Water Quality Multi-parameter Online Monitor
pH/ORP
Operating Manual

Contents

Preface

Thank you for your support. Please read this manual carefully before use.The correct use will maximize the performance and advantages of the product, and bring you a good experience.
When receiving the instrument, please open the package carefully, check whether the instrument and accessories are damaged by transportation and whether the accessories are complete. If any abnormalities are found, please contact our after-sales service department or regional customer service center, and keep the package for return processing.

This instrument is an analytical measurement and control instrument with highly precision.Only skilled,trained or authorized person should carry out installation, setup and operation of the instrument.Ensure that the power cable is physically separated from the power supply when connection or repair.Once the safety problem occurs, make sure that the power to the instrument is off and disconnected.
For example, it may insecurity when the following situations occur:
1) Apparent damage to the analyzer
2) The analyzer does not work properly or provides specified measurements.
3)The analyzer has been stored for a long time in an environment where the temperature exceeds 70 °C.

The analyzer must be installed by professionals in accordance with relevant local specifications, and instructions are included in the operation manual.
Comply with the technical specifications and input requirements of the analyzer.

Features

The meter is a microprocessor-based water quality online monitoring control instrument. The instrument is widely used in industrial waste water, surface water, drinking water, sea water, and industrial process control ions on-line automatic testing and analysis, etc. Continuously monitor and control pH and ORP of aqueous solution.

Features and functions:

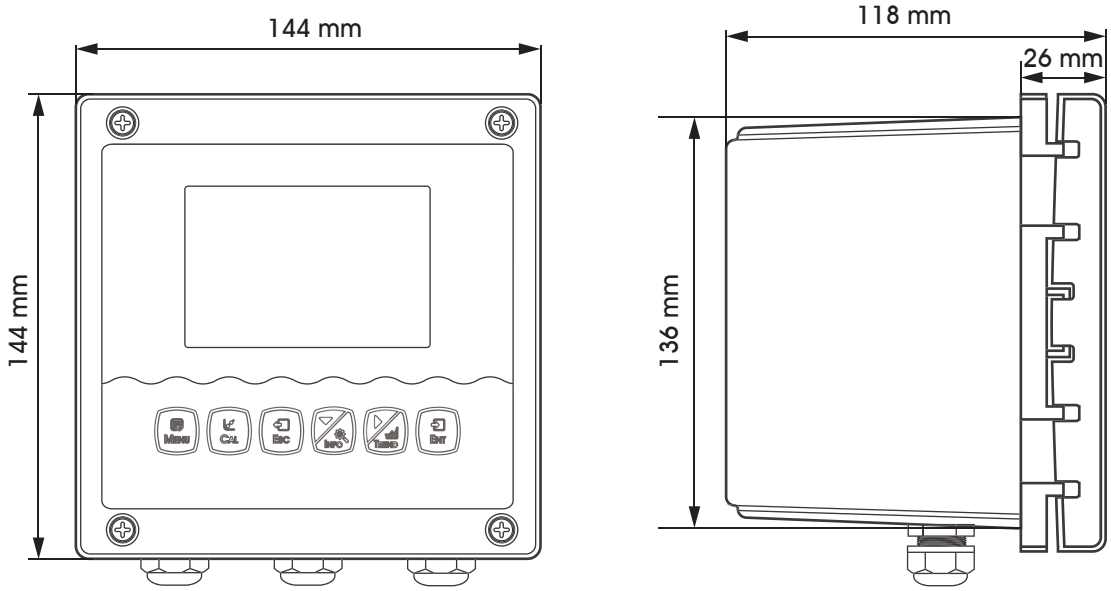
- Large color LCD display.
- Intelligent menu operation.
- Data Recording /Curve display/Data upload function.
- Multiple automatic calibration to ensure the accuracy.
- Differential signal model, stable and reliable.
- Three relay control switches.
- High & low alarm and hysteresis control.
- 4-20mA&RS485 Multiple output modes.
- Password protection to prevent misoperation by non-staff.

Technical Specifications

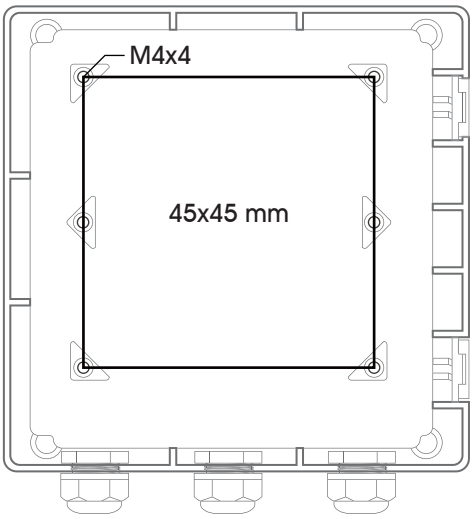
Measuring range	pH:-2~16pH; ORP:-2000~+2000mV
Unit	pH,mV
Resolution	pH:0.001pH; ORP:1mV
Basic error	pH:±0.01pH;ORP:±1mV;
Temperature	-10~150℃
Resolution	±0.3℃
Temperature compensation	Automatic or manual
Stability	pH: ≤0.01pH/24h; ORP:≤1mV/24h
Current output	2 Rd 4~20mA, 20~4mA, 0~20mA
Communication output	RS 485 Modbus RTU
Other function	Data recording, curve display
Relay control contact	3 Groups: 5A 240VAC,5A 28VDC or 120VAC
Optional power supply	85~265VAC,9~36VDC, Power: ≤3W
The work environment	In addition to the earth's magnetic field around no strong magnetic field interference
The environmental temperature	-10~60℃
Relative humidity	No more than 90%
Protection grade	IP65
The instrument weight	0.8kg
Instrument dimensions	144*144*118mm
Mounting hole dimensions	138*138mm
Installation	Embedded, wall - mounted, pipe type

Instrument installation

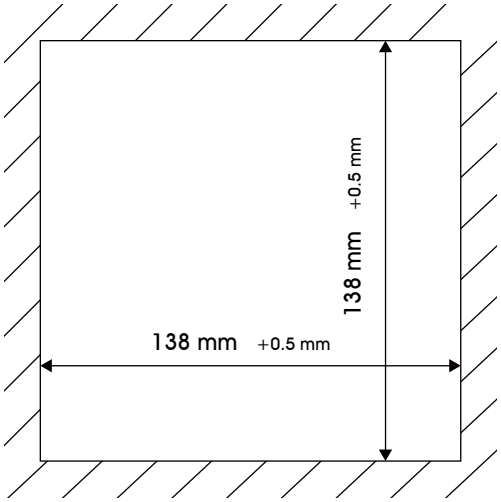
Installation size



Instrument dimensions

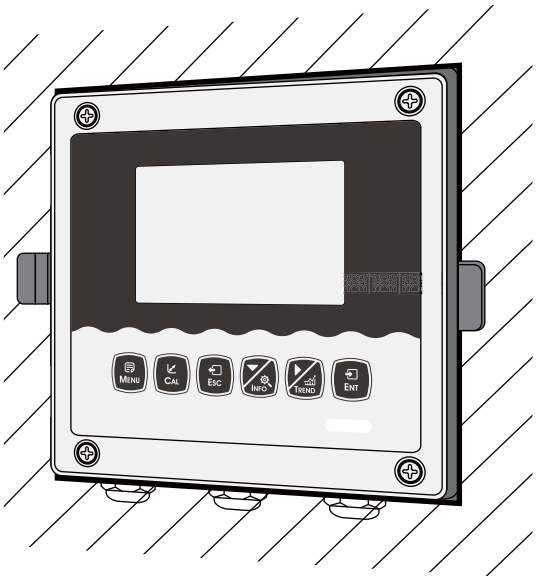


Back fixed hole size



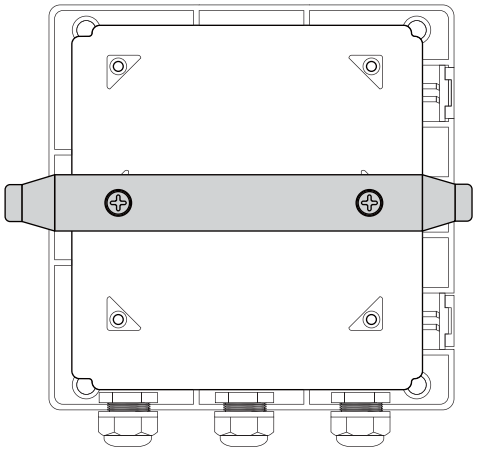
Embedded mounting Cut-out size

Instrument installation: embedded installation

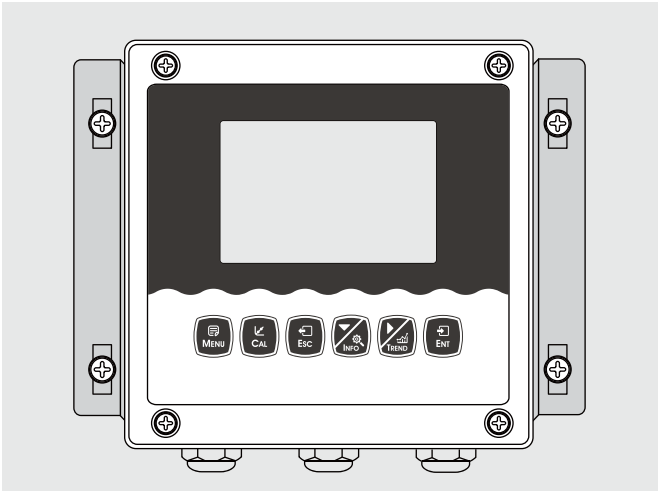


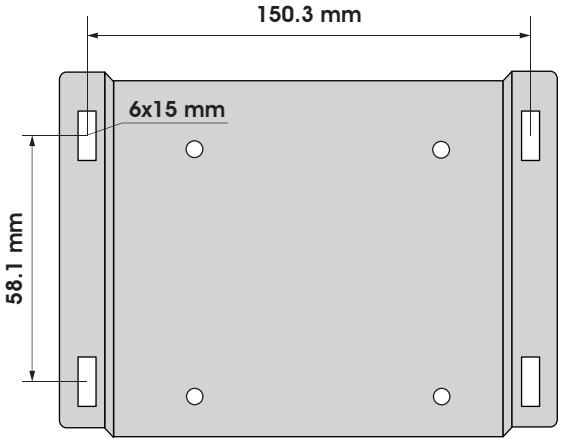
Installation completion diagram

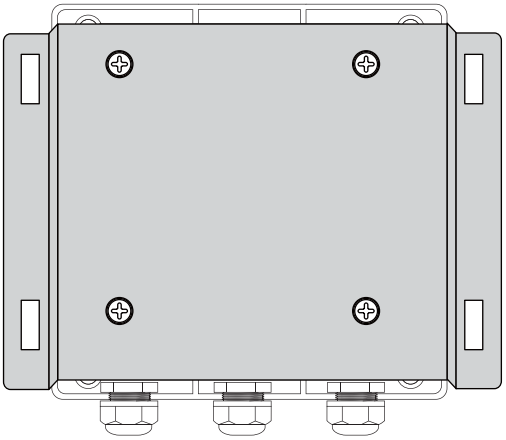
Install fixing bracket for instrument
Insert into the cut-out hole



Instrument installation:Wall mounted installation





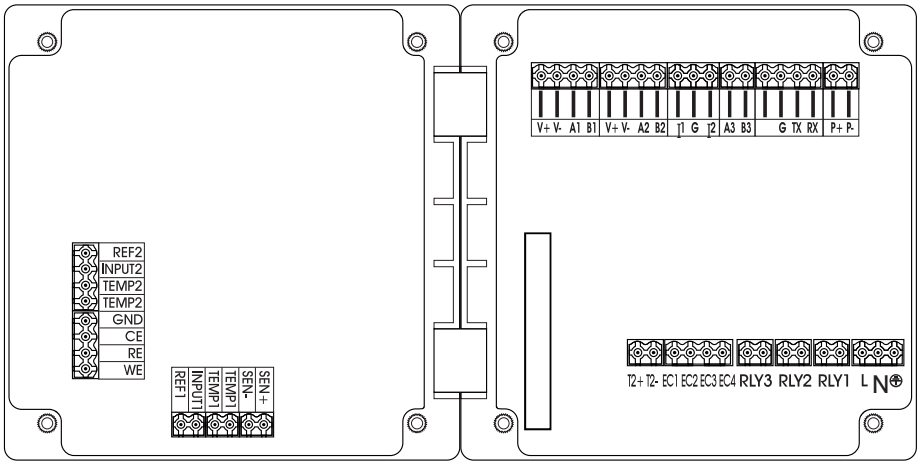


Installation completion diagram

a. Install fixing bracket for instrument
b.Wall screw fixing

Install fixed bracket top view,
pay attention to

Instrument connection



V+,V-,A1,B1	None	REF1	PH REF1
VV+,V-,A2,B2	None	INPUT1	PH INPUT1
I 1,G,I 2	Output current	TEMP	Temp
A3,B3	RS485 communication output	SEN-,SEN+	None
G,TX,RX	RS232 communication output		
P+,P-	VDC power supply	REF2	ORP REF2
		INPUT 2	ORP INPUT2
T2+,T2-	Temperature wiring	TEMP	Temp
EC1,EC2,EC3,EC4	Conductivity/Resistance wiring	GND	Grounding (for testing)
RLY3, RLY2, RLY1	Group 3 relays	CE,RE,WE	None
L,N, ⏚	L fire wire, N neutral wire, ⏚ geodesic		

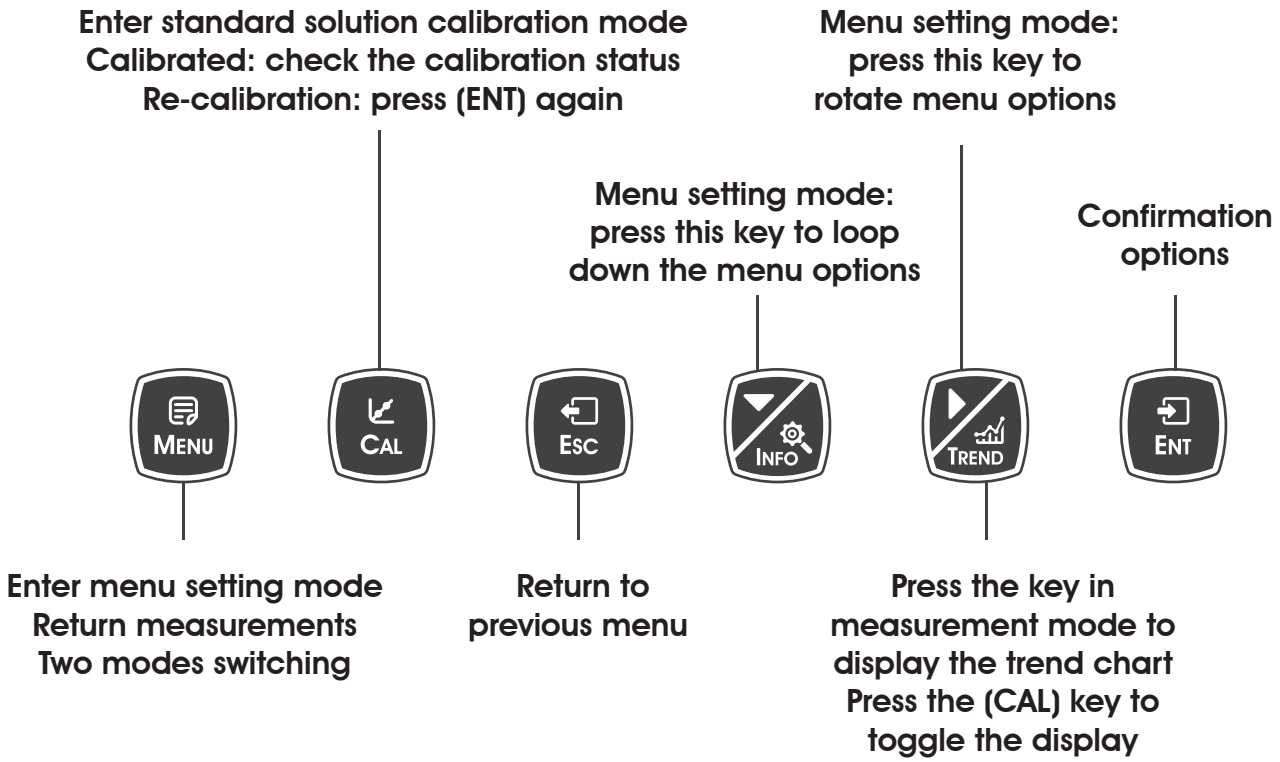
Electrical connection

Connection of instrument and sensor: the power supply, output signal, alarm contact of relay and connection of sensor and instrument are all inside the instrument. The connection is made according to figure 3. The length of the cable lead fixed by the electrode is usually 5-10 meters. Insert the corresponding labeled or color line on the sensor into the corresponding wiring terminal inside the meter and tighten it.

Keypad descriptions

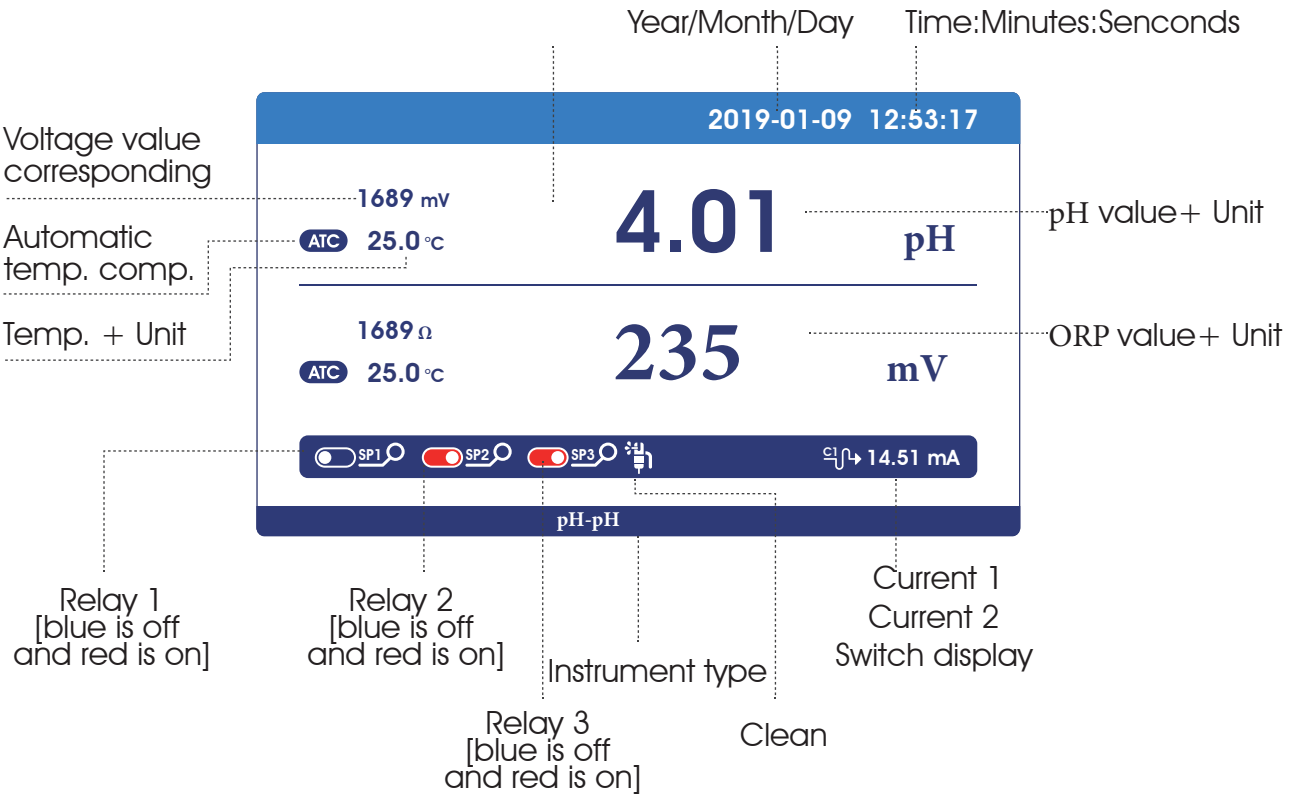
Keypad operation tips:

Short Press: Short Press means to release the key immediately after pressing. ((Default to short presses if not indicated below)
Press and hold: Press and hold means to press the button, and accelerate after a certain time until the data is adjusted to the user's required value before releasing the button.

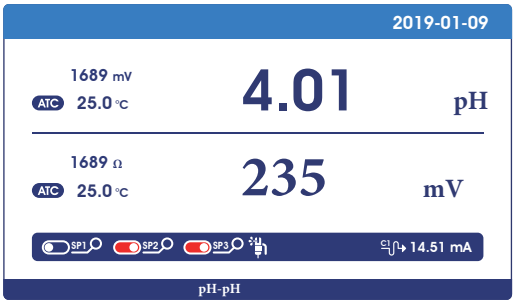


Display descriptions

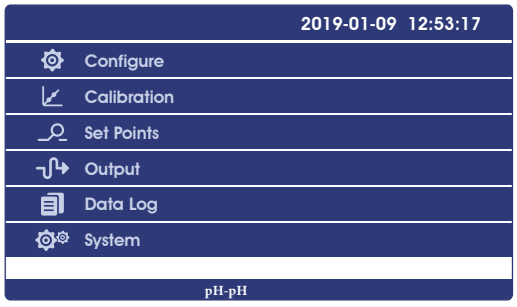
All pipe connections and electrical connections should be checked before use. After the power is switched on, the meter will display as follows.



Measurement mode

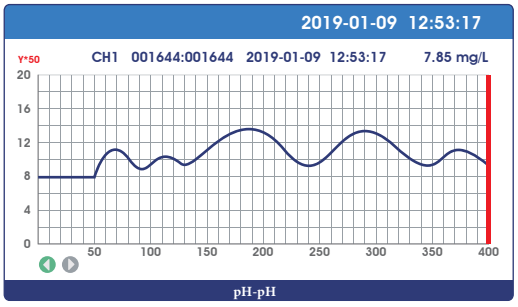


Setting mode



Calibration mode

Trend Chart Display



Menu structure

The following is the menu structure of this instrument,press【MENU】key to enter menu setting mode:

Please press **[▼]** or **[▶]** to set the security password, and then press **[ENT]** to confirm . No initial password, directly press **[ENT]** to enter.

Configure	pH	Sensor 1	pH	
			Unit	pH
		Temperature	Temperature Sensor	NTC2.252 kΩ
				NTC10 kΩ
				Pt100
				Pt1000
			Temperature Offset	
			Temperature Input	Automatic
				Manual
			Temperature Unit	℃
				℉
	Conductivity	Sensor 2	ORP	ORP
			Unit	MV
		Temperature	Temperature Sensor	NTC2.252 kΩ
				NTC10 kΩ
				Pt100
				Pt1000
			Temperature Offset	0.0000
			Temperature Input	Automatic
				Manual
			Temperature Unit	℃
				℉
Calibration	Sensor 1	Standard Calibration	USA: 7.00, 4.01, 10.01	Automatic identification
			NIST: 6.86, 4.01, 9.18	Automatic identification
		Field Calibration	Field Calibration	
			Offset Adjustment	
			Slope Adjustmen	
		Calibration Adjustment	Voltage 1	
			Voltage 2	
			Voltage 3	
			Voltage 4	
			Voltage 5	
	Sensor 2	Standard Calibration	Point 1	
			Point 2	
			Point 3	
			Point 4	
			Point 5	
		Field Calibration	Field Calibration	
			Offset Adjustment	
			Slope Adjustmen	
		Calibration Adjustment	Voltage 1	
			Voltage 2	
			Voltage 3	
			Voltage 4	
			Voltage 5	
Alarm		Relay 1	Channel	pH
				ORP
				Temperature 1
				Temperature 2
			Status	ON
				OFF
			High/Low Alarm	High Alarm
				Low Alarm
				Cleanning(Cleaning time setting is as below)
			Limit Value (Cycle)	(Continuous opening time)
			-under cleaning status	
			Hysteresis (INterval)	(The interval between the last opening
			-under cleanning status	and closing and the next opening)
		Relay 2	Channel	pH
				ORP
				Temperature 1
				Temperature 2
			Status	ON
				OFF
			High/Low Alarm	High Alarm
				Low Alarm
				Cleanning(Cleaning time setting is as below)

		Limit Value (Cycle)	(Continuous opening time)
		-under cleaning status	
		Hysteresis (INterval)	(The interval between the last opening
		-under cleanning status	and closing and the next opening)
	Relay 3	Channel	pH
			Conductivity
			Temperature 1
			Temperature 2
		Status	ON
			OFF
		High/Low Alarm	High Alarm
			Low Alarm
			Cleanning(Cleaning time setting is as below)
		Limit Value (Cycle)	(Continuous opening time)
		-under cleaning status	
		Hysteresis (INterval)	(The interval between the last opening
		-under cleanning status	and closing and the next opening)
Output	Current 1	Channel	pH
			ORP
			Temperature 1
			Temperature 2
		Output Option	4-20mA
			0-20mA
			20-4mA
		Upper Limit	
		Lower Limit	
	Current 2	Channel	pH
			ORP
			Temperature 1
			Temperature 2
		Output Option	4-20mA
			0-20mA
			20-4mA
		Upper Limit	
		Lower Limit	
	RS485	Baud Rate	4800BPS
			9600BPS
			19200BPS
		Parity Check	None
			Odd
			Even
		Stop Bit	1 Bit
			2 Bit
		Network Node	001+
Data Log	Graphic Trend	Interval/point	
	(trend chart)	1h/point	
		12h/point	
		24h/point	
	Data Query	year/month/day	
	Interval	7.5s	
		90s	
		180s	
	Memory information	176932point	
	Data Output		
System	Language	English	
	Date/Time	Year-Month-Day	
		Hour-Minute-Second	
	Display	Display Speed	Low
			Standard
			Medium
			High
		Backlight	Saving
			Bright
	Soft Version	Soft Version	19 - V1.0
		Password Settings	0000
		Serial Number	
	Factory Default	No	
		Yes	
	Terminal Current Tuning	Current 1 4mA	(The positive and negative ends of the ammeter are connected to the current 1 or current 2 output terminals of the instrument respectively, press 【▼】 key to adjust the
		Current 1 20mA	
		Current 2 4mA	
		Current 2 20mA	
	Relay Test	Relay 1	
		Relay 2	
		Relay 3	

Calibration

Press [MENU] to enter the setting mode and select the calibration

Calibration of Standard Solution

Select the Standard Solution Calibration, a total of two groups: USA: 7.00, 4.01, 10.01 and NIST: 6.86, 4.01, 9.18. After the selection is completed, press the [**ENT**] button to confirm and enter the standard sulution calibration mode.

If the instrument has been calibrated, the screen shows the calibration status and then press the 【**ENT**】 key again to enter the re-calibration if you need re-calibration.

If the monitor prompts you to enter the calibration security password, press the 【▼】 key or 【▸】 key to set the calibration security password, and then press the 【**ENT**】 key to confirm the calibration security password.

pH Calibration: After entering the calibration mode, the instrument displays as shown above.The instrument automatically identifies the standard liquid, first calibrates the midpoint (example 7.00pH), then calibrates 4.01pH or 10.01pH. The corresponding mV value will be displayed on the left side of the screen.

After the calibration is completed, the offset and slope will be displayed on the right side of the screen. If only two points of calibration are needed, after two points of calibration, press the 【**Menu**】 button to exit directly.

During the calibration process, Error prompt appears on the screen when the standard liquid is wrong.

Calibration results: The slope of glass electrode (> 0.90) is qualified, and that of metal antimony electrode (> 0.80) is qualified.

ORP Calibration: Press 【**Menu** 】key to enter the setting mode, select ORP standard liquid calibration, and input the known standard liquid value (default 235mV).

Press the key to return to the measurement screen and press the 【**CAL**】 key to enter the standard solution calibration mode. If there is no need to modify the value, this setting is omitted.

Press 【**CAL**】 key to enter the calibration mode.After entering the calibration mode, the instrument will be displayed as the upper right image, and the corresponding mV value will be displayed on the left side of the screen.

After the calibration is completed, the slope will be displayed on the right side of the screen.

If the instrument has been calibrated, press the 【**CAL**】 key to inspect the calibration state, and then press the key to enter the re-calibration.

The pH value of buffer solution was measured at 25℃.

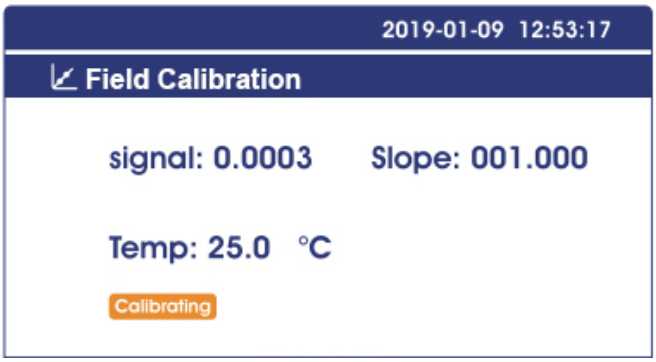
To calibrate the instrument using an automatic identification buffer, you need a standard pH buffer that matches any of these values. Before using automatic calibration, please select the correct buffer table (see "Buffer Table").

Before calibration, the sensor can be activated in the pH sensor immersion solution to ensure the stability and accuracy of calibration and monitoring values.

Point 1 calibration: After entering the calibration mode, the instrument displays as shown in the figure above. The main value of the instrument displays the known standard liquid value of point 1. Place the electrode into the standard solution of the corresponding value, and the corresponding voltage mV value and calibration state will be displayed on the left side of the screen. After completion of calibration, [Done]will be displayed on the right side of the screen.If the next point is calibrated, press[▼]to switch the calibration point.
If only one point calibration is needed, after the calibration is completed, press [MENU] to exit. During the calibration process, when the standard solution is wrong, the screen will show Error.

Field calibration

Select field calibration mode: [field calibration], [Offset adjustment], [linear adjustment].[Field calibration]



[Offset adjustment]

Compare the data from laboratory or portable instrument with the data measured by instrument. If there is any error, the error data can be modified by this function.

[Linear adjustment]

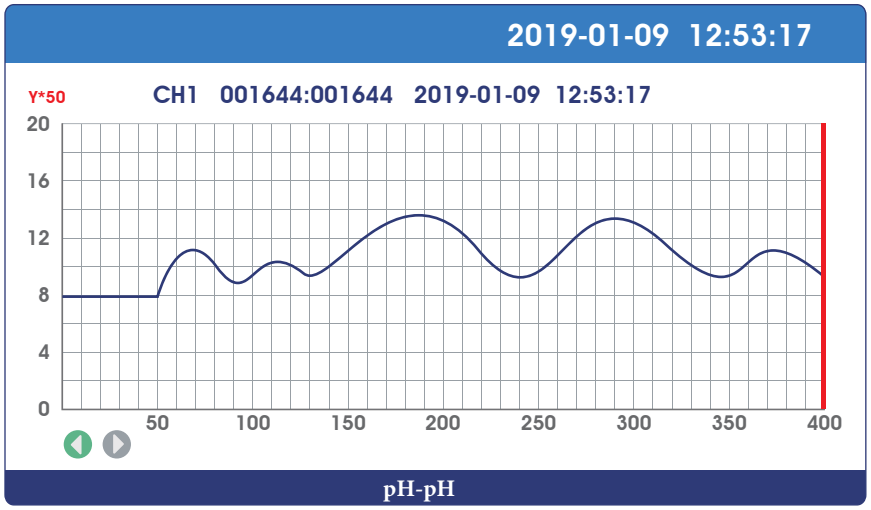
The linear value after "field calibration" will be saved in this item and the factory data is 1.00.

Graphic Trend(Trend Chart)

Press【Menu】key to enter the setting mode,set the recording interval, and the instrument will

Data Log	Curve query (trend chart)	Interval/point	400 points per screen,displays the most recent data trend graph according to interval Settings
		1h/point	400 points per screen, display trend chart of the last 16 days of data
		12h/point	400 points per screen, display trend chart of the last 200 days of data
		24h/point	400 points per screen, display trend chart of the last 400 days of data
	Data Query	year/month/day	Year/month/day time: minute: second value unit
	Interval	7.5s	Store data every 7.5 seconds
		90s	Store data every 90 seconds
		180s	Store data every 180 seconds

Press the **[MENU]** button returns to the measurement screen. Press the **[▶/TREND]** button in the measurement mode to view the trend chart of the saved data directly. There are 480 sets of data record per screen, and the interval time of each record can be selected [7.5s, 90s, 180s], corresponding to the data displayed in [1h, 12h, 24h] per screen.



In the current mode, press the【**ENT**】key to move the data display line to the left and right (red), and display the data in left and right circles.Long pressing of the 【**ENT**】 key can accelerates displacement. (When the bottom icon is green, 【**ENT**】 key is displacement direction,press 【**▶/TREND**】key to switch the direction of displacement)

In the current mode, press the【**CAL**】key to switch display electrode trend chart.

MODBUS RTU General Information

Overview

The hardware version number of this document is V2.0; the software version number is V5.9 and above. This document describes the MODBUS RTU interface in details and the target object is a software programmer.

MODBUS command structure

Data format description in this document;
Binary display, suffix B, for example: 10001B
- decimal display, without any prefix or suffix, for example: 256
Hexadecimal display, prefix 0x, for example: 0x2A
ASCII character or ASCII string display, for example: "YL0114010022"

Command Structure
The MODBUS application protocol defines the Simple Protocol Data Unit (PDU), which is independent of the underlying communication layer.

Figure 1: MODBUS Protocol Data Unit

MODBUS protocol mapping on a specific bus or network introduces additional fields of protocol data units. The client that initiates the MODBUS exchange creates the MODBUS PDU, and then adds the domain to establish the correct communication PDU.

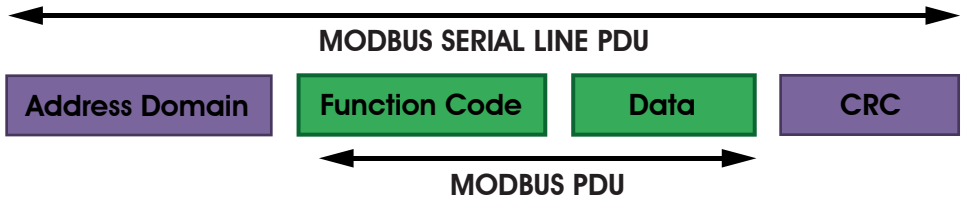


Figure 2: MODBUS architecture for serial communication

On the MODBUS serial line, the address domain contains only the slave instrument address. Tips:
The device address range is 1...247
Set the device address of the slave in the address field of the request frame sent by the host.
When the slave instrument responds, it places its instrument address in the address area of the response frame so that the master station knows which slave is responding.
Function codes indicate the type of operation performed by the server.
CRC domain is the result of the " redundancy check" calculation, which is executed according to the information content.

MODBUS RTU Transmission Mode

When the instrument uses RTU (Remote Terminal Unit) mode for MODBUS serial communication, each 8-bit byte of information contains two 4-bit hexadecimal characters. The main advantages of this mode are greater character density and better data throughput than the ASCII mode with the same baud rate. Each message must be transmitted as a continuous string.

The format of each byte in RTU mode (11 bits):
Coding system: 8-bit binary
Each 8-bit byte in a message contains two 4-bit hexadecimal characters (0-9, A-F)
Bits in each byte: 1 starting bit
8 data bits, the first minimum valid bits without parity check bits
2 stop bits
Baud rate: 9600 BPS
How characters are transmitted serially:
Each character or byte is sent in this order (from left to right) the least significant bit (LSB)... Maximum Significant Bit (MSB)

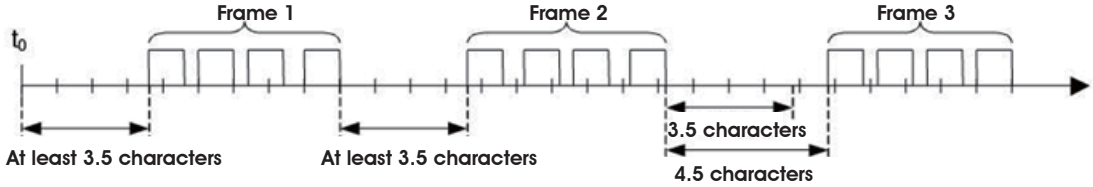
Start bit	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Stop bit**	**Stop bit**

Figure 3: RTU pattern bit sequence
Check Domain Structure: Cyclic Redundancy Check (CRC16)
Structure description:

Slave Instrument	Function Code	Data	CRC	
Address	1 byte	0...252 byte	2 byte	
			CRC Low byte	CRCHigh byte

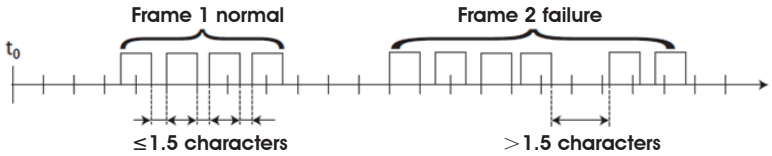
Figure 4: RTU information structure

The maximum frame size of MODBUS is 256 bytes
MODBUS RTU Information Frame
In RTU mode, message frames are distinguished by idle intervals of at least 3.5 character times, which are called t3.5 in subsequent sections.



Starting	Address	Function code	Data	CRC check	End
≥3.5 characters	8 bit	8 bit	Nx8 bit	16 bit	≥3.5 characters

Figure 5: RTU message frame
The entire message frame must be sent in a continuous character stream.
When the pause time interval between two characters exceeds 1.5 characters, the information frame is considered incomplete and the receiver does not receive the information frame.



MODBUS RTU CRC Check
The RTU mode contains an error-detection domain based on a cyclic redundancy check (CRC) algorithm that performs on all message contents. The CRC domain checks the contents of the entire message and performs this check regardless of whether the message has a random parity check. The CRC domain contains a 16-bit value consisting of two 8-bit bytes. CRC16 check is adopted..Low bytes precede, high bytes precede.

Implementation of MODBUS RTU in Instrument

According to the official MODBUS definition, the command starts with a 3.5 character interval triggering command, and the end of the command is also represented by a 3.5 character interval. The device address and MODBUS function code have 8 bits. The data string contains n*8 bits, and the data string contains the starting address of the register and the number of read/write registers. CRC check is 16 bits.

Value	Start	Device address	Function	Data	Summary Check		End
	No signal bytes during 3.5 characters	1-247 1	Function codes conforming to MODBUS specification	Data conforming to MODBUS specification	CRCL	CRCL	No signal bytes during 3.5 characters
Byte	3.5		1	n	1	1	3.5

Figure 7: MODBUS definition of data transmission

Instrument MODBUS RTU function code
The instrument only uses two MODBUS function codes:
0x03: Read-and-hold register
0x10: Write multiple registers

MODBUS Function Code 0x03: Read-and-hold Register
This function code is used to read the continuous block content of the holding register of the remote device. Request the PDU to specify the start register address and the number of registers. Address registers from zero. Therefore, the addressing register 1-16 is 0-15. The register data in the response information is packaged in two bytes per register. For each register, the first byte contains high bits and the second byte contains low bits.

Request

Function code	1 byte	0x03
Start Address	2 byte	0x0000….0xfffff
Read register number	2 byte	1…125

Figure 8: Read-and-hold register request frame

Response

Function code	1 byte	0x03
number of bytes	1 byte	N×2
Register values	N×2 byte	

N = Register number
Figure 9: Read-and-hold register response frame

The following illustrates the request frame and response frame with the read and hold register 108-110 as an example. (The contents of register 108 are read-only, with two byte values of 0X022B, and the contents of register 109-110 are 0X0000 and 0X0064)

Request Frame		Response Frame	
Number Systems	(Hexadecimal)	Number Systems	(Hexadecimal)
Function code	0x03	Function code	0x03
Start address (high byte)	0x00	Byte count	0x06
Start address (low byte)	0x6B	Register Value (High Bytes) (108)	0x02
Number of Read Registers (High Bytes)	0x00	Register Value (Low Bytes)(108)	0x2B
Number of Read Registers (Low Bytes)	0x03	Register Value (High Bytes) (109)	0x00
		Register Value (Low Bytes) (109)	0x00
		Register Value (High Bytes)(110)	0x00
		Register Value (Low Bytes) (110)	0x64

Figure 10: Examples of read and hold register request and response frames

MODBUS function code 0x10: write multiple registers

This function code is used to write continuous registers to remote devices (1... 123 registers) block that specifies the value of the registers written in the request data frame. Data is packaged in two bytes per register. Response frame return function code, start address and number of registers written.

Request

Function code	1 byte	0x10
Start Address	2 byte	2 byte
Number of input registers	2 byte	2 byte
number of bytes	1 byte	1 byte
Register values	N×2 byte	N×2 byte

N = Register number

Figure11:Write multiple register request frames

Response

Function code	1 byte	0x10
Start Address	2 byte	0x0000….0xffff
Register number	2 byte	1…123(0x7B)

N = Register number

Figure 12: write multiple register response frames

The request frame and response frame are illustrated below in two registers that write the values 0x000A and 0x0102 to the start address of 2.

Request Frame	(Hexadecimal)	Response Frame	(Hexadecimal)
Number Systems	0x10	Number Systems	0x10
Function code	0x00	Function code	0x00
Start address (high byte)	0x01	Start address (high byte)	0x01
Start address (low byte)	0x00	Start address (low byte)	0x00
Input register number (high bytes)	0x02	Input register number (high bytes)	0x02
Input register number (low bytes)	0x04	Input register number (low bytes)	
number of bytes	0x00		
Register value (high byte)	0x0A		
Register value (low byte)	0x01		
Register value (high byte)	0x02		
Register value (low byte)			

Figure 13: Examples of writing multiple register request and response frames

Data format in instrument

Overview

Floating Point
Definition: Floating point, conforming to IEEE 754 (single precision)

Description	Symbol	Index	Mantissa	SUM
Bit	3	30…23	22…0	22…0
Index Deviation	127			

Figure 14: floating point single-precision definition (4 bytes, 2 MODBUS registers)
Example: Compile decimal 17.625 to binary

Step 1: Converting 17.625 in decimal form to a floating-point number in binary form, first finding the binary representation of the integer part
17decimal= 16 + 1 = $1\times2^4 + 0\times2^3 + 0\times2^2 + 0\times2^1 + 1\times2^0$
The binary representation of integer part 17 is 10001B
then the binary representation of decimal part is obtained
0.625= 0.5 + 0.125 = $1\times2^{-1} + 0\times2^{-2} + 1\times2^{-3}$
The binary representation of decimal part 0.625 is 0.101B.
So the binary floating point number of 17.625 in decimal form is 10001.101B

Step 2: Shift to find the exponent.
Move 10001.101B to the left until there is only one decimal point, resulting in 1.0001101B, and 10001.101B = 1.0001101 B× 24 . So the exponential part is 4, plus 127, it becomes 131, and its binary representation is 10000011B.

Step 3: Calculate the tail number
After removing 1 before the decimal point of 1.0001101B, the final number is 0001101B (because before the decimal point must be 1, so IEEE stipulates that only the decimal point behind can be recorded). For the important explanation of 23-bit mantissa, the first (i.e. hidden bit) is not compiled. Hidden bits are bits on the left side of the separator, which are usually set to 1 and suppressed.

Step 4: Symbol bit definition
The sign bit of positive number is 0, and the sign bit of negative number is 1, so the sign bit of 17.625 is 0.

Step 5: Convert to floating point number
1 bit symbol + 8 bit index + 23-bit mantissa
0 10000011 00011010000000000000000B (the hexadecimal system is shown as
0 x418d0000)

Reference code:
1. If the compiler used by the user has a library function that implements this function, the library function can be called directly, for example, using
C language, then you can directly call the C library function memcpy to obtain an integer representation of the floating-point storage format in memory.
For example: float floatdata; // converted floating point number
void* outdata; memcpy(outdata,&floatdata,4);
Suppose floatdata = 17.625
If it is a small-end storage mode, after executing the above statement,
the data stored in the address unit outdata is 0x00.
Outdata + 1 stores data as 0x00
address unit (outdata + 2) stores data as 0x8D
address unit (outdata + 3) stores data as 0x41

If it is large-end storage mode, after executing the above statement,
the data stored in outdata of address unit is 0x41
Outdata + 1 stores data as 0x8D
address unit (outdata + 2) stores data as 0x00
address unit (outdata + 3) stores data as 0x00

2. If the compiler used by the user does not implement the library function of this function, the following functions can be used to achieve this function:

```
void memcpy(void *dest,void *src,int n)
{
char *pd = (char *)dest; char *ps = (char *)src;
for(int i=0;i<n;i++) *pd++ = *ps++;
}
```

And then make a call to the above memcpy(outdata,&floatdata,4);

Example: Compile binary floating-point number 0100 0010 0111 1011 0110 0110 0110 10B to decimal number

Step 1: Divide the binary floating-point number 0100 0010 0111 1011 0110 0110 0110B into symbol bit, exponential bit and mantissa bit.

0 10000100 11110110110011001100110B

1-bit sign + 8-bit index + 23-bit tail sign bit S: 0 denotes positive number

Index position E: $10000100B = 1\times2^7+0\times2^6+0\times2^5+0\times2^4 + 0 \times 2^3+1\times2^2+0\times2^1+0\times2^0$

$=128+0+0+0+0+4+0+0=132$

Mantissa bits M: 11110110110011001100110B =8087142

Step 2: Calculate the decimal number

$D = (-1)^S\times(1.0 + M/2^{23})\times2^{E-127}$

$= (-1)^0\times(1.0 + 8087142/2^{23})\times2^{132-127}$

$= 1\times1.964062452316284\times32$

$= 62.85$

Reference Code:

```
float floatTOdecimal(long int byte0, long int byte1, long int byte2, long int byte3)
{ long int realbyte0,realbyte1,realbyte2,realbyte3; char S;
long int    E,M;

float D;
realbyte0 = byte3; realbyte1 = byte2; realbyte2 = byte1; realbyte3 = byte0;

if((realbyte0&0x80)==0)
{ S = 0;//positive number }
else { S = 1;//negative number }
E = ((realbyte0<<1)|(realbyte1&0x80)>>7)-127;
M = ((realbyte1&0x7f) << 16) | (realbyte2<< 8)| realbyte3;
D = pow(-1,S)*(1.0 + M/pow(2,23))* pow(2,E);

return D; }
```

Function description: parameters byte0, byte1, byte2, byte3 represent 4 bytes of binary floating point number (

The decimal number converted from the return value

For example, the user sends the command to get the temperature value and dissolved oxygen value to the probe. The4 bytes representing the temperature value in the received response frame are 0x00, 0x00, 0x8d and 0x41. Then the user can get the decimal number of the corresponding temperature value through the following call statement.

That is temperature = 17.625.

```
float temperature = floatTOdecimal( 0x00, 0x00, 0x8d, 0x41)
```

Read instruction mode

The communication protocol adopts MODBUS (RTU) protocol. The content and address of the communication can be changed according to the needs of customers.
The default configuration is network address 01, baud rate 9600, even check, one stop bit, users can set their own changes;

Function code 0x04: This function enables the host to obtain real-time measurements from slaves, which are specified as single-precision floating-point type (i.e. occupying two consecutive register addresses), and to mark the corresponding parameters with different register addresses.

Communication address is as follows:
0000-0001: Main Measured Value
0002-0003: Temperature value
0004-0005: Main Voltage Value
0006-0007: Temperature and Voltage Value

Communication examples:
Examples of function code 04 instructions:
Communication address = 1, pH value = 20.0, itemperature= 10.0, pH voltage= 100.0, temperature voltage = 200.0

Host Send: 01 04 00 00 08 F1 CC
Slave Response: 01 04 10 00 41 A0 00 41 20 00 42 C8 00 43 48 81 E8

Note:
[01] Represents the instrument communication address;
[04] Represents function code 04;
[10] represents 10H (16) byte data;
[00 00 00 41 A0] = 20.0; / Main Measured Value
[00 00 4120]= 10.0; // temperature value
[00 00 42 C8] = 100.0; / / Main measured voltage value
[00 00 43 48] = 200.0; / / Temperature and Voltage Value
[81 E8] represents CRC16 check code;

PH buffer Solution vs Temperature

Temp(°C)	pH4.01	pH6.86	pH9.18	pH4.00	pH7.00	pH10.01
0	4.01	6.98	9.47	4.01	7.12	10.32
5	4.01	6.95	9.38	4.00	7.09	10.25
10	4.00	6.92	9.32	4.00	7.06	10.18
15	4.00	6.90	9.27	4.00	7.04	10.12
20	4.00	6.88	9.22	4.00	7.02	10.06
25	4.01	6.86	9.18	4.00	7.00	10.01
30	4.01	6.85	9.14	4.01	6.99	9.97
35	4.02	6.84	9.10	4.02	6.98	9.93
40	4.03	6.84	9.07	4.03	6.97	9.89
45	4.04	6.83	9.04	4.04	6.97	9.86
50	4.06	6.83	9.01	4.06	6.97	9.83
55	4.08	6.83	8.99	4.07	6.97	9.81
60	4.10	6.84	8.96	4.09	6.98	9.79
70	4.12	6.85	8.92	4.12	6.99	9.76
80	4.16	6.86	8.89	4.16	7.00	9.74
90	4.20	6.88	8.85	4.20	7.02	9.73

Daily maintenance

According to the requirements of use, the installation position and working condition of the instrument are relatively complex. In order to make the instrument work normally, maintenance personnel need to carry out regular maintenance on the instrument. Please pay attention to the following matters during maintenance:

1. Please check whether the installation box of the instrument is leaking or not when it is installed outdoors;
2. Check the working environment of the instrument. If the temperature exceeds the rated range of the instrument, please take appropriate measures; otherwise, the instrument may be damaged or its service life may be reduced;
3. When cleaning the plastic shell of the instrument, please use a soft cloth and a soft cleaner to clean the shell. Be careful not to let moisture enter the inside of the instrument.
4. Check whether display data of the instrument is normal or not.
5. Check whether the wiring on the terminal of the instrument is firm. Pay attention to disconnect the AC power before removing the wiring cover.

Package Set

Product Description	Quantity
1) Water Quality Multi-parameter Online MonitorPH/ORP	1
2) Instrument Installation Accessories	1
3) Operating Manual	1
4) Qualification Certificate	1

Note: Please check the complete set of instruments before use.
The company's other series of analytical instruments, please login to our website for enquiries.

FAQ

1.LCD display is not bright

Possible causes:Instrument or LCD Screen power supply failure.
Solutions:Check whether the power supply is connected or not, and check whether the power supply wire of the sensor is connected in the wrong direction.

2.No current output

Possible causes:It could be a fault in the current module or a wiring fault.
Solutions:Please check that the current output wiring is correct. Please refer to the wiring terminal diagram in the instructions.

3.The output current of the transmitter does not match the display current.

Possible causes:Current output may not be correctly calibrated.
Solutions:Please re-calibrate the 20mA output.

4.The instrument shows"???"

Possible causes:The transmitter and sensor are not communicating properly.
Solutions:Check that the sensor signal cable is correct. Please refer to the wiring diagram in the manual.

5.Measurement shows the result as full scale SLOP.

Possible causes:May be sensor was contaminated, damaged or measured value exceeds measurement range.
Solutions:After cleaning the sensor, put it in a medium with low concentration to observe whether the meter works normally. If the meter works normally, the concentration of the measured medium may exceed the range.

6.Measurements display results fluctuate greatly.

Possible causes:Sensor wiring error or low display rate setting.
Solutions:Check wiring or increase display rate appropriately.

Warranty

We Instruments warrants this product to be free from significant deviations in material and workmanship for a period of one year from the date of purchase. If repair is necessary and has not been the result of abuse or misuse within the warranty period, please return to We Instruments and amendment will be made without any charge. We Instruments Customer Service Center will determine if product problem is due to deviations or customer abuse. Out of warranty products will be repaired on a charge basis.

Authorization must be obtained from We Instruments Customer Service Center to issue a RIR number before returning items for any reason. When applying for authorization, please nclude date requiring the reason of return. Instruments must be carefully packed to prevent damage in shipment and insured against possible damage or loss. We Instruments will not be responsible for any damage resulting from careless or insufficient packing.
Warning: Damage as a result of inadequate packaging is the User / distributor's responsibility.
Please follow the guidelines below before transporting.

Use the original packaging materialif possible, when transporting back the unit for repair. Otherwise wrap it with bubble pack and use a corrugated box for better protection. Include a brief description of any faults suspected for the convenience of Customer Service Center, if possible.If there are any questions, feel free to contact our Customer Service Center or distributors.

Notes

Distinguished users, please pay attention to the following points when using the instrument, in order to ensure the life and accuracy of the instrument.

★ Careful handling to avoid collision and falling instruments in use.
★ Avoid contact with water or other liquids during use.
★ Don't put the instrument in the sunshine for a long time. After use, it should be stored in a cool, dry and ventilated place.
★ If you don't use the instrument for a long time, you should unplug the power supply to avoid accidents.
★ This instrument is not suitable for use in harsh environment, high temperature, low temperature or strong magnetic field interference,which may lead to instrument damage.
★ If there is any problem with the instrument, please contact the dealer or the company. Do not disassemble the instrument by yourself. If disassembled, the company will no longer be responsible for the warranty.