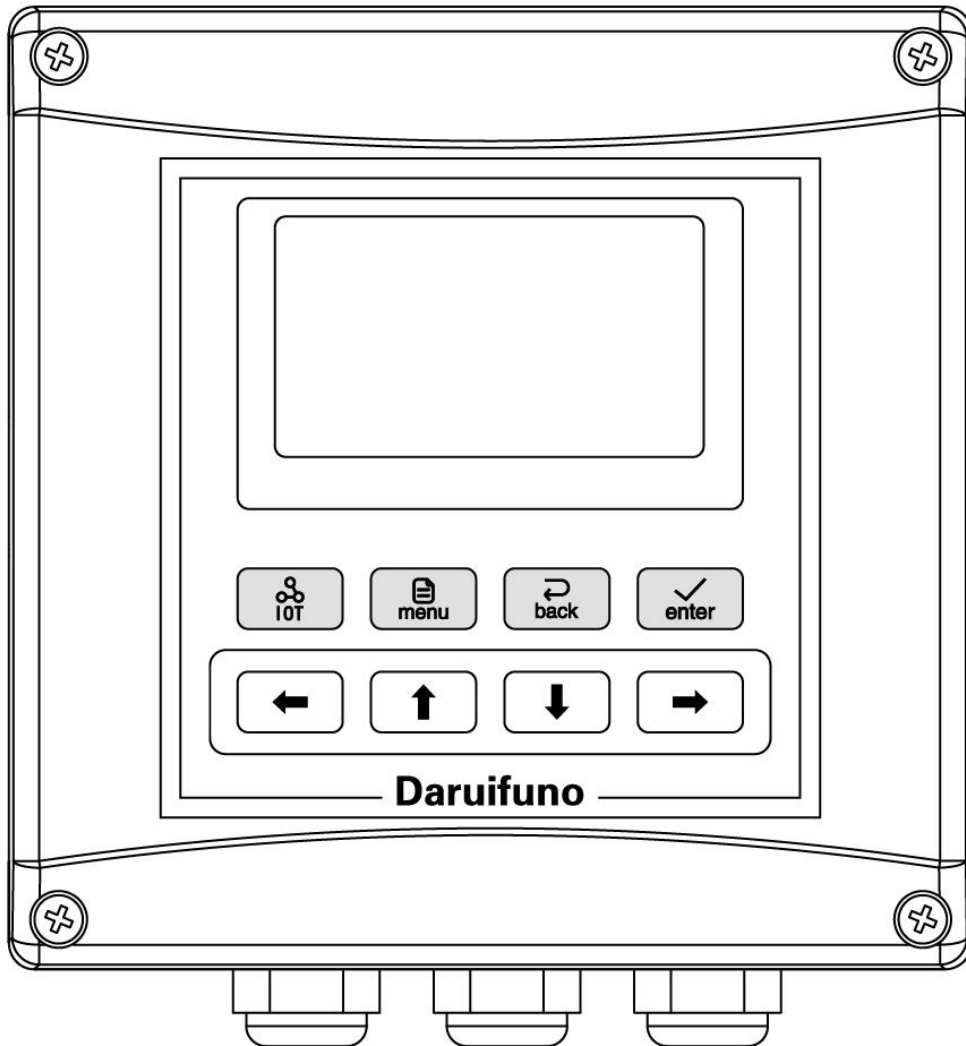# Online pH/ORP Meter

User Manual

Model: APX2-C3/G3

Version 1.0

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 zero line, use a double-blade switch to disconnect 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 addition 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 be liable for damage caused by incidental or consequential damages, whether to persons or objects. The Company shall not be liable 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.

Contents

Part 4 Repair and Maintenance

Chapter 9 Summary

Appendix

Part 1 Introduction

Industrial online pH (redox potential) meters are suitable for continuous monitoring of pH (redox potential) values of aqueous solutions in various industries.

1.1 Technical Parameters

Measuring Range	PH: -2~16pH ORP: ±2000mV TEMP: -10~150℃	
Resolution	0.01pH/1mV/0.1℃	
Accuracy	±0.02pH/±2mV	
Temperature Compensation	NTC10K/PT1000 automatic or manual	
Relay Control	Channel Quantity	2
	Control Type	pH high/low alarm ORP high/low alarm Temperature high/low alarm Ambient temperature alarm
	Contact Type	SPST software settable always on/off mode
	Contact Capacity	3A 250V AC
Current Output	Channel Quantity	2
	Corresponding Channels	PH/ORP/TEMP
	Output Type	Active 4~20mA or 0~20mA
Communication Interface	A RS485 Modbus RTU	
Operating Environment	0~+60℃, RH 0~95%, no condensation	
Storage Environment	-20~+70℃, RH 0~95%, no condensation	
Power Requirement	100~240VAC or 18 ~ 36VDC, 7W MAX	
Installation Method	Panel mounting, wall mounting, pipe installing	
Dimension	144mm*144mm*120mm	
Protection Grade	IP66	
Weight	800g	

Part 2 Installation

After unpacking, it is recommended that the shipped cardboard boxes and packing materials be saved for instrument storage or reshipment. Inspect equipment and packing materials for signs of damage during shipment. If there are signs of damage, immediately notify the person delivering the shipment.

3.1 Installation Location

The installation location of the meter is:
Unaffected by weather (rain, snow, ice, dust, etc.)
- Clean, dry and with little or no vibration
- Keep away from corrosive liquids
- Within ambient temperature limits（32～140˚F or 0～60℃）

Caution:
Analyzer directly exposed to the sun, its operating temperature may exceed its specified limit temperature, and will reduce the visibility of the display.

☞ Note: Please read this operation manual thoroughly before installation to avoid damage to the instrument due to wrong wiring.

- Please choose a well-ventilated location to install the instrument to avoid direct sunlight.
- The electrode signal transmission must use specific cables or cables provided by our company, and cannot be replaced by random wires.
- When using AC 220V power supply, avoid using three-phase power supply to avoid power spike interference (if power spike interference occurs, the power supply of the controller can be separated from the power supply of the control device, so that the controller uses a separate power supply, 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 accessible to the electrode during installation.
- Avoid corrosive liquids, or need to protect and isolate the environment.

3.2   Instrument Dimension
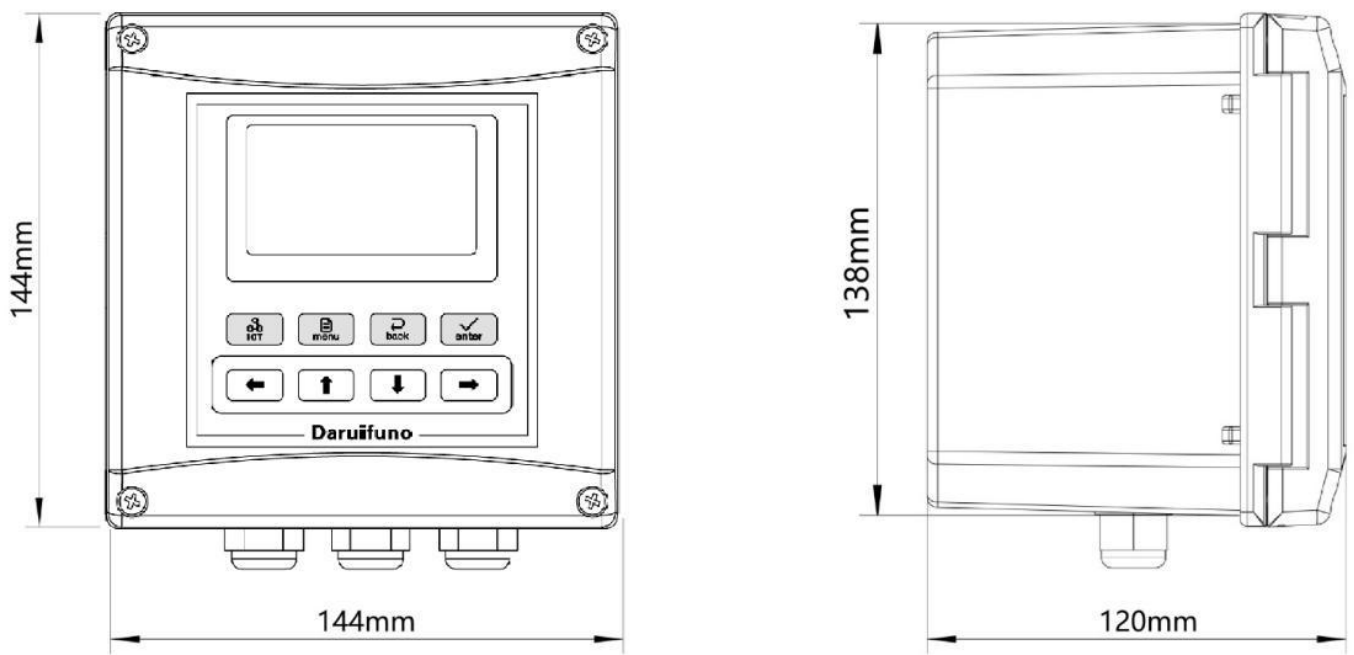
Figure 3-1 Instrument size

3.3 Panel Installation

When the instrument is installed in a panel cabinet, use two fixing brackets to fix the instrument. The installation diagram is as follows:
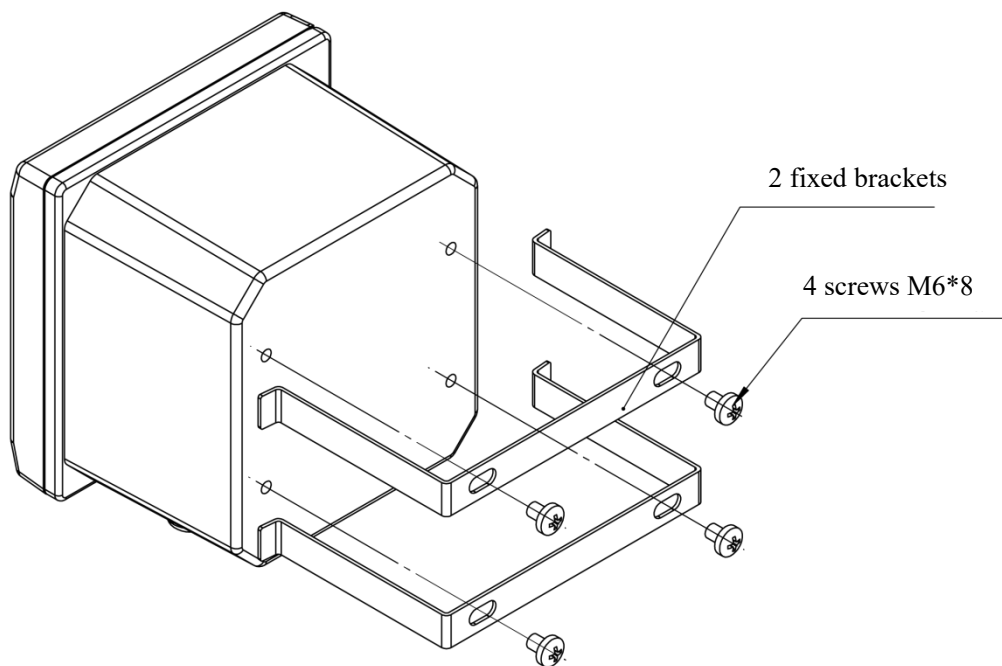
Figure 3-2 Panel mounting

3.4 Wall Mounting

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:

Back panel

304 Phillips pan head screw
M6*14
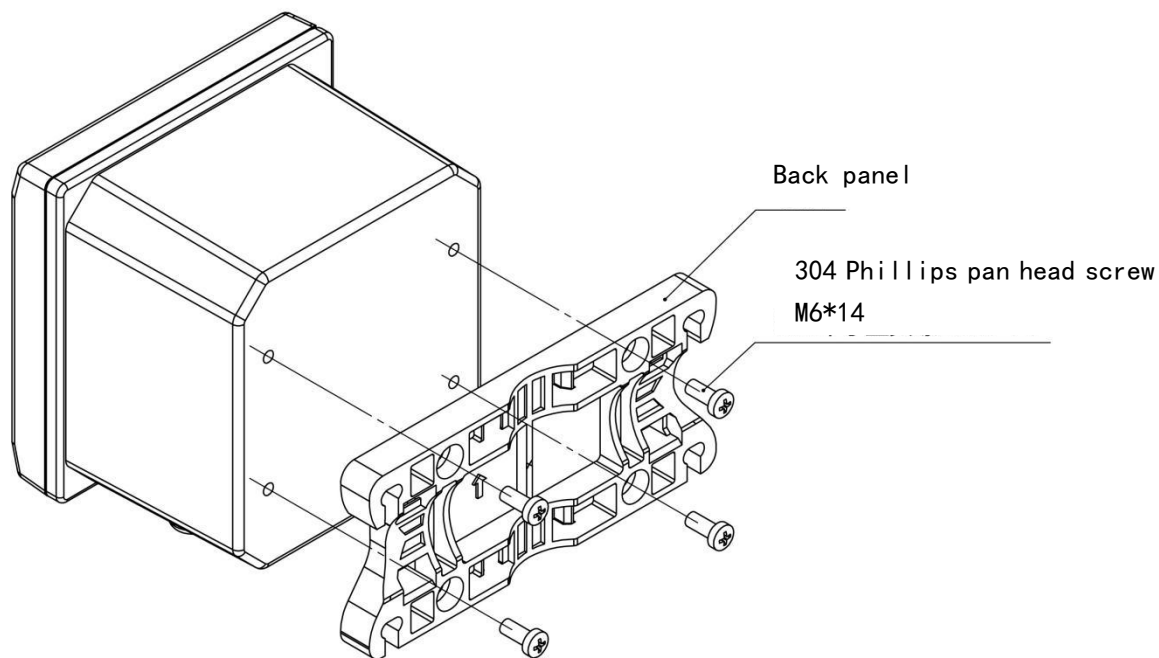
Figure 3-3 Wall mounting

4mm   R3.5mm

60mm

158mm
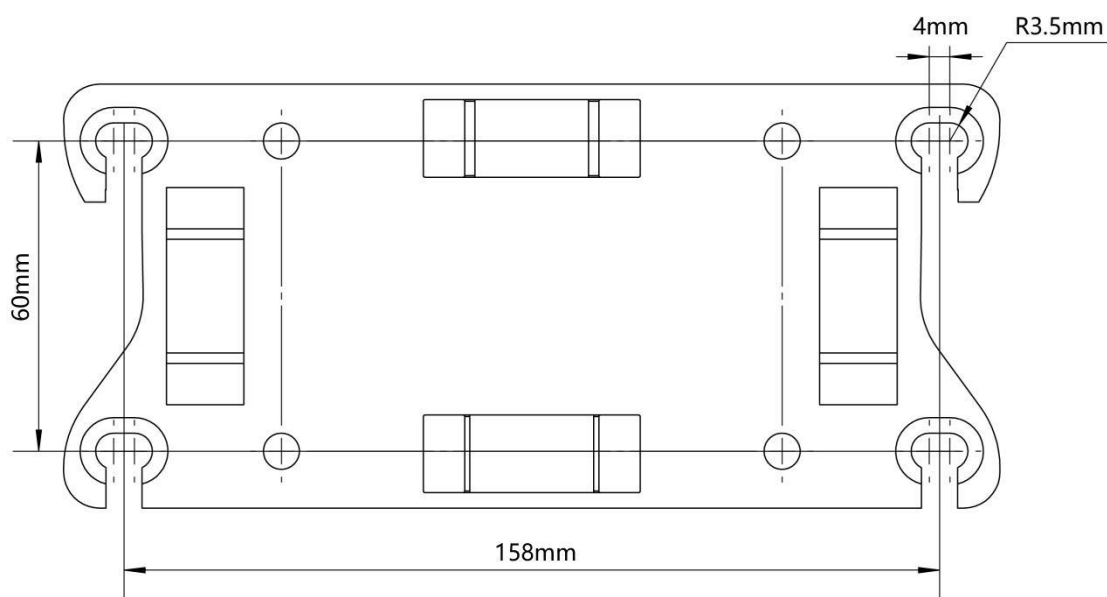
Figure 3-4 Wall mounting hole size dimensional drawing

3.5 Pipe Installation

Connect the gray back panel to the instrument, and then fix the back panel to the horizontal pipe or vertical pipe with a clamp. The installation diagram is shown below:

PVC pipe

Back panel

304 phillips pan head screw M6*14

Clamp
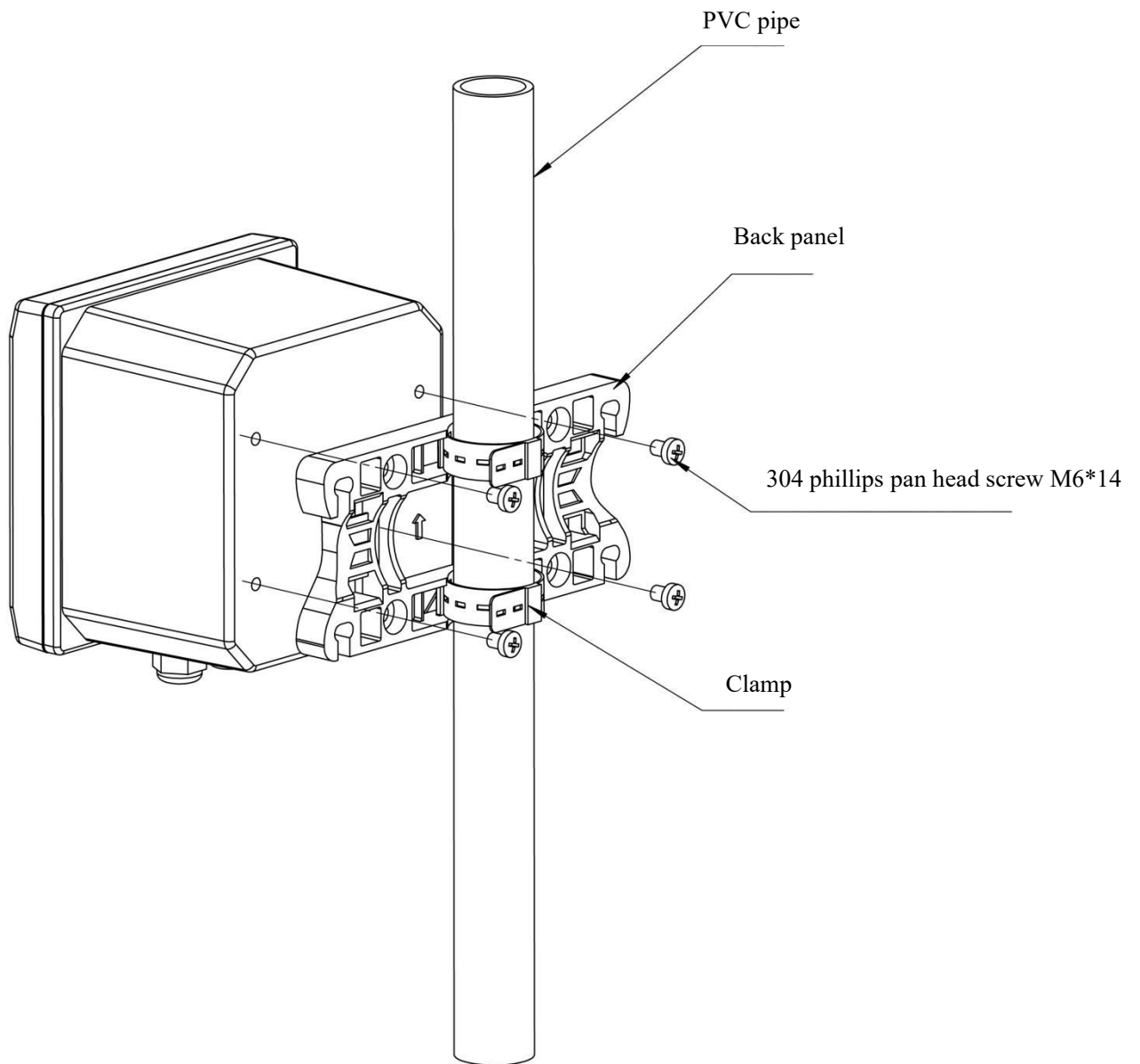
Figure 3-5 Pipe installation

4.1 Power Connection

Two types of power supply: AC 100 ~ 240V and DC 18 ~ 36V.

After unscrewing the screws at the back of the meter and taking off the cover, you can see two rows of terminals.

Figure 4-1 indicates the location and name of the access terminals for both power supplies.

☞ Note: Before connecting AC power, be sure to cut off the power supply and operate only in the power-off state!
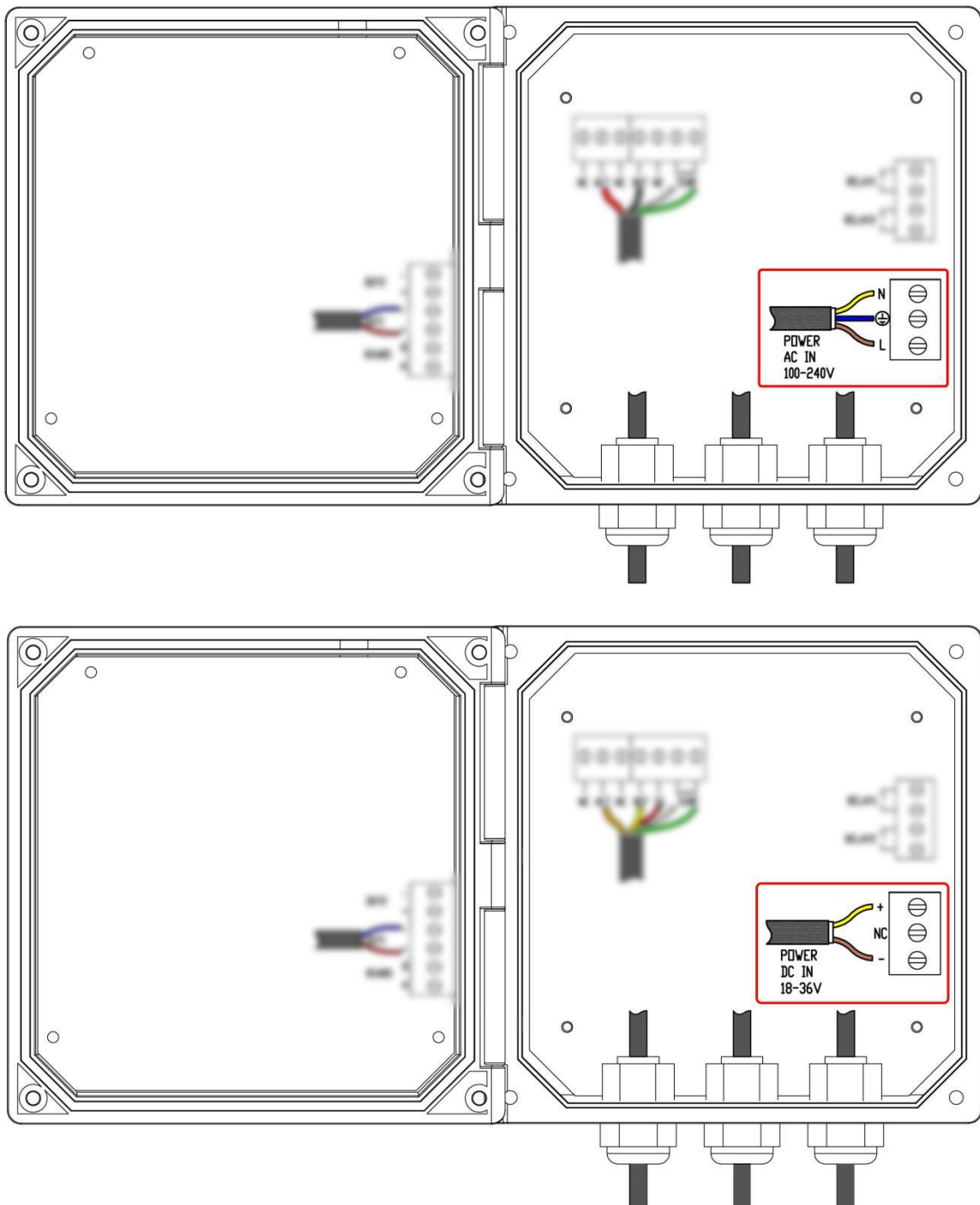
Figure 4-1 Two types of power terminals

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

POWER AC IN 100-240V	L	AC power fire wire input	POWER DC IN 18-36V	+	DC power positive
	⏚	AC power ground wire		NC	Floating terminal
	N	AC power zero line input		-	DC power negative

Table 4-1 Two types of power terminals definition

4.2 Wiring Terminals Definition

The terminal positions and names of each series of models are shown in the figure below:
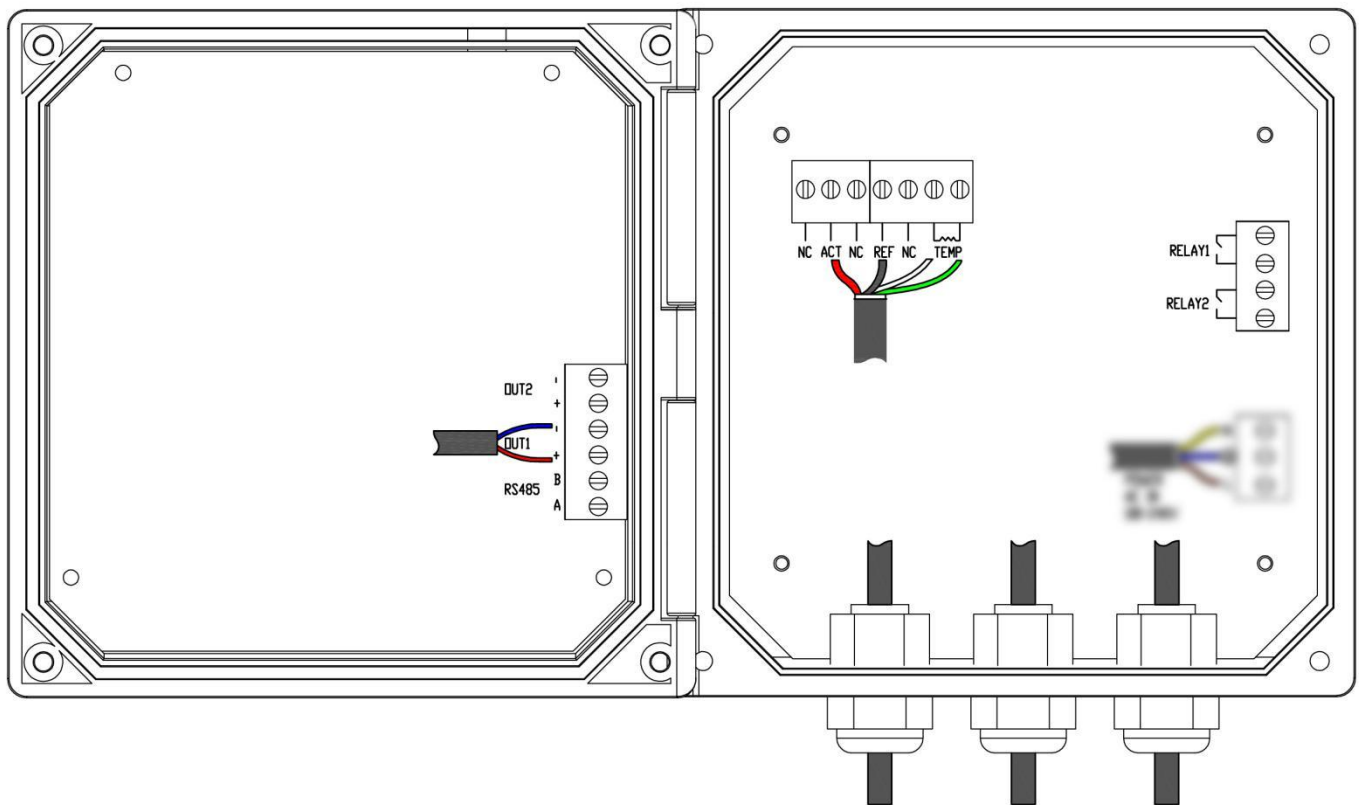
APX2-C series terminal position arrangement
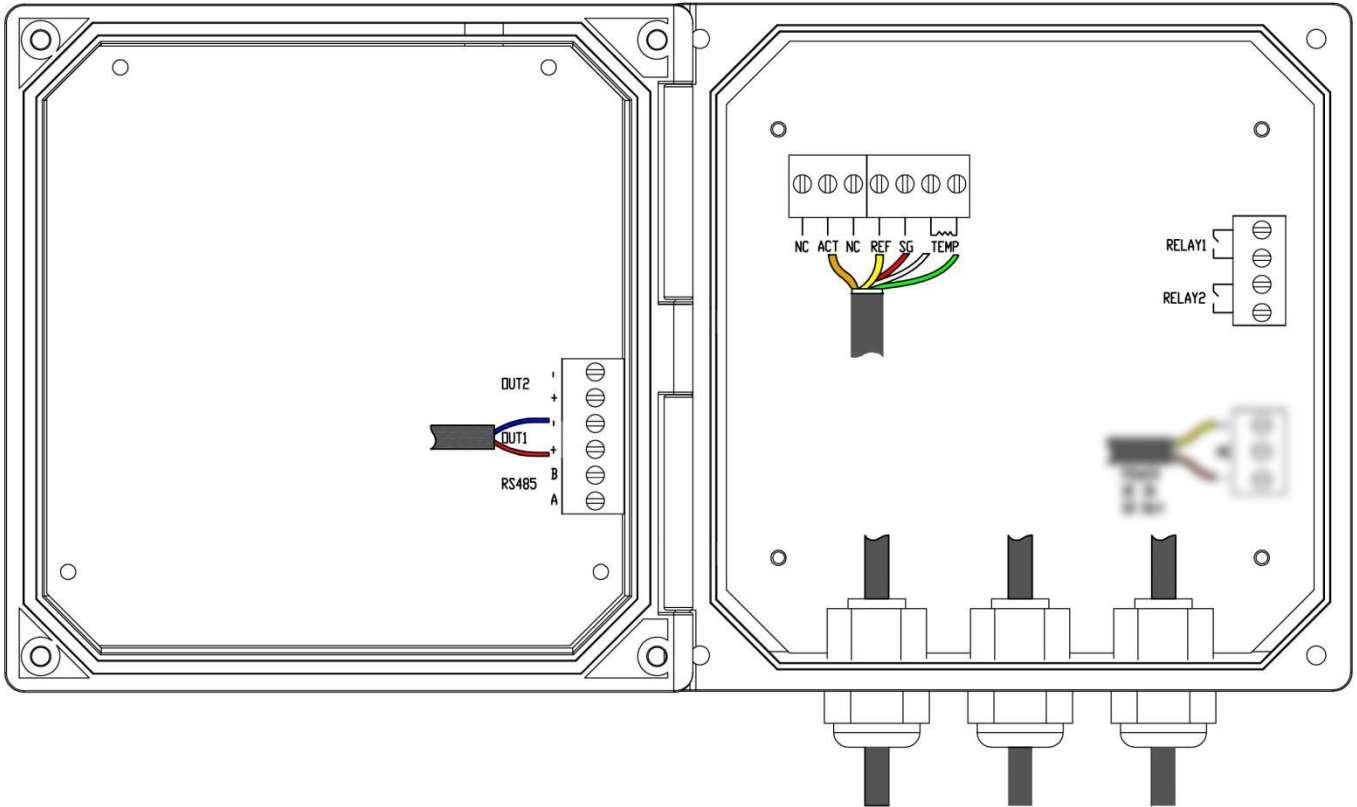
APX2-G series terminal position arrangement

The following table is the terminal definition:

OUT1	+	Current 1 Output positive	REF	pH(ORP) probe reference terminal
	-	Current 1 Output negative	SG ☞ (support by APX2-G series only)	Probe Ground terminal
OUT2	+	Current 2 Output positive	TEMP	Temperature sensor input terminal
	-	Current 2 Output negative		Temperature sensor input terminal
RS485	A	RS485 signal D+(A) terminal	RELAY1	Relay 1 contact
	B	RS485 signal D-(B) terminal		Relay 1 contact
NC		Floating terminals	RELAY2	Relay 2 contact
ACT		pH(ORP) probe indication terminal		Relay 2 contact

☞ Note: When connecting the APX2-G series meter to the composite probe, short-circuit the meter REF and SG.

Part 3 Operation

The instrument panel consists of a display screen and eight buttons, namely IOT (Internet of Things) button, menu button, back button, enter button, and up, down, left and right arrow keys. As shown below:

5.1 Button
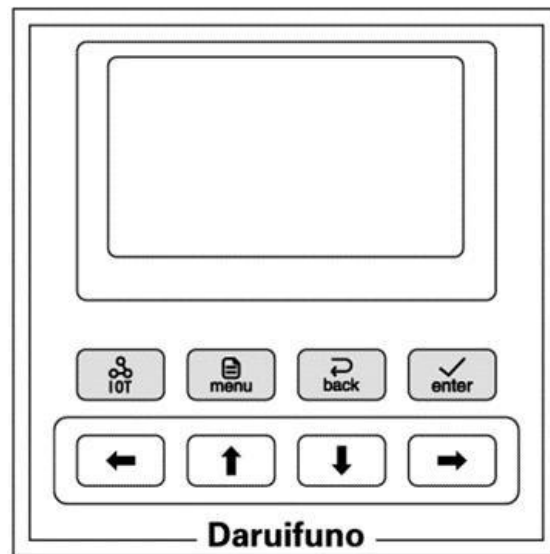
Up key: Press this key in the menu option interface to move the cursor up; press this key in the parameter setting interface to increase the data by 1 (change in the order of 0, 1, 2.... 9, 0); in the measurement interface, press this key can switch three kinds of secondary displays: "temperature & electrode connection status" → "relay status" → "two currents".

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 (change in the order of 9, 8, 7... 0, 9); in the measurement interface , Press this key can switch three kinds of secondary displays: "temperature & electrode connection status" → "relay status" → "two currents".

Left key: In the parameter setting interface, press this key to move the cursor left; in the menu interface, press this key to return to the previous menu; in the pH measurement mode, press this key to switch the display "pH measurement value" ⟷ "mV" /pH measurement value".

Right key: In the parameter setting interface, press this key to move the cursor right; in the pH measurement mode, press this key to switch the display "pH measurement value" ⟷ "mV" /pH measurement value".

Internet of Things 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.

☞　Note: The IoT function is only supported by meters with hardware version 10 and above.

Menu button: 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, press this key in the parameter setting interface to return to the previous menu.

Enter button: 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 button: press this key to 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 single.

5.2 Display

The meter normally displays the measurement interface after power-on.

The specific information is as follows:
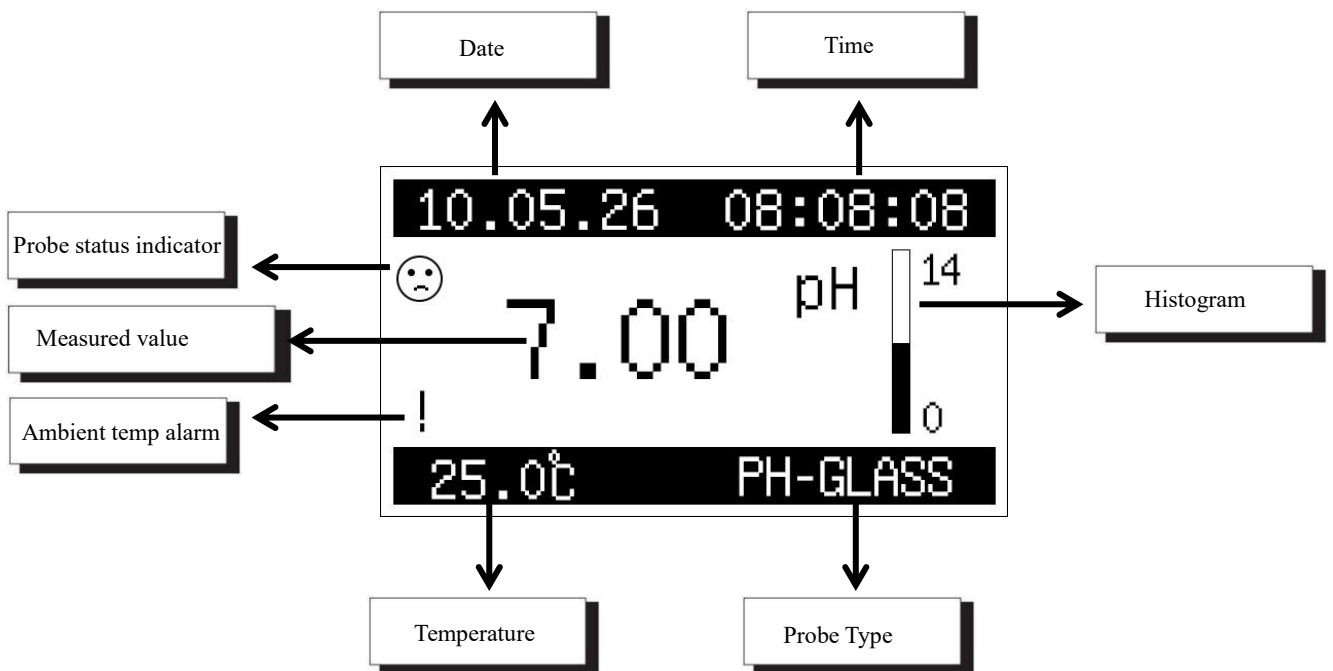
Date and time: Display current date and time information.

Electrode status indicator: The instrument diagnoses the electrode zero point and slope during calibration and maintenance. When the electrode selection menu is set to "pH glass electrode", if the electrode slope exceeds the standard value ±20% or the zero point exceeds ±1pH, it will display " " , when the electrode selection menu is set to "ORP electrode", if the electrode slope exceeds the standard value ±20% or the zero point exceeds ±100mV, it will display " " .

Measured value: Display the current PH (ORP) measurement value, if ">" or "<" symbol appears in front of the measurement value, it means the measurement is out of range. In the pH measurement mode, press the left or right button on the panel to switch between "pH measurement value" ↔ "mV/pH measurement value".

Histogram: Indicates the ratio of the current measured value to the range.

Ambient temperature alarm: When the operating environment temperature exceeds 50°C, a"!"will appear on the screen, indicating that the working environment temperature of the instrument is too high, and heat dissipation measures are needed.

Temperature: The temperature value is not displayed when the temperature electrode is not connected.

Probe Type: Displays the currently selected probe type.
                "PH-GLASS" means "pH glass probe"
                "PH-ANT. " means "pH antimony probe"
                "ORP" means "ORP probe"

System Default Settings

Menu Title		Input Range or Option	Factory Set
Probe Set			
Probe Selection		PH-Glass, PH-Antimony, ORP probe	pH-Glass probe
Probe Cal	6.86pH CAL	0.00 ~ 14.00pH	06.86pH
	4.01pH CAL	0.00 ~ 14.00pH	04.01pH
	9.18pH CAL	0.00 ~ 14.00pH	09.18pH
	Offset	-14.00 ~ +14.00pH	+00.00pH
Probe State	Zero	-414.1 ~ +414.1mV	+000.0mV
	Acid slope	0 ~ 99.99 mV/pH	59.16mV/pH
	Alkali slope	0 ~ 99.99 mV/pH	59.16mV/pH
Temperature Set			
Probe Type		NTC10K, PT1000, Manual	NTC10K
Temperature Format		xxx.x°C, xxx.x°F	xxx.x°C
Temperature Cal		-100.0 ~ +100.0°C	+025.0°C
Alarm Set			
Relay 1	Function Set	PH/ORP control, Temp control, cleaning output, ETEMP alarm	PH/ORP control
	ON Value	0 ~ 14.00pH	14.00pH
	OFF Value	0 ~ 14.00pH	13.80pH
Relay 2	Function Setting	PH/ORP control, temp control, cleaning output, ETEMP alarm	PH/ORP control
	On Value	0 ~ 14.00pH	00.00pH
	Off Value	0 ~ 14.00pH	00.20pH
Current Set			
Current 1	Output Type	4-20mA, 0-20mA	4-20mA
	Channel	Main CH, temperature	Main CH
	Upper Value	0 ~ 14.00pH	14.00pH
	lower Value	0 ~ 14.00pH	00.00pH

Current 2	Output Type	4-20mA, 0-20mA	4-20mA
	Channel	Main CH, temperature	Temperature
	Upper Value	0 ~ 100°C	100.0°C
	Lower Value	0 ~ 100°C	000.0°C
Communication Set			
Slave ID		001 ~ 254 Add	001Add
Baud Rate		4800, 9600, 19200, 38400, 57600, 115200	9600
Check Bit		No parity, odd parity, even parity	No parity
Stop Bit		1bit, 2bit	1bit
Communication Protocol		ModBus, Json	ModBus
System Set			
Language		Chinese, English	English
Display Speed		Buffer level 2, buffer level 4, buffer level 8, buffer level 16, buffer level 32	Buffers 2
Backlight		Scanty power, always on	Scanty power
Scanty Power		01min, 05min, 10min	01min
Contrast Set		0 ~ 63	25
Password		000000 ~ 999999	000000
Test Maintenance			
Measure Method		Probe measurement, analog measurement	Probe measurement
Ambient Temperature CAL		-999.9 ~ +999.9°C	+025.0°C
Buzzer Alarm		off, on	off

In the measurement interface, long press the MENU button to enter the menu. The following is a detailed introduction to the menu content.

7.1 Probe Set

7.1.1 Probe Select

Select the type of electrode connected to the meter.

7.1.2 Probe Cal

After the new probe is connected to the meter, in order to eliminate the possible error between the probe and the meter, the meter needs to be calibrated first.
The specific steps are as follows:

A. pH calibration
I. Preparation before calibration
a. pH 4.01 standard solution 100mL
b. pH 6.86 standard solution 100mL
c. pH 9.18 standard solution 100mL
d. Deionized cleaning solution 300~500mL and some absorbent paper.

II. Zero calibration
(1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into a standard solution with pH 6.86;
(2) Select " 6.86 pH CAL", the screen will display "6.86 pH", press the key ⌈enter⌉ to start calibration;
(3) "Please Wait..."appears on the screen and the current measurement value will be displayed later. After the calibration is completed, the meter automatically returns to the previous menu.

☞ Note: During calibration, the user can press the key ⌈enter⌉ to forcibly end the calibration, but this method is not recommended, because it may cause the meter to perform calibration when the measurement is not stable.

☞ Hint: During calibration, press the key ⌈menu⌉ to cancel the current calibration.

III. Slope 1 calibration
(1) Clean the electrode with deionized cleaning solution, dry it with absorbent paper and put it into a standard solution with pH 4.01;
(2) Select"4.01 pH CAL", the screen will display"4.01 pH", press the key ⌈enter⌉ to start calibration;
(3) "Please Wait..." appears on the screen and the current measurement value will be displayed later. After the calibration is completed, the meter automatically returns to the previous menu.

IV. Slope 2 calibration
(1) Clean the electrode with deionized cleaning solution, dry it with absorbent paper and put it into a standard solution with pH 9.18;

(2) Select "9.18 pH CAL", the screen will display "9.18 pH", press the key ☑enter to start calibration;

(3) "Please Wait..." appears on the screen and the current measurement value will be displayed later. After the calibration is completed, the meter automatically returns to the previous menu.

☞ Note: The default setting of the meter is to use three solutions with pH values of 6.86, 4.01 and 9.18 respectively for calibration. If the user has other pH standard solutions, the value displayed on the screen can be modified to the pH value of the actual standard solution after selecting "4.01pH CAL", "6.86pH CAL" and "9.18pH CAL". However, the modified values in the three options should remain in the order of "pH4"<"pH7"<"pH9".

B. ORP Calibration
I. Preparation before calibration
a. ORP 86mV standard solution 100mL
b. ORP 256mV standard solution 100mL
c. Deionized cleaning solution 300~500mL and some absorbent paper.

II. Zero calibration
(1) Clean the probe with deionized cleaning solution, dry it with absorbent paper and put it into a standard solution with ORP 86mV;

(2) Select "86mV CAL", the screen will display +0086mV, press the key ☑enter to start calibration;

(3) "Please Wait..." appears on the screen and the current measurement value will be displayed later. After the calibration is completed, the meter automatically returns to the previous menu.

III.Slope calibration
(1) Clean the electrode with deionized cleaning solution, dry it with absorbent paper and put it into a standard solution with ORP 256mV;
(2) Select "256mV CAL", the screen will display +0086 mV, press the key ☑enter to start calibration;
(3) "Please Wait..." appears on the screen and the current measurement value will be displayed later. After the calibration is completed, the meter automatically returns to the previous menu.

☞ Note: The default setting of the meter is to use two solutions with ORP values of 86mV and 256mV respectively for calibration. If users have other ORP standard solutions, they can modify the displayed value to the ORP value of the actual standard solution after selecting "86mV CAL"or"256mV CAL". However, the values in the two modified options should remain in the order of "ORP 86mV" < "ORP 256mV".

Offset
If there is a fixed deviation between the measured and actual value of the electrode, the measurement deviation can be corrected by setting the value in this menu.

7.1.3 Probe State

You can view and set the current electrode zero and slope status values. These values will be automatically generated after calibration, and it is generally not recommended that users modify them by themselves. Experienced users can judge the service life of the electrode by checking these status values.

7.1.4 Reset Cal

Restore the user calibration values to the factory default values.

7.2 Temperature Set

7.2.1 Probe Type

When the meter is connected to a pH prob with temperature compensation, the menu needs to be set according to the temperature sensor type. If you need to input the compensation temperature manually, you can select "Manual Compensation" and set the manual compensation temperature.

7.2.2 Temperature Format

Select the temperature display unit, either "°C" or "°F".

7.2.3 Temperature CAL

In this menu, enter the target temperature value and press the key (✓ enter) to calibrate the temperature measurement to the entered target value.

7.2.4 Reset CAL

Restore the temperature calibration data to the factory default values.

7.3 Alarm Set

The meter provides two completely independent relay output contacts, corresponding to the "Relay 1" and "Relay 2" menus, which allow the user to set the functions and parameters of the two relays separately.

7.3.1 Control Function

When selecting "Main measurement control" or "Temperature control" in the "Main menu" -> "Alarm settings" -> "Relay X" -> "Function settings" menu,   this relay is the control output relay. When "Main Measurement Control" is selected,   the relay status is controlled by the pH (ORP) measurement; when "Temperature Control" is selected, the relay is controlled by the temperature measurement.

When"on value">"off value" is set in the menu, the relay is high alarm control
When"off value"<"on value" is set in the menu, the relay is low alarm control
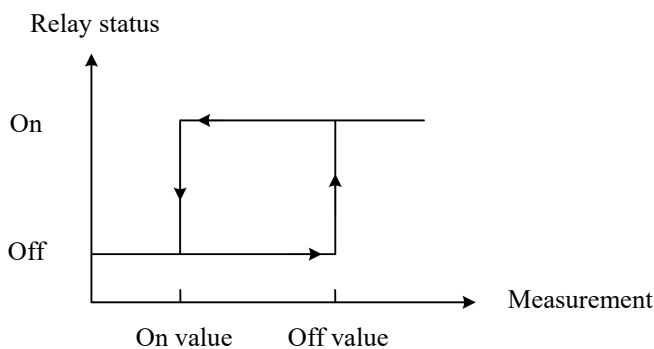
High alarm control
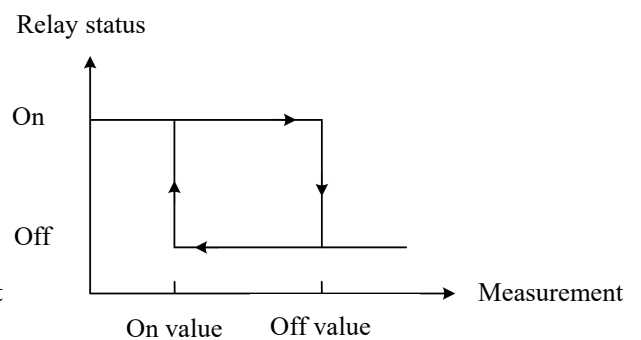
Low alarm control

7.3.2 Cleaning Output

When selecting "Cleaning Output" in "Main Menu" -> "Alarm Setting" -> "Relay X" -> "Function Setting" menu , the relay is in the cleaning output state, the relay can be closed periodically to do cleaning control.
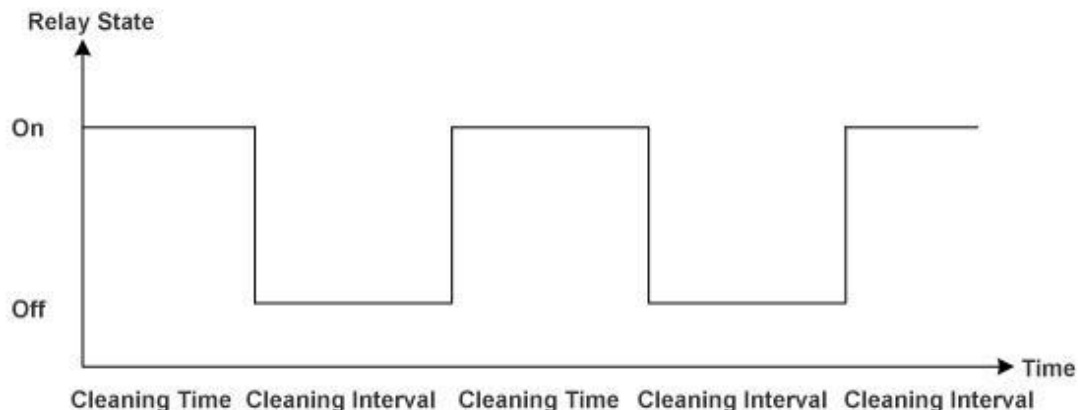
7.3.3 Cleaning State

Select the status of the measured value during cleaning.

After selecting "Keep", when cleaning, the measured value displayed maintains the value before the relay action.

After selecting "Continuous", the measured value is the real-time value of continuous measurement.

7.3.4 Ambient Temperature Alarm

When "Ambient Temperature Alarm" is selected in the "Main Menu" -> "Alarm Setting" -> "Relay X" -> "Function Setting" menu, the relay is in the alarm control output state. The relay status is controlled by the meter's operating ambient temperature. When the ambient temperature exceeds 50°C, the relay closes.

7.4 Current set

The instrument provides two independently configurable current signals output, corresponding to the "Current 1" and "Current 2" menus, which allow the user to set the corresponding channels and the upper and lower limits of the two currents.
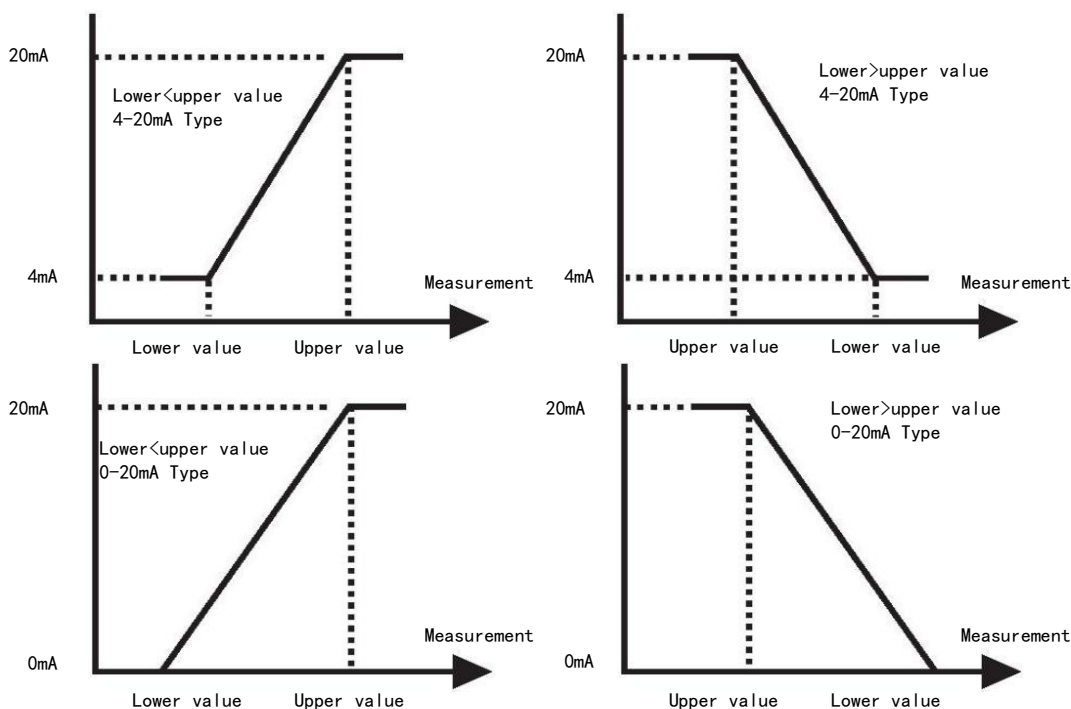
7.4.1 Output Type

The output current type can be selected as "4-20mA" or "0-20mA".

7.4.2 Channel Selection

The measurement value corresponding to the current can be specified as the "main measurement channel" or "temperature channel"

7.4.4 Lower Value

Specify the measured value corresponding to the maximum output current.

7.4.3 Upper Value

Specify the measured value corresponding to the minimum output current.

7.5 Communication Set

The meter provides one digital communication interface, this menu can set the communication interface parameters.

7.5.1 Slave ID

Sets the slave address used by the instrument in the communication network.

7.5.2 Baud Rate

Select the baud rate to be used for the communication interface.

7.5.3 Check Bit

Select the check mode, the default is "No parity".

7.5.4 Stop Bit

Select the number of stop bits, the default is "one bit".

7.5.5 Protocol

When the protocol is selected as "ModBus", the RS485 interface uses ModBus-RTU protocol. When the protocol is selected as "Json", the RS485 interface will send measurement data in Json format to the host every 1 minute.

7.6 System Set

7.6.1 Language

Select the system language as "Chinese" or "English".

7.6.2 Time Set

Set the system time "year, month, day" and "hour, minute, second".

7.6.3 Display Speed

Adjust the rate of the change of the measured display value. The display rate from fast to slow is "buffered 2", "buffered 4", "buffered 8", "buffered 16", and "buffered 32".

7.6.4 Backlight

Set the working mode of the LCD backlight. If it is set to "Scanty power" mode, the backlight will automatically turn off if there is no key operation within the set time.

7.6.5 Contrast

Set the contrast of the LCD display, the left key decreases the contrast, the right key increases.

7.6.6 Software

View program version information.

7.6.7 Password

Used to set the verification password to enter the menu in the measurement mode. The password is set to "000000" default, and you can enter the menu directly without password in the measurement mode. If the user sets other password, they will be prompted to enter the password when entering, and the password will be verified .

7.7 History Record

7.7.1 Memory Information

View history storage information of the meter.

7.7.2 Recording Interval

Set the interval time for the meter to record measurement data. The setting range is 0 ~ 999min. hen the recording interval is set to 0, it means that the recording function is closed.

7.7.3 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.

7.7.4 Calibration Log

You can view the last 30 calibration operation records.

7.7.5 Alarm Log

You can view the latest 100 instrument alarm records.

7.8 Test Maintenance

7.8.1 Current Calibration

To calibrate the current output value, take calibrating current 1 20mA as an example, first connect the ammeter to the current 1 output terminal, then 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, then 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.

7.8.2 Relay Testing

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

7.8.3 Current Testing

Two current outputs can be tested. First, connect the ammeter to the current output terminal to be tested, enter the menu and change the output current value by pressing the key, and verify whether the meter current output is correct by the ammeter reading.

7.8.4 Measurement Method

The 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 is displayed as the input value set by the user.

7.8.5 Ambient Temperature

Ambient temperature value: Display the current ambient temperature value.

Ambient temperature calibration: Calibrate the ambient temperature measurement value of the meter.

Buzzer alarm: Set whether the buzzer outputs an alarm sound when the ambient temperature is alarmed.

7.8.6 Meter Reset

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

7.9 Setting List

All calibration and setting parameters of the instrument can be viewed.

Part 4 Repair and Maintenance

8.1 Maintenance

The meter and the electrode contain precision parts. Please make sure that the meter and the electrode will not be subjected to any strong mechanical impact during use. There are no user maintenance parts inside the instrument.

Maintenance cycle:

Maintenance Item	Maintenance Content	Maintenance Cycle
Instrument test	Visual inspection, check whether the meter display is normal and whether the housing is obviously damaged.	Every 4 weeks
Probe cleaning	The contamination and coverage of the electrode reference oozing interface and the surface of the glass bulb will cause measurement errors or measurement instability. The electrode needs to be cleaned regularly during use. The cleaning agent can be clean water, 3-5% hydrochloric acid, 3-5% NaOH, and daily detergent, etc.	7~15 days (According to the use environment, industrial wastewater is recommended to be cleaned once every 7~15 days)
Probe Calibration	Contamination and blockage of the reference ooze interface will inevitably occur during the use of the electrode, which can cause measurement errors. The use of standard solutions and regular calibration of the electrode in use can correct the errors.	7~15 days (According to the use environment, industrial wastewater is recommended to be calibrated once in 7~15 days)
Probe Maintenance	The ionic balance on the surface of the glass membrane is changed when the pH electrode is applied with strong acid, strong alkali or high temperature or after cleaning by harsh detergent, which will lead to measurement drift or measurement error. Soaking the electrode with 3mol/L KCL solution after cleaning will help to improve the electrode life.	After each cleaning

8.2 Troubleshooting

Fault phenomenon	Possible reason	Troubleshooting
No display	Power supply is not properly connected	Check if the power connection is normal and the power supply voltage is normal
	Incorrect contrast setting	Readjust the display contrast
The screen appears ⊗	Probe calibration error	Recalibrate the probe
	pH antimony electrode is being measured, but the menu is not set to antimony electrode	Set "PH-ANT"in the "Electrode selection" menu
	Probe damage	Replace probe
The screen appears "!" prompt	Instrument temperature is too high	Lower the ambient temperature or increase heat dissipation measures
	Ambient temperature calibration error	Recalibrate the measured value of the meter's ambient temperature
The clock display is abnormal or garbled	Wrong clock setting	Reset date and time
	The clock battery is exhausted	Contact the supplier to replace the battery
Data communication does not respond	Data line polarity is reversed	Correct the polarity connection of the data line
	Communication parameter setting error	Check and reset communication parameters (slave address, baud rate, parity bits, stop bits)
	Communication cable failure	Replace or repair cables
Communication data error	Slave address conflict	Check whether the instrument slave address conflicts with other devices in the network and reset the slave address
Inaccurate current output	Parameter setting error	Check and reset current parameters
	Load impedance is too high	Check if the wire is too long or the load impedance is too high, and correct
	Current output drift generates errors	Recalibrate the current output in the test maintenance menu

8.3 Fault checking

Judgment items	Judgment method
Whether the instrument measurement function is normal	Short connect the instrument terminal ACT and REF with a wire, and execute resume calibration in the menu, after the calibration is restored, the pH reading of the meter is 7.00±0.02pH, which means the instrument measurement function is normal
Whether the relay is normal	Switch between "close" and "open" in the test maintenance menu, listen to whether the relay has an action sound, and measure whether the resistance value of the relay is less than 10 Ω when the relay is closed with a multimeter
Whether the current output is normal	Remove the wire of the current output terminal of the meter, connect the ammeter to the current output terminal of the meter, set different current values in the current test menu, and observe whether the ammeter reading is the same as the value set in the menu
Whether the zero point of pH electrode is normal	Switch the meter display to "mV/pH measurement value" mode, put the electrode into the standard solution with pH 6.86, if the mV reading is within ±60mV and stable, it means the electrode zero point is normal

Appendix

A Modbus register information

2. Modbus RTU Overview:

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

The 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 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 starts 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 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 start of the new message. Similarly, if a new message starts after the previous message frame in less than 3.5 character, the receiving device will assume that it is a continuation of the previous frame, and this will cause an error because the last CRC value cannot be correct.

1. Function code details (function code 0×04):

This function enables the host (upper computer) to obtain the real-time measured value from the slave (instrument). The value is specified as a single-precision floating-point type (that is, occupying 2 consecutive register addresses), and the corresponding parameter are marked by different register address.

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

Host send:

1	2	3	4	5	6	7	8
Slave address	Function code	Register start Address high 8 bit	Register start address low 8 bit	Register number high 8 bit	Register number low 8 bit	CRC low 8 bit	CRC high 8 bit
Addr	04	xx	xx	xx	xx	CRC	CRC

Slave response:

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 bit	Data 1 low 8 bit	Data n high 8 bit	Data n low 8 bit	CRC low 8 bit	CRC high 8 bit
Addr	04	Len	xx	xx	xx	xx	CRC	CRC

☞ Note : 1. Addr is the slave address, with an optional range of 0 x 01 to 0 x FE.

2. Len is the number of bytes of returned data.

Examples:

Send frame: [01 04 00 02 00 02 D0 0B], the meaning is as follows:

       [01]: Instrument address

       [04]: Function code

       [00 02]: Starting register address 0 x 02

       [00 02]: Read 2 registers from the start address (read a single-precision floating-point data result)

       [D0 0B]: 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]: The number of bytes returned (here 4)

       [CC CD 41 48]: 0 x 4148CCCD (12.55 floating-point values, specific numerical meaning to find the corresponding address) (Note: 16-bit integer registers coalition of a single-precision floating-point, pay attention to the order of the data)

       [65 4D]: CRC check data

3. Corresponding parameter table of communication

Numbering from address 0 is as follows:

00   Temperature value (℃)

02   PH value (pH)

04   mV value (mV)

06   Current 1 (mA)

08   Current 2 (mA)

10   Ambient temperature value (℃)