Online pH/ORP Controller

User Manual
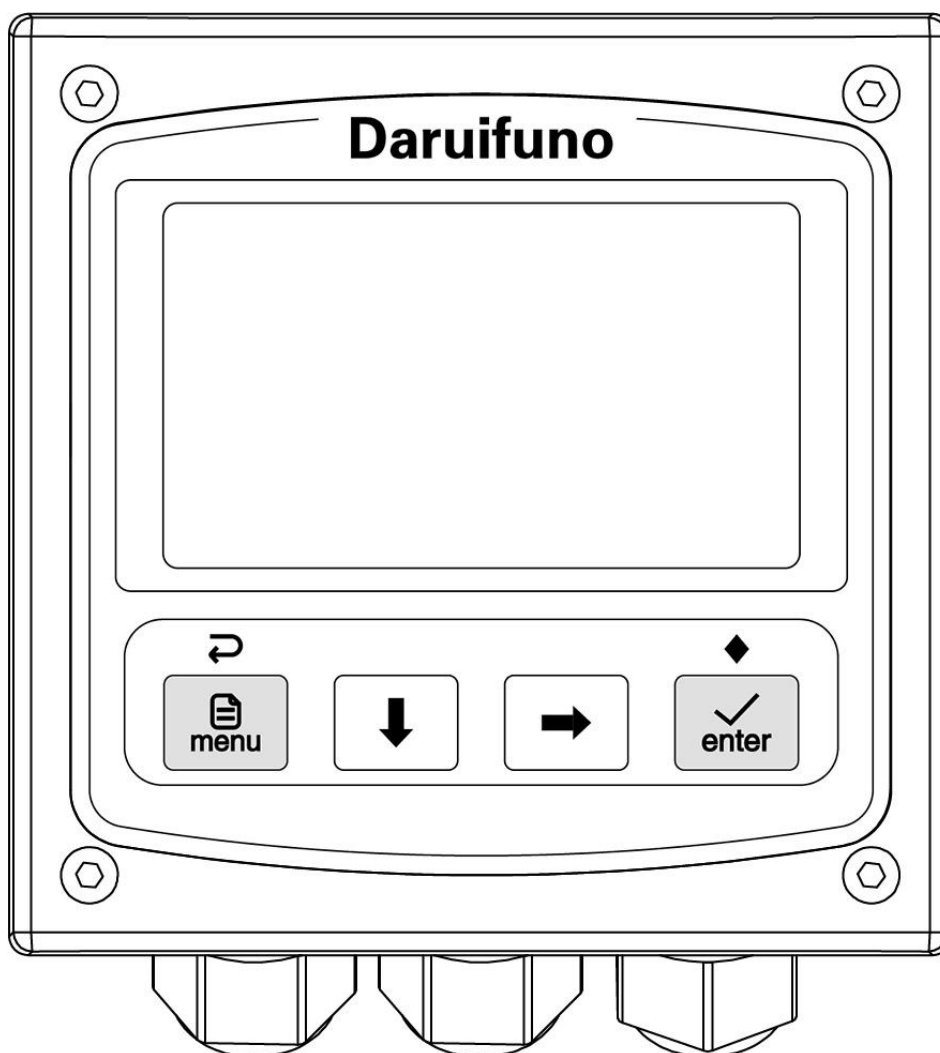
Model: APX1-C1/C1Z

Version 01.25

CONTENTS

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	±0.02pH/±2mV
Temp. Compensation	NTC10K/PT1000 automatic or manual
Relay Control	Channel Quantity: 2
	Control Type: main value control/temp. control/wash control
	Contact Type: SPST
	Contact Capacity: 3A 250V AC
Current Output	Channel Quantity: 1
	Output Type: active 4~20mA or 0~20mA
	Max. Load: 1000Ω
Comm. Interface	A RS485 MODBUS-RTU
	Note: Only APX1-C1Z has comm. functions
Display Screen	3.2 inch graphic LCD display
Configuration information	Power failure protection, parameters are retained indefinitely
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 mounting
Instrument Dimension	100*100*120(unit: mm)
Protection Grade	IP66
Instrument Weight	About 500g

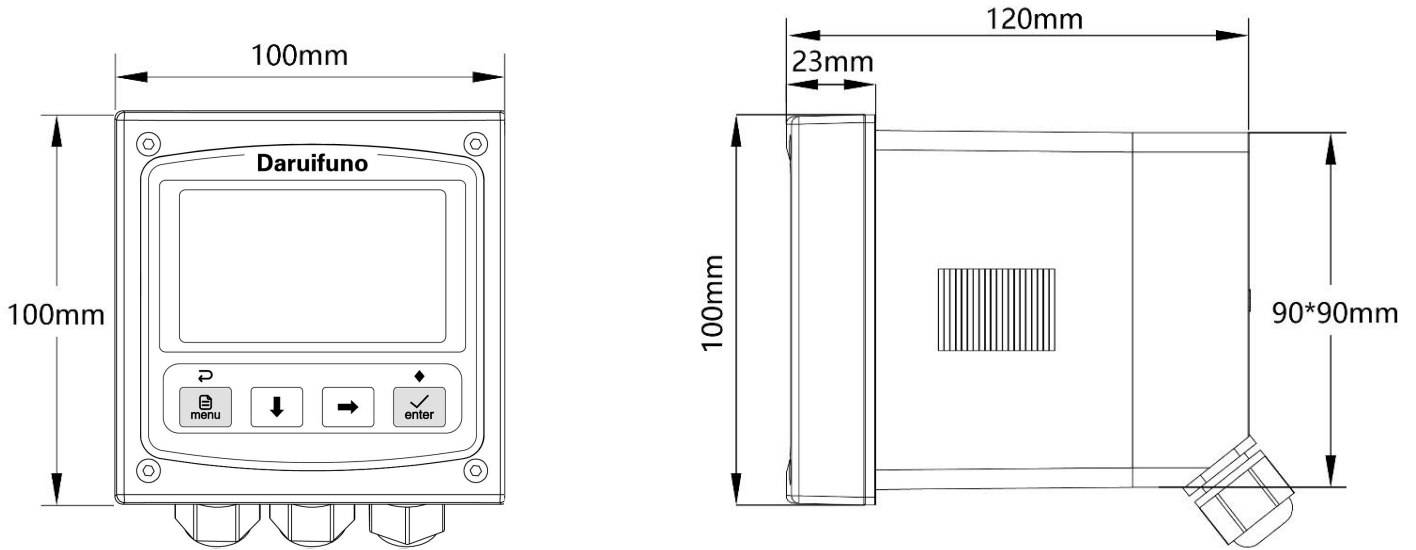# Chapter 2 Mechanical Installation

2.1 Dimension

Figure 2-1 Instrument dimension

2.2 Installation

When the controller is selected for panel mounting, the user passes the fixing clips through the back of the instrument until it is tightened, and the mounting dimensions and diagram are shown below:
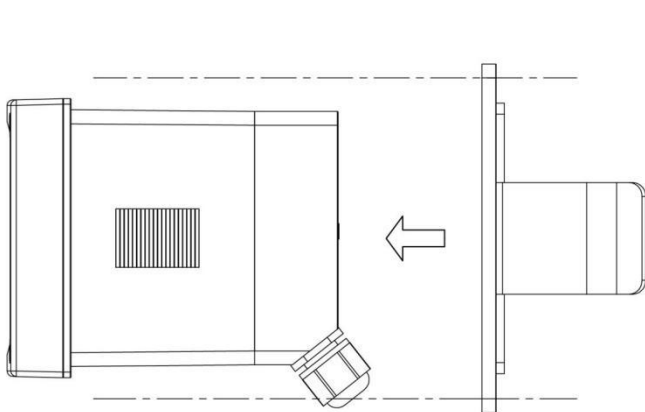

Figure 2-2 Panel mounting
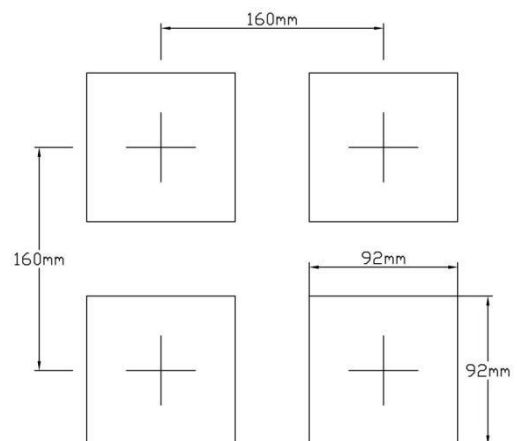
Figure 2-3 The minimum opening spacing

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
	⏚	AC power ground wire		NC	Floating terminal
	N	AC power NEUTRAL wire		-	DC power negative

3.2 Terminal Definition

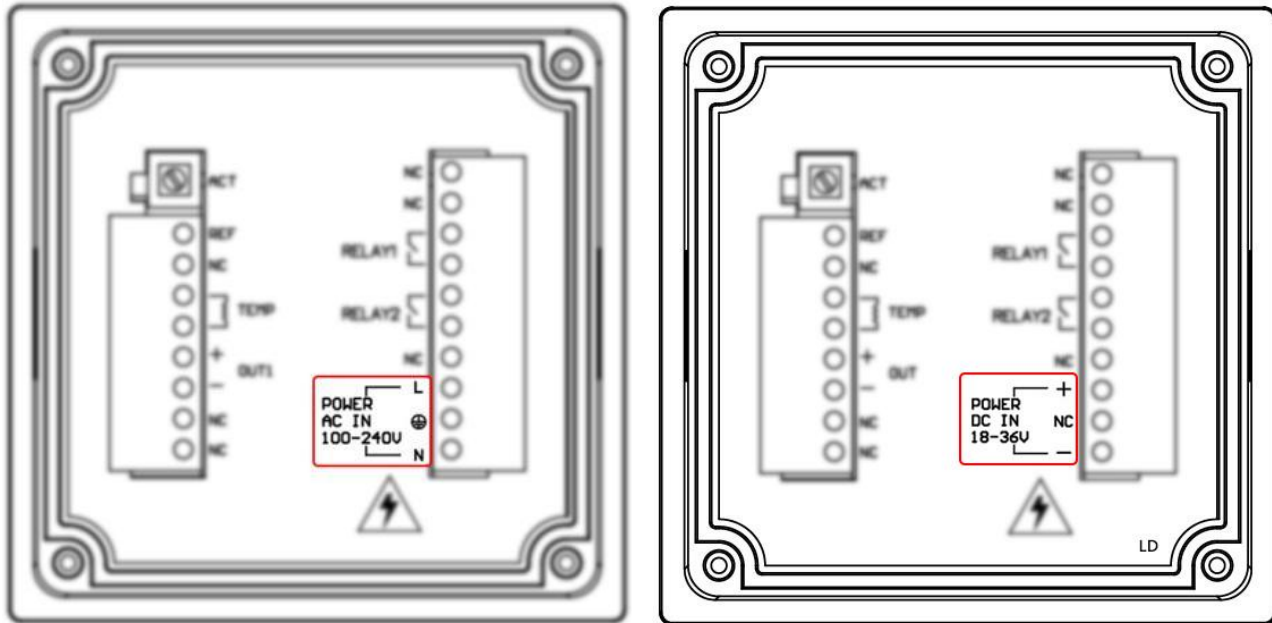The electrode cable is connected to the ACT, REF, TEMP terminals, and the rest are connected according to actual needs.
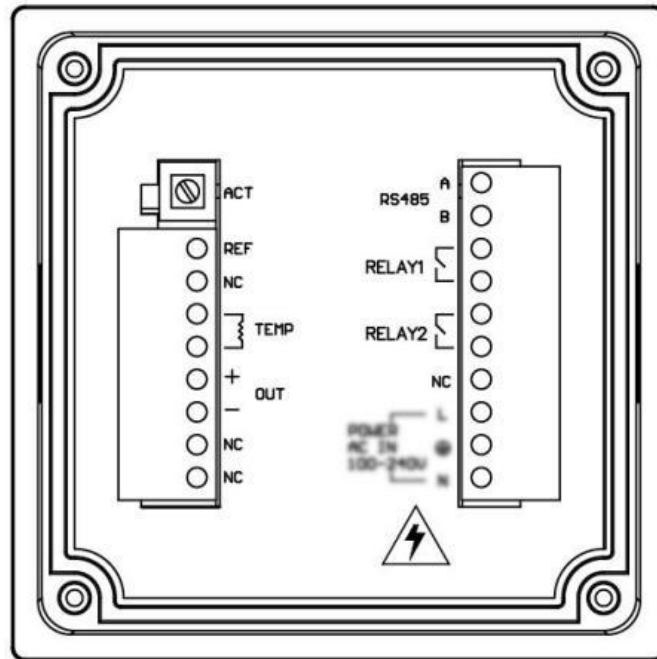
Figure 3-2 terminal blocks

The terminal locations and names are shown in the table below:
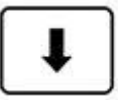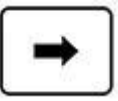
ACT	pH(ORP) probe indication	RS485[1]	A[1]	RS485 signal D+(A) terminal
REF	pH(ORP) probe reference		B[1]	RS485 signal D-(B) terminal
TEMP	Temp. probe input terminal	RELAY1		Relay 1 contact
	Temp. probe input terminal			Relay 1 contact
OUT	+ Current Output positive	RELAY2		Relay 2 contact
	- Current Output negative			Relay 2 contact
NC	Floating terminal	NC		Floating terminal

Note: (1) only APX1-C1Z has RS485 function, and for APX1-C1, the terminal is marked with "NC".

Chapter 4 User Interface

4.1 Panel Button

Button	Function
⇄ 🗎 menu	In the main menu, return to the measurement mode In the sub menu, return to the previous menu When setting the value, abandon the modification and return to the previous menu During calibration, cancel the calibration process In measurement mode, long press to enter the main menu
↓	In measure mode, switch between two secondary display modes In the menu, move the cursor down When setting the value, subtract 1 from the value, or to change the sign bit
→	In measurement mode, switch between two measurement value display modes (only pH measurement mode is available) In the menu, move the cursor up When setting the value, move the cursor right
◆ ✓ enter	In measurement mode, long press to open the quick calibration menu In the menu, enter the sub menu or the item selected by the cursor When setting the parameter (value or option), save the setting 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:
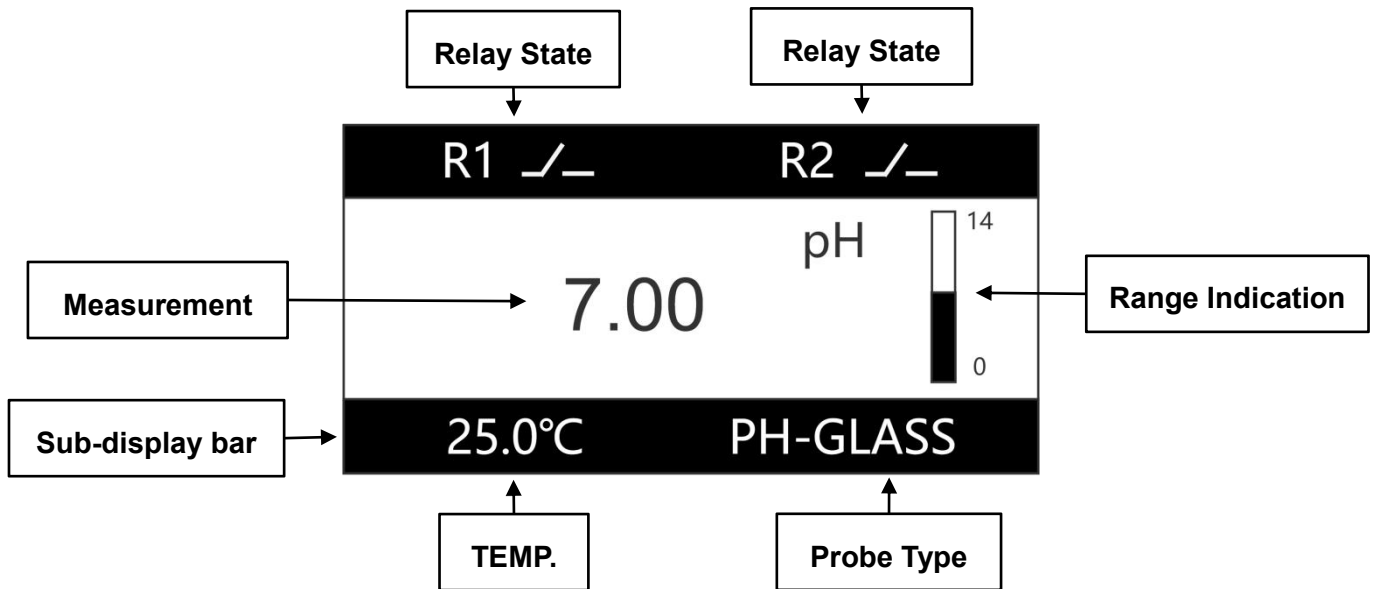
- **Relay state:** indicate the current relay state: on or off

- **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 button

  [→] to switch " pH measurement " to " mV/pH measurement "

- **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 ⮐🗎menu 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.

● Quick Calibration Mode

Press and hold the button [enter] on the measurement interface to open the Quick calibration menu. At this time, " RST ", pH/ORP calibration point, and " Exit " will appear in the sub-display bar, and you can perform the corresponding operation by pressing the key below the corresponding position.

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.

● **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.

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

   Output measured values using RS485 interface. Please refer to the appendix for an introduction to the Modbus communication.

   Note: Only APX1-C1Z has comm. functions

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 (℃)	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

```
┌── 5. Comm. Set ──┬── 1. Slave Address
│                  │
│                  ├── 2. Baud Rate ──────┬── 1. 4800 BPS
│                  │                      ├── 2. 9600 BPS
│                  │                      ├── 3. 19200 BPS
│                  │                      ├── 4. 38400 BPS
│                  │                      ├── 5. 57600 BPS
│                  │                      └── 6. 115200 BPS
│                  │
│                  ├── 3. Verify Bit ─────┬── 1. NONE
│                  │                      ├── 2. ODD
│                  │                      └── 3. EVEN
│                  │
│                  └── 4. Stop Bit ───────┬── 1. 1 Bit
│                                         └── 2. 2 Bit
│
├── 6. System Set ─┬── 1. Display Speed ──┬── 1. Buffers Level 2
│                  │                      ├── 2. Buffers Level 4
│                  │                      ├── 3. Buffers Level 8
│                  │                      ├── 4. Buffers Level 16
│                  │                      └── 5. Buffers Level 32
│                  │
│                  ├── 2. Backlight ──────┬── 1. Scanty Power ──┬── 1. 01 Minute
│                  │                      └── 2. Always On      ├── 2. 05 Minute
│                  │                                            └── 3. 10 Minute
│                  ├── 3. Contrast Set
│                  ├── 4. Software
│                  └── 5. Password
│
└── 7. Test/Maint. ┬── 1. Current CAL ────┬── 1. CAL 4mA
                   │                      └── 2. CAL 20mA
                   │
                   ├── 2. Relay Test ─────┬── 1. Relay I ───────┬── 1. Turn-ON
                   │                      │                     └── 2. Turn-OFF
                   │                      └── 2. Relay II ──────┬── 1. Turn-ON
                   │                                            └── 2. Turn-OFF
                   ├── 3. Current Test ───┬── 1. Probe Measure
                   ├── 4. Measure Mode ───┴── 2. Sim. Measure
                   │
                   └── 5. Restore Defaults ┬── 1. Cancel
                                           └── 2. OK
```

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