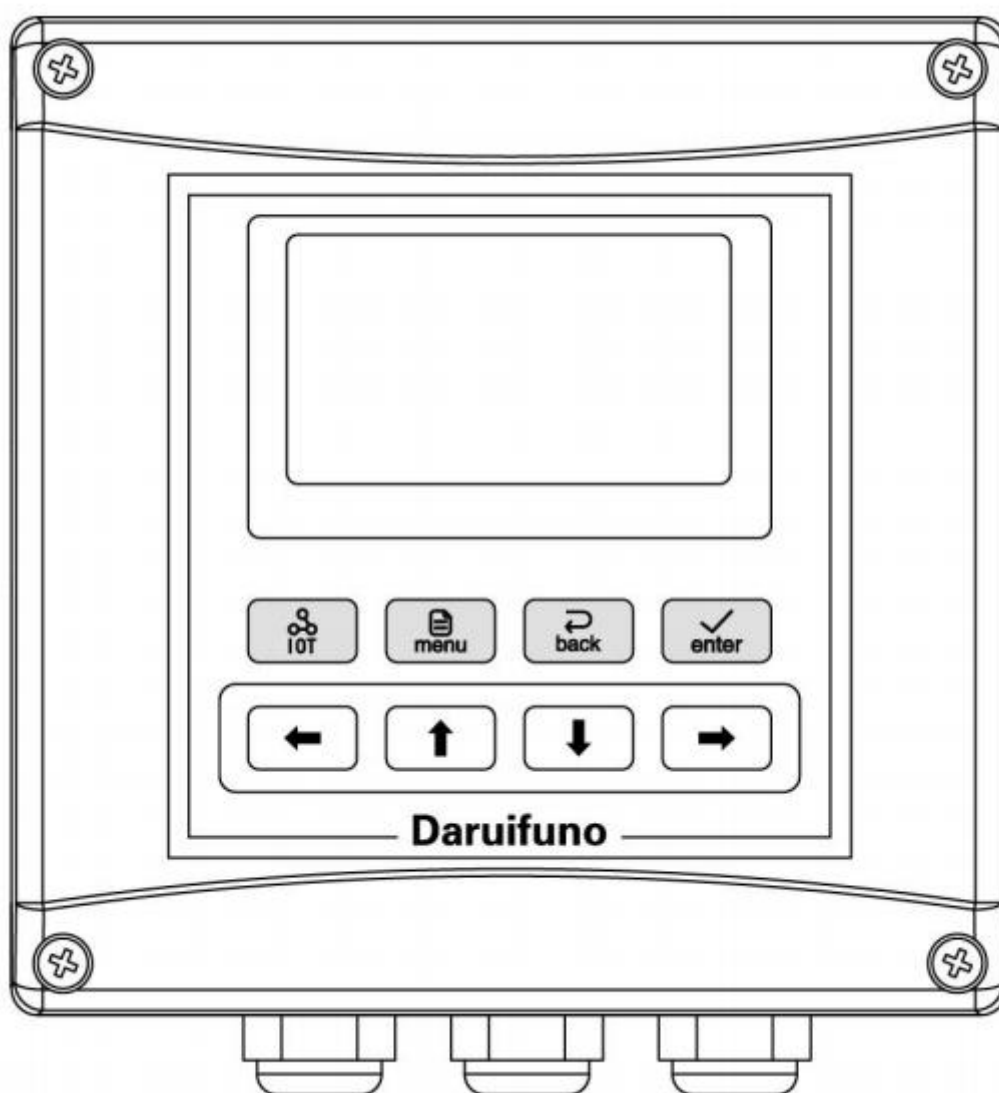




Online pH/ORP Controller

User Manual



Model: APX2-C3

Version 1.20.00.00

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Chapter 1 Overview

The online pH/ORP controllers are suitable for continuous monitoring of pH or ORP values of aqueous solutions in various industries.

1.1 Technical Parameters

Display Range	pH: 0~14pH, ORP: -2000mV~2000mV, Temp.: -10~+150℃
Resolution	pH: 0.01pH ORP: 1mV Temp.: 0.1℃
Accuracy	pH: ± 0.02 pH, ORP: ± 2 mV
Temp. Compensation	NTC10K/PT1000 automatic or manual
Relay Control	Channel Quantity: 2 SPST relays, 3A 250V AC
	Control Type: main value control / temp. Control / wash control / internal temp. alarm
Current Output	Two active 4~20mA or 0~20mA, Max. Load: 1000Ω
	Corresponding Channel: Main measurement value/ Temp
Comm. Interface	A RS485, support MODBUS-RTU protocol and JSON text format
Calibration Method	pH: 3-point calibration, ORP: 2-point calibration
Display Screen	3.2 inch graphic LCD display
Electronic Clock	Year-Month-Day, Hour-Minute-Second
History Recording	10,000 historical data can be recorded
	100 calibration logs, 100 internal temp. overtemperature alarm logs
Operating Environment	0~+60℃, relative humidity 0~95%, no condensation
Storage Environment	-20~+70℃, relative humidity 0~55%, no condensation
Power Supply	100~240VAC or 18~36VDC, 3W Max
Installation Method	Panel / wall / pipe mounting
Instrument Dimension	144*144*120 (unit: mm)
Protection Grade	IP66
Instrument Weight	About 800g

Chapter 2 Mechanical Installation

2.1 Dimension

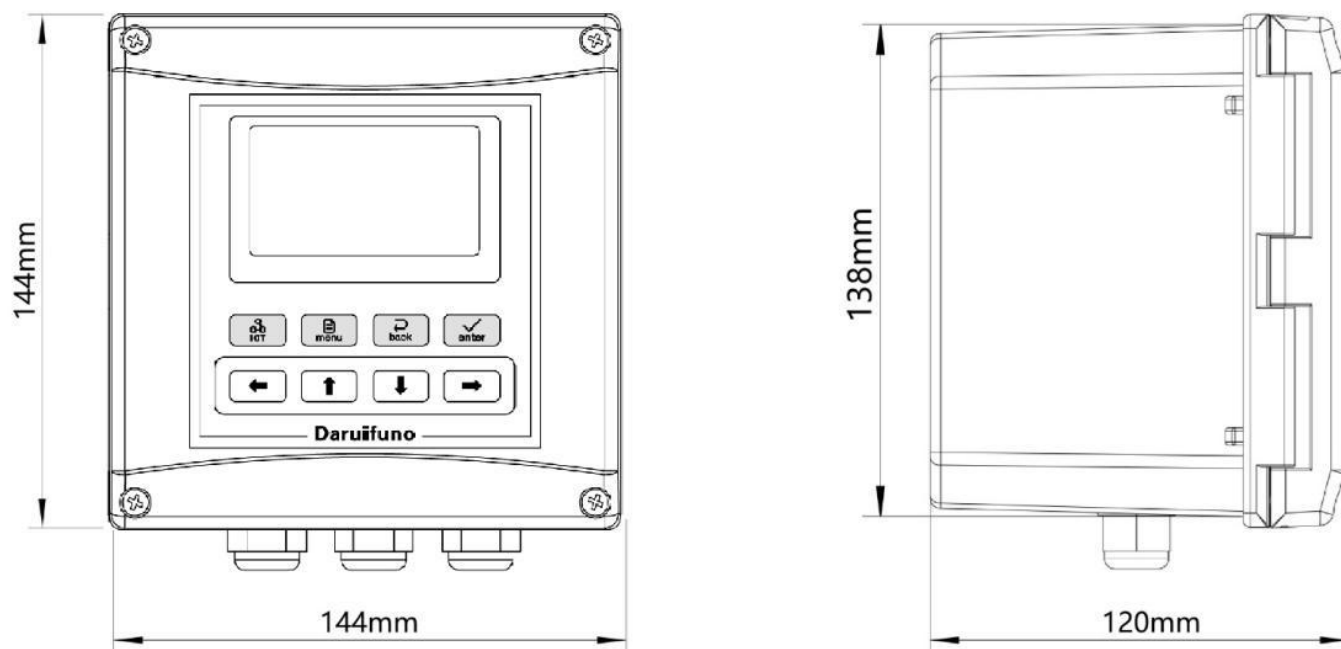


Figure 2-1 Instrument dimension

2.2 Installation

● Panel installation

When selecting a rack mount for the meter, use 2 mounting brackets to secure the meter, and the installation diagram is shown below:

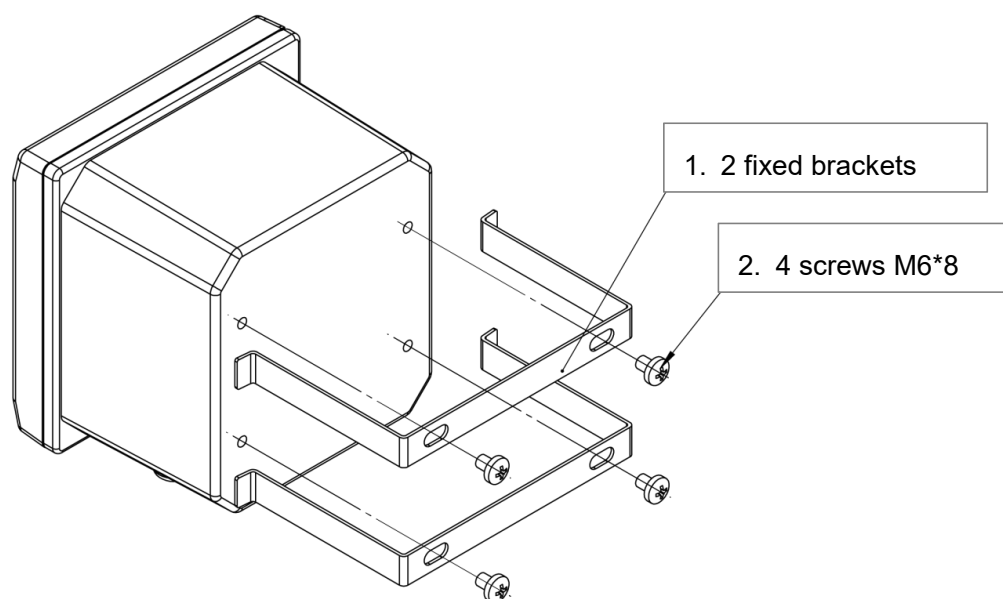


Figure 2-2 Panel mounting

- Wall installation

Connect the gray backplate to the meter, and then install it on the box or wall sidewall, the installation dimensions and schematic diagram are as follows:

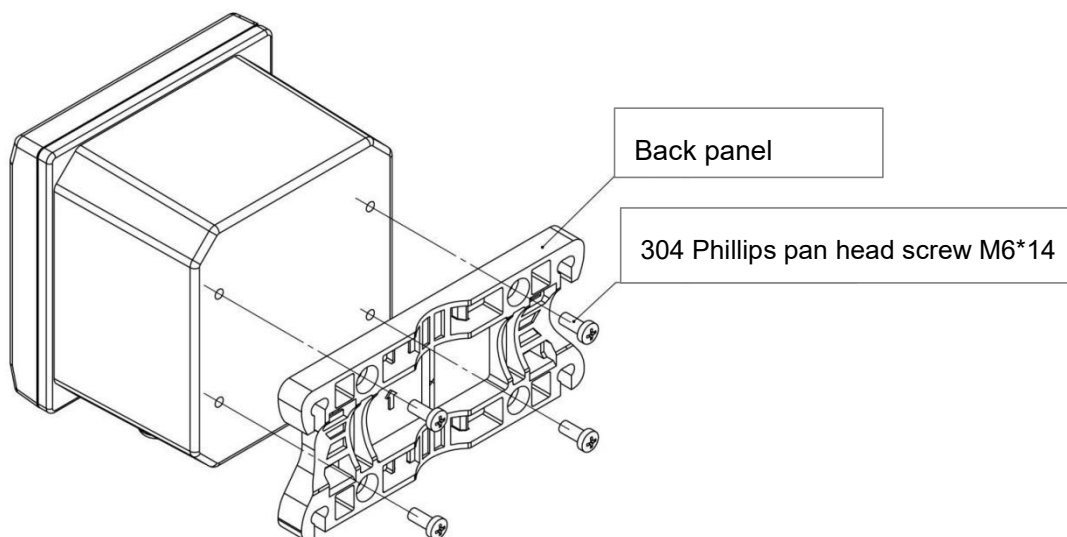


Figure 2-3 Wall mounting

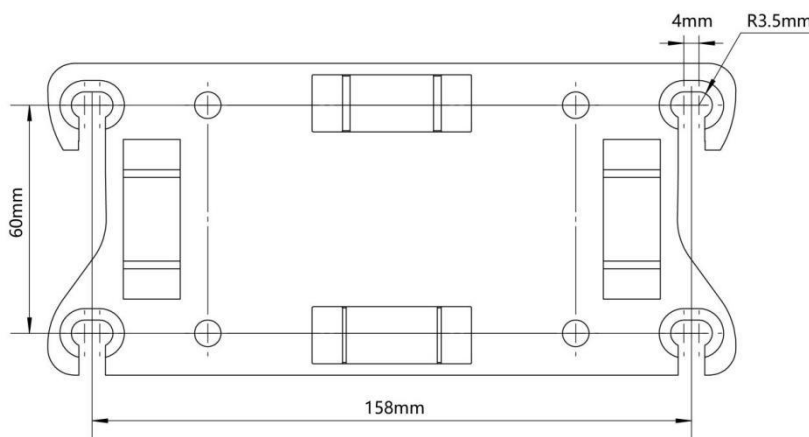
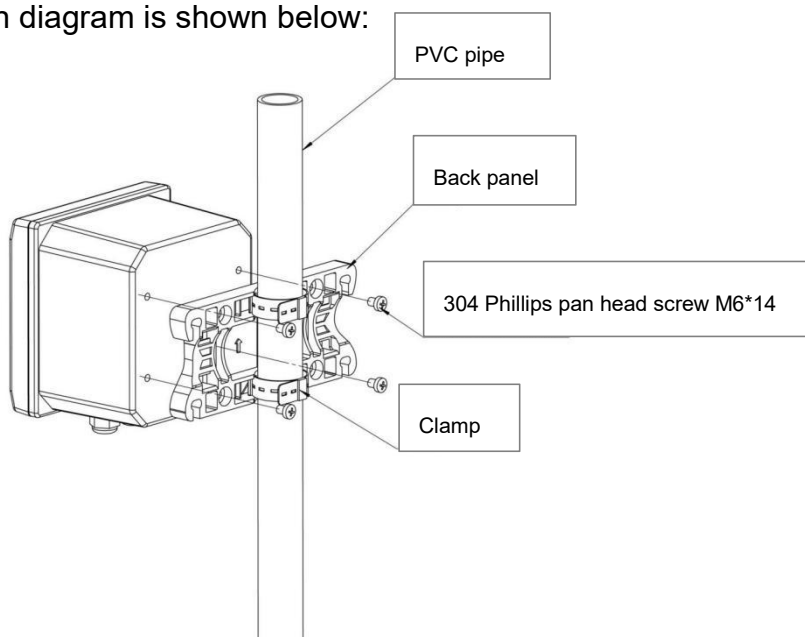


Figure 2-4 Wall mounting hole size dimensional drawing

- Pipe installation

Connect the gray backplate to the meter, and then fix the backplate to the horizontal or vertical pipe with a clamp, the installation diagram is shown below:



Chapter 3 Electrical Installation

3.1 Power Connection

After unscrewing the screws on the back of the meter, remove the cover and see the terminal blocks. According to the power supply type of the instrument, access 100~240VAC or 18~36VDC.

Note: Before connecting AC power, be sure to cut off the power supply !

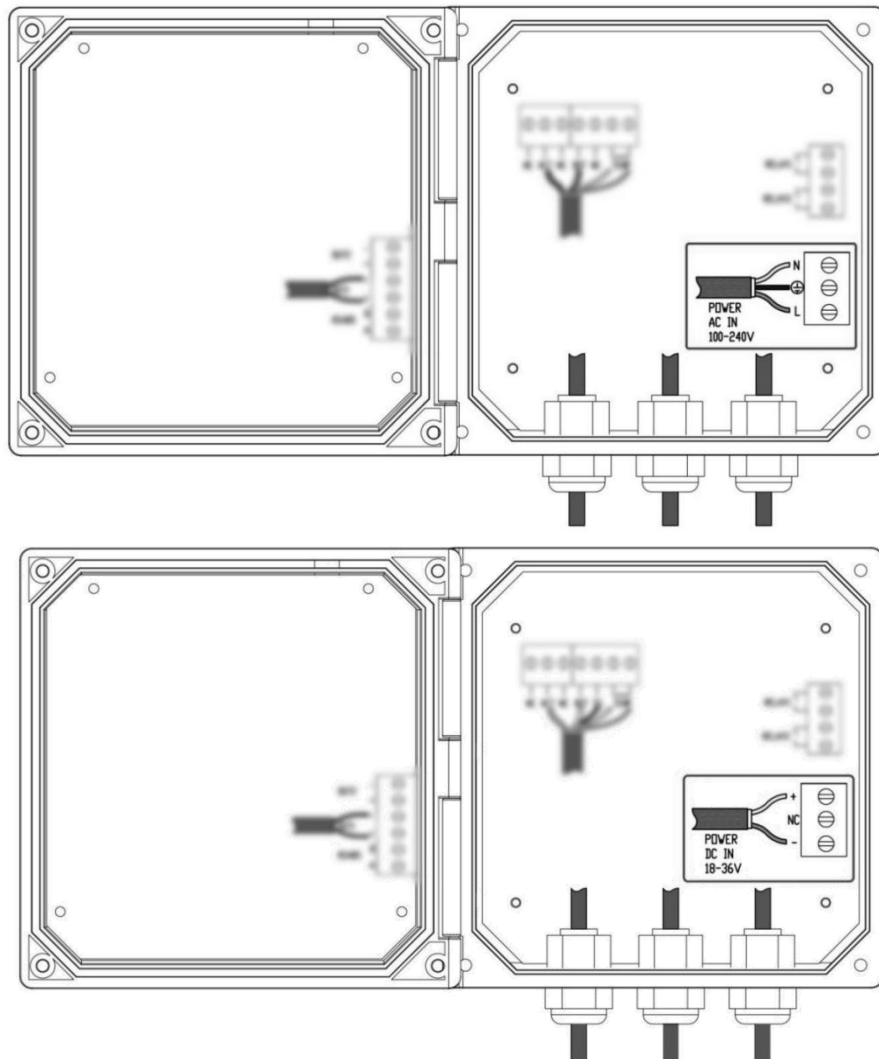


Figure 3-1 Two types of power terminals

Two kinds of power terminals are defined in the Table:

POWER AC IN 100-240V	L	AC power LIVE wire	POWER DC IN 18-36V	+	DC power positive
	$\oplus$	AC power ground wire		NC	Floating terminal
	N	AC power NEUTRAL wire		-	DC power negative

3.2 Terminal Definition

The electrode cable is connected to the ACT, REF, TEMP terminals, and the rest are connected according to actual needs.

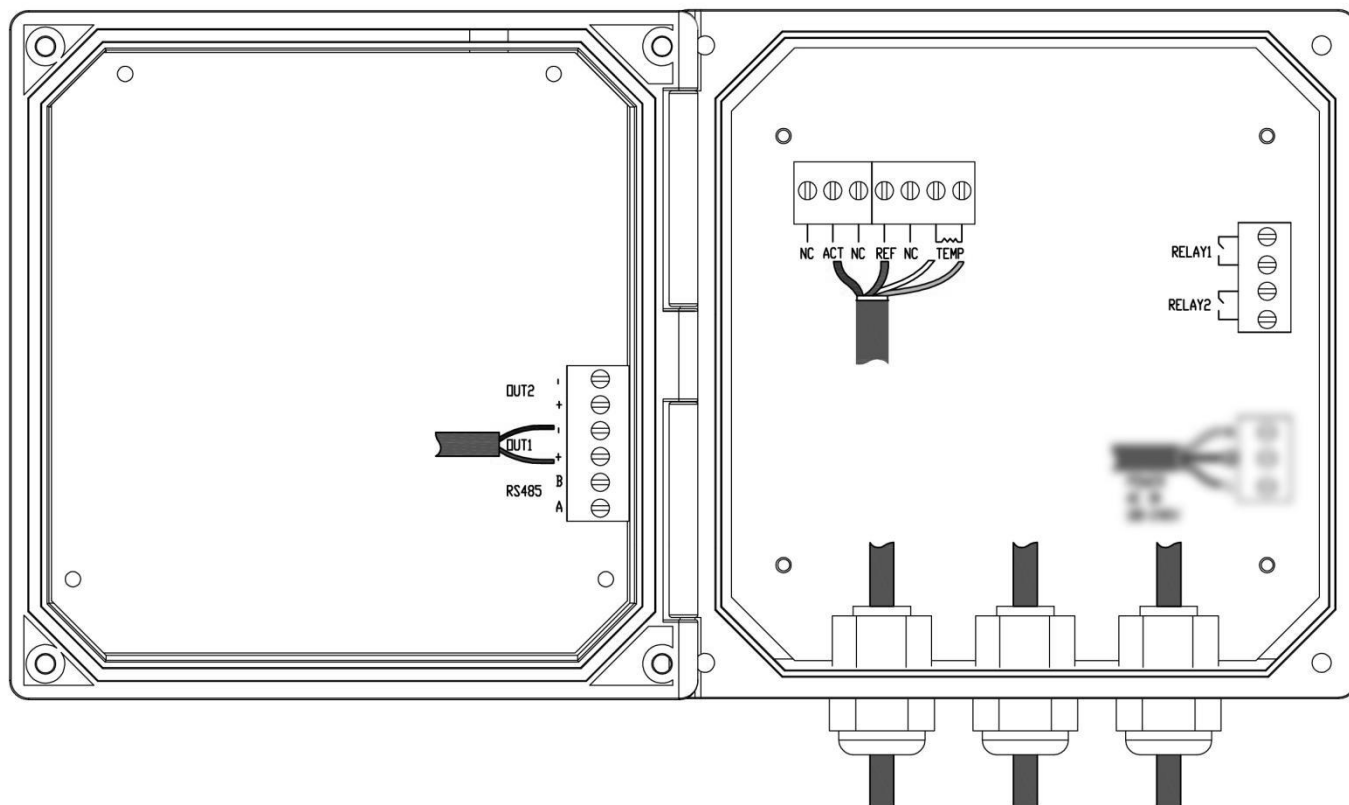


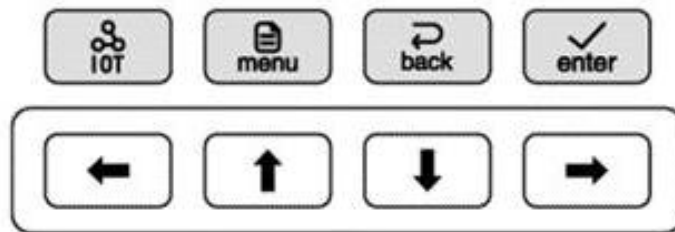
Figure 3-2 terminal blocks

The terminal locations and names are shown in the table below:

OUT2	+	Current 2 Output positive	ACT	pH(ORP) probe indication terminal
	-	Current 2 Output negative	NC	Floating terminal
OUT1	+	Current 1 Output positive	REF	pH(ORP) probe reference terminal
	-	Current 1 Output negative	TEMP	Temperature sensor input terminal
RS485	A	RS485 signal D+(A) terminal	RELAY1	Relay 1 contact
	B	RS485 signal D-(B) terminal		Relay 1 contact
			RELAY2	Relay 2 contact
				Relay 2 contact

Chapter 4 User Interface

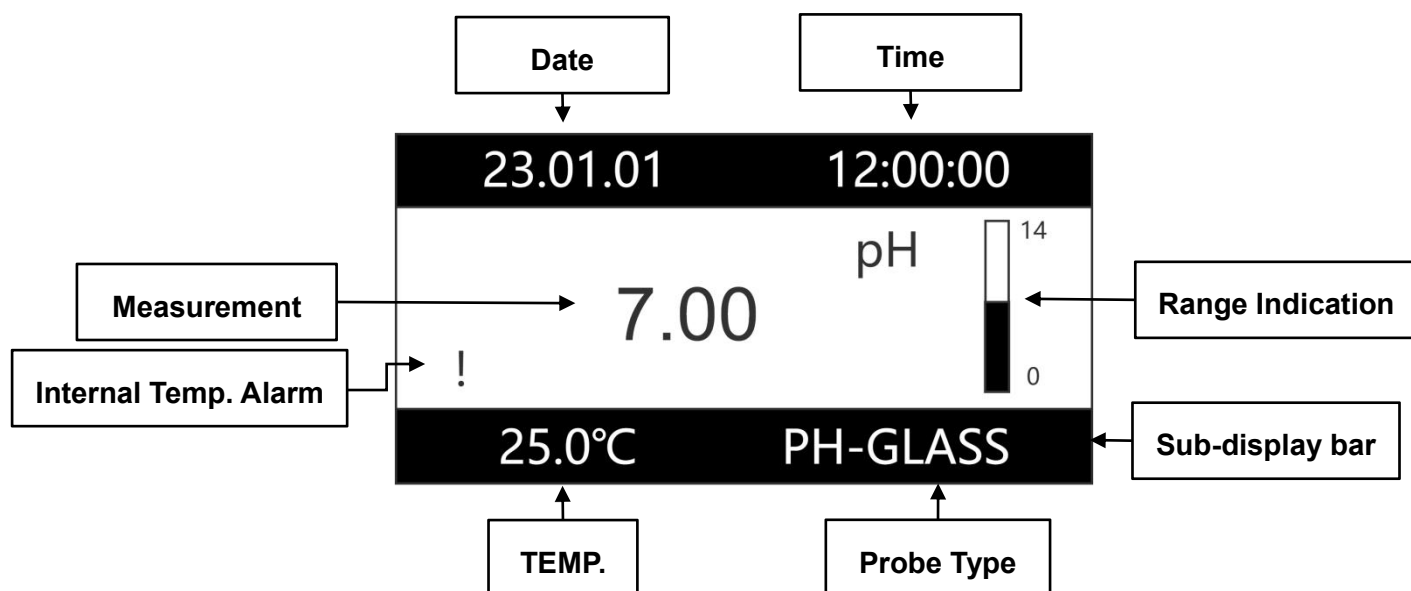
4.1 Panel Button



- **Up key:** In the menu option interface, to move the cursor up;
In the parameter setting interface to increase the data by 1 (change in the order of 0, 1, 2.... 9, 0);
In the measurement interface, can switch the secondary displays: “probe type” → “current value”.
- **Down key:** In the menu option interface to move the cursor down;
In the parameter setting interface to reduce the data by 1 (change in the order of 9, 8, 7... 0, 9);
In the measurement interface, can switch secondary displays: “probe type” → “current value”.
- **Left key:** In the parameter setting interface, to move the cursor left;
In the menu interface, to return to the previous menu;
in the pH measurement, can switch displays “pH measurement” → “mV/pH measurement”.
- **Right key:** In the parameter setting interface, to move the cursor right;
In the pH measurement mode, switch the display “pH measurement” → “mV/pH”.
- **Internet of Things key:** has no function
- **Menu key:** In the measurement interface to enter the menu interface,
In the menu option interface to directly return to the measurement state,
In the parameter setting interface to return to the previous menu.
- **Back key:** return to the previous menu, such as in the parameter setting interface, press this key to abandon the modification and 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.

4.2 Display Screen

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



- **Date and Time:** Display the current date and time
- **Measurement:** display the current pH/ORP value, if “ > ” symbol appears in front of the value, it means the measurement is out of the range. In the pH measurement mode, press the left/right key to switch “ pH measurement ” to “ mV/pH measurement ”
- **Internal Temp. Alarm:** When the internal temperature of the instrument exceeds 50°C, the measurement interface will appear “ ! ”, reminding users to increase ventilation and heat dissipation measures.
- **Sub-display bar:** Press ↑ or ↓ key under the measurement interface to switch the sub-display bar information.
- **Range Indication:** Indicates the ratio of the current measured value to the range.
- **Temperature:** The temp. value is not displayed when the temp. probe is not connected.
- **Probe Type:** Display the currently selected probe type.
 - “ PH-GLASS ” means “ pH glass probe ”
 - “ PH-ANT ” means “ pH antimony probe ”
 - “ ORP ” means “ ORP probe ”

Chapter 5 Menu Description

In the measurement interface, long press the  button to enter the menu. This chapter describes the main features.

5.1 Probe Setting

Perform sensor calibration and view of sensor status.

After the probe is connected to the controller, it needs to be calibrated first due to the error between the signal of the actual electrode and the standard.

● pH Calibration

1. Preparation before calibration

- In the menu “ select probe ”, select “ pH Glass probe ” or “ pH Antimony probe ”
- pH 4.01, 6.86, 9.18 standard solution⁽¹⁾
- Deionized cleaning solution and absorbent paper

2. Zero Calibration

- (1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into pH 6.86 standard solution;
- (2) After the measured value is stable, select “ 6.86pH CAL ” to start calibration;

3. Acid slope Calibration

- (1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into pH 4.01 standard solution;
- (2) After the measured value is stable, select “ 4.01pH CAL ” to start calibration;

4. Alkali slope Calibration

- (1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into pH 9.18 standard solution;
- (2) After the measured value is stable, select “ 9.18pH CAL ” to start calibration;

● ORP Calibration

1. Preparation before calibration

- In the menu “ select probe ”, select “ ORP probe ”
- ORP 86mV, 256mV standard solution⁽¹⁾
- Deionized cleaning solution and absorbent paper

2. Zero Calibration

- (1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into ORP 86mV standard solution ;
- (2) After the measured value is stable, select " 86mV CAL " to start calibration;

3. Slope Calibration

- (1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into ORP 256mV standard solution;
- (2) After the measured value is stable, select " 256mV CAL " to start calibration;

Note: (1) If there is a standard solution with other values, the calibration value can be modified to the actual value after selecting the calibration value.

5.2 Alarm Setting

- **Control function**

When “ Main value Control ” or “ Temp. Control ” is selected in the “ Function Set ” menu, the relay is a control output relay.

When “ Main value Control ” is selected, the relay is controlled by the main measurement value;

When “ Temp. Control ” is selected, the relay is controlled by the temp. measurement.

When “ On Value ” > “ Off Value ” are set in the menu, the relay is a high alarm control.

When “ On Value ” < “ Off Value ” are set in the menu, the relay is low alarm control.

- **Buzzer alarm**

Once turned on, enter the set value.

When the relay is controlled by a pH high alarm, the buzzer will sound an alarm when the measured value is > (closed value + set value) or the measured value is < (open value - set value);

When the relay is controlled by pH low alarm, the buzzer will sound an alarm when the measured value is < (closed value - set value) or measured value > (open value + set value).

The buzzer alarm is only valid for pH measurements, not for ORP measurements.

- **Wash relay**

When “ wash relay ” is selected in the “ Function Set ” menu, the relay is in the wash output state, and the relay will on and off in the set cycle for wash control.

When “ Hold ” is selected for “ wash State ”, when cleaning, the measurement display value remains unchanged before the relay is operated.

When “ constant ” is selected for “ wash State ”, the measurement value is the real-time value of continuous measurement.

- **Internal temp. alarm**

When [Internal temperature alarm] is selected in the menu [Function set], the relay will close when the internal temperature of the instrument exceeds 50 °C.

5.3 Current Setting

Use a current signal to output the measured value.

Set the measured value for the current in “ Channel Select ”.

The measured values corresponding to the current output “ 20mA ” and “ 0mA/4mA ” are set in “ Max. Value ” and “ Min. value ”, respectively.

5.4 Comm. Setting

Use RS485 interface to output the measured value.

When [ModBus] is selected for [Comm. Protocol], Modbus standard comm. is used. Refer to the appendix for the description of relevant registers.

When [Json] is selected for [Comm. Protocol], the instrument will send the measured value every one minute in text format.

Appendix

ModBus Register Introduction

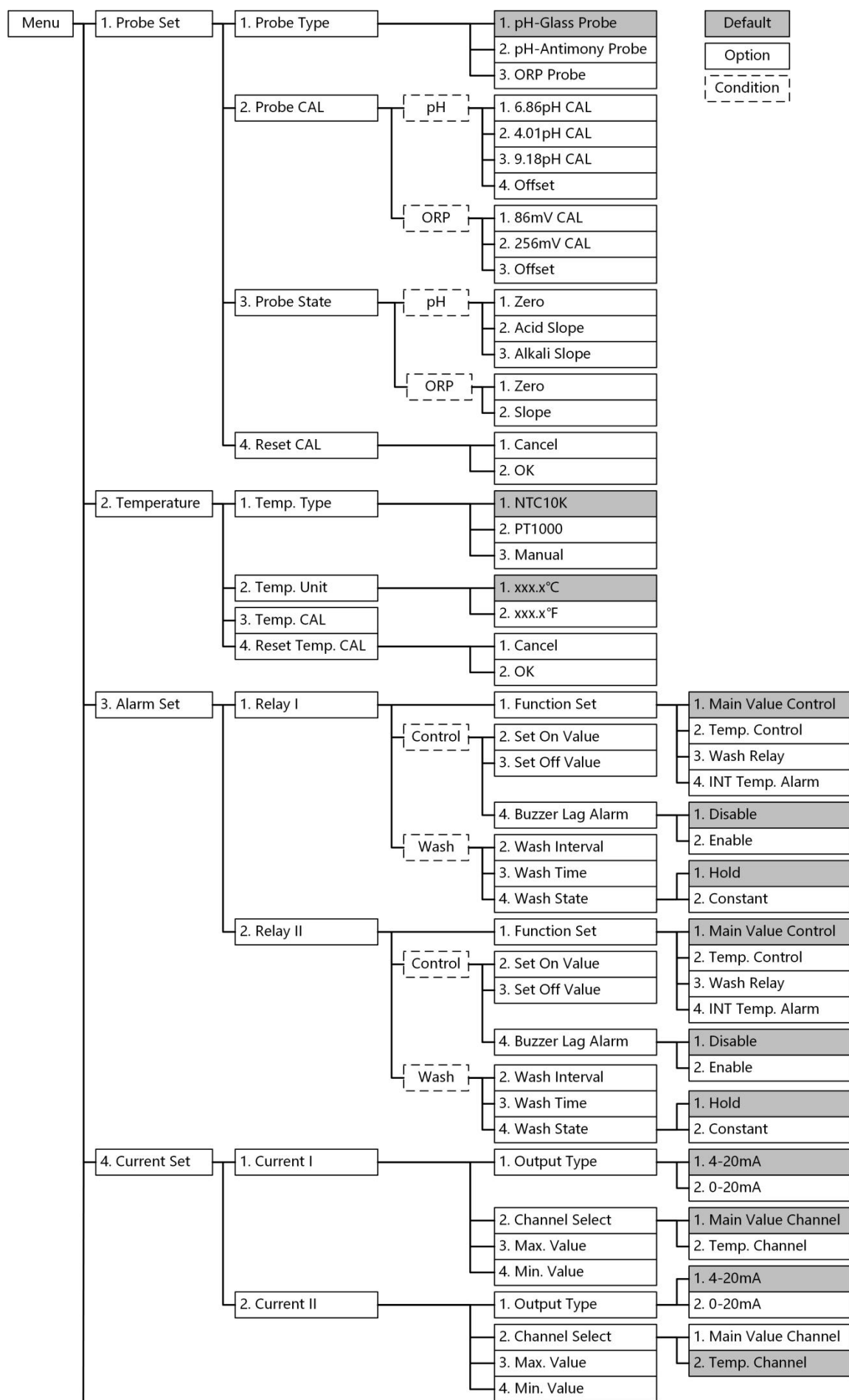
The instrument acts as a slave on the network and supports the Modbus RTU communication protocol.

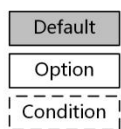
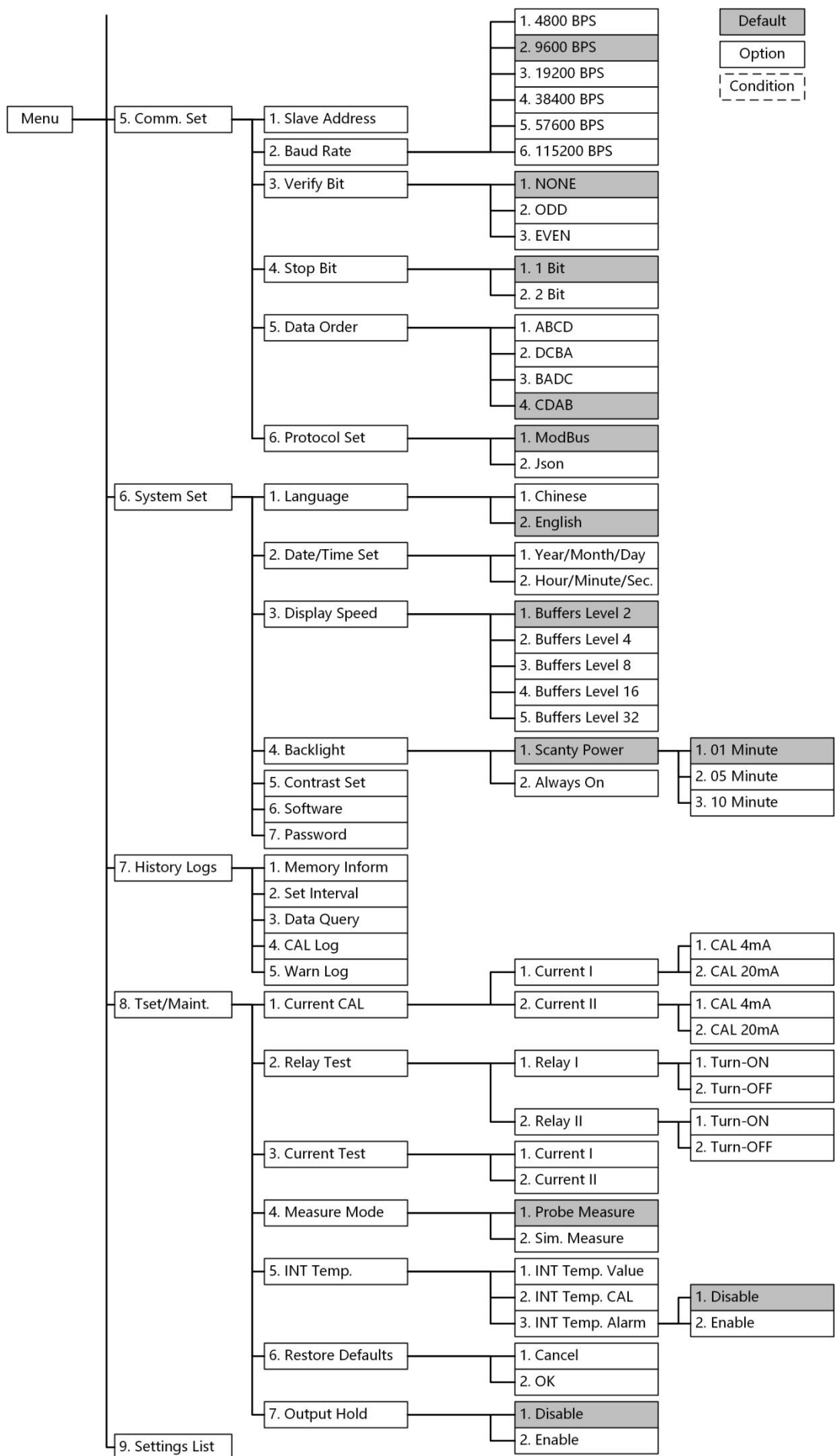
The main unit can use function code 04 to read the measurement results.

The parameters corresponding to the register address are defined as follows:

Register Start Address	Function Code	Parameters	Number of Registers	Data Format
0	04	Temp value (°C)	2	32-bit floating point default CDAB(3412)
2	04	pH value	2	32-bit floating point default CDAB(3412)
4	04	ORP value(mV)	2	32-bit floating point default CDAB(3412)

Menu Structure Diagram







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