PH01
Integrated PH Transmitter
User Manual

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1. product description

This product is a device for measuring the PH value of solution (hydrogen ion concentration index, pH value), with automatic temperature compensation function, automatic temperature compensation and manual temperature compensation can be switched at will. This product adopts an integrated design, the structure is lighter and simpler, and the use is more convenient. Waterproof grade IP68. The reference electrode adopts double salt bridge design, which has stronger anti-pollution ability. This product is suitable for industrial sewage, domestic sewage, agriculture, aquaculture and other scenarios in a non-corrosive weak acid and weak alkali environment.

1.1 Features

- pH measurement range 0~14pH, resolution 0.01pH.
- The temperature measurement range is 0~60℃, and the resolution is 0.1℃.
- One-piece design, light and simple structure, easy to use。
- The reference adopts double salt bridge design, which has stronger anti-pollution ability.
- Waterproof grade IP68。
- With automatic temperature compensation function, manual compensation and automatic compensation can be switched at will.
- RS485 communication interface: MODBUS RTU communication protocol can be easily connected to the computer for monitoring and communication。
- ModBus communication address can be set, baud rate can be modified。
- The equipment adopts wide voltage power supply DC 7~30V。

1.2 Equipment technical parameters

powered by	DC 7~30V
Power consumption	0.3W
Communication Interface	RS485; standard MODBUS-RTU protocol; communication baud rate: default 4800 (1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 can be set)
pH measurement range	0~14.00pH ; Resolution: 0.01pH
pH measurement error	±0.15pH
repeatability error	±0.02pH

Temperature measurement range	0~60℃; Resolution: 0.1℃ (It is the set temperature during manual temperature compensation, the default is 25°C)
Temperature measurement error	±0.5℃
Equipment working conditions	Ambient temperature: 0-60℃
waterproof level	IP68
Pressure resistance	0.6MPa
line length	Default 5m (other lengths can be customized)
Electrode life cycle	1 year

Data measured by Laboratory

1.3 product model

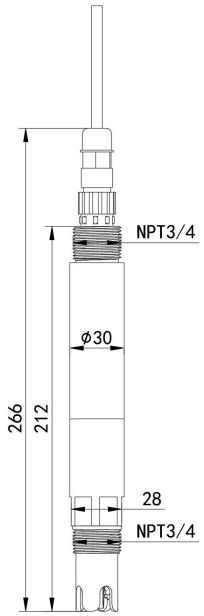
PH01-			Industrial pH Transmitter
	N01-		RS485 (Modbus-RTU protocol)
		3	One-piece housing

1.4 Product List

◆1 integrated PH transmitter
◆5m (or custom length) cable
◆Certificate, Warranty Card, etc.

1.5 Equipment size and installation

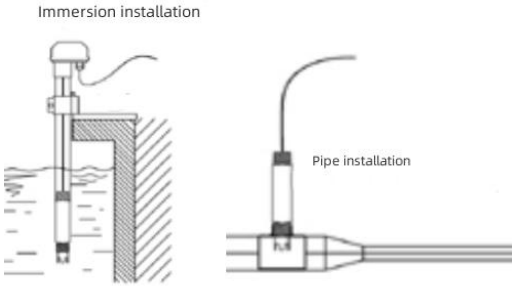
1.5.1Equipment size



1.5.2device installation

1. Submerged installation: The lead wire of the equipment is passed through the waterproof pipe, and the 3/4 thread on the top of the equipment is connected with the 3/4 thread of the waterproof pipe with raw material tape. Make sure that the top of the equipment and the equipment lines are free of water.

3. Pipe Installation: Connect to the pipe through the 3/4 thread of the device.



2. Equipment Instructions

2.1 Wiring Instructions

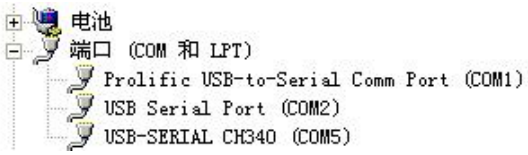
	illustrate	illustrate
power supply	brown	V+（7~30V DC）
	black	V-
communi cation	yellow	485-A
	blue	485-B

2.2 Parameter configuration description

Open the data package, select "Debugging Software"---"485 Parameter Configuration Software",turn up 

Just open it.

1) Select the correct COM port (check the COM port in "My Computer - Properties - Device Manager - Port"), the following figure lists the driver names of several different 485 converters.

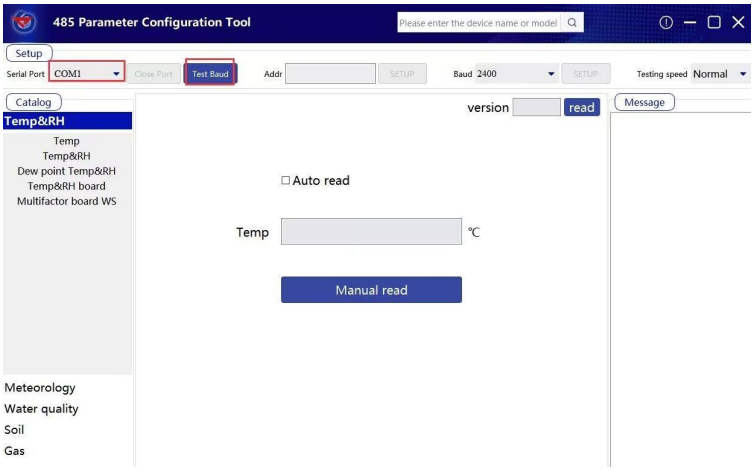


2) Connect only one device and power it on, click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

3) Modify the address and baud rate according to the needs of use, and at the same

time, you can query the current functional status of the device.

4) If the test is unsuccessful, please re-check the equipment wiring and 485 driver installation.



2.3 Electrode Calibration Instructions

1) Prepare two standard buffer solutions with different pH. If measuring acidic solution, use standard buffer solution of 4.01 and 6.86, if measuring alkaline solution, use standard buffer solution of 6.86 and 9.18, and use standard buffer solution of 4.01 and 9.18 if it is general. Standard buffer.

2） Open the configuration software 

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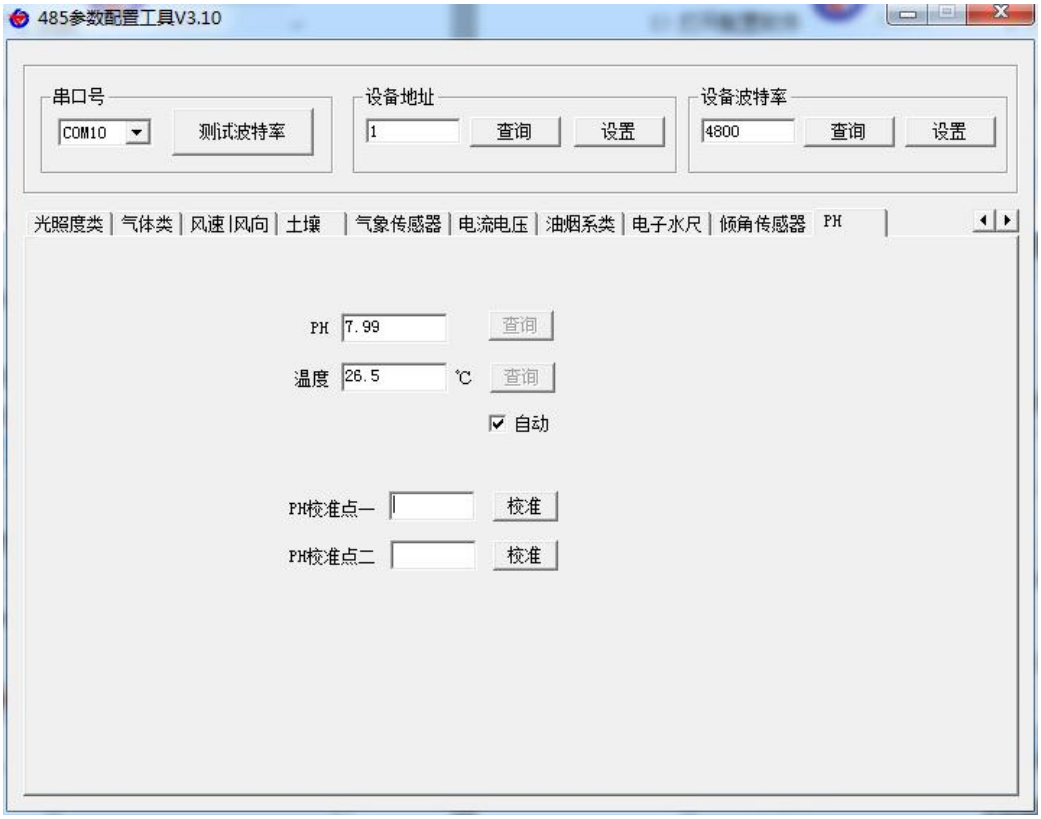
3) Select the corresponding serial port number, select the correct device address (the default address is 1) and the baud rate (the default baud rate is 4800), then open the serial port, find the PH tab, and check the automatic
option.



4) Put the pH electrode into a standard buffer solution with a relatively small pH value at room temperature (about 25°C) (for example, choose 4.01 when using 4.01 and 9.18 buffers), and input the standard buffer solution at the calibration point. pH value, cancel automatic after the value is stable, click "Calibration" of calibration point 1 to calibrate the first point.

5) After the calibration of the first point is completed, clean the pH electrode and use a paper towel or soft cloth to absorb excess water (do not damage the electrode glass bulb, otherwise the electrode will fail), re-check the automatic option, and put the pH value relative In a large standard buffer solution (for example, choose 9.18 when using 4.01 and 9.18 buffers), enter the pH value of the standard buffer solution at the calibration point, cancel the automatic when the value is stable, and click "Calibration" at the second calibration point to calibrate Second point. Calibration is complete.

2.4 Mod Bus Communication and register details

2.4.1 Device Communication Basic Parameters

coding	8 bit binary
data bits	8 bits
parity bit	none
stop bit	1 person
error checking	CRC (Redundant Cyclic Code)
baud rate	Factory default is 4800bit/s

2.4.2 Data Frame Format Definition

Adopt Modbus-RTU communication protocol, the format is as follows:

Initial structure ≥4 bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

Time to end structure ≥ 4 bytes

Address code: It is the address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: the function instruction of the command sent by the host.

Data area: The data area is the specific communication data, pay attention to the high byte of the 16bits data first!

CRC code: two-byte check code.

2.4.3 register address

register address	PLC address	Support function code	illustrate
0x0000	40001	0x03/0x04	pH value (16-bit unsigned integer, 100 times the actual value)
0x0001	40002	0x03/0x04	temperature (16-bit signed integer, 10 times the actual value)
0x0050	40081	0x03/0x04/0x06	PH deviation value (16-bit signed integer, 100 times the actual value)
0x0051	40082	0x03/0x04/0x06	Temperature deviation value (16-bit signed integer, 10 times the actual value)
0x0060	40097	0x03/0x04/0x06	Whether to manually compensate (1: yes 0: no)
0x0061	40098	0x03/0x04/0x06	Manual compensation for temperature (16-bit signed integer, 10 times the actual value)
0x0120、0x0121	40289、40290	0x10	Electrode calibration (two registers are used in conjunction)
0x07D0	42001	0x03/0x04/0x06/0x10	1~254 (16-bit unsigned integer, factory default 1)
0x07D1	42002	0x03/0x04/0x06/0x10	0 for 2400 1 for 4800 2 for 9600 3 for 19200 4 for 38400 5 for 57600 6 for 115200 7 for 1200

2.4.4 Communication protocol example and explanation

Example 1: Read the current pH and temperature of the device with address 01

Send frame:

address code	function code	register address	register content	Check code low	Check code high
0x01	0x03	0x00 0x00	0x00 0x02	0xc4	0x0b

Response frame: (eg read pH 7.90, temperature 26.5°C)

address code	function code	number of valid bytes	register content	Check code low	Check code high
0x01	0x03	0x04	0x03 0x16 0x01 0x09	0xb8	0xbe

pH calculation: 316H (hex)=790 => pH=7.90

Temperature calculation: 109H (hexadecimal)=265=>temperature=26.5℃

Example 2: Perform numerical correction on the deviation value of the current pH value setting of the device whose address is 01

Sending frame: (if the current device output pH is 7.90, the value should be corrected to 8.00, the difference is 8.00-7.90=0.10, and the expansion is 100 times as 10=>0xa (hexadecimal), and the register content is written 00 0a)

address code	function code	register address	register content	Check code low	Check code high
0x01	0x06	0x00 0x50	0x00 0x0a	0x09	0xdc

Response frame: (according to the MODBUS standard, the response is a mirrored message of the delivered frame)

address code	function code	register address	register content	Check code low	Check code high
0x01	0x06	0x00 0x50	0x00 0x0a	0x09	0xdc

2.4.5 Register calibration electrode

If the electrode needs to be calibrated, it can be calibrated by writing parameters to the 0x0120 and 0x0121 registers through the 0x10 function code. This equipment adopts two-point calibration, and two known PH standard solutions need to be prepared. When calibrating the first point, write 0x0001 to the 0x0120 register, and write 100 times the standard PH value of the first point to the 0x0121 register; when calibrating the second point, write 0x0002 to the 0x0120 register, and write the second point to the 0x0121 register 100 times the standard pH. Calibration is complete.

Example: Select the PH standard solution of 4.01 and calibrate the first point.

Delivery frame: 4.01*100=401 converted to 16 hexadecimal is 0x191

address code	function code	register address	register length	length in bytes	register content	Check code low	Check code high
0x01	0x10	0x01 0x20	0x00 0x02	0x04	0x00 0x01 0x01 0x91	0x6d	0xdb

Response frame: (according to the MODBUS standard, the response is a mirrored

message of the delivered frame)

address code	function code	register address	register length	Check code low	Check code high
0x01	0x10	0x01 0x20	0x00 0x02	0x41	0xfe

Then select the PH standard solution of 9.18, and calibrate the second point.

Delivery frame: 9.18*100=918 converted to 16 hexadecimal is 0x396

address code	function code	register address	register length	length in bytes	register content	Check code low	Check code high
0x01	0x10	0x01 0x20	0x00 0x02	0x04	0x00 0x02 0x03 0x96	0xdd	0x79

Response frame: (according to the MODBUS standard, the response is a mirrored message of the delivered frame)

address code	function code	register address	register length	Check code low	Check code high
0x01	0x10	0x01 0x20	0x00 0x02	0x41	0xfe

3. Precautions and maintenance

- The equipment itself generally does not require daily maintenance. When there is an obvious failure, please do not open it to repair it yourself, and contact us as soon as possible!
- There is an appropriate amount of soaking solution in the protective bottle at the front of the electrode, and the electrode tip is soaked in it to keep the glass bulb and the liquid junction activated. When measuring, unscrew the bottle cap, pull out the electrode, and wash it with pure water before use.
- Preparation of electrode soaking solution: Take a bag of pH4.00 buffer, dissolve it in 250 ml of pure water, add 56 grams of analytical pure potassium chloride, heat it properly in an electric furnace, and stir until it is completely dissolved. It can also be soaked in 3.3M potassium chloride solution, and the preparation is as follows: Dissolve 25 grams of analytically pure potassium chloride in 100 ml of pure water.
- The glass bulb at the front of the electrode should not be in contact with hard objects, and any damage and rubbing will make the electrode ineffective.
- Before the measurement, the bubbles in the electrode glass bulb should be shaken off, otherwise it will affect the measurement. During the measurement, the electrode should be left statically after stirring in the solution to be measured to speed up the response.
- Deionized water should be used to clean the electrode before and after measurement to ensure accuracy.
- The pH electrode will be passivated after long-term use. The phenomenon is that the sensitivity gradient is reduced, the response is slow, and the reading is inaccurate. At this time, the bulb at the lower end of the electrode can be soaked in 0.1M dilute hydrochloric acid for 24 hours (0.1M dilute hydrochloric acid preparation: 9 ml Dilute hydrochloric acid to 1000 ml with distilled water), and then soak it in 3.3M potassium chloride solution for 24 hours. If the pH electrode is passivated seriously and soaking with 0.1M hydrochloric acid has no effect, the bulb end of the pH electrode can be soaked in 4% HF (hydrofluoric acid) for 3-5 seconds, washed with pure water, and then soaked in 3.3M potassium chloride solution for 24 hours to restore performance.
- The contamination of the glass bulb or the blockage of the liquid junction will also passivate the electrode. At this time, it should be cleaned with an appropriate solution according to the nature of the contaminant, as shown in the table below (for reference).

pollutants： detergent：

Inorganic metal oxides	Less than 1M dilute acid
organic oils	Dilute detergent (weak alkaline)
resin macromolecule	Alcohol, acetone, ether
protein blood sediment	Acid enzyme solution
Pigment substances	Dilute Bleach, Hydrogen Peroxide

◆ The electrode life cycle is about one year, and the new electrode should be replaced in time after aging.

◆ The equipment should be calibrated before each use. It is recommended to calibrate every 3 months for long-term use. The calibration frequency should be adjusted according to different application conditions (the degree of dirt in the application, the deposition of chemical substances, etc.).