Soil PH sensor Introduce

Type: RD-SPH-O-01

1. Product Introduce

The pH sensor is widely used in the occasions where pH value monitoring is needed, such as soil pH detection. The input power, induction probe and signal output of the sensor are completely isolated. Safe and reliable, beautiful appearance and easy installation. The probe of this product adopts PH electrode, which has stable signal and high precision. With wide measuring range, good linearity, good waterproof performance, easy to use, easy to install, long transmission distance and so on.

2. Product Features

1. Easy measurement

Soil PH testing is no longer limited to laboratories and professionals, and can be measured by inserting into the soil.

2. Low measurement cost

Compared with traditional laboratory measurement, this product has low cost, fewer steps, no reagents required, and unlimited testing times.

3. High precision

High accuracy, fast speed.

4. Portable measurement

Convenient to carry, can be read by inserting the soil, can grasp the soil condition at any time, make the soil fertility balanced, and reach the suitable growth environment of the plant.

3. Product Parameter

1. Technical Parameters

- Measurement parameters: soil PH
- Measuring range: 3~ 9
- Measurement accuracy: ±0.3PH
- Resolution: 0.1
- Response time: ＜15s
- Output signal: RS485 (standard Modbus-RTU protocol, default address: 01)
- Baud rate:2400;4800;9600
- Supply voltage: 12 ~ 24V DC
- Power consumption≤0.15W（@12V,25 ° C）
- Working temperature range: 0 ~ 55 ° C
- Working humidity range: 5-95%(Relative humidity, non-condensing)

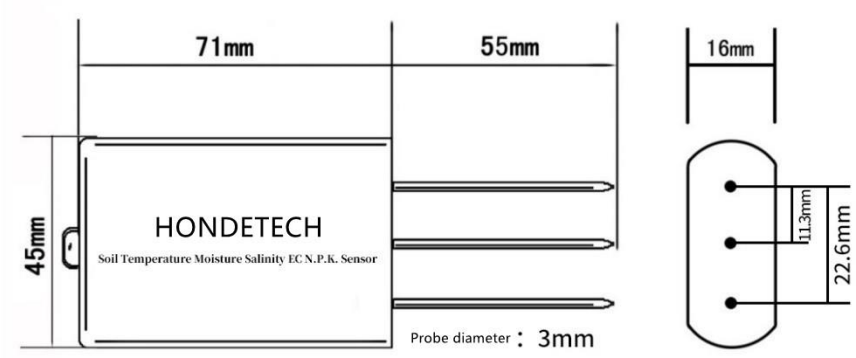
2. Physical parameter

- Sealing material: ABS engineering plastic, epoxy resin, waterproof grade IP68
- Probe Material: Austenitic 316 stainless steel which Anti-rust, anti-electrolysis, salt and alkali

resistance, Suitable for all kinds of soil

- Low power consumption, high sensitivity, signal stabilization

3. Product size



4. Connection diagram

Wire colour	Interface
Brown	Power positive
Black	Power negative
Yellow (gray) color	RS485A
Blue	RS485B

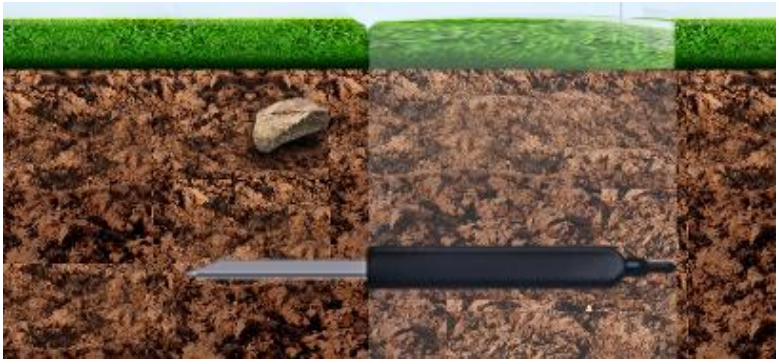
5. Measurement methods

1. Soil Surface measure method

- Select a representative soil environment to clean up surface debris and vegetation
- Insert the sensor vertically and completely into the soil
- If there is a hard object, the measurement location should be replaced and re-measured

- For accurate data, it is recommended to measure multiple times and take the average
- To measure deep soil moisture, it is recommended to use our company's dedicated soil drill

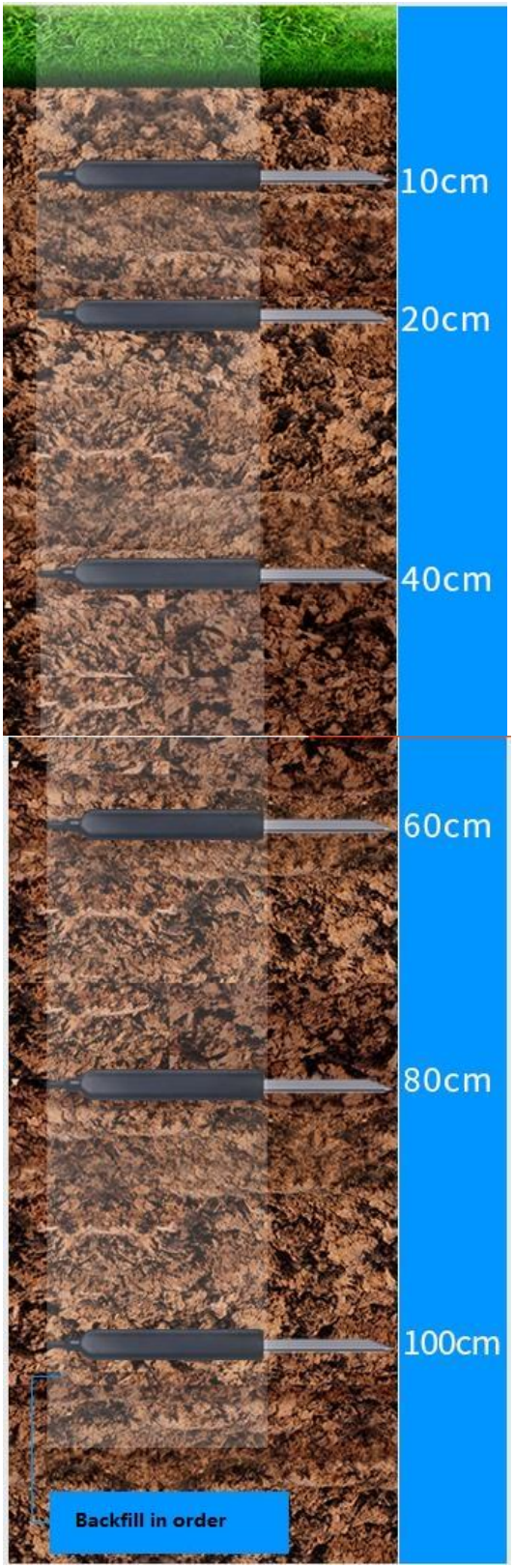
2. Buried measure method



- Make a soil profile in the vertical direction, slightly deeper than the installation depth of the bottommost sensor, between 20cm and 50cm in diameter
- Insert the sensor horizontally into the soil profile
- After the installation is completed, the excavated soil is backfilled in order, layered and compacted, and horizontal installation is guaranteed.
- If you have the conditions, you can put the removed soil in a bag and number it to keep the soil moisture unchanged, and backfill it in reverse order.

3. Three-tier installation

4. Six-tier installation



5. Measure Notes

(1). Avoid installing in areas where heat transfer is easy and will directly cause a temperature difference with the area to be measured, otherwise the PH measurement will be inaccurate.

(2). Install in an area with stable environment, avoid direct light, keep away from windows and air-conditioning, heating and other equipment, and avoid directly facing windows and room doors.

6. Soil pH parameter table

The soil contains many organic acids, inorganic acids, alkalis, salts and other substances. The content of various substances is different, which makes the soil show different acidity and alkalinity. The acidity and alkalinity of the soil can be expressed by acidity, that is, the pH value is used to indicate the acidity and alkalinity of the soil. It is customary to call the soil with a pH value in the range of 6.5 to 7.5 as neutral soil.

See the table below for the classification of soil PH.

PH Value	Soil pH degree
< 4.5	Strong acid
4.5 ~ 5.5	Acid
5.5 ~ 6.5	Weak acid
6.5 ~ 7.5	Moderate
7.5 ~ 8.5	Weakly alkaline
8.5 ~ 9.5	Alkaline
> 9.5	Strong alkaline

The pH of the soil will affect the growth of crops, and various crops have different requirements for soil PH. The following table shows the suitable pH ranges for some major crops.

Crop	Optimal pH range	Crop	Optimal pH range
Rice	5.7 ~ 7.0	Broad bean	6.0 ~ 8.0
Wheat	6.0 ~ 7.0	Tea	4.5 ~ 5.5
Barley	6.0 ~ 7.0	Cotton	6.0 ~ 8.0
Corn	6.0 ~ 7.0	Watermelon	6.0 ~ 7.0
Rape	5.8 ~ 6.7	Tomato	6.0 ~ 7.0
Soybeans	6.5 ~ 7.5	Sugar cane	6.0 ~ 8.0
Peanut	5.0 ~ 6.0	Licorice	7.2 ~ 8.5

*Note: The above PH value is for reference only. For different climates and crops, please refer to the local area.

7. RS485 Communication protocol

1. Standard Modbus-RTU protocol

Baud rate: 2400bit/s, 4800bit/s, 9600 bit/s can be set, the factory default is 9600bit/s

Check digit: none;

Data bit: 8; Stop bit: 1

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

End structure ≥ 4 bytes of time

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

Function code: the instruction function instruction issued by the host, this transmitter only uses the function code 0x03 (read register data).

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

CRC code: two-byte check code.

Host inquiry frame structure

Address code	Function code	Register start address	Register length	Check digit low	Check digit high
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave response frame structure

Address code	Function code	Effective bytes	Data 1 area	Data 2 area	Data N area	Check code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

3. Register address

Register address	PLC or configuration address	Content	Operation	Definition description
0000 H	40001 (Decimal)	PH Value	Read only	Real-time value of PH value (expand 10 times)
0054 H	40085(Decimal)	Calibration value of PH value	Read and write	Integer (expand 10 times)
0030 H	40049 (Decimal)	Device address	Read and write	1~254 (factory default 1)
0031H	40050 (Decimal)	Baud rate	Read and write	Baud rate: 2400 Baud rate: 4800 Baud rate: 9600 Baud rate: 19200

4. Communication protocol examples and explanations

(1) Modify the address, for example: change the address of the transmitter with address 1 to 2, host → slave

Original address	Function code	Register address low	Register address high	New address low	New address high	CRC16 low	CRC16 high
0X01	0X06	0X00	0X30	0X00	0X02	0X08	0X04

If success, the slave will send: 01 06 00 30 00 02 08 04

(2) Read soil PH at device address 0x01

- Inquiry frame

Address code	Function code	Register start address	Register length	Low check bit	Check code high
0X01	0X03	0X00 0X00	0X00 0X01	0X84	0X0A

- Response frame

Address code	Function code	Number of valid bytes	Data area	Low check bit	High Check bit
0X01	0X03	0X02	0x00 0x47	0XD8	0x15

PH calculation instructions:

0047H (hexadecimal) = 71 => pH = 7.1pH

(3) Calibrate the PH value at device address 0x01, for example, increase the PH value by 0.8

- Inquiry frame

Address code	Function code	Register start address	Change value	Low check bit	Check code high
0X01	0X06	0X00 0X54	0X00 0X08	0XC9	0XDC

If success , it will feedback : 01 06 00 54 00 08 C9 DC

(4) Calibration value at device address 0x01 reset to factory settings

- Inquiry frame

Address code	Function code	Register start address	Change value	Low check bit	Check code high
0X01	0X06	0X00 0X54	0X00 0X00	0XC8	0X1A

If success , it will feedback : 01 06 00 54 00 00 C8 1A

(5) Chang the baud rate , the default is 9600, if change into others, please send the following:

- Inquiry frame

Change Baud rate	Address code	Function code	Register start address	Change value	Low check bit	Check code high
2400	0X01	0X06	0X00 0X31	0X24 0X00	0XC3	0X05
4800	0X01	0X06	0X00 0X31	0X48 0X00	0XEE	0X05
19200	0X01	0X06	0X00 0X31	0X19 0X20	0XD2	0X45

If success, it will feedback the same with the sending instruction.

8. Matters needing attention in use

Please read this manual completely before using it.

Do not try to insert the probe into stones or hard clods, so as not to damage the probe.

When the sensor is removed from the soil, the cable cannot be pulled directly.

The sensor probe should be fully inserted into the soil/substrate to reduce the operation error and improve the measurement accuracy.

9. Product warranty

The warranty period of this product is one year. From the date of delivery, within 12 months, due to sensor quality problems (non-man-made damage) caused by the failure, the company is responsible for free repair or replacement, beyond the warranty period only charge cost.