TR-01
Conductivity soil temperature moisture three-in-one transmitter 485 type manual



SIBO.X INDUSTRIAL CO.,LTD.
Add: No. Building 1, No. 1, Jingshi Road, Cicheng Town Industrial Park, Jiangbei District, Ningbo City, Zhejiang, China
https://www.sbxsun.com
Email: info@sbxsun.com
Tel: +86-15958288207

Table of Contents

1.product description 1
1.1product description 1
1.2Features 1
1.3technical parameter 1
1.4product model 2
2.Dimensions 2
3.Instructions 2
3.1 Quick test method 2
3.2Buried survey method 3
3.3 Precautions 4
4.Equipment installation instructions 4
4.1 Check before installation 4
4.2Interface Description 4
4.3 Wiring instructions 4
5.Configuration software installation and use 5
5.1 Software selection 5
5.2parameter settings 5
6.letter of agreement 6
6.1Communication basic parameters 6
6.2Data frame format definition 7
6.3 Register address 7
6.4 Sample communication protocol and explanation 8
7.Common problems and solutions 9
7.1 The device cannot be connected to a PLC or computer 9

1.product description

1.1product description

The sensor has stable performance and high sensitivity, and is an important tool for observing and studying the occurrence, evolution, improvement and water-salt dynamics of saline soil. By measuring the dielectric constant of the soil, it can directly and stably reflect the true moisture content of various soils. The volume percentage of soil moisture that can be measured is a method of measuring soil moisture that complies with current international standards.

The sensor is suitable for soil moisture monitoring, scientific experiments, water-saving irrigation, greenhouses, flowers and vegetables, grassland pastures, soil rapid measurement, plant cultivation, sewage treatment, precision agriculture and other occasions.

1.2 Functional characteristics

1) The three parameters of soil moisture, electrical conductivity and temperature are integrated.

2) It can also be used for the conductivity of water and fertilizer integrated solutions, and other nutrient solutions and substrates.

3) The electrode adopts specially treated alloy materials, which can withstand strong external impact and is not easy to damage.

4) Completely sealed, resistant to acid and alkali corrosion, can be buried in the soil or directly into the water for long-term dynamic detection.

5) High precision, fast response, good interchangeability, probe insertion design ensures accurate measurement and reliable performance.

1.3Technical parameter

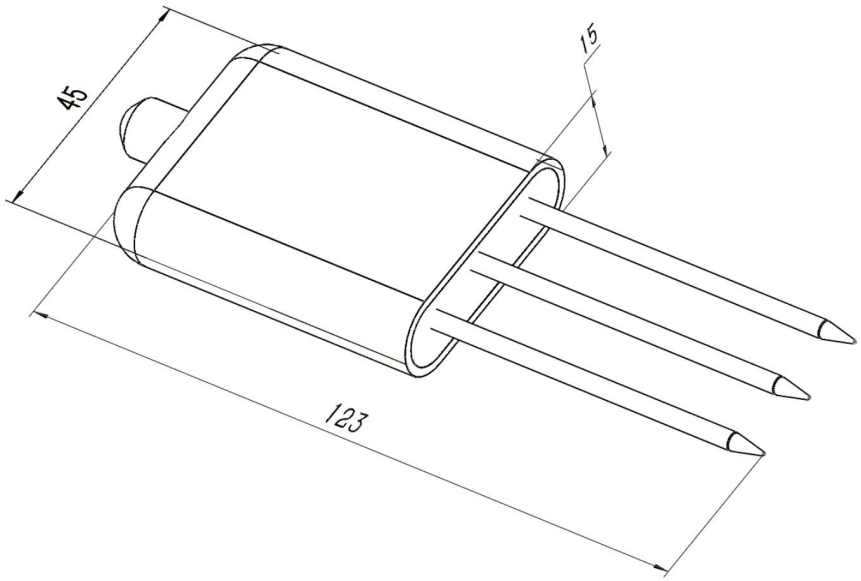
DC power supply (default)	DC 4.5-30V	
Maximum power consumption	0.7W（24V DC powered by）	
Operating temperature	-40℃~+60℃	
	85℃	
Conductivity parameter	Range	0-20000us/cm
	Resolution	10us/cm
	Accuracy	0-10000us/cm In range±3%; 10000-20000us/cm In range±5%
Soil moisture parameters	Range	0-100%
	Resolution	0.1%
	Accuracy	0-50% Inside 2%，50-100% Inside 3%
Soil temperature parameters	Range	-40~80℃
	Resolution	Resolution：0.1℃

	Accuracy	±0.5℃（25℃）
Conductivity temperature compensation	Built-in temperature compensation sensor, compensation range 0-50℃	
Protection class	IP68	
Probe material	Anti-corrosion special electrode	
Sealing material	Black flame retardant epoxy resin	
Default cable length	2 meters, cable length can be customized	
Dimensions	45*15*123mm	
output signal	RS485 (Modbus protocol)	

1.4product model

RS-				Company code
	ECTH-			Conductivity temperature moisture three-in-one transmitter
	ECH-			Conductivity soil moisture transmitter
		N01-		RS485 (Modbus-RTU protocol）
			TR-1	Soil testing enclosure

2.Dimensions



Equipment size drawing (unit: mm)

3.Instructions

Since the electrode directly measures the conductivity of the soluble salt ions in the soil, the volumetric water content of the soil needs to be higher than about 20% to accurately reflect the conductivity of the soil. In long-term observation, the measured value after irrigation or rainfall is

closer to the true level. If a quick test is carried out, water can be poured on the measured soil first, and the measurement can be carried out after the water has fully penetrated.

If you are measuring on a hard surface, you should drill a hole (the diameter of the hole should be smaller than the diameter of the probe), and then insert it into the soil and compact the soil before measuring; the sensor should prevent violent vibration and shock, let alone hit with a hard object. Because the sensor is in a black package, it will cause the sensor to heat up sharply (up to 50°C or more) under strong sunlight. In order to prevent excessive temperature from affecting the temperature measurement of the sensor, please pay attention to shading and protection when using it in the field or in the field .

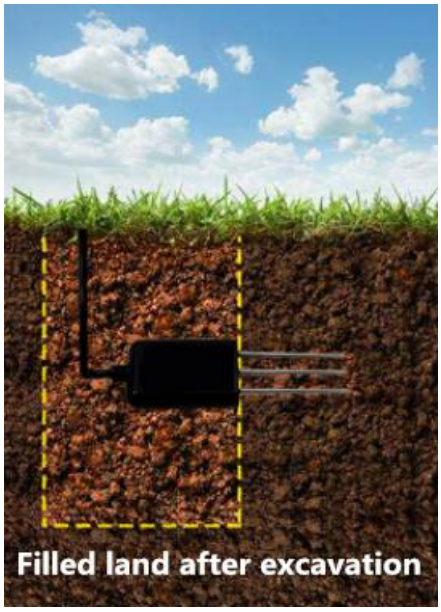
3.1 Method of Speed Measurement

Choose a suitable measurement location, avoid stones, ensure that the steel needle does not touch hard objects, throw away the topsoil according to the required measurement depth, maintain the original tightness of the soil below, hold the sensor vertically into the soil, insert It is not allowed to sway from side to side. It is recommended to measure multiple times to get the average value within a small range of a measuring point.



3.2 Buried survey method

Dig a pit with a diameter >20cm vertically, insert the steel needle of the sensor horizontally into the pit wall at a predetermined depth, and fill the pit tightly. After a period of stability, it can be measured and recorded for several days, months or even longer.



3.3 Precautions

1. The steel needle must be fully inserted into the soil during measurement.

2. Avoid direct sunlight on the sensor causing excessive temperature. Pay attention to lightning protection when using in the field.

3. Do not bend the steel needle violently, do not pull the sensor lead forcibly, and do not drop or hit the sensor violently.

4. The protection grade of the sensor is IP68, which can soak the sensor in the water.

5. Due to the existence of radio frequency electromagnetic radiation in the air, it should not be energized in the air for a long time.

4.Equipment installation instructions

4.1 Check before installation

Equipment List:

1. One sensor device

2. Qualification certificate, warranty card, wiring instructions, etc.

3. USB to 485 (optional)

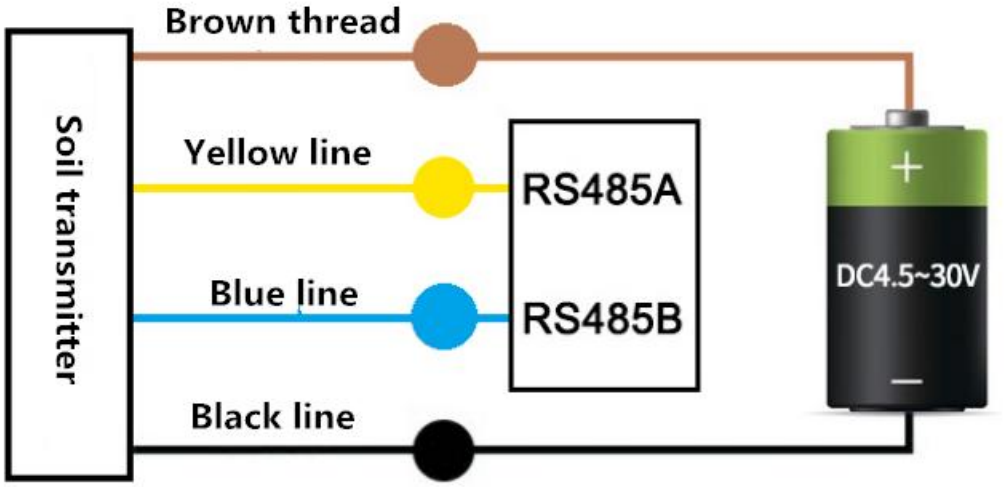
4.2 Interface Description

Wide voltage power input can be 4.5~30V. 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.

4.3 Wiring instructions

Thread color	Explanation	Remarks
brown	Power is positive	4.5~30V DC

black	Power ground	GND
yellow	485-A	485-A
blue	485-B	485-B



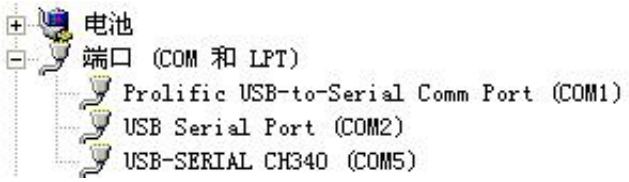
5.Configuration software installation and use

5.1 Software selection

Open the data package, select "Debug software" --- "485 parameter configuration software", find and Just open it.

5.2 parameter settings

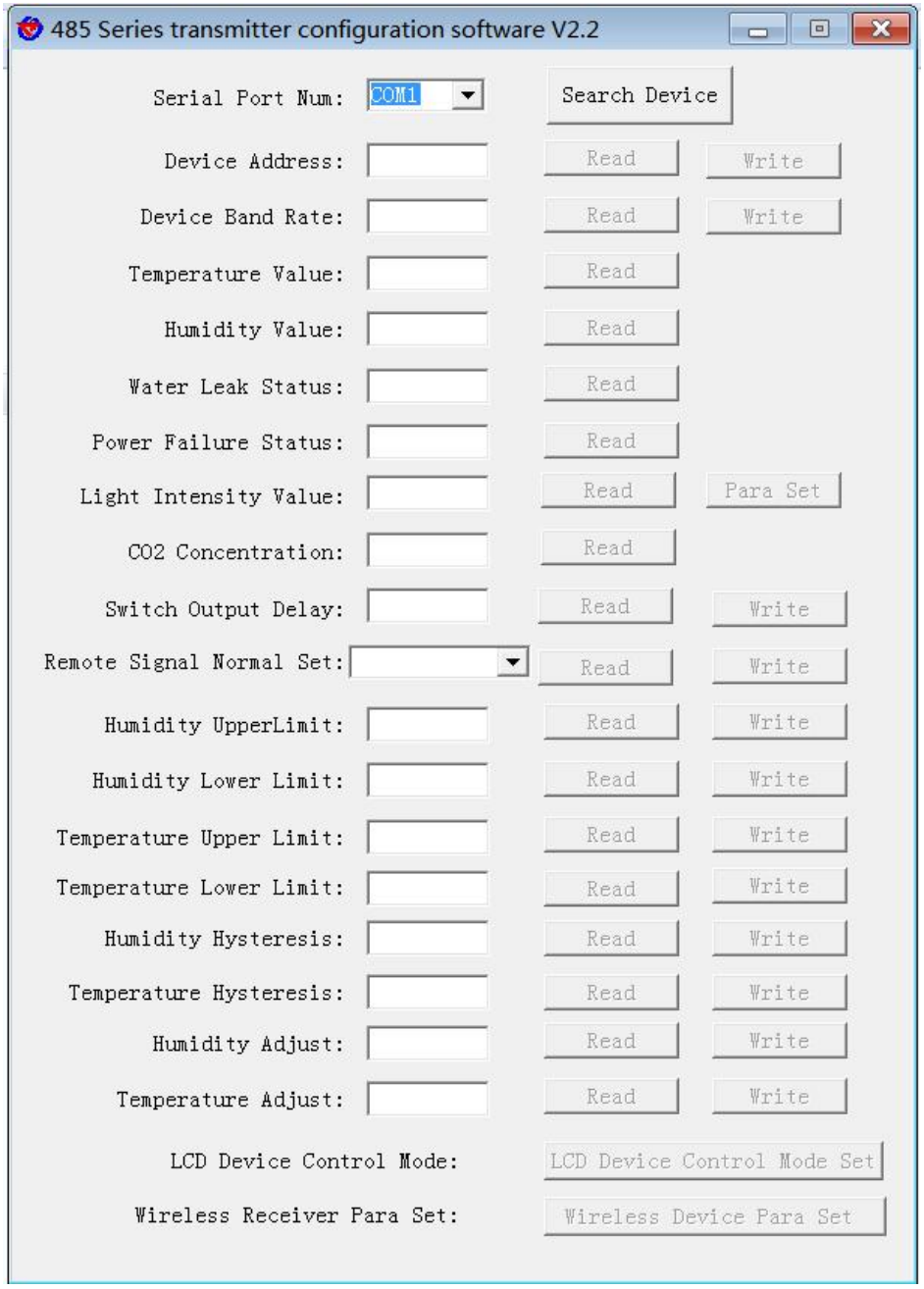
①、Select the correct COM port ("COM" in "My Computer-Properties-Device Manager-Port" to view the COM port). The following figure lists the driver names of several different 485 converters.



② Only connect one device and power it on, click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

③ Modify the address and baud rate according to the needs of use, and at the same time can query the current functional status of the device.

④ If the test is unsuccessful, please recheck the device wiring and 485 driver installation.



6.letter of agreement

6.1Communication basic parameters

Coding	8-bit binary
Data bit	8 bit
Parity bit	no
Stop bit	1 person
Error checking	CRC (Redundant Cyclic Code)
Baud rate	Can be set, the factory default is 4800bit/s

6. 2 Data frame format definition

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

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

Function code: instruction function instruction issued by the host.

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 code low byte	Check code high byte
1byte	1byte	2byte	2byte	1byte	1byte

Slave response frame structure:

address code	functio n code	Effective bytes	Data area	Data area two	Data N area	Check code low byte	Check code high byte
1byte	1byte	1byte	2byte	2byte	2byte	1byte	1byte

6. 3 Register address

Register address	PLC or configuration address	content	operati ng	Definition description
0000 H	40001 (Decimal)	Water content	Read only	Real-time value of water content (expand 10 times)
0001 H	40002 (Decimal)	Temperature value	Read only	Real-time temperature value (enlarge 10 times)
0002 H	40003 (Decimal)	Conductivity	Read only	Real-time conductivity
0003 H	40004 (Decimal)	salinity	Read only	Salinity real-time value

0004 H	40005 (Decimal)	Total dissolved solids TDS	Read only	TDS real-time value
0022 H	40035 (Decimal)	Conductivity temperature coefficient	Read and write	0-100 corresponds to 0.0%-10.0% 0.0% by default
0023 H	40036 (Decimal)	Salinity coefficient	Read and write	0-100 corresponds to 0.00-1.00 Default 55 (0.55)
0024 H	40037 (Decimal)	TDS coefficient	Read and write	0-100 corresponds to 0.00-1.00 Default 50 (0.5)
0050 H	40081 (Decimal)	Temperature calibration value	Read and write	Integer (expand 10 times)
0051 H	40082 (Decimal)	Calibration value of water content	Read and write	Integer (expand 10 times)
0052 H	40083 (Decimal)	Conductivity calibration value	Read and write	Integer
07D0 H	42001 (Decimal)	Device address	Read and write	1~254 (factory default 1)
07D1 H	42002 (Decimal)	Device baud rate	Read and write	0 for 2400 1 for 4800 2 for 9600

Note: The conductivity moisture equipment has no temperature value and its calibration value register

6. 4 Sample communication protocol and explanation

Example: Read the conductivity and temperature moisture value of the three-in-one device for conductivity, temperature and moisture (address 0x01)

Inquiry frame

address code	function code	starting address	Data length	Check code low byte	Check code high byte

0x01	0x03	0x00 0x00	0x00 0x03	0x05	0xCB

Reply frame

address code	function code	Return valid Bytes	Moisture value	Temperature value	Conductivity value	Check code Low byte	Check code high byte
0x01	0x03	0x06	0x02 0x92	0xFF 0x9B	0x03 0xE8	0xD8	0x0F

Temperature calculation:

When the temperature is lower than 0 ℃, the temperature data is uploaded in the form of complement.

Temperature: FF9B H (Hexadecimal) = -101 => Temperature = -10.1℃

Moisture calculation:

Moisture: 292 H (hexadecimal) = 658 => Humidity = 65.8%, that is, the soil moisture content is 65.8%.

Conductivity calculation:

Conductivity: 3E8 H (Hexadecimal) = 1000 => Conductivity = 1000 us/cm

7.Common problems and solutions

7. 1 The device cannot be connected to a PLC or computer

possible reason:

1) The computer has multiple COM ports, and the selected port is incorrect.

2) The device address is wrong, or there are devices with duplicate addresses (the factory default is all 0x01).

3) Baud rate, check mode, data bit, stop bit error.

4) The 485 bus is disconnected, or the A and B lines are reversed.

5) If the number of devices is too large or the wiring is too long, power should be supplied nearby, and a 485 booster should be added, and 120Ω terminal resistance should be added.

6) The USB to 485 driver is not installed or damaged.

7) The equipment is damaged.