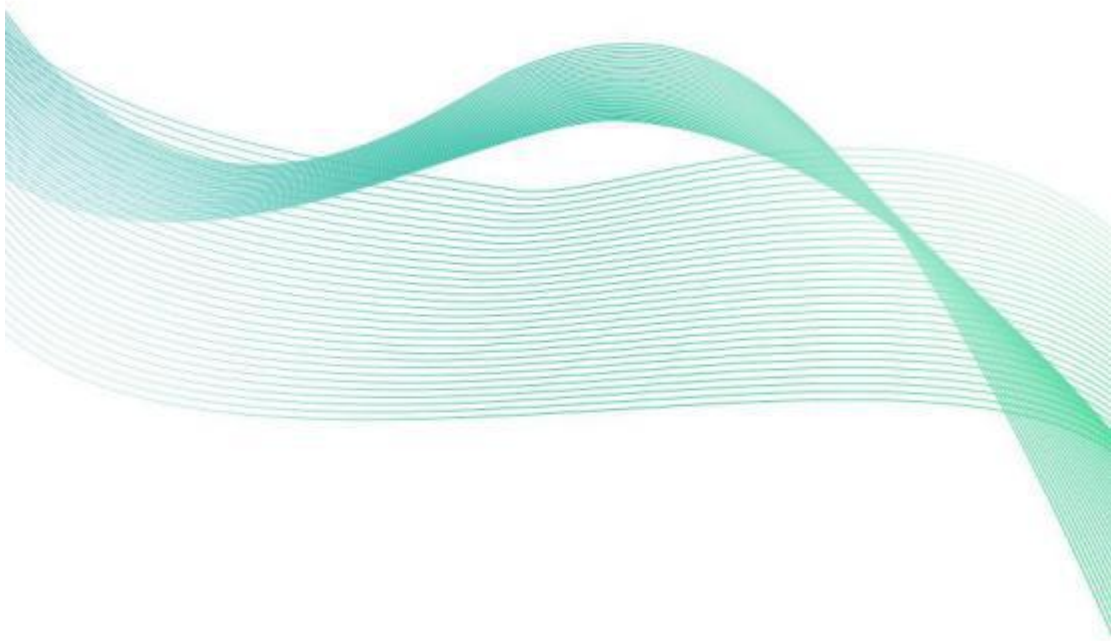


Henan Bingsheng Industrial Co.,
Ltd

Full Parameter Soil Sensor (Type RS 485)



catalogue

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Chapter 1: Product Introduction

1.1 Product Overview

The transmitter has high performance stability and sensitivity, fast response, stable output, suitable for all kinds of soil quality. It is an important tool to observe and study the occurrence, evolution and improvement of water and salt soil. By measuring the dielectric constant of the soil, it can directly and stably reflect the true water content of various soils. The volume percentage of measurable soil water is a method for measuring soil water in accordance with current international standards. Can be buried in the soil for a long time, long-term electrolysis resistance, corrosion resistance, vacuum sealing, completely waterproof.

The transmitter is suitable for soil moisture monitoring, scientific experiments, water-saving irrigation, greenhouse, flowers and vegetables, grassland pasture, soil speed testing, plant culture, sewage treatment, conductivity, PH testing and other occasions.

1.2 Functional features

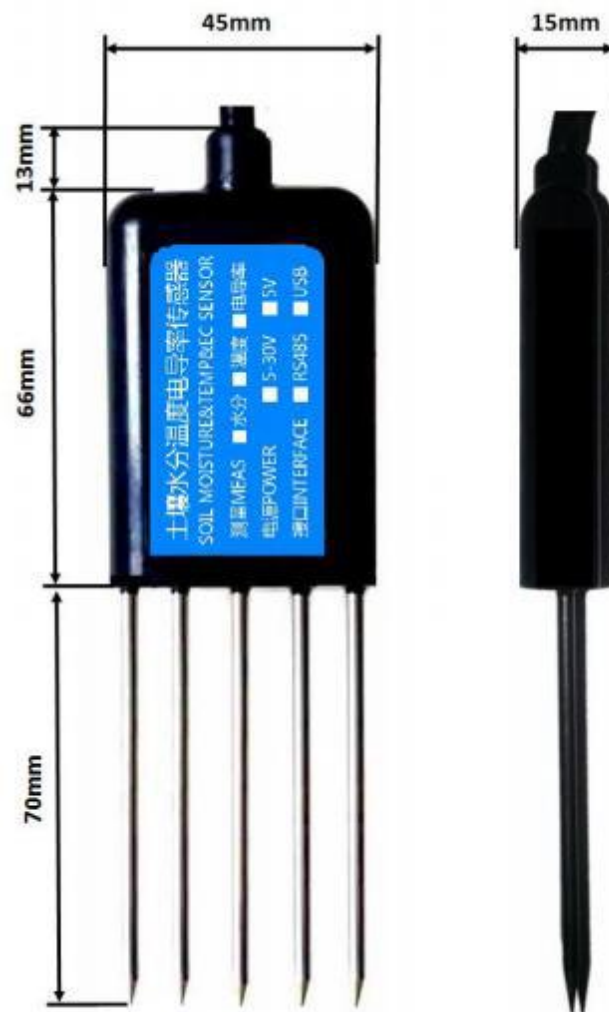
- Soil moisture content, conductivity, temperature, nitrogen, phosphorus, potassium, fertility, and PH value eight in one.
- Low threshold, few steps, fast measurement, no reagent required, no limit to the number of tests.
- The electrode adopts specially treated alloy material, which can withstand strong external impact and is not easy to damage.
- Fully sealed, acid-alkali corrosion resistance, can be buried in soil or directly into water for long-term dynamic detection.
- High accuracy, fast response, good interchangeability, probe insertion design to ensure accurate measurement, reliable performance.
- Can also be used in the conductivity of water and fertilizer integrated solution, and other nutrient solutions and matrix.
- PH value measurement accuracy is high, up to ± 0.3 PH accuracy, fast response speed, good interchangeability.

1.3 Main parameters

DC power supply (by default)	DC 5-30V	
maximum power dissipation	0.5W (24V DC Power Supply)	
working temperature	-20°C~+60°C	
Core chip temperature resistance	85°C	
Conductivity parameters	range	0-20000us /cm
	resolution ratio	1us/cm
	accuracy	0 ± 3%FS in range of 10000 u s / cm; ± 5%FS in range of 10000-20000us / cm
Soil moisture parameters	range	0100%
	resolution ratio	0.1%
	accuracy	0-50% ± 2%, 50100% ± 3% (brown soil, 60%, 25°C)
Soil temperature parameters	range	-40~80°C
	resolution ratio	Resolution: 0.1°C
	accuracy	.5±0°C (25°C)
Soil PH parameters	range	3~10PH
	resolution ratio	0.1
	accuracy	±0.3PH
N, phosphorus and potassium parameters	range	11999 mg/kg(mg/L)
	resolution ratio	1 mg /kg (mg /L)
	accuracy	±2%FS
The electrical conductivity temperature compensation	Built-in temperature compensation sensor, compensation range 0-50°C	

levels of protection	IP 68
Probe material	Special electrode for corrosion prevention
sealing material	Black flame-retardant epoxy resin
Default cable length	2 meters, the cable length can be customized according to the requirements
outline dimension	45*15*123mm
output signal	RS 485 (Modbus protocol)

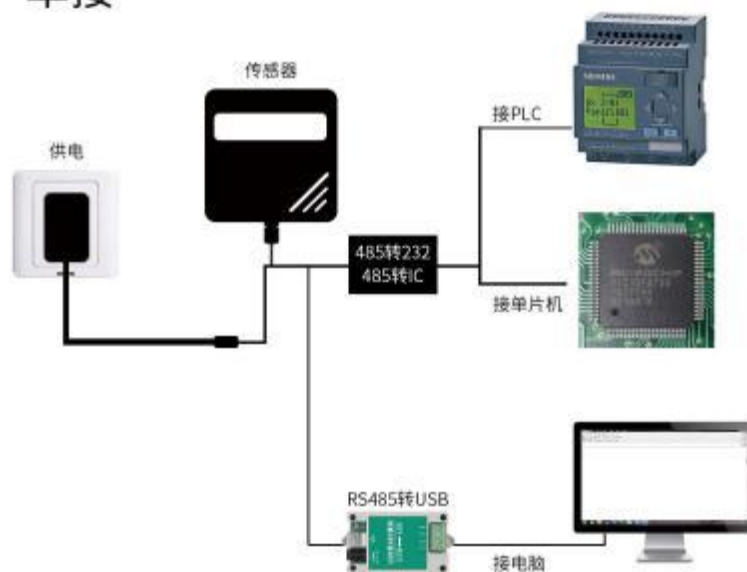
Shell size



Equipment dimensions drawing (in mm)

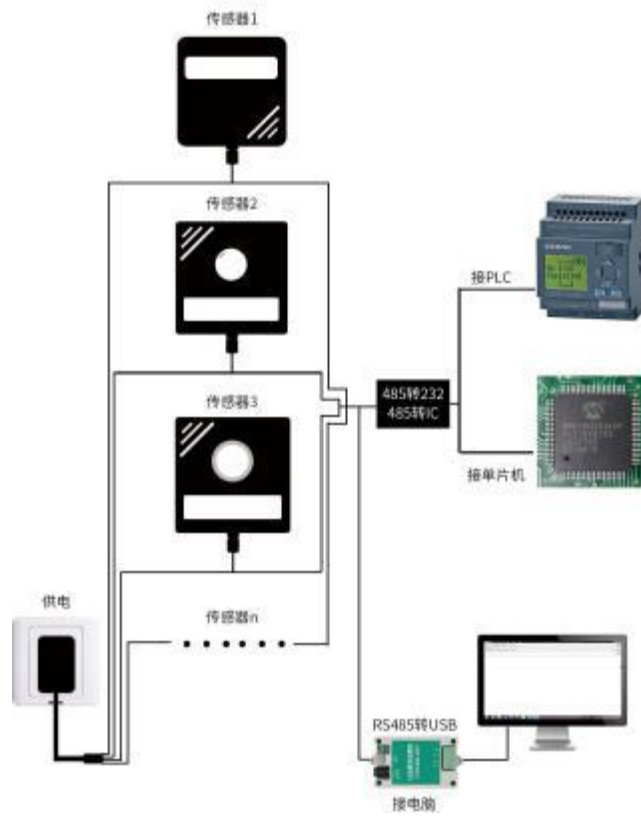
.41 System framework diagram

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The product can also be combined with multiple sensors in a 485 bus, theoretically one bus can be 254 485 sensors, 485 on the other end, interface PLC, 485 interface chip, or use USB to 485 to connect to the computer, using our sensor configuration tools (only one device can be connected when using the configuration software).

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Chapter 2: Hardware Connection

.12 Check the equipment before installation

equipment list:


- 1 set of transmitter equipment
- Certificate of qualification, wiring instructions, etc
- USB to 485 (optional)

.22 Interface description

Wide voltage power supply input of 5~30V can be used.485 When wiring the signal line, note that A / B lines cannot be connected to reverse, and the addresses of multiple devices on the bus cannot be conflicting.

2.2.1, Sensor wiring

3 Sensor wiring

model	hookup
RS 485 joggl e moul d M odbu s joint opin ion	<p>Red (V +):, the power supply is positive</p> <p>Black (G): Power supply ground</p> <p>Yellow (T +): RS 485 + / A / T +</p> <p>Green (T-): RS 485- - / B / T-</p>
	

Chapter 3: Methods of Use

Because the electrode directly determines the conductivity of soluble salt ions in soil, the water content of soil volume should be higher than about 20% for the soluble ions in soil to correctly reflect the conductivity of soil. During long-term observations, the measurements after irrigation or rainfall are closer to the true level. If a quick test is conducted, it can be watered at the measured soil and the water is fully permeated.

If in a hard surface survey, drilling shall first (the aperture shall be less than the probe diameter), then inserted into the soil and compaction of the soil and then measurement; the transmitter shall prevent violent vibration and impact, not with hard objects. Because the transmitter is packaged in black, the transmitter will be heated sharply under the strong sunlight (up to more than 50°C). In order to prevent the impact of excessive temperature on the temperature measurement of the transmitter, please pay attention to shading and protection when using in the field or in the field.

.13. Quick test method

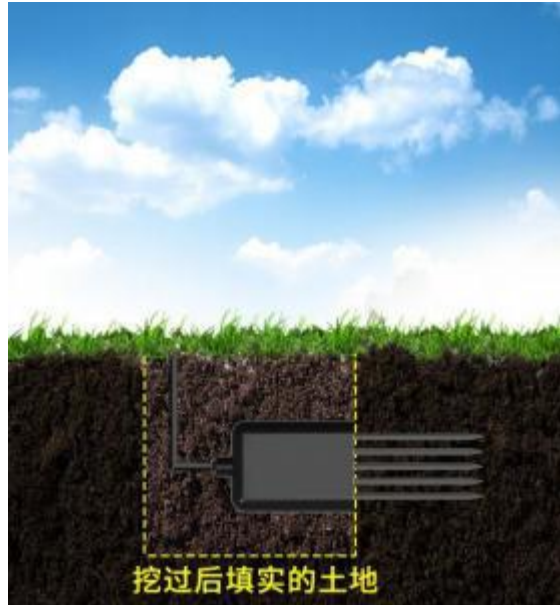
Select the appropriate measuring site, avoid stones to ensure that the steel needle does not touch hard objects, put aside the topsoil according to the required measurement depth, maintain the original tightness of the soil below, hold the sensor to insert vertically into the soil,

When inserting, do not shake left and right. It is recommended to average multiple measurements in a small range of a measuring point.



.23 buried measurement method

Dig a hole with a diameter $> 20\text{cm}$ vertically and horizontally insert the steel needle of the transmitter into the hole at a established depth, and the pit is buried tightly. After stabilizing for a period of time, it can be measured and recorded for several days, months or even longer.



.33 considerations

1. All steel needles must be inserted into the soil during measuring.
- 2, avoid strong sunlight directly exposed to the transmitter resulting in high temperature. Pay attention to lightning strike in the field.
3. When measuring PH, conductivity, nitrogen, phosphorus, potassium, fertility and other parameters, the soil should be kept moist (more than 20%).
4. The transmitter protection grade is IP 68, which can soak the whole transmitter in water.
5. When used for the first time, there are oil stains on the probe. It is recommended to insert it in the soil for several times, and grind off the oil on the needle before measuring it.
6. In the 5-heel probe, a black color probe is a consumer, which is recommended in the application of long-term measurement of acid soil.
7. The PH value cannot be read immediately after the sensor is inserted into the soil. The PH value can only be read until the value value is stabilized

Chapter 4: Communication Protocol

.14. Basic parameters of communication

encoding	The 8-bit binary
data bit	Eight

parity check bit	not have
stop bit	One
error check	CRC 16 (Redundant cycle code)
Baud rate	1200bit / s, 2400bit / s, 4800bit / s, 9600 bit/s, 19200 bit/s can be set, the factory default is 9600bit / s

.24 Data frame format definition

Adopt the Modbus-RTU communication protocol in the following format:

Time for the initial structure of 4 bytes

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

End the structure 4 bytes

Address code: is the address of the transmitter, which is unique in the communication network (factory default 0x 01).

Function code: the transmitter only uses the function code 0x 03 (read the register data).

Data area: data area is specific communication data, note 16bits data high byte in front!

CRC code: a two-byte check code.

Host inquiry frame structure:

address code	FC	Register start address	register length	Calibration code low	Calibration code high
1 Bytes	1 Bytes	2 Bytes	2 Bytes	1 Bytes	1 Bytes

Deliver answer frame structure:

address code	FC	Number of valid bytes	Data area 1	Second data area	Data area # N	check code
1 Bytes	1 Bytes	1 Bytes	2 Bytes	2 Bytes	2 Bytes	2 Bytes

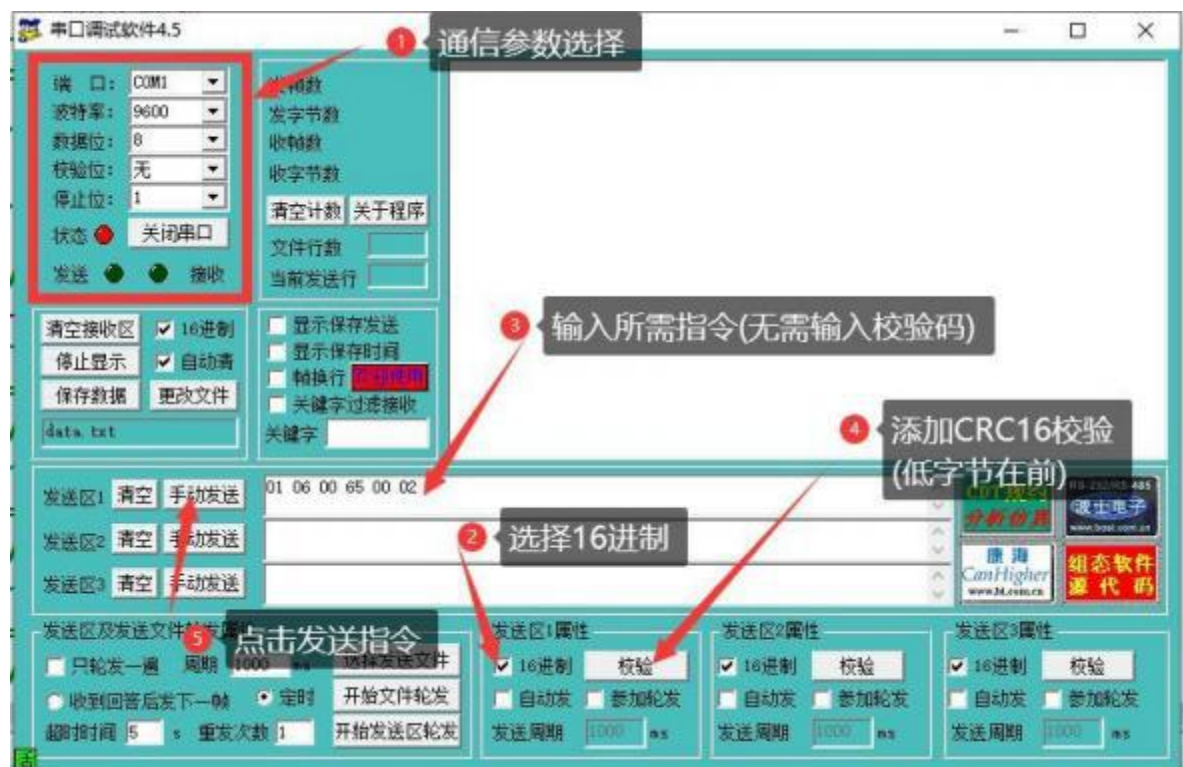
4.3 Register address

The parameter name	Register address (16 / 10 MILTER)	parameter type	Modbus FC	Parameter ranges and description
volumetric moisture content	0x 0000/0	UNIT 16 Read-only	3/4	0 – 1000 corresponds to 0 – 100.0%
temperature scale	0x 0001/1	UNIT 16 Read-only	3/4	-200-800 corresponding to this one -20.0~80.0℃.

conductivity	0x 0002/2	UNIT 16 Read -only	3/4	0-20000 corresponding 0-20000us /cm
PH price	0x 0003/3	UNIT 16 Read -only	3/4	30 – 100 correspond to this one

				3.0-10.0
nitrogen content	0x 0004/4	UNIT 16 Read-only	3/4	0-2000 corresponds to 0-2000mg / kg
Phosphate content	0x 0005/5	UNIT 16 Read-only	3/4	0-2000 corresponds to 0-2000mg / kg
potassium content	0x 0006/6	UNIT 16 Read-only	3/4	0-2000 corresponds to 0-2000mg / kg
salinity	0x 0007/7	UNIT 16 Read-only	3/4	0-2000 corresponds to 0-2000mg / kg
TDS	0x 0008/8	UNIT 16 Read-only	3/4	0-2000 corresponds to 0-2000mg / kg
Modbus Equipment address	0x 0064 /100	UINT 8 read-write	3/4/6	1-254 Corresponding to the equipment address 1-254 Default address: 01
Modbus Paud rate	0x 0065 /101	UINT 8 read-write	3/4/6	0: 1200 1: 2400 2: 4800 3:9600 (by default) 4: 19200

4.3 Use of computer-side communication software



4.4 Example and explanation of the communication protocol

Example 1: Read the parameter values of all the parameters (address 0x 01) detected by the sensor

The host sends the instruction: 01 03 00 00 00 08 44 0C

Host instruction resolution:

01 / / Equipment address

03 // 0x 03 function code (read instructions)

00 00 / / Start register address

00 08 / / Read the 8 register addresses

44 0C // CRC 16 check, low bytes in front

Sensor return data: 01 03 10 03 E 8 00 E 3 02 9D 00 51 00 21 00 2E 00 6B 00 19 90 AC

Sensor return data analysis:

01 / / Equipment address

03 // 0x 03 function code (read instructions)

10 / / Response data length is 16 Bytes

03 E 8 / / moisture 100.0% RH, retain 1 decimal place, 0-1000 corresponds to 0-100%

00 E 3 / / temperature 22.7°C, retain 1 decimal place, -200-800 corresponding to -20.0-80.0°C

02 9D // Conductivity 669us / cm, 0-20000 corresponds to 0-20000us / cm

00 51 // pH PH = 8.1,30-100 corresponding to PH 3.0-10.0

00 21 // N content N =33mg / kg, 0-2000 corresponds to 0-2000mg / kg

00 2E // P content P =46mg / kg, 0-2000 corresponds to 0-2000mg / kg

00 6B // potassium content P =107mg / kg, 0-2000 corresponds to 0-2000mg / kg

00 19 // salt content P =25mg / kg, 0-2000 corresponds to 0-2000mg / kg

90 AC // CRC 16 check, low byte in front

Example 2: Modify the sensor address (01, address modified to 05)

Host to send instruction: 01 06 00 64 00 05 08 16

Host instruction resolution:

01 // Equipment address

06 // 0x 06 function code (write instructions)

00 64 // Start register address

00 05 // Overwrite the address to 05

08 16 // CRC 16 Check, low bytes in front

Sensor return data: 01 06 00 64 00 05 08 16

Sensor return data analysis:

01 // Equipment address

06 // 0x 06 function code (write instructions)

00 64 // Start register address

00 05 // The address has been changed to 05

08 16 // CRC 16 Check, low bytes in front

Example 3: Modify sensor rate (9600 modified to 4800)

The host sends the instruction: 01 06 00 65 00 02 18 14

Host instruction resolution:

01 // Equipment address

06 // 0x 06 function code (write instructions)

00 65 // Start register address

The 00 02 // port rate was changed to 4800

08 14 // CRC 16 Check, low bytes in front

Sensor return data: 01 06 00 65 00 02 18 14

Sensor return data analysis:

01 / / Equipment address

06 / / 0x 06 function code (write instructions)

00 65 / / Start register address
The 00 02 / / port rate was changed to 4800
08 14 / / CRC 16 Check, low bytes in front

Chapter 5: Common Problems and Solutions

No output or output errors

probable cause:

①, The computer has a COM port, the choice of the mouth is not correct.

②, Porter rate error.

The ③, 485 bus is disconnected, or lines A and B are reversed.

④. If the number of equipment is too much or the wiring is too long, the power supply should be provided nearby, add 485 enhancer, and add 120 Ω terminal resistance.

⑤, USB to 485 driver is not installed or damaged.

⑥, Equipment damage.