

Smart PH Sensor

IQPH-D

Product Manual

(V1.0)



● Important statement

Thank you very much for choosing our products, we will serve you sincerely forever. Our company pursues excellent quality and pays more attention to excellent after-sales service.

Operation errors will shorten the life of the product, reduce its performance, and may cause accidents in severe cases. Please hand over this manual to the end user and read it carefully before using the product. And please keep it in a safe place for reference when needed. The company reserves the right to modify this manual due to product technology and process updates. If there is any change, no further notice will be given, and the final interpretation of this manual is reserved.

● Product description

The IQPH-D sensor can be used for environmental water quality monitoring, acid/alkali/salt solutions, chemical reaction processes, and industrial production processes, and can meet the requirements for online pH measurement in most industrial applications.

● Features

- ◇ Universal RS485 interface, Modbus/RTU protocol
- ◇ Conveniently connected to third-party equipment such as industrial control computers, general controllers, recording instruments, PLC, DCS, etc.
- ◇ Dual high-impedance differential amplifiers, strong anti-interference and fast response speed
- ◇ 3/4" NPT pipe thread is easy to install, convenient for submersible installation or installation in pipes and tanks
- ◇ Protection grade IP68

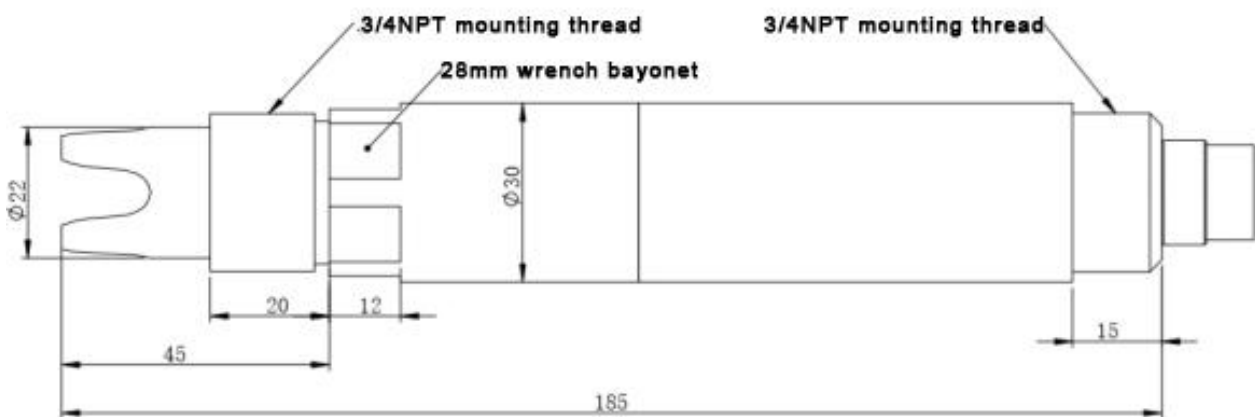
● Technical indicators

model	IQPH-D
Measuring range	0~14.00pH
resolution	0.01pH
Accuracy	±0.1pH, ±0.3℃
Operating temperature	0 ~ 65℃
work pressure	< 0.2MPa
Temperature compensation	Automatic temperature compensation (NTC)
powered by	12~24VDC
Signal output	RS-485(Modbus/RTU)

shell material	POM
Installation method	Submersible installation, 3/4" NPT pipe thread
Cable length	5 meters, other lengths can be customized
Calibration method	Two point calibration
Power consumption	0.2W@12V
Protection level	IP68

Note: If there are differences between the technical specifications and cable definitions in the manual and the actual product, please refer to the technical specifications of the order.

● Product dimensions and installation electrical interface

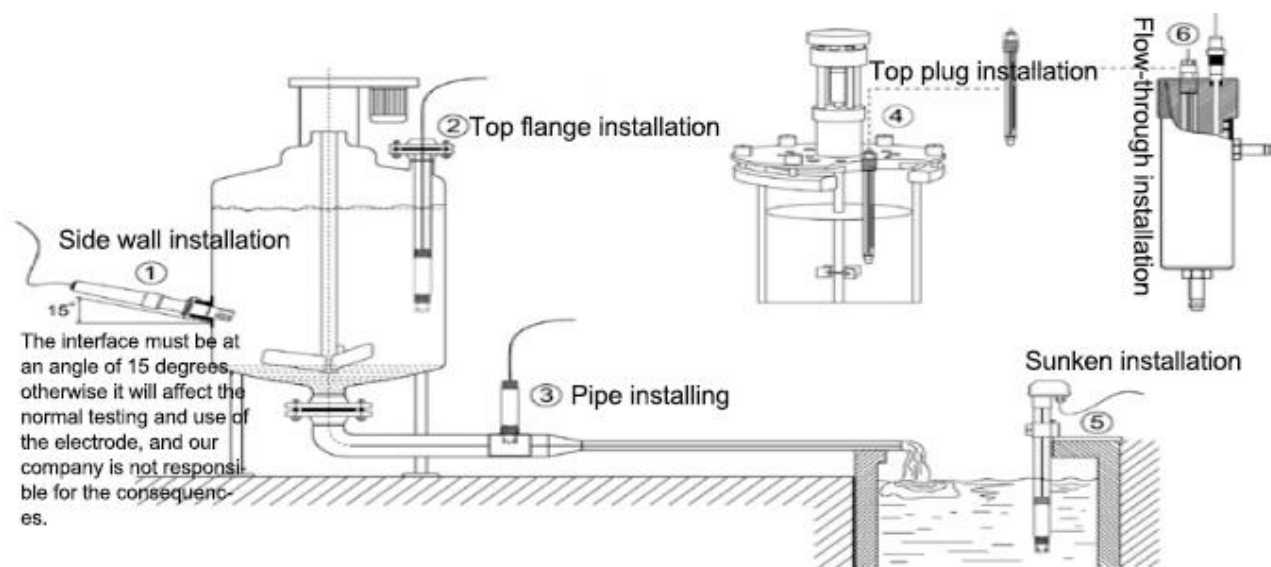


The cable is a 4-core twisted pair shielded wire, and the line sequence is defined as follows:

- ◇ Red wire—power cord (12~24VDC)
- ◇ Black wire—ground wire (GND)
- ◇ Blue wire—RS485 A
- ◇ White wire—RS485 B

The wiring sequence should be carefully checked before powering on to avoid unnecessary losses caused by wiring errors.

Wiring instructions: Considering that cables are immersed in water (including seawater) or exposed to the air for a long time, all wiring locations are required to be waterproofed, and user cables should have certain anti-corrosion capabilities.



● Use and care

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

The sensor should be cleaned when not in use, and inserted into a protective sleeve with 3.5mol/L potassium chloride solution, or the sensor should be inserted into a container with 3.5mol/L potassium chloride solution.

Check whether the terminal block is dry. If there is any stain, please wipe it with absolute alcohol and blow dry before use. Long-term immersion in distilled water or protein solutions should be avoided, and contact with silicone grease should be avoided. If the sensor has been used for a long time, its glass film may become translucent or have sediments attached. In this case, it can be washed with dilute hydrochloric acid and rinsed with water. The sensor has been used for a long time and when measurement errors occur, it must be calibrated and corrected in conjunction with the instrument.

When the sensor still cannot be calibrated and measured after maintaining it in the above way, it means that the sensor has failed. Please replace the sensor.

Standard buffer pH value reference table

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

● Calibration

Note: The sensor has been calibrated before leaving the factory. Unless the measurement error is exceeded, it should not be calibrated at will.

1. Zero point calibration

Use a graduated cylinder to measure 250mL of distilled water, pour it into a beaker, add one pack of calibration powder with pH=6.86, stir evenly with a glass rod until the powder is completely dissolved, prepare a solution with pH=6.86, put the sensor into the solution, and wait for 3 ~5 minutes. After the value is stable, check whether the displayed value is 6.86. If not, zero point calibration is required. For calibration instructions, refer to the appendix.

2. Slope calibration

For acidic solutions: Use a graduated cylinder to measure 250mL of distilled water, pour it into a beaker, add a pack of pH=4.00 calibration powder, stir evenly with a glass rod until the powder is completely dissolved, and prepare a pH=4.00 solution; put the sensor into In the solution, wait for 3 to 5 minutes. After the value is stable, check whether the displayed value is 4.00. If not, slope calibration is required. For calibration instructions, refer to the appendix.

For alkaline solution: Use a graduated cylinder to measure 250mL of distilled water, pour it into a beaker, add a pack of calibration powder with pH=9.18, stir evenly with a glass rod until the powder is completely dissolved, and prepare a solution with pH=9.18; place the sensor Put it into the solution and wait for 3 to 5 minutes. After the value stabilizes, check whether the display is 9.18. If not, slope calibration is required. For calibration instructions, refer to the appendix.

● Precautions

1. After opening the product package, please check whether the appearance of the product is intact, verify whether the relevant contents of the product instruction manual are consistent with the product, and properly keep the product instruction manual for more than one year;
2. Connect strictly according to the product wiring diagram, and work under the product's allowable excitation voltage. Do not use it with overvoltage;
3. Do not knock the product to avoid damaging the appearance and internal structure of the ring;
4. The product does not have customer-repairable parts. Please contact our company if a fault

occurs;

5. If our company's products malfunction under normal use, the warranty period is one year (13 months from the date of shipment to the date of return). Whether the malfunction occurs under normal circumstances will be determined by our company's quality inspectors. as basis. If the repair exceeds the time limit, the company will charge a cost of repair, and all the company's products will be repaired for life;

6. For any unfinished information, please check our company's website or call us for enquiries.

(RS485) MODBUS RTU communication protocol

● Basic settings of communication protocol

Transmission method: MODBUS-RTU mode.

Communication parameters: Default baud rate 9600bps, 1 start bit, 8 data bits, no parity, 1 stop bit, communication parameters can be customized.

Slave address: The factory default is 6, which can be configured according to user requirements.

● Keep register list

parameter	MODBUS holding register address (16 bits)	Number of registers	interview method
Measured value + temperature	Address: 0x0000, 4 double-byte integers, which are the measured value, the number of decimal places of the measured value, the temperature value, and the number of decimal places of the temperature value.	4 (8 bytes)	read
Zero point calibration	Address: 0x1000, calibrated in a standard solution with a pH of 6.86, and the written data is 0.	1 (2 bytes)	Write
slope calibration (4pH)	Address: 0x1002, calibrated in a standard solution with a pH of 4.00, and the written data is 0.	1 (2 bytes)	Write
slope calibration (9.18pH)	Address: 0x1004, calibrated in a standard solution with a pH of 9.18, and the written data is 0.	1 (2 bytes)	Write
Zero point calibration value	Address: 0x1006, the read data is zero offset.	1 (2 bytes)	read
slope calibration value	Address: 0x1008, the read data is the slope value x1000.	1 (2 bytes)	read

temperature calibration	Address: 0x1010, calibrated in solution, the written data is the actual temperature value x10; the read data is the temperature calibration offset x10.	1 (2 bytes)	write/read
sensor address	Address: 0x2002, default is 6, write data range is 1~127.	1 (2 bytes)	write/read
Reset sensor	Address: 0x2020, the calibration value returns 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 bytes)	Write

● Modbus RTU commands

Supported MODBUS function codes: 0x03, 0x06

03H function code example: Read the PH and temperature measurement data of the sensor with slave address 6.

★Host query command:

Slave Address	06H	slave address
Function	03H	function code
Starting Address Hi	00H	The high 8 bits of the starting register address
Starting Address Lo	00H	The lower 8 bits of the starting register address
No. of Registers Hi	00H	The upper 8 bits of the register number
No. of Registers Lo	04H	The lower 8 bits of the register number
CRC Check Lo	45H	CRC check code lower 8 bits
CRC Check Hi	BEH	CRC check code high 8 bits

★Slave machine response:

Slave Address	06H	slave address
Function	03H	function code
Byte Count	08H	Length is 2 bytes
Data Hi	00H	At this time the PH is: 0.98 00 62 represents the pH value in hexadecimal reading, 00 02 represents the pH value with 2 decimal places, and the converted decimal value is 0.98.
Data Lo	62H	
Data Hi	00H	

Data Lo	02H	
Data Hi	01H	
Data Lo	01H	The temperature at this time is: 25.7°C 01 01 represents the hexadecimal reading temperature value, 00 01 represents the temperature value with 1 decimal place, and the converted decimal value is 25.7.
Data Hi	00H	
Data Lo	01H	
CRC Check Lo	24H	
CRC Check Hi	59H	CRC check code high 8 bits

06H function code example: modify the slave address (modified to 1 in this example)

★Host query command:

Slave Address	06H	slave address
Function	06H	function code
Starting Address Hi	20H	The holding register address of the slave address is 2002H
Starting Address Lo	02H	
Data Hi	00H	Change sensor address 06 to 01
Data Lo	01H	
CRC Check Lo	E3H	CRC check code lower 8 bits
CRC Check Hi	BDH	CRC check code high 8 bits

★Slave machine response:

Slave Address	06H	slave address
Function	06H	function code
Starting Address Hi	20H	The holding register address of the slave address is 2002H
Starting Address Lo	02H	
Data Hi	00H	Change sensor address 06 to 01
Data Lo	01H	
CRC Check Lo	E3H	CRC check code lower 8 bits
CRC Check Hi	BDH	CRC check code high 8 bits

