output an alarm sound when the ambient temperature is alarmed.

**7.7.6 Meter reset**

The instrument calibration parameters and all setting parameters can be restored to the factory default state.

**7.8 Setting list**

All parameters set by the user can be viewed.

| | Appendix |
|---|---|
| | **A Modbus register** |

## 1. Overview of Modbus RTU:

The instrument acts as a slave on the network and supports Modbus RTU communication protocol.

Data communication is initiated by the host, and the first byte of the transmitted message is the target slave address. When the first byte is received by all the slaves on the network, each slave will decode it to determine whether the message is sent to itself.

The transmission of the RTU message frame must start with a pause interval of at least 3.5 characters. After the last character is transmitted, a pause of at least 3.5 characters marks the end of the message frame. A new message can start after this pause. In the transmission process, the entire message frame must be transmitted in a continuous stream. If there is a pause interval of more than 1.5 characters before the completion of the message frame transmission, the receiving device will refresh the incomplete message and assume that the next byte is the beginning of a new message. Similarly, if a new message starts after the previous frame in less than 3.5 characters, the receiving device will consider it a continuation of the previous frame, and this will cause an error because of the final CRC The value cannot be correct.

The meter uses the function code 0x04 to complete the output of the measurement results and the output of two current values.

## 2. Function code details (function 0x04 code):

This function enables the master (host computer) to obtain the real-time measurement value of the slave (instrument). The value is specified as a single-precision floating-point type (that is, occupying two consecutive register addresses), and the corresponding parameters are marked with different register addresses;

The host can send a command frame to read a single or all data results. The data frame format is as follows (the data is all in Hex format):

**Host sends:**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Slave address | function code | The upper 8 bits of the register start address | The lower 8 bits of the register start address | The upper 8 bits of the number of registers | The lower 8 bits of the number of registers | CRC low 8 bits | CRC high 8 bits |
| Addr | 04 | xx | xx | xx | xx | CRC | CRC |

**Slave machine answer:**

| 1 | 2 | 3 | 4 | 5 | 5+n | 5+n+1 | 5+n+2 | 5+n+3 |
|---|---|---|---|---|-----|-------|-------|-------|
| Device address | function code | length | Data 1 high 8 bits | Data 1 low 8 bits | Data n high 8 bits | Data n lower 8 bits | CRC low 8 bits | CRC high 8 bits |
| Addr | 04 | Len | xx | xx | xx | xx | CRC | CRC |

☞ **Note: 1. Addr is the slave address, and the optional range is 0x01～0xFE;**
　　　**2. Len is the number of bytes of the returned data.**

**For example:**
**Send frame:** [01 04 00 00 00 02 71 CB], the meaning is as follows:
[01]: Instrument address
[04]: Function code
[00 00]: The starting register address is 0x0000
[00 02]: Read 2 registers starting from the starting address (that is, read 1 single-precision floating-point data result)
[71 CB]: CRC check data
**Return frame:** [01 04 04 CC CD 41 48 65 4D], the meaning is as follows:
[01]: Instrument address
[04]: Function code
[04]: Number of bytes returned (here 4)
[CC CD 41 48]: 0x4148CCCD (that is, the floating-point value is 12.55, and the specific value means to find the corresponding address) (Note: Combine two 16-bit integer registers to form a single-precision floating-point number, pay attention to the order of the data)
[65 4D]: CRC check data

## 3. Corresponding parameter table of communication address:

According to the measurement object, the meter is connected to different electrodes. Please refer to the "Digital Universal Controller Electrode Setting Instructions" for the corresponding parameter table of the communication address.

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