

User's Manual of

Smart water sensor

pH/ORP digital water sensor

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Version

U-LPH8001-MYEN1

1. Safe precautions

Please follow the operating procedures and precautions of this manual when using

- Do not power on before wiring is completed to avoid danger.
- If you find that the instrument works abnormally or is damaged during use, please contact us instead of repairing it yourself.
- In order to make the measurement more accurate, the meters must be calibrated frequently with sensors.
- If your electrode has been purchased for nearly a year or there is a quality problem with the electrode, please replace it.
- Please power on the instrument to warm up for 30 minutes before calibration.
- If the product is updated, this manual may be changed, but we will not notice.

2. Applications

Aquaculture, water testing, informatization data collection, IoT water testing

3. Features

- Isolated power supply design, data stability, strong anti-interference ability
- pH supports automatic/manual temperature compensation, (Automatically detect whether the temperature probe is disconnected or faulty, then switch to manual temperature compensation) The default is 25.0℃

- Support USA/NIST/custom pH calibration solution, and user-defined ORP standard solution
- Communication: RS485 interface*1 (Modbus RTU protocol)

4. Protocol function

- Protocol instructions support pH, ORP user-defined calibration solution
- Protocol commands can support ID modification (1-255)
- Protocol instructions support factory reset
- Other functions to be inquired

5. Product Introduction

The pH digital sensor designed by our company for the aquaculture industry, with a digital interface (RS485*1), can be used to measure changes in the pH/ORP value of the aqueous system within the range

It has a standard RS485 Modbus RTU protocol interface function, which can communicate with the host computer remotely

6. Parameters

Measurement	pH or ORP
Measurement range	0.00-14.00pH, ±1000.0mV
Resolution	0.01pH,0.1mV
Temperature range	0- 60℃ @0.1℃
Transducer tyoe	pH electrode or ORP electrode
Accuracy	0.02pH 0.5℃

	0.2mV
Output type	RS485 interface*1
Communication protocol	Standard MODBUS-RTU protocol RS485
ID	9600, 8, 1, N (default) 1-255
	Default ID: 01 (0x01)
Setting method	RS485 remote setting calibration and parameters
Power supply	12VDC
Power consumption	30mA @12VDC

Ordering information **[Please specify pH or ORP before ordering]**

Standard: pH/ORP digital sensor*1

Customized cable length: dedicated for cleaning the floating body (40cm), electrode cable length 5m

7. Intelligent module communication protocol

● Introduction

Communication interface RS485

Port setting 9600,N,8,1 (default)

Device address 0x01 (default)

Protocol Modbus RTU

Command support 0x03 read register

0x06 write register | 0x10 write register

continuously

● Information frame format

0x03 Read data [HEX]		
01	03	xx xx
Address	Function code	Date address
	xx xx	xx xx
	Data length	Check code

0x06 Write data [HEX]		
01	06	xx xx
Address	Function code	Date address
	xxxx	xx xx
	Write data	Check date

0x10 Write data continuously [HEX]		
01	10	xx xx
Address	Function code	Data address
	xx xx	xx
	number of registers	Number of bytes
	xxxx	xxxx
	Write data	Check code

8. Register data format

Address	Data name	Transform coefficient	Status
0	temperature	[0.1℃]	R
1	pH	[0.01pH]	R
2	pH.mV	[0.1mV]	R
3	pH. Zero point	[0.1mV]	R
4	pH. Slope	[0.1%S]	R
5	pH. Calibration points	-	R
6	system status .01	format 4*bits 0xFFFF	R
7	system status 02 User command address	format 4* bits 0xFFFF	R/W
8	User command. Result	-	R
9	ORP	[0.1mV]	R
11	ORP. drift	[0.1mV]	R

● Remarks

Each address data is a 16-bit signed integer with a length of 2 bytes

Actual result = register data * Transform coefficient

Status: R = read only R/W = read/write

9. Parameter settings

Address	Data name	Setting range
11	RS485.address	1-255 (Default: 0x01)
12	RS485. Baud rate	4800, 9600 (Default) , 14400 ,19200
13	RS485. Communication format	0 = N81(Default) 1 = N82 2 = E81, 3 = O81
14	ORP. Customized	± 10000 ± 0.1mV
15	pH. Customized	0 - 1400 ± 0.01pH
16	pH. Calibration type	0 = USA (Default) 1 = NIST 2 = USA Custom, 3 = NIST.Custom
17	Temperature. Drift	± 50 @ 0.1℃
18	Temperature.MT C	-200 ~ + 600 @ 0.1℃
19	Temperature. Type	Manual= 0 NTC=1(Default)
20	Temperature Unit	Unit.C = 0 (Default) Unit.F = 1 Address 0 numerical display different types of temperature

10. Common instruction set [HEX]

- **Read temperature, pH, pH.mV**
[Send Tx]: 01 03 00 00 00 03 05 CB
[Receive Rx]: 01 03 06 00 FA 02 BC 00 06 B9 3F
Temperature = 00FA = $250 \times 0.1^{\circ}\text{C} = 25.0^{\circ}\text{C}$
pH = 02BC = $700 \times 0.01\text{pH} = 7.00\text{pH}$
pH.mV = 0006 = $6 \times 0.1\text{mV} = 0.6\text{mV}$
 - **Set RS485 address**
The original address is: 0x01
needs to be modified to: 0x02
[Send Tx]: 01 06 00 0B 00 02 79 C9
[Receive Rx]: 01 06 00 0B 00 02 79 C9 (Set successfully)
 - **Query the RS485 address (stand-alone mode)**
The device address is unknown, you can use the address 0x00 to send the 03 command
[Send Tx]: 00 03 00 00 00 03 04 1A
[Receive Rx]: 01 03 06 00 FA 02 BC 00 06 B9 3F
Current device address = 0x01
 - **Electrode calibration**
Please use the user command set to write a command to address 0x07 to complete the operation
pH7.00 | [Send Tx]: 01 06 00 07 00 0D F9 CE
pH4.00 | [Send Tx]: 01 06 00 07 00 0B 79 CC
pH10.00 | [Send Tx]: 01 06 00 07 00 0F 78 0F
[Receive Rx] returns the same command as [Send Tx], which means the calibration is successful.
- ✧ When calibrating, please put the electrode into the standard liquid, wait for the signal to stabilize before performing the calibration operation

11. Restore factory default settings

Please use the user command set to write the command to address 0x07 to complete the operation restore the factory default | TX: 01 06 00 07 00 D2 B8 56

[Receive Rx] returns the same command as [Send Tx], which means the recovery is successful.

Execute user commands

Users can write commands to address 0x07 to perform corresponding device operations.

Serial number	User command	Decimal	Hexadecimal
01	Calibration PH4.00	11	0x000B
02	Calibration PH6.86	12	0x000C
03	Calibration PH7.00	13	0x000D
04	Calibration PH9.18	14	0x000E
05	Calibration PH10.01	15	0x000F
06	Calibration pH.Custom	16	0x0010
07	Calibration ORP.Custom	21	0x0015
08	Restore factory default	210	0x00D2
09	Select baud rate 4800	4800	0x12C0
10	Select baud rate 9600	9600	0x2580
11	Select baud rate 14400	14400	0x3840
12	Select baud rate 19200	19200	0x4B00

Note: According to the 16 address pH. Calibration type, choose to support different standard solution types

USA standard solution: pH 4/7 / 10.01 NIST standard solution: pH 4.00 / 6.86 / 9.18

USA. Custom: pH 7 / pH. Custom NIST. Custom: 6.86 / pH. Custom

12. User command error code returned

For example:

	Addresses	Return code	Error code	Check code
Error return	01	86	02	C3 A1

Error code	Description
0x01	Invalid command or current command is not available
0x02	The content of this address cannot be written into data, such as executing commands, It means that the current sensor status cannot perform this operation.
0x03	The current input data is invalid and exceeds the input range

● Other instructions

Command 0x03 Error return command: 0x83

Command 0x06 Error return command: 0x86

Command 0x10 Error return command: 0x90

- **Device status code**

System status.01 Address: 0x06, content format:
4*4bit, 0xFFFF

[HEX]	Err.04	ERR.03	ERR.02	ERR.01
Serial number	3	2	1	0
Description	System Reservation	DO Calibration	DO	Temperature

System status.02 Address: 0x07, content format:
4*4bit, 0xFFFF

Description	System reservation	ORP Calibration	ORP	Operating mode
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13. pH/ORP digital electrode preservation and maintenance

- **Electrode preservation:**

When the electrode is not in use for a short time, please use the rubber sleeve protective cover + wet sponge to ensure that the electrode is in a wet state. The protective cover and sponge are used to protect the electrode, please do not discard.

- **Parts replacement cycle**

Electrode: The electrode is recommended to be replaced in 12 months

Electrode slope: <70% Slope is recommended to be replaced

- **Maintenance - cleaning the old sensor**

Observe the glass measuring part of the electrode head. If the glass contact surface is covered, use a moistened cotton swab to gently

wipe the surface until it is clean.

- **Maintenance - pH before use**

Observe whether there is liquid in the bulb of the pH electrode sensitive membrane. If it is not filled with liquid or there are bubbles, shake the electrode gently to fill the bulb with liquid without bubbles.

- **Maintenance - pH repair - unable to calibrate / after a long time dry**

If the sensor is left dry for a long time or its performance is reduced, you can try to soak it in pH4.00 buffer for a few minutes, and then soak it in pH 7.00 buffer for a few minutes before attempting calibration

- **Maintenance - pH calibration**

Please pay attention to the buffer used during calibration. Place the electrode in the buffer for 1 minute before subsequent operations. After rinsing the electrode, only use a soft tissue to absorb the water.

► Do not rub the pH sensitive membrane

14. Digital pH/ORP sensor wiring definition instructions

Please check the color and wiring definition carefully before wiring. If wiring is wrong, the sensor may be damaged.

Sensor power supply 12VDC

Working current 25mA

communication interface RS485

communication format N 8 1

baud rate 9600

communication protocol Modbus-RTU

- **Wiring definition**

Color	Red	Black	Green	White
description	12V+	GND	485A	485B