JXCT®

JXBS-3001-PH-RS

Soil PH Sensor User Manual

RS485 Modubus
Version: 2.0
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Status: Released

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I. Product Introduction

1.1 General Info

The transmitter is widely used in applications where pH value monitoring is required, such as soil pH measurement. The input power supply, sensor probe, and signal output of the sensor are completely isolated. Safe and reliable, beautiful appearance and convenient installation.

1.2 Features

The probe of this product adopts PH electrode, with stable signal and high precision. It has the characteristics of wide measurement range, good linearity, good waterproof performance, easy to use, easy to install, and long transmission distance.

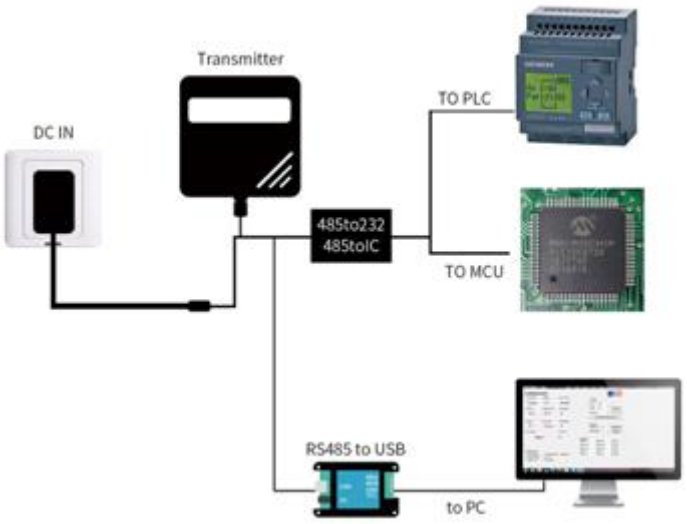
1.3Main Specs

Specs	Content
Power Supply Default	12-24V DC
Consumption	≤0.15W
Detect Accuracy	±0.3pH
PH Detect Range	3-9pH
Long-term Stability	≤5%/year
Transmit Output	RS485Output (Modbus)
Working Temperature	0-55℃
Response Time	≤15s

1.4System Framework

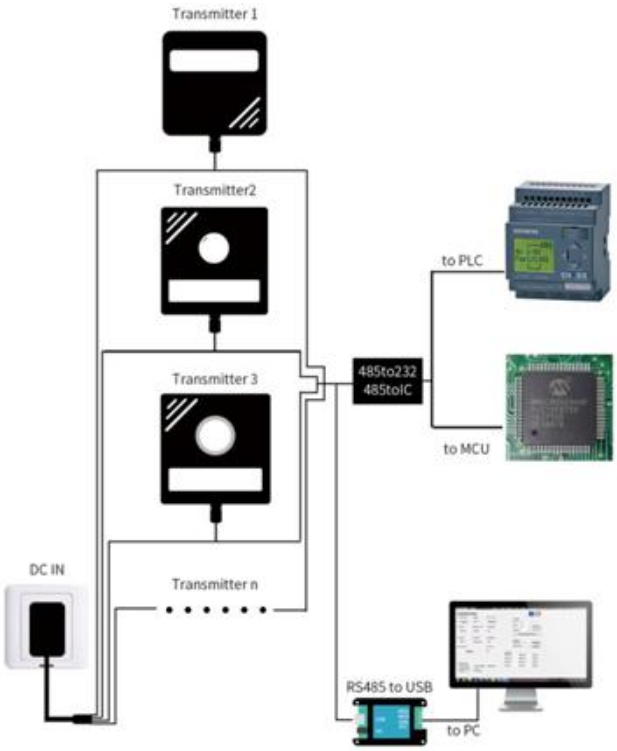
This sensor can be connected to be used alone, firstly using 12V DC power supply, the device can be directly connected to the PLC with 485 interface, and can be connected to the single chip through the 485 interface chip. The microcontroller and PLC can be used with the sensor by programming the modbus protocol specified later. At the same time, use USB to 485 to connect to the computer, and use the sensor configuration tool provided by our company to configure and test.

Single Sensor Connection:



This product can also be used by combining multiple sensors on one 485 bus. Please observe the "485 Bus Field Wiring Code" (see appendix) when performing 485 bus combination. In theory, a bus can connect more than 16 485 sensors. If you need to connect more 485 sensors, you can use a 485 repeater to expand more 485 devices. The other end is connected to a PLC with a 485 interface through a 485 interface chip. Connect the single chip microcomputer, or use USB to 485 to connect to the computer, use the sensor configuration tool provided by our company to configure and test.

Multiple Sensors Connection:



II. Hardware Connection

2.1 Check before installation

Product List:

Name	Qty
Sensor	1Pc
12V Water-proof battery	1Pc(Optional)
USB to 485 Converter	1Pc(Optional)
Warranty	1Pc

2.2 Port Description

Wide voltage power input can be 12-24V. When connecting the 485 signal line, please note that the two lines of A / B cannot be reversed, and the addresses of multiple devices on the bus must not conflict.

Function	Cable Color	Specs
Power	Brown	Power supply +
	Black	Power supply -
Communication	Yellow (grey)	485-A
	Blue	485-B

Note: Please be careful not to connect the wrong wire sequence, the wrong wiring will cause the device to burn.
The factory default provides 0.6 meters long wire, the customer can extend the wire or connect according to the need.
Note that there may be no yellow line in the line sequence that may be provided in some factory batches. In this case, the gray line is equivalent to replace the yellow line.

2.3 **Installation**

Please note the following precautions:

1. Avoid installation in areas that are easy to transfer heat and directly cause a temperature difference with the area to be measured, otherwise it will cause inaccurate PH measurement.
2. Install in a stable environment, avoid direct sunlight, stay away from windows and air-conditioning, heating and other equipment, and avoid direct windows and doors.

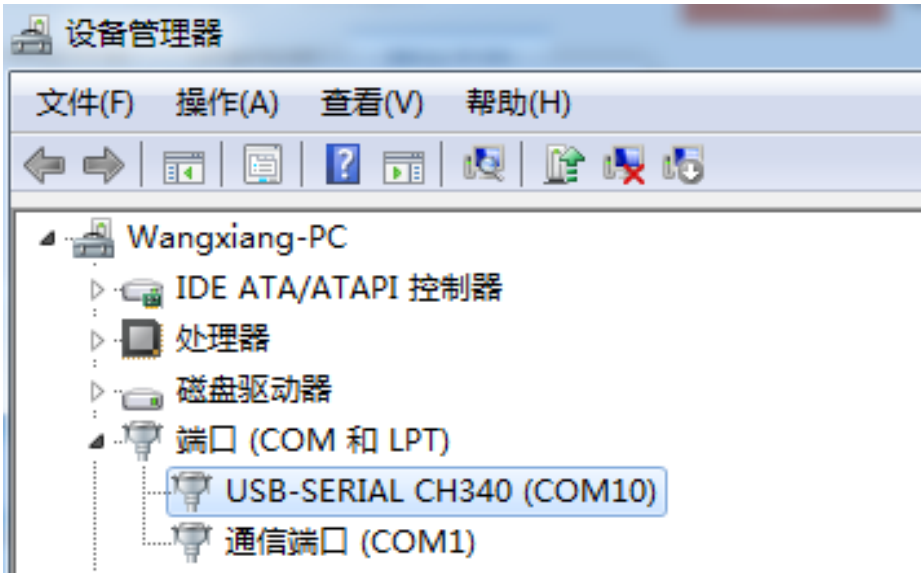
III Configuration Software Installation

3.1 485 output mode sensor

Our company provides matching "sensor monitoring software", which can easily read the parameters of the sensor using a computer, and flexibly modify the device ID and address of the sensor.

3.1.1 Sensor connected to computer

After the sensor is correctly connected to the computer via USB to 485 and provides power, you can see the correct COM port in the computer ("My Computer-Properties-Device Manager-Port" to view the COM port).



As shown in the figure above, your serial number is COM10 at this time, please remember this serial port, you need to fill in this serial number in the sensor monitoring software.

If the COM port is not found in the device manager, it means that you have not inserted the USB to 485 or installed the driver correctly, please contact the technical staff for help.

3.1.2 Use of sensor monitoring software

The software interface is shown in the figure:

After opening the software, first select the “Sensor Type” at the top of the software, then obtain the serial number and select the correct serial port according to the method in section 3.1.1, and then click “Automatically obtain the current baud rate and address” to automatically detect All devices and baud rates on the 485 bus. Please note that there is only one sensor on the 485 bus when using software for automatic acquisition. Then click "Connect Device" to get sensor data information in real time.

3.1.3 Modify Baud Rate & Device Address

In the case of disconnecting "device connection", click "modify baud rate and modify slave station number" in "configure sensor communication parameters" to complete the relevant settings. Please note that after setting, please restart the device, and then "automatically obtain the current "Baud Rate and Address", you can find that the address and baud rate have been changed to the address and baud rate you need.

IV Communication Protocol

4.1 Basic Specs

Specs	Content
coding	8-bit binary
Data bit	8-bit
Parity bit	None
Stop bit	1-bit
Error calibration	CRC Long cyclic code
Baud rate	2400bps/4800bps/9600bps Optional. Can Customize. Default is 9600bps

4.2 Data Frame Format Definition

Using Modbus-RTU communication protocol, the format is as follows:
Time for initial structure ≥ 4 bytes
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 function indication of the transmitter. This transmitter only uses the function code 0x06 (read register data).

Data area: The data area is the specific address, which is unique in the communication network (factory default 0x01).

Function code: Command communication data sent by the host, pay attention to the high byte of 16bits data first!

CRC code: two-byte check code.

Inquiry Frame					
Address Code	Function Code	Register start address	Register length	Check digit low	Check Digit High
1bit	1bit	2bits	2bits	1bit	1bit

Reply Frame					
Address code	Function code	Effective bit number	First data area	Second data area	Nth data area
1bit	1bit	2bits	2bits	2bits	2bits

4.3 Register Address

Register address	PLC Configure address	Content	Operation
0006H	40007	High precision pH Value (0.01pH)	Read only
000dH	4000e	Low accuracy pH Value (0.01pH)	Read only
0100H	40101	Device Address (0-252)	Read Write
0101H	40102	Baud rate (2400/4800/9600)	Read Write

4.4 Communication Protocol Example

4.4.1 Read the pH value of device address 0x01

Inquiry Frame						
Address code	Function code	Starting address	Data Length	Check digit low	Check digit high	
0x01	0x03	0x00 0x0d	0x00 0x01	0x15	0xC9	
Reply frame (ie. Reading Value is 7.1pH)						
Address code	Function code	Returns the number of valid bits	Data area	Check digit low	Check digit high	
0x01	0x03	0x02	0x00 0x47	0xD8	0x15	

Explanation of pH calculation:
0047H (hexadecimal) = 71 => pH = 7.1pH

4.4.2 Read the pH value of device address 0x01

Inquiry Frame						
Address code	Function code	Starting address	Data Length	Check digit low	Check digit high	
0x01	0x03	0x00 0x06	0x00 0x01	0x64	0x0B	
Reply Frame						
Address code	Function code	Returns the number of valid bits	Data area	Check digit low	Check digit high	
0x01	0x03	0x02	0x01 0x34	0xD8	0x15	

Explanation of pH calculation:
0047H (hexadecimal) = 308 => pH = 3.08pH