Soil EC Sensor Introduce

Type NO.: RD-SE-P-O

1. Product Introduce

The sensor is soil EC sensors. It has the advantages of convenient carrying, sealing and high precision. It is an ideal choice for soil EC measurement.

The part of soil conductivity is converted into analog or digital signal of soil conductivity by stainless steel probe through sensor. In the development process, the conductivity value is converted into corresponding analog or digital signal. After the conductivity sensor is embedded in soil, the conductivity of soluble salt ions in soil solution can be directly measured.

2. Product Features

1. The sensor is compact in size, high in measurement accuracy, fast in response, and interchangeable.
2. Good sealing, waterproof grade IP68, can be directly buried in the soil, and is not corroded.
3. Real-time temperature and humidity monitoring function, which can measure the temperature of soil at different depths.
4. The soil quality is less affected and the application area is wide.
5. High measurement accuracy, reliable performance, ensuring normal operation, fast response, high data transmission efficiency.

3. Product application

Applicable to water-saving agricultural irrigation, meteorological monitoring, environmental monitoring, greenhouses, flowers and vegetables, grassland pastures, soil speed measurement, plant cultivation, scientific experiments, etc., which need to measure soil temperature and humidity.

4. Product Parameter

1. Technical Parameters

(1) Measurement parameters: soil EC

(2) Unit of measurement: μ S/cm

(3) EC range: 0-20000us/cm , (can be customized 0 ~ 2000 μ S/cm, 0 ~ 10000 μ S/cm,);

(4) Measurement accuracy: ±2%

(5) Working range: -30 ° C ~ 70 ° C

(6) Output signal:

- A: voltage signal (0 ~ 2V, 0 ~ 2.5V, 0 ~ 5V, 0 ~ 10V Optional)
- B: 4 to 20 mA (current loop)
- C: RS485 (standard Modbus-RTU protocol, device default address: 01)

(7) Supply voltage:

- 5 ~ 24V DC (when the output signal is 0 ~ 2V, 0 ~ 2.5V, RS485)
- 12~24V DC (when the output signal is 0~5V, 0~10V, 4~20mA)

(8) Stabilization time: <1 second

(9) Response time: <1 second

(10) Measuring area: a cylinder with a diameter of 7 cm and a height of 7 cm centered on the center probe

2. Physical parameter

(1) Probe specifications: 55mm, φ3mm

(2) Probe material: 316L stainless steel;

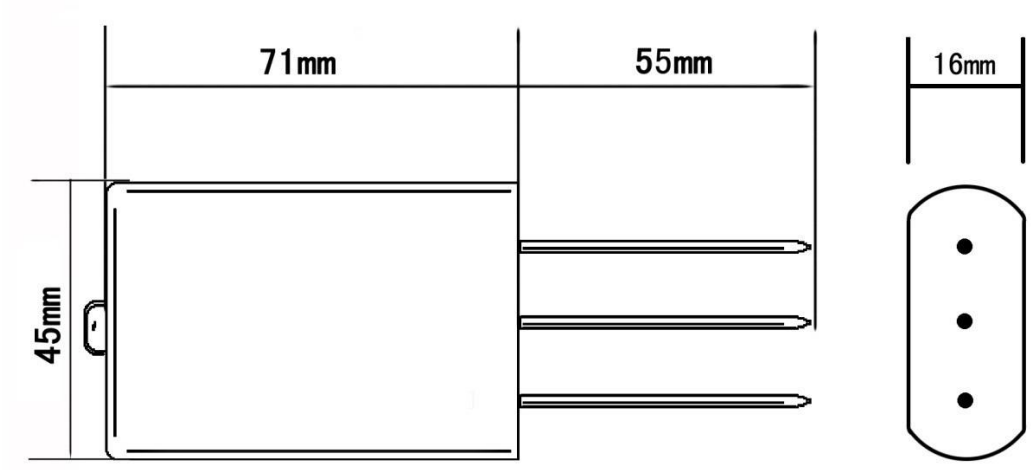
(3) Sealing material: ABS engineering plastic, epoxy resin, waterproof grade IP68

(4) Cable specification: standard 2 meters (can be customized for other cable lengths, up to 1200 meters)

3. Impedance requirements for current signals

Supply Voltage	9V	12V	20V	24V
Maximum impedance	125Ω	250Ω	500Ω	>500Ω

5. Product size



6. Connection diagram

1. For the RS485 output

Colour	Description	Note
Red	Power positive	5-24 V DC
Black	GND	GND
Yellow	485-A	485-A
Green	485-B	485-B

2. For the 0-10V output

Colour	Description	Note
Red	Power positive	12-24V DC
Black	GND	GND
Yellow	Temperature voltage output	GND is the negative output
Green	EC voltage output	

7. Measurement methods

1. Surface speed test

(1) Select a representative soil environment to clean up surface debris and vegetation

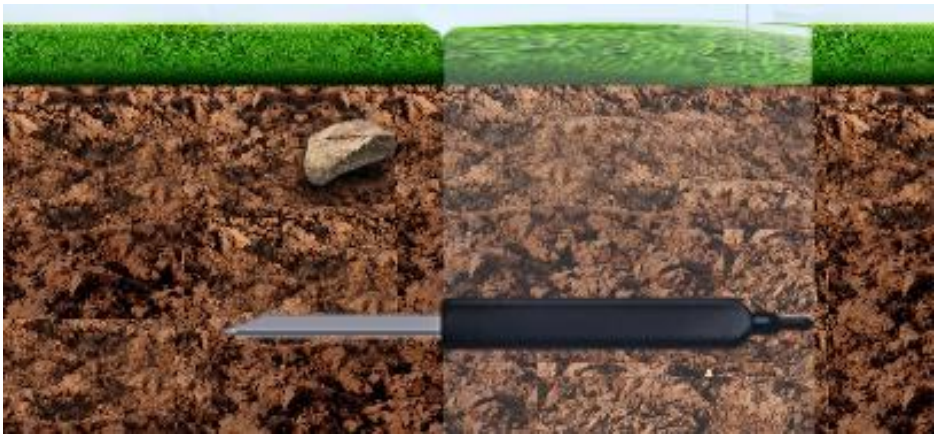
(2) Insert the sensor vertically and completely into the soil

(3) If there is a hard object, the measurement location should be replaced and re-measured

(4) For accurate data, it is recommended to measure multiple times and take the average

(5) To measure deep soil moisture, it is recommended to use our company's dedicated soil drill

2. Ground measurement



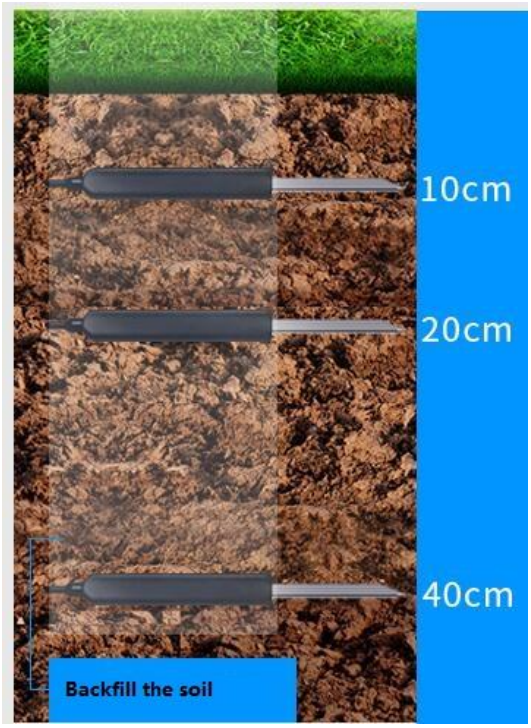
(1) Make a soil profile in the vertical direction, slightly deeper than the installation depth of the bottommost sensor, between 20cm and 50cm in diameter

(2) Insert the sensor horizontally into the soil profile

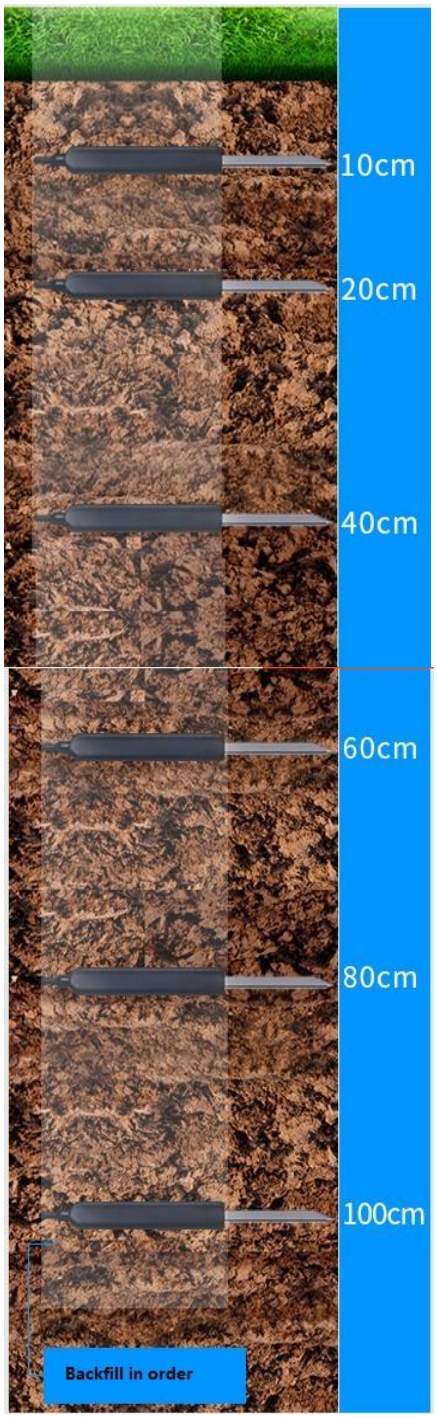
(3) After the installation is completed, the excacated soil is backfilled in order, layered and compacted, and horizontal installation is guaranteed.

(4) 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



8. Data conversion method

The soil EC sensor has good linear characteristics in the range of soil saturated water content.

1. Current voltage analog output

EC: soil EC

V: voltage value collected by the collector, unit: V;

A: Current value collected by the collector, potential: mA

Output signal	EC conversion method (0 ~ 20000us/cm)
0 ~ 2V DC	EC = 10000*V
0 ~ 5V DC	EC = 4000*V
0 ~ 10V DC	EC = 200*V
4 ~ 20mA	T = 1250*A – 5000

2. 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

3. 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

4. Register address

Register address	PLC or configuration address	Content	Operation	Definition description
0000 H	40001 (Decimal)	Soil EC	Read only	Real-time value of soil moisture value
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

5. Address Modification

For example, the sensor with address 1 is changed to address 2, and the host → slave

Original address	Function code	Start register high	Start register low	High starting address	Low starting address	Low CRC16	CRC16 High
0X01	0X06	0X00	0X30	0X00	0X02	0X08	0X04

If the sensor receives correctly, the data returns according to the original route.

Remarks: If you forget the original address of the sensor, you can use the broadcast address 0XFE instead. When using 0XFE, the host can only connect with one slave, and the return address is still the original address, which can be used as an address query method.

6. Query Data

Inquire the data of sensor (address 1) (soil EC) , master → slave

Address	Function code	Start register address high	Start register address low	High register length	Low register length	Low CRC16	CRC16 High
0X01	0X03	0X00	0X00	0X00	0X01	0X84	0X0A

If the sensor receives correctly, return the following data, slave → host

Address	0X01		
Function code	0X03		
Data length	0X02		
Register 0 data high	0X01	Soil EC: hexadecimal to decimal	Soil EC: 356us/cm
Register 0 data low	0X64		
Low CRC16	0XB8		
High CRC16	0X3F		

Change the HEX(0164) to decimal(356), so the soil EC=356us/cm.

7. 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
9600	0X01	0X06	0X00 0X31	0X96 0X00	0XB7	0XA5
19200	0X01	0X06	0X00 0X31	0X19 0X20	0XD2	0X45

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