



Digital pH & ORP Transmitter

User's Manual

Basic Safety Guide

Personnel requirements

- Only trained professional and technical personnel are allowed to install, debug, operate and maintain the measurement system.
- Technicians performing specific operations must be authorized by the factory.
- Only electricians are allowed to make electrical connections to the equipment.
- Technicians must read the "Operation Manual", understand and comply with its regulations.
- Only authorized personnel with professional training are allowed to troubleshoot measuring points.

NOTE: Repair operations not described in the Operating Manual are only allowed to be performed directly by the manufacturer or its service organization.

Workplace Safety

Users are responsible for and must comply with the requirements of the following safety standards:

- Installation guide
- Local standards and regulations
- Explosion protection regulations

Product Safety

The product is designed to meet the strictest safety requirements and has passed factory testing to work safely. Relevant regulations and international standard requirements must be followed.

- Please read this manual carefully before using this instrument.
- In order to make the measurement more accurate, the instrument must calibrate the sensor frequently. One year after leaving the factory, its performance will be affected whether it is used or not, and it should be replaced in time.
- The pH sensor used for the first time or the pH sensor stopped for a long time must be soaked in 3mol / L potassium chloride solution for 24h before use.
- If the instrument works abnormally or is damaged during use, please contact the dealer and do not repair it by yourself.
- The instrument has only one sensor input. When pH mode is selected, pH sensor shall be installed, and ORP sensor shall be installed when ORP mode is selected.
- Please power on the instrument and preheat it for about 20 minutes before performing the calibration work.

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1. FEATURES

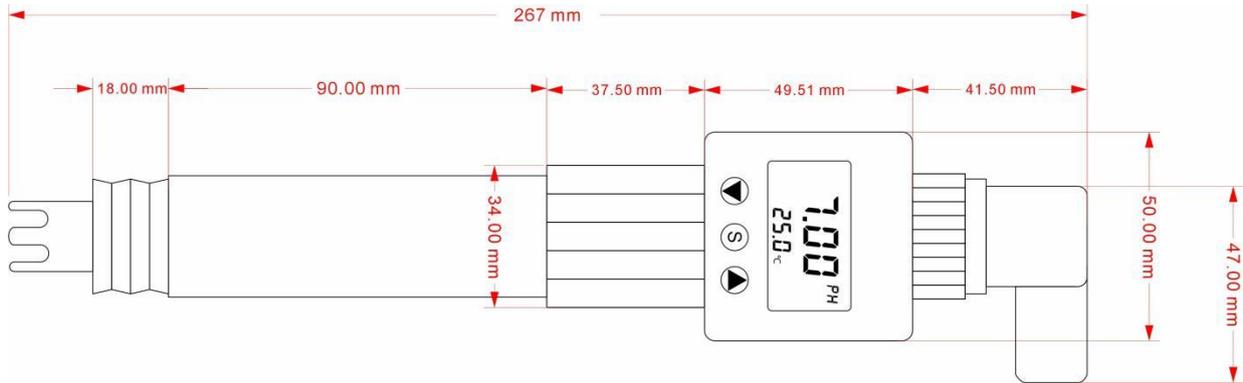
OLED pH/ORP transmitter DX-PH36RS/I and DX-ORP36RS/I are used for environmental water quality monitoring, acid / alkali / salt solution, chemical reaction process and industrial production process, and can meet the requirements of most industrial applications for online pH/ORP measurement.

- Signal output: 4~20mA current output or RS-485 (Modbus-RTU protocol)
- It is convenient to connect to third-party equipment such as PLC, DCS, industrial control computer, general controller, paperless recording instrument or touch screen.
- Dual high impedance differential amplifier, strong anti-interference and fast response.
- Professional pH/ORP electrode, the internal reference liquid seeps out from the microporous salt bridge extremely slowly under a pressure of at least 100KPa (1Bar). Such reference systems are very stable.
- Easy to install: 3/4" NPT pipe thread for sink installation or installation in pipes and tanks.
- Display IP65 protection level, sensor IP68 protection level.

2. MAIN TECHNICAL INDICATORS

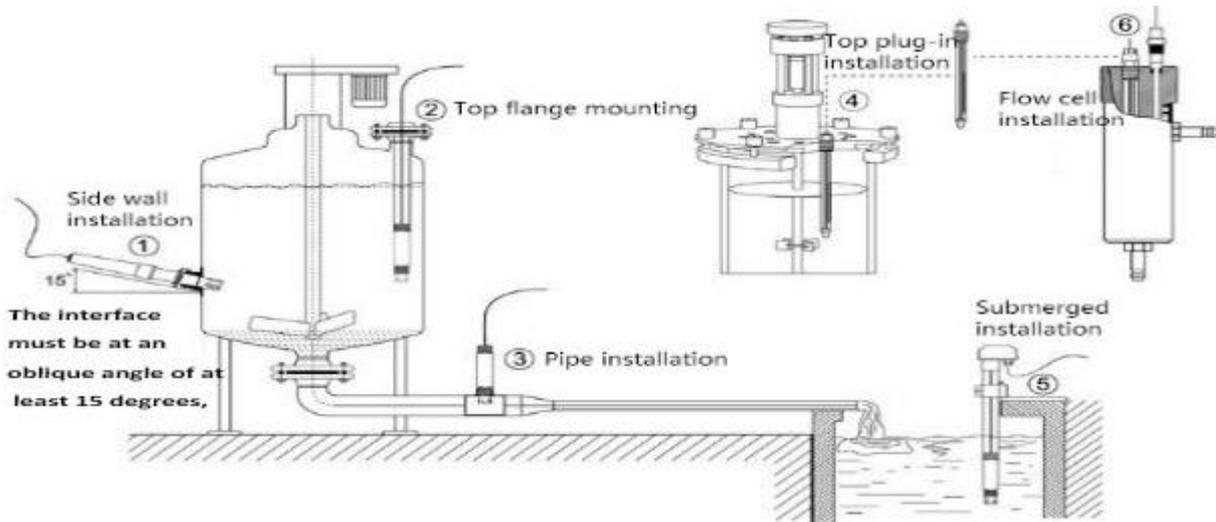
Model	DX-PH36I/RS	DX-ORP36I/RS
Measure Range	0.00~14.00pH	-1999~1999mV
Resolution	0.01pH	1mV
Accuracy	±0.1pH	±1mV
Working Temp	0~65℃	
Working Pressure	<0.2MPa	
Temp compensation	Automatic Temperature Compensation (PT1000)	No
Power supply	12~24VDC	
Signal output	4~20mA output or RS-485(Modbus/RTU)	
Liquid junction material	PPS	PC
Installation Mode	Immersion mounting, 3/4" pipe thread	
Cable length	5 meters, other lengths can be customized.	
Calibration Mode	Two point calibration	Offset calibration
Power Consumption	<0.5W	
Protect grade	IP68	

3. DIMENSION



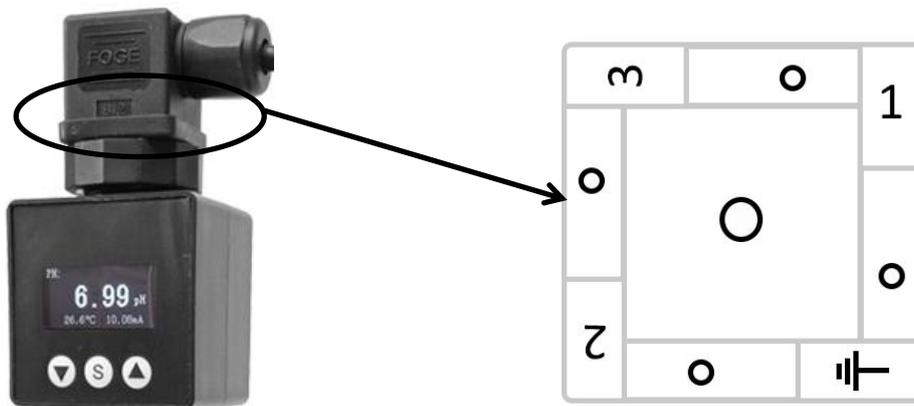
4. INSTALLATION AND CONNECTIONS

4.1 Installation



Note: the sensor shall not be installed upside down or horizontally, and shall be installed at an angle of at least 15 degrees.

4.2 Connection



Wire \ Output signal	Red/1	Black/GND	Yellow/2	Green/3	White/2
4-20mA	12-24V	GND	\	\	Signal
RS485	12-24V	GND	A	B	\

Note: Carefully check the wiring sequence before power on to avoid unnecessary loss due to wrong wiring.

Wiring instructions: considering that the cable is immersed in water (including seawater) or exposed to air for a long time, all wiring places are required to be waterproof, and the user's cable shall have anti-corrosion ability.

4.3 Sensor Replacement

Attention, it is necessary to turn off the power before operating

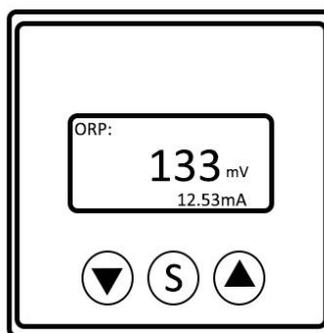
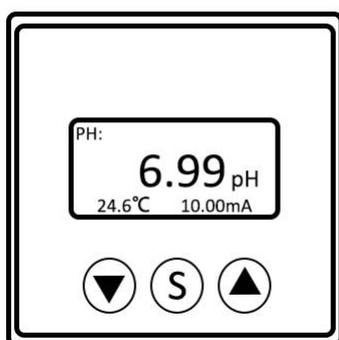
Step 1: Gently unscrew the previously connected sensor in a clockwise direction from the meter .

Step 2: Finally, connect the replacement sensor to the meter , and carefully tighten the sensor in a counterclockwise direction.



5. CORRECT SETTING

5.1 Introduction Of Screen Soft Keyboard Functions

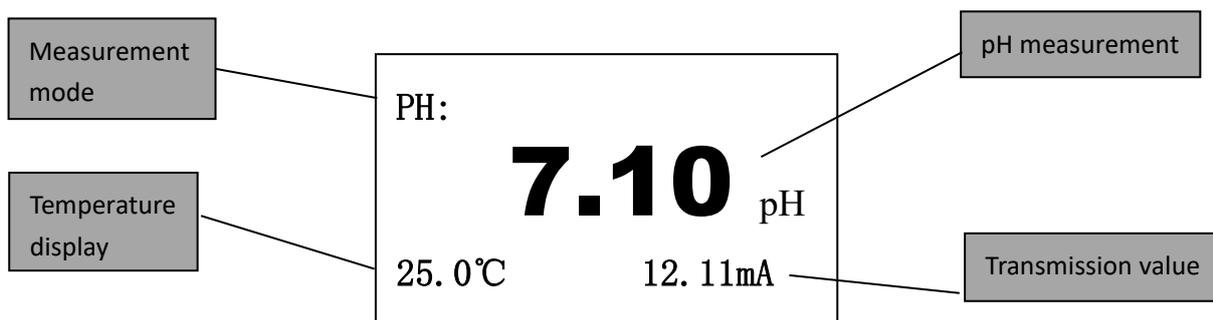


Soft Key	Function	Description
▼	Down	Select down or decrease parameter value
▲	UP	Select up or increase parameter value
Ⓢ	OK	Long press to confirm, short press to return to the previous layer

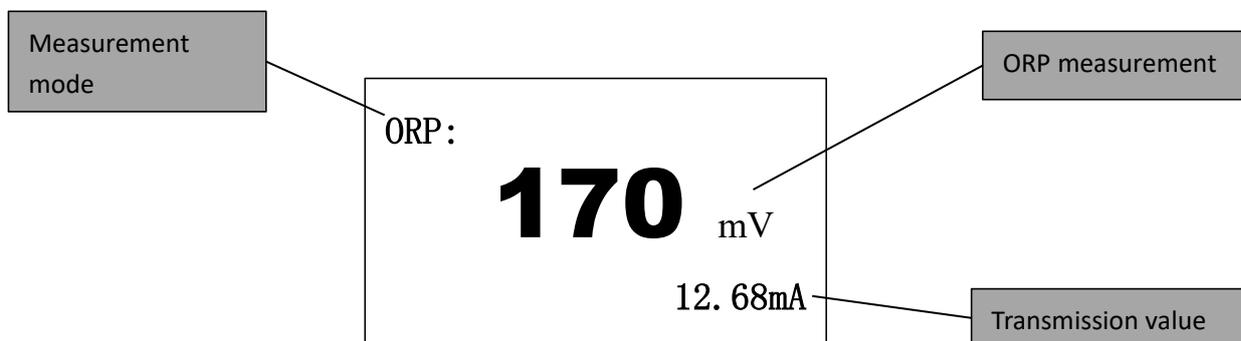
On the main interface, long press the "Ⓢ" key to enter the setting menu

5.2 Main Interface Display

① pH sensor



② Orp sensor



5.3 Introduction Of Setting Menu

S/N	Menu name	Introduction of menu contents
1	Measurement	Measurement-related parameters such as measurement mode, temperature compensation mode, pH offset, temperature offset, and temperature unit can be set;
2	Current Loop	Set pH or temperature transmission parameters, or ORP transmission parameters;
3	Communication	Set Address, Baud, Frame;
4	Calibration	Calibration of pH or ORP sensors;
5	Calibration reset	Restore the calibration parameters of the meter to the state of calibration parameters before leaving the factory;

6	Settings reset	Restore the setting parameters of the instrument to the parameter state before leaving the factory;
7	Language 语言	Can be selected in English or Chinese.

5.4 Measurement

① pH sensor

Measurement
1. Measurement Mode
2. Temperature Mode
3. Ph Offset
4. Temperature Offset
5. Temperature Units
6. Data Filter

② Orp sensor

Measurement
1.Measurement Mode
2.Data Filter

Press "▼" or "▲" to select a menu item, and long press "S" to enter.

5.4.1 Measurement Mode

Measurement mode
1. pH
2. Ph-Sb
3. ORP

Press "▼" or "▲" to select Measurement mode, and long press "S" to enter.

5.4.2 Temperature Mode

Temperature mode
1. ATC
2. MTC

Press "▼" or "▲" to select Temperature mode, and long press "S" to enter.

If you choose manual mode, you will enter the manual temperature adjustment page:

MTC
25.0°C

Press "▼" or "▲" to input manual compensation temperature value, long press "S" to confirm and return to temperature mode menu automatically.

5.4.3 pH Offset

pH offset
0.00 pH

Press "▼" or "▲" to input the pH offset value, long press "S" to confirm and automatically return to the measurement parameter menu.

5.4.4 Temperature Offset

Temperature Offset
0.0 °C

Press "▼" or "▲" to input the temperature offset value, long press "S" to confirm and automatically return to the measurement parameter menu.

5.4.5 Temperature Unit

Temperature Unit
1. °C 2. °F

Press "▼" or "▲" to select the temperature unit, long press "S" to confirm.

5.4.6 Data Filter

Data Filter
Level 0

Press "▼" or "▲" to select the filter level, press and hold "S" to confirm and automatically return to the measurement parameter menu.

5.5 Current Loop

5.5.1 pH sensor

Sign Source
1.pH Output 2.Temperature Output

Press "▼" or "▲" to select 4~20mA signal source, and press and hold "S" to enter.

① pH Output

4mA Value
0.00 pH

Press "▼" or "▲" to input the pH value corresponding to 4mA, long press "S" to confirm and automatically enter the corresponding value setting page of 20mA.

20mA Value
14.00 pH

Press "▼" or "▲" to input the pH value corresponding to 20mA, long press "S" to confirm and automatically return to the signal source menu.

② Temperature Output

4mA Value
0.0°C

Press "▼" or "▲" to input the temperature value corresponding to 4mA, long press "S" to confirm and automatically enter the corresponding value setting page of 20mA.

20mA value
70.0°C

Press "▼" or "▲" to input the temperature value corresponding to 20mA, long press "S" to confirm and automatically return to the signal source menu.

5.5.2 ORP sensor

4mA Value
-1999mV

Press "▼" or "▲" to input the ORP value corresponding to 4mA, long press "S" to confirm and automatically enter the corresponding value setting page of 20mA.

20mA value
1999mV

Press "▼" or "▲" to input the ORP value corresponding to 20mA, long press "S" to confirm and return to the setting menu automatically.

5.6 Communication

Communication
1. Address
2. Baud
3. Frame

Press "▼" or "▲" to select a menu item, and long press "S" to enter.

Note: The default device address is 1, the baud rate is 9600, and the frame format is RTU.

5.7 Calibration

Note: the sensor has been calibrated before leaving the factory. If it does not exceed the measurement error, it should not be calibrated at will.

5.7.1 Ph sensor

1) Configure standard solution

Use a graduated cylinder to measure 250mL of distilled water, pour it into a beaker, add a buffer corresponding to the pH, and stir evenly with a glass rod until the powder is completely dissolved.

2) Select the calibration mode

The pH sensor supports two calibration modes, TECH and NIST. Their operation steps are the same, but the standard solutions used are different. Users can choose according to the standard solutions they have. The following uses TECH mode as an example.

Calibration Mode
1. TECH
2. NIST

Press "▼" or "▲" to select TECH mode, long press "S" to enter TECH standard solution menu.

Standard pH
1. 4.00-7.00pH
2. 7.00-10.00pH

3) Start calibration

According to the standard solution you have, press "▼" or "▲" to select the corresponding option, taking 4.00-7.00pH as an example, long press "S" to enter the 7.00pH calibration page.

7.00pH
16.05mV

Put the sensor into the 7.00pH standard solution, wait for the data to stabilize, and press and hold "S" to calibrate. After the calibration is successful, it will automatically enter the 4.00pH calibration page.

4.00pH
0.08mV

Put the sensor into the 4.00pH standard solution, wait for the data to stabilize, and press and hold "S" to calibrate. After the calibration is successful, it will automatically return to the standard solution menu.

4) Calibration failed

If the calibration fails, you can find the reason for the failure according to the error message.

error message	Error reason		possible causes and solutions
error 1	7.00pH	Zero point voltage exceeds $\pm 100\text{mV}$	1. The wrong standard solution is used, please check whether the standard solution used is correct. 2. The standard solution is contaminated, please replace it with a new standard solution. 3. The sensor is damaged, please replace it with a new one.
	4.00pH/10.00pH	The slope exceeds 65% to 135%	
error 2	Data fluctuates too large		1、 Please wait for the data to stabilize before performing calibration.

5.7.2 ORP sensor

Calibration
12mV 0mV

Put the sensor into the solution with known ORP value, adjust the coefficient by pressing the "▲" and "▼" keys to make the ORP measurement value equal to the known value, long press "S" to confirm and automatically return to the setting menu.

5.8 Calibration Reset

Restoring the factory calibration will delete the data calibrated by the user through "6. Electrode Calibration".

Calibration reset
Calibration Reset ?

Long press "S" to confirm and return to the setting menu automatically.

5.9 Settings Reset

Restoring settings to factory settings will delete some user settings data.

Settings reset
Settings Reset ?

Long press "S" to confirm and return to the setting menu automatically.

Factory parameter default value:

Menu Name	Set Range	Factory Default
Temperature compensation	ATC / MTC	MTC
Manual temperature compensation value	-20 ~ 120 °C	25 °C
4 mA value	pH: 0.00 ~ 13.00 pH	pH: 0.00 pH
	Temp: -20.0 ~ 110.0°C	Temp: 0°C
	ORP: -1999 ~ 1899 mV	ORP: -1999 mV
20 mA value (Greater than 4mA value)	pH: 1.00 ~ 14.00 pH	pH: 14.00 pH
	Temp:-10.0 ~ 120.0°C	Temp: 70°C
	ORP: -1899 ~ +1999 mV	ORP: +1999 mV
Data filtering	Leve0-9	Leve0

5.10 Language 语言

Language 语言
1.中文 2.English

Press "▼" or "▲" to select language, long press "S" to confirm.

6. USE AND MAINTENANCE

When measuring the pH sensor, it shall be cleaned in distilled water (or deionized water) first, and the water shall be sucked dry with filter paper to prevent impurities from entering the measured liquid. 1 / 3 of the sensor shall be inserted into the measured solution.

When the sensor is not in use, it shall be cleaned and put into the protective sleeve containing 3.5mol/l potassium chloride solution, or put the sensor into the container containing 3.5mol/l potassium chloride solution.

Check whether the wiring terminal is dry. If there is any contamination, please wipe it with anhydrous alcohol and use it after drying. Avoid long-term immersion in distilled water or protein solution, and prevent contact with silicone grease.

If the sensor is used for a long time, its glass film may become translucent or attached with sediment. At this time, it can be washed with dilute hydrochloric acid and washed with water. The sensor has been used for a long time. In case of measurement error, it must be calibrated and corrected with the instrument.

When the sensor cannot be calibrated and measured after maintenance and repair in the above way, it indicates that the sensor has failed. Please replace the sensor.

Reference table for pH value of standard buffer

Temp(°C)	4.00	4.01	6.86	7.00	9.18	10.01
0	4.00	4.00	6.98	7.12	9.46	10.32
5	4.00	4.00	6.95	7.09	9.39	10.25
10	4.00	4.00	6.92	7.06	9.33	10.18
15	4.00	4.00	6.90	7.04	9.28	10.12
20	4.00	4.00	6.88	7.02	9.23	10.06
25	4.00	4.01	6.86	7.00	9.18	10.01
30	4.01	4.02	6.85	6.99	9.14	9.97
35	4.02	4.02	6.84	6.98	9.17	9.93
40	4.03	4.04	6.84	6.97	9.07	9.89
45	4.04	4.05	6.83	6.97	9.04	9.86
50	4.06	4.06	6.83	6.97	9.02	9.83

There is sometimes ± 1 word error between the actual reading value of the instrument and the standard.

7. 4-20mA CURRENT OUTPUT CALCULATION FORMULA

7.1 pH current output calculation formula

When the machine leaves the factory, the output current is defined as:

- 0 pH is the corresponding value of 4 mA; 14 pH is the corresponding value of 20 mA;
- $I = (D - 4 \text{ mA Corresponding value}) \times (16 / (20 \text{ mA Corresponding value} - 4 \text{ mA Corresponding value})) + 4.00;$

- $I = (D - 0) \times (16 / 14) + 4.00;$

Note: I is the output current value, $4 \text{ mA} \leq I \leq 20 \text{ mA};$

D is the pH value displayed by the instrument, $0.00\text{pH} \leq D \leq 14.00\text{pH};$

7.2 ORP current output calculation formula

When the machine leaves the factory, the output current is defined as:

- -2000mV is the corresponding value of 4 mA; +2000mV is the corresponding value of 20 mA;
- $I = (D - 4 \text{ mA Corresponding value}) \times (16 / (20 \text{ mA Corresponding value} - 4 \text{ mA Corresponding value})) + 4.00;$
- $I = (D - (-2000)) \times (16 / (+2000 - (-2000))) + 4.00 ;$
- $I = (D + 2000) \times (16 / 4000) + 4.00 ;$

Note: I is the output current value, $4 \text{ mA} \leq I \leq 20 \text{ mA};$

D is the ORP value displayed by the device, $- 2000\text{mV} \leq D \leq + 2000\text{mV}.$

8. TROUBLESHOOTING

Q: Controller no display?

A: The power supply is not connected or the fuse is blown. Check the power supply line and fuse.

Q: Display numbers, but jump up and down?

A: Sensor wire contaminated with moisture or liquid junction. Check the sensor wire and clean the liquid junction (0.1 m HCl).

Q: Standard solution pH 4.01 and pH 7.00 can't be adjusted?

A: The outside of the sensor is polluted, the sensor wire is wet, the sensor is damaged or cracked, and the sensor liquid junction is blocked. Clean the sensor (0.1 m HCl), check the sensor wire, replace the sensor, and clean the liquid junction (0.1 m HCl).

Q: Slow digital response?

A: The sensor film or liquid junction is contaminated. Clean the sensor.

Q: When the actual pH value has changed greatly, but the value displayed on control changed very little?

A: The liquid junction of the sensor is blocked, the sensor is aging and the reaction is slow. Clean the sensor (0.1 m HCl) with regeneration solution.

Q: The display value of the controller does not change?

A: The sensor is broken and the sensor cable is short circuited. Replace the sensor and check the cable.

Q: The controller reading signal interferes with the reading and the reading is unstable?

A:1) The solution is grounded; 2) The equipment is not grounded; 3) The liquid flow rate is unstable;
4) There is signal interference from surrounding equipment.

Annex Data communication

Note: This section is only applicable to electrodes that support RS485 communication.

Serial port debugging tool settings:



The **MODBUS** protocol is used for communication between the device and the host computer. The frame format adopts **RTU** mode, the baud rate is **9600bps**, the data bit is **8bit**, **no** parity bit, and **1** stop bit. **The time interval for reading data should not be less than 500 milliseconds**. The specific agreement is as follows:

Part 1. Command Format

1. Read Data:

a) Read data instruction frame

01	03	XX XX	XX XX	XX XX
address	function code	register address	number of registers	CRC check code (low byte first)

b) Read data response frame

01	03	XX	XX...XX	XX XX
address	function code	byte count	response data	CRC check code (low byte first)

2. Write Data:

a) write data instruction frame

01	06	XX XX	XX XX	XX XX
address	function code	register address	data input	CRC check code (low byte first)

b) Write data response frame (same write data command frame)

01	06	XX XX	XX XX	XX XX
address	function code	register address	data input	CRC check code (low byte first)

3. Command Example:

pH sensor

a) read data command

Function: Obtain the measurement data of the sensor, where the unit of pH is pH, and the unit of temperature is °C. Examples are as follows:

request frame: 01 03 00 00 00 04 44 09

response frame: 01 03 08 02 BC 00 02 00 FA 00 01 F1 F4

data interpretation:

- 01 - address
- 03 - function code
- 08 - byte count

02 BC 00 02 - 02 BC is the hexadecimal pH value, converted to decimal is 700, 00 02 is the decimal place of the hexadecimal pH value, converted to decimal is 2, indicating that there are 2 decimal places, that is, the read pH value 7.00pH

00 FA 00 01 - pH temperature sensor value. 00 FA is the temperature value in hexadecimal system, converted to decimal is 250, 00 01 is the number of decimal places in the temperature value in hexadecimal, converted to decimal is 1, indicating that there is 1 decimal place, that is, the read temperature value The negative temperature is 25.0° C, and the negative temperature is output in the form of 16-bit two's complement, such as FF38 means -200; in short, when programming, you only need to regard the received 16-bit binary number as a **signed number (signed)** to participate in the operation

F1 F4 - CRC check (low byte first)

b) pH Zero Point Calibration Instructions

Function: Set the pH zero point calibration value of the sensor, and the zero point is calibrated with 7.00pH standard solution. Examples are as follows:

request frame: 01 06 10 00 00 00 8D 0A

response frame: 01 06 10 00 00 00 8D 0A

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

② It will take a certain amount of time (not more than 30s) to execute this command,

please wait until the execution is complete before performing other operations.

c) pH Slope Calibration Instructions

Function: Set the pH slope calibration value of the sensor; the slope calibration is divided into high point calibration and low point calibration, the measurement of alkaline solution is calibrated at the high point, and the measurement of acidic solution is calibrated at the low point; the high point calibration is 10.00pH standard solution As the calibration standard, the low point calibration uses the 4.01pH standard solution as the calibration standard. Examples are as follows:

Low point 4.01pH calibration:

request frame: 01 06 10 02 00 00 2C CA

response frame: 01 06 10 02 00 00 2C CA

High point 10.00pH calibration:

request frame: 01 06 10 04 00 00 CC CB

response frame: 01 06 10 04 00 00 CC CB

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

② It takes a certain amount of time (not more than 30s) to execute this command, please wait until the execution is complete before performing other operations.

d) reset sensor

Function: Delete the user's calibration data, and the sensor needs to be re-calibrated before it can be used after resetting the sensor.

request frame: 01 06 20 20 00 00 83 C0

response frame: 01 06 20 20 00 00 83 C0

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

Note that the reset sensor function is only valid for the following parameters:

① pH zero point value

② pH slope value

③ pH offset

④ pH temperature offset

e) Set sensor address

Function: Set the communication address of the sensor. Here, the sensor address 0x01 is changed to 0x0F as an example.

request frame: 01 06 20 02 00 0F 63 CE
response frame: 01 06 20 02 00 0F 63 CE

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

ORP sensor

a) Read data command

Function: Obtain the measurement data of the sensor, where the unit of ORP is mV, and the unit of temperature is °C. Note: Since the temperature has no effect on the ORP value, the read temperature value is only a reserved function and has no meaning. Examples are as follows:

request frame: 01 03 00 00 00 04 44 09
response frame: 01 03 08 03 E8 00 00 00 FA 00 01 5C 3D

data interpretation:

01 - address
03 - function code
08 - byte count

03 E8 00 00 - 03 E8 is the hexadecimal ORP value, converted to decimal is 1000, 00 00 is the decimal place of the hexadecimal ORP value, converted to decimal is 0, indicating that there are 0 decimal places, that is, the read ORP value 1000mV

00 FA 00 01 - temperature sensor value. 00 FA is the temperature value in hexadecimal system, converted to decimal is 250, 00 01 is the number of decimal places in the temperature value in hexadecimal, converted to decimal is 1, indicating that there is 1 decimal place, that is, the read temperature value The negative temperature is 25.0° C, and the negative temperature is output in the form of 16-bit two's complement, such as FF38 means -200; in short, when programming, you only need to regard the received 16-bit binary number as a **signed number (signed)** to participate in the operation

5C 3D - CRC check (low byte first)

b) ORP offset calibration

Function: Set the ORP offset value of the sensor, take the offset 250mV as an example. The example is as follows:

request frame: 01 06 10 10 00 FA 0C 8C
response frame: 01 06 10 10 00 FA 0C 8C

data interpretation:

01 - address

- 06 - function code
- 10 10 - ORP offset register address
- 00 FA - Hexadecimal value of ORP offset value 250 in mV
- 0C 8C - CRC check (low byte first)

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

c) reset sensor

Function: Delete the user's calibration data, and the sensor needs to be re-calibrated before it can be used after resetting the sensor.

request frame: 01 06 20 20 00 00 83 C0

response frame: 01 06 20 20 00 00 83 C0

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

Note that the reset sensor function is only valid for the following parameters:

- ① ORP offset

d) Set sensor address

Function: Set the communication address of the sensor. Here, the sensor address 0x01 is changed to 0x0F as an example.

request frame: 01 06 20 02 00 0F 63 CE

response frame: 01 06 20 02 00 0F 63 CE

Notice:

① If the response frame is consistent with the request frame, the operation is successful. If the inconsistency indicates that the operation failed, please refer to the "Error Response" section for detailed return data.

Part 2. Error Response

If the sensor cannot execute the upper computer command correctly, it will return the following format:

definition	address	function code	error code	CRC check code
data	ADDR	80H+FUN	CODE	CRC16
byte count	1	1	1	2

▲ ADDR: address

- ▲ FUN: function code
- ▲ CODE: error code
 - 01 – Function code error
 - 02 – wrong register address
 - 03 – data error
- ▲ CRC16: CRC check code

If the error code 0x03 is returned when executing the "Zero Calibration" or "Slope Calibration" command, the possible reasons are as follows:

- ① Data fluctuates too large
- ② Zero point deviation is too large (when "zero point calibration")
- ③ Slope deviation is too large (when "slope calibration")

At this point, you should check that the calibration conditions meet the requirements and repeat the calibration operation.

Part 3. Function Menu

pH sensor:

register address	name	illustrate	number of registers	interview method
0x0000	pH value pH temperature	4 double-byte integers, respectively: pH value pH Decimal Places pH temperature value Decimal places for pH temperature value	4 (8 byte)	read
0x1000	PH zero point calibration	Calibrated in a solution of 7.00pH, write data as 0.	1 (2 byte)	write
0x1002	pH slope calibration (low 4.01pH)	Calibrate in a solution of 4.01pH, write data as 0.	1 (2 byte)	write
0x1004	pH slope calibration(high point 10.00pH)	Calibrate in a solution with a pH of 10.00, write data as 0.	1 (2 byte)	write
0x1010	pH offset	Write or read the pH offset value (pH × 100) register. Data range -1000~1000.	1 (2 byte)	read/write
0x1012	PH temperature offset value	Write or read PH temperature offset value (° C × 10) register. Data range -1000~1000.	1 (2 byte)	read/write
0x2002	sensor address	The default is 1, the write data range is 1-127, the read data is the current sensor	1 (2 byte)	read/write

		address, and the broadcast address is 0xFF.		
0x2020	reset sensor	The calibration value is restored to the default value, and the written data is 0. Note: After the sensor is reset, it needs to be calibrated again before it can be used.	1 (2 byte)	write
0x8016	pH calibration mode	Write or read pH calibration mode. 0-TECH 1-NIST Default is 0 - TECH. Before calibration, the calibration mode should be set according to the standard solution used. 4.01-7.00pH or 7.00-10.00pH select TECH mode. 4.01-6.86pH or 6.86-9.18pH select NIST mode.	1 (2 byte)	read/write

ORP sensor

register address	name	illustrate	number of registers	interview method
0x0000	ORP value temperature value	4 double-byte integers, respectively: ORP value ORP value decimal places temperature value Decimal places of temperature value	4 (8 byte)	read
0x1010	ORP offset	Write or read the ORP offset value (mV) register. Data range -1000~1000.	1 (2 byte)	read/write
0x1012	temperature offset	Write or read temperature offset value ($^{\circ}\text{C} \times 10$) register. Data range -1000~1000.	1 (2 byte)	read/write
0x2002	sensor address	The default is 1, the write data range is 1-127, the read data is the current sensor address, and the broadcast address is 0xFF.	1 (2 byte)	read/write

0x2020	reset sensor	The calibration value is restored to the default value, and the written data is 0. Note: After the sensor is reset, it needs to be calibrated again before it can be used.	1 (2 byte)	Write
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