

485 Soil pH Sensor

User Manual



Applicable Product Model: AT-So-PH

Thank you for purchasing our product. Please read this manual carefully before use. Be sure to operate in strict accordance with the instructions and requirements to avoid damage to the product.

If you have any questions, please contact us for support.

Table of Contents

I. Product Overview	8
1.1 Introduction	8
1.2 Application Range	8
1.3 Product Features	8
1.4 Product Dimensions	8
II. Product Parameters	9
2.1 Technical Parameters	9
2.2 Usage Method and Precautions	9
2.2.1 Usage Method	9
2.2.2 Precautions	10
2.3 Recommended Soil pH Range for Different Crops	11
(For Reference Only)	
2.3.1 Vegetable Category	11
2.3.2 Grain Category	12
2.3.3 Fruit Tree Category	12
III. Instructions for Use	13
3.1 Unboxing Inspection	13
3.2 Reading the Address and Modifying the Address	13
(Depending on Situation)	
3.3 Interface Description	13
3.4 Configuration Software Installation and Use	14
3.4.1 Connecting the Sensor to the Computer	14
3.4.2 Using the Sensor Monitoring Software	15
IV. Communication Protocol	16
4.1 Basic Communication Parameters	16
4.2 Communication Protocol Examples and Explanations	16

4.2.1 Data Register Address	16
4.2.3 Reading the pH Value of Device Address 01	17
4.2.5 Changing Device Address from 01 to 02	17
V. After-Sales Service	17
VI. Revision Record	18
VII. Contact Information	18

User Notice

- 1 .For a better user experience, please read this manual carefully before installation, operation, and maintenance.
If you encounter any issues afterward, contact customer service for assistance.
- 2 .Please follow the operating procedures and precautions described in this manual. If you have any questions during installation or use, please contact us.
- 3 .When receiving the equipment, please open the package carefully and check whether the device and accessories have been damaged during transportation.
If any damage is found, please contact us immediately and keep the original packaging to facilitate return or replacement.
- 4 .Our company shall not be responsible for any failures or damages caused by improper use or operation not in accordance with the instructions.
- 5 .The content described in this manual may be updated or modified as the product evolves.
Such updates will not be notified separately, and our company shall not be liable for any consequences arising from such changes.

I. Product Overview

• 1.1 Introduction

This sensor is an RS485 bus-type soil pH sensor. It uses an RS485 interface and the standard MODBUS-RTU protocol to achieve multiple devices monitored simultaneously. It is suitable for various application scenarios. This product measures the potential difference generated between two electrodes; according to the pH value, the potential difference varies, and the resulting potential difference is used for data observation. It is a commonly used device for soil pH measurement.

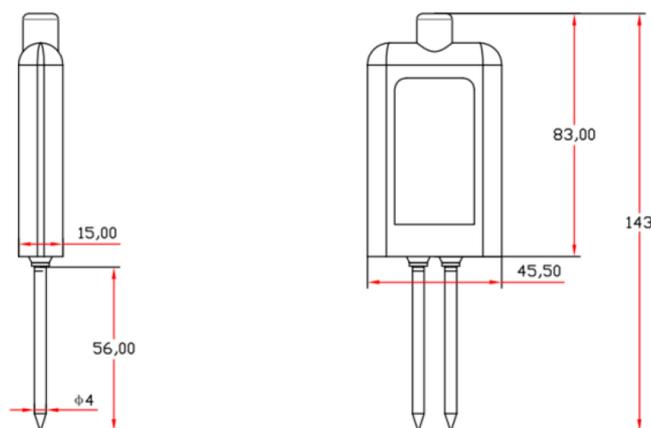
• 1.2 Application Range

Widely used in scientific experiments, water-saving irrigation, greenhouse cultivation, flower and vegetable production, grassland improvement, soil rapid testing, plant cultivation, and sewage treatment soil pH measurement.

• 1.3 Product Features

- ▶ Epoxy encapsulation, fully sealed, completely waterproof
- ▶ Easy to use and simple to install
- ▶ Bus-type transmission, long communication distance
- ▶ Fast response, high reliability

• 1.4 Product Dimensions



II . Product Parameters

- **2.1 Technical Parameters**

Parameter Name	Parameter Value
DC Power Supply	12–24V DC
Output Method	RS485 interface, standard Modbus-RTU communication protocol
Device Address	Default 1
Baud Rate	Default 9600
Operating Environment	Temperature: 0–65°C
Average Power Consumption	48mW
Measurement Range	4–10PH
Resolution	0. 1PH
Measurement Accuracy	±0. 5PH
Protection Level	IP68

- **2.2 Usage Method and Precautions**

2.2.1 Usage Method

1. Remove stones, grass, leaves, and other debris covering the soil surface to be measured. Remove the topsoil layer.
2. Before measurement, wipe the metal surface of the probe with a soft cloth. When using the instrument for the first time, it is recommended to take several measurements before recording the reading, so that the protective oil layer on the metal probe surface does not affect the moisture value or pH value.

3. During measurement, insert the probe of the instrument into the soil. Make sure that the probe electrodes are fully inserted into the soil (the probe should be inserted more than 10 cm), and ensure that the electrodes are in close contact with the surrounding soil. Because soil properties vary, the tightness of contact between the probe and the soil will also differ. It is recommended to take multiple measurement values and use the average as the final result.
4. After use, please wipe the probe clean and dry.



2.2.2 Precautions

1. Do not leave the probe inserted in the soil for too long (do not exceed half a year; generally it should be inspected or recalibrated every six months), otherwise the probe surface may be easily damaged.
2. After use, make sure to wipe the probe clean and dry.

3. Keep the instrument away from magnetic objects, and do not store it together with other metal items to avoid damage.
4. Do not use it for liquid measurements.
5. Do not touch the probe with your fingers; the oil on your fingertips will affect the conductivity between the probe electrodes, resulting in inaccurate measurement data.
6. Do not forcibly bend the probe pins. Do not pull the sensor cable with force. Do not drop or strike the sensor violently.
7. Prevent chemical reagents, oil, and dust from directly corroding the sensor. Avoid use in icing or extreme temperature environments for long periods. Prevent rapid temperature shocks.

- **2.3 Recommended Soil pH Range for Different Crops (For Reference Only)**

2.3.1 Vegetable Category

Crop	Optimal pH Range	Crop	Optimal pH Range
Carrot	7.0–7.5	Watermelon	5.0–7.0
orange variety	5.3–6.0	Sweet melon	6.0–6.8
Tomato	6.0–7.0	Silk gourd	6.0–6.5
Cucumber	5.5–7.6	Bitter melon	5.5–6.5
Cauliflower	6.0–6.7	Pumpkin	6.5–7.5
sweet cabbage	5.5–6.7	Winter melon	5.5–7.6
Spinach	5.5–7.0	Zucchini	5.5–6.8
Celery	6.0–7.6	Chinese cabbage	6.5–7.0
Chili pepper	6.2–7.2	Eggplant (slender)	6.0
Eggplant	6.8–7.3	Radish	5.6–6.0
Kidney bean	6.2–7.0	Taro	7.0–7.4
Green bean	6.2–7.0	Cabbage (round head)	6.0–7.0
Soybean	6.0–7.2	Potato	5.5–6.5
Sweet potato	5.0–7.0	Yam	6.5–7.5
Garlic sprout	5.0–6.8	Ginger	6.5

- **2.3.2 Grain & Oil Crops**

Crop	Optimal pH Range	Crop	Optimal pH Range
Cotton	6.5–8	Wheat	5.5–6.5
Rice	6.0–7.5	Barley	6.8–7.5
Rapeseed	5.8–6.7	Tobacco	5.0–6.5
Soybean	6.5–7	Green bean	6.2–7.0
Peanut	5.6–6.0	Sesame	6.0–7.0
Corn	6.5–7.0	Panax notoginseng	5.5–7.0
Sunflower	7.0	Chinese yam	6.5–7.5

- **2.3.3 Fruit Trees**

Crop	Optimal pH Range	Crop	Optimal pH Range
Grape	6.0–7.5	Apple	7.0–7.5
Strawberry	5.7–6.5	Citrus	5.5–6.5
lychee	5.5–6.5	Sugar orange	6.5
Longan	5.4–6.5	Pear	5.6–7.2
Chestnut	5.5–6.5	Peach	6.0–8.0
Mulberry	4.4–6.0	Apricot	5.5–7.0
Banana	6.5	Almond	6.5–8.0
Tea tree	4.0–6.5		

III. Instructions for Use

- **3.1 Unboxing Inspection**

Remove the sensor from the package and check whether the sensor surface is intact, whether the lead wire is complete, and whether the quantity is correct. The factory default provides a 1.0-meter cable, and customers may request longer cables if needed.

- **3.2 Reading and Modifying the Address (Depending on Requirements)**

The device's default address is "1", and the default baud rate is "9600". Our company can provide customized device addresses and baud rates according to customer requirements. Customers may also use our dedicated software to modify the device address and baud rate themselves (see Section 3.4 for modification instructions). Available address range: 1–247.

- **3.3 Unboxing Inspection**

The sensor supports a wide DC input range of 9–24V.

When wiring the RS485 signal lines, pay attention to A/B polarity — the two wires cannot be reversed. Multiple devices on the same bus must not have address conflicts.

The color code for the communication wiring is shown below:

485 Communication Wire Color	Description
Red	+
Black	–
Yellow	A
Green	B

Note: Please ensure correct wiring order. Incorrect wiring may cause device damage. Some batches may not include a yellow wire in the RS485 cable; in such cases, a gray wire may be used to replace the yellow wire.

• 3.4. Software Installation and Usage

We provide a supporting software tool called “Sensor Assistant” .

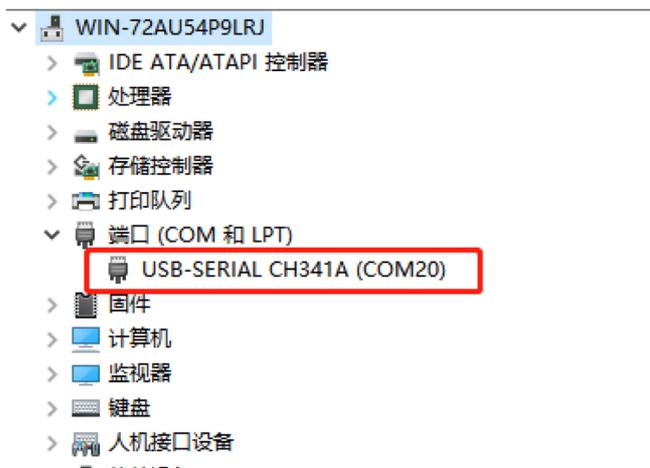
Please contact us if needed. This software allows you to conveniently read the sensor parameters from your computer and modify the device ID and address if required.

• 3.4.1. Connecting the Sensor to the Computer

After installing the driver, connect the sensor to the computer using a USB-to-RS485 converter, and supply power to the device.

Once properly connected, you should be able to see the correct COM port on your computer

(you can check it under “Device Manager” → “Ports (COM & LPT)”).



As shown in the figure, your current COM port is COM20.

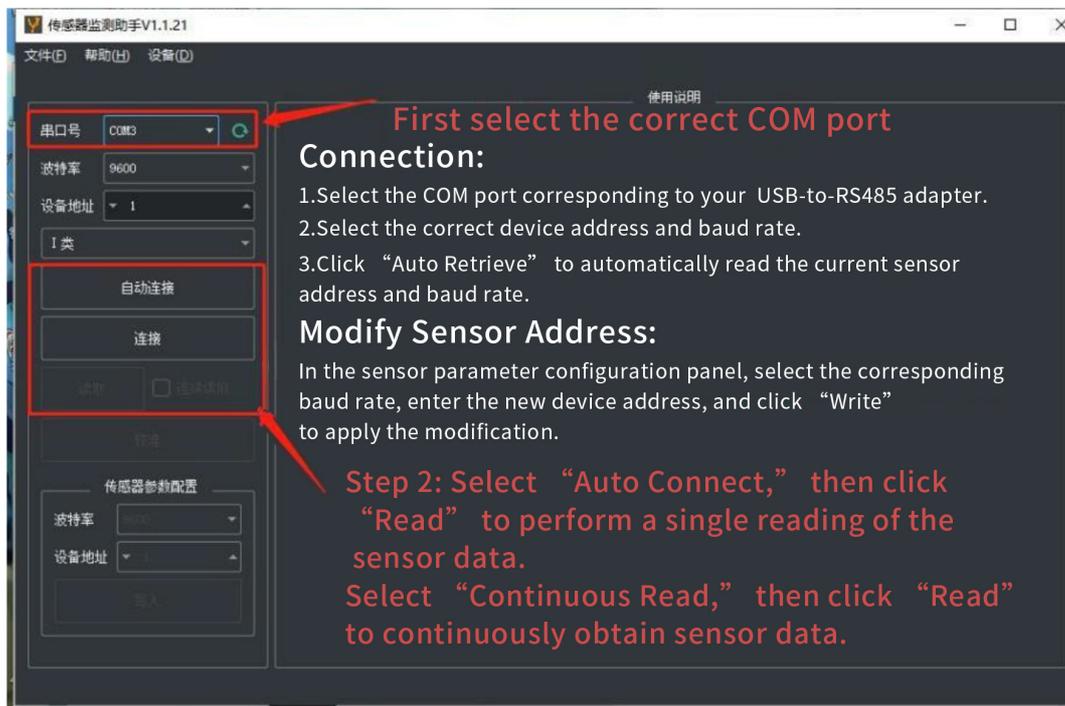
Please remember this port number, as you will need to enter it in the Sensor Monitoring Software.

If the COM port does not appear in Device Manager, it means that the USB-to-RS485 converter is not properly connected, or the driver has not been correctly installed. Please contact technical support for assistance.

• 3.4.2 Using the Sensor Monitoring Software

The configuration interface is shown in the figure.

First, obtain the COM port number using the method described in Section 3.4.1 and select the correct port. Then click Auto Detect to automatically retrieve the current baud rate and device address, which will detect all devices and baud rates on the current RS485 bus.



Please note that when using the software’s auto-detection function, there must be only one sensor connected to the 485 bus.

After that, click Connect Device, and you will be able to obtain real-time sensor data.

When the device is already connected, select the desired baud rate and address in the communication settings to complete the configuration. After modifying these settings, please restart the device. Then click “Automatically retrieve current baud rate and address,” and you will see that the device’s address and baud rate have been successfully updated to the values you set.

IV. Communication Protocol

- 4.1 Basic Communication Parameters

Parameter	Content
Encoding	8-bit binary
Data Bits	8 bits
Parity	None
Stop Bit	1 bit
Error Check	CRC-16 (Modbus)
Baud Rate	Factory default 9600 bps; supports 2400 / 4800 / 19200

- 4.2 Communication Protocol Examples and Explanations

4.2.1 Data Register Address

Register Address	PLC Address	Description	Operation
0008H	40009	pH value	Read only
003EH	40063	Modify-address register	Write only

- 4.2.2 Data Frame Format Definition

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

Query Frame:

Address Code	Function Code	Starting Address	Number of Registers Requested	Checksum
1 byte	1 byte	2 bytes	2 bytes	2 bytes

Response Frame:

Address Code	Function Code	Data Length	Returned Data Content	Checksum
1 byte	1 byte	1 byte	N bytes	2 bytes

The address code refers to the device address, which is unique in the communication network (factory default: 01). This device supports function codes 03 and 06. **Note that the high byte comes first and the low byte comes after. The data read from the device must be converted from hexadecimal to decimal.**

• 4.2.3 Reading the pH Value of Device Address 01

Query Frame: 01 03 00 08 00 01 05 C8

Response Frame: 01 03 02 00 33 F8 51

The returned pH value in the above example is:

0033H (hexadecimal) = 51 (decimal) → 51 / 10 = 5.1

• 4.2.5 Changing Device Address from 01 to 02

Query Frame: 01 06 00 2E 00 02 69 C7

Response Frame: 01 06 00 2E 00 02 69 C7

V. After-Sales Service

Common Issues

Problem Description	Possible Reason	Solution
Sensor fails to connect	<ol style="list-style-type: none"> 1. Incorrect COM port selection 2. Multiple devices on the bus 3. RS485 bus broken 4. Insufficient power supply 5. Driver not installed 6. Device malfunction 	<ol style="list-style-type: none"> 1. Select the correct COM port 2. Connect only one device 3. Check whether wiring is loose 4. Check whether the power supply is DC 9–24V 5. Contact us to obtain correct drivers 6. Contact us for after-sales service
Missing accessories	Leakage / missing items	Contact us for replacement
After a period of use, data becomes inaccurate	<ol style="list-style-type: none"> 1. Probe fouled / covered with dirt 2. Probe/module damaged 3. Water ingress in the device 	<ol style="list-style-type: none"> 1. Clean the probe surface according to the situation to avoid dirt accumulation 2. Contact us for after-sales service 3. Contact us for after-sales service

VI. Revision Record

Revision Date	Version	Revision Notes
2023. 9	V1.8	Version revised

VII. Contact Information

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