INSTRUCTION MANUAL

Soil EC humidity temperature sensor

JXBS-3001-EC

TYPE 485

VER1.0

WeihaiJXCTElectronicTechnologyCo.,Ltd.

I PRODUCT INTRODUCTION

1.1 Product Overview

The soil EC moisture temperature three-in-one sensor is suitable for measuring soil temperature and moisture and total soil salt content (conductivity). The soil three-in-one sensor creatively measures salinity, moisture, and temperature together, which greatly facilitates the customer's systematic evaluation of soil conditions. .

Compared with the German original high-precision sensor and the actual soil drying and weighing method calibration, the precision is high, the response is fast, and the output is stable. It is less affected by the salt content of the soil and is suitable for various soil qualities. Can be buried in the soil for

a long time, resistant to long-term electrolysis, corrosion resistance, vacuum potting, completely waterproof.

1.2 Application

It is widely used in scientific experiments, water-saving irrigation, greenhouses, flowers and vegetables, grass pastures, rapid soil testing, plant cultivation, sewage treatment, grain storage and water content and temperature measurement of various particulate matter.

1.3 Measurement parameters and hardware parameters

PARAMETERS	CONTENT	PARAMETERS	CONTENT
POWER SUPPLY	12-24V DC	TEMPERATURE MEASURING RANGE	-40 ℃ -80 ℃ (可定制)

MOISTURE MEASURING RANGE	0-100%	TEMPERATURE ACCURACY	±0.5℃
STORAGE ENVIRONMENTS	-45℃-115℃	OUTPUT SIGNAL	RS485
MOISTURE ACCURACY	± 3% in the range of 0-53%; ± 5% in the range of 53-100%	INSTALLAITION METHOD	Fully embedded or all probes inserted into the test medium
EC RANGE	0-10000us/cm	EC RESOLUTION	10us/cm
RESPONSE TIME	<1s	PROTECTION CLASS	IP68
POWER CONSUMPTION	≤ 0.15W （ @12V DC , 25℃）	WORKING PRESSURE RANGE	0.9-1.1atm

When measuring frozen soil layer, the moisture value will be low and inaccurate, which requires user compensation.

The factory default product is suitable for measuring

ordinary yellow, black and red land. It is not suitable for absolute moisture measurement in saline-alkali land, sandy land or other powder objects with large salt content. The single can still characterize the relative moisture difference. For this type of moisture measurement, the manufacturer should be contacted for a separate calibration.

1.4 Calculation method and meaning of soil moisture

The soil moisture calculated by this sensor is the soil volumetric water content (also called soil volumetric water content), which is what people call "soil humidity" and "soil moisture" in a popular sense.

The volumetric water content of soil is calculated as the ratio of the volume of water in the soil to the total volume of the soil. 0% means completely dry soil without any moisture, 100% means completely water without any soil.

1.5 System Frame Diagram

The sensor can be connected and used alone. First, it is powered by 12V DC power supply. The device can be directly connected to a PLC with a 485 interface, and it can be connected to a microcontroller through a 485 interface chip. Program the microcontroller and PLC through the modbus protocol specified later to cooperate with the sensor. At the same time, you can use USB to 485 to connect to the computer,
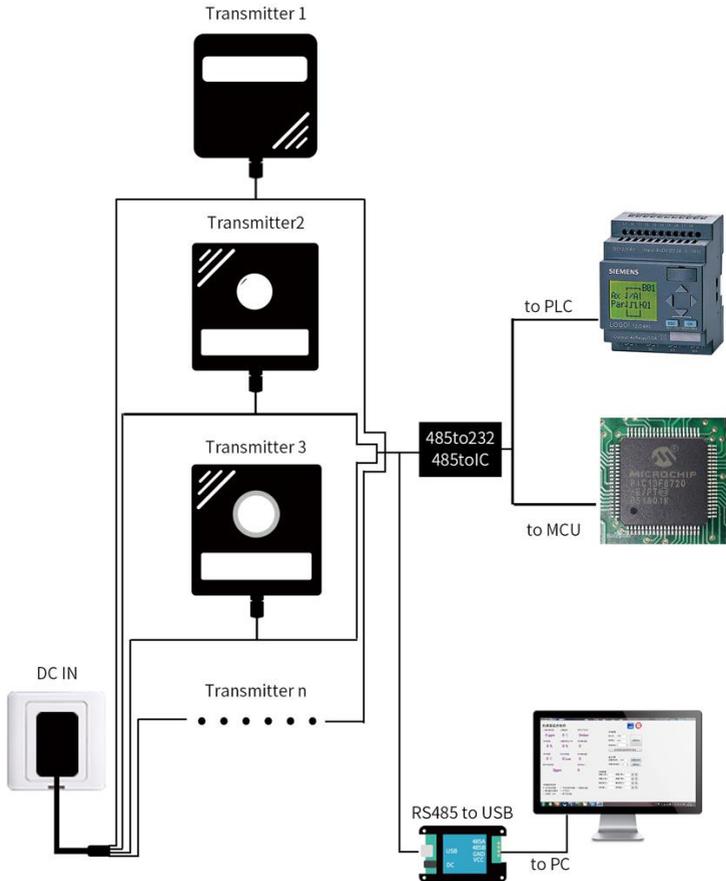
and use the sensor configuration tool provided by our company for configuration and testing.
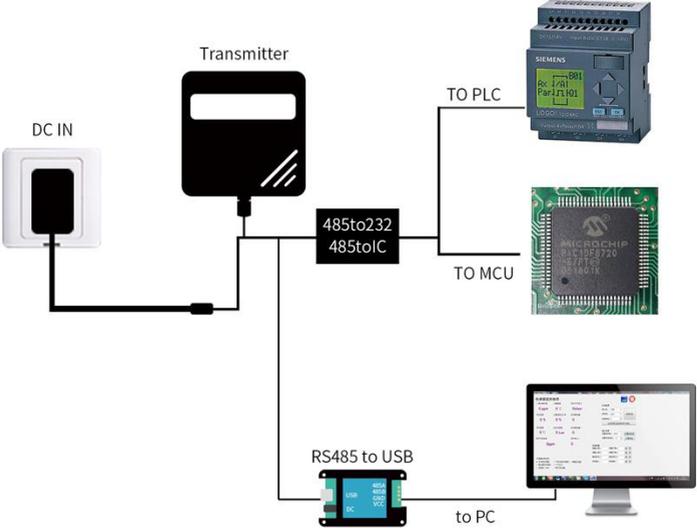
This product can also be used in combination with multiple sensors on a 485 bus. Please observe the "485 bus field wiring code" (see Appendix) when combining 485 buses.

In theory, one bus can connect more than 16 485 sensors. If you need to connect more 485 sensors, you can use a 485 repeater to expand more 485 devices. The other end is connected to a PLC with a 485 interface and a 485 interface chip. Connect to a single chip microcomputer, or use USB to 485 to connect to a computer. Use the sensor configuration tool provided by our company for configuration and testing.

Transmitter 1

Transmitter2

Transmitter 3

DC IN

Transmitter n

485to232
485toIC

to PLC

to MCU

RS485 to USB

to PC

II INSTRUCTIONS

2.1 Equipment inspection before installation

Please check the equipment list before installing the equipment:

Name	Number
THE SENSOR DEVICE	1
12V POWER ADAPTER（Optional）	1
WARRANTY CARD / CERTIFICATE	1
THE USB TO 485 DEVICE（Optional）	1

2.2 Interface description

The power interface can be 12-24V for wide voltage

power supply. When wiring the 485 signal line, pay attention that the two A / B lines cannot be reversed, and the addresses between multiple devices on the bus must not conflict.
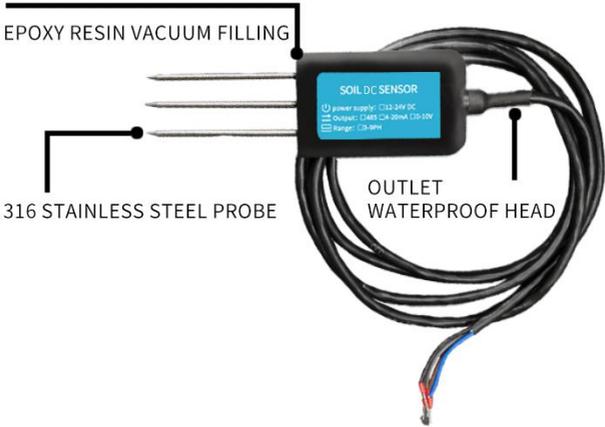
	Line Color	Description
Power	Brown	Power supply Positive (12-24V DC)
	Black	Power supply Negative
Communication	Yellow (Gray)	485-A
	Blue	485-B

Note: Please be careful not to connect the wrong wire sequence, the wrong wiring will cause the equipment to burn out.

The factory provides 1.25 meters long wire by default, and the customer can extend the wire as required or connect the wires sequentially.

Note that there may not be a yellow line in the line order that may be provided in some factory batches. At this time, the gray line is equivalent to replace the yellow line.

2.3 Measurement method

The factory default product is suitable for measuring ordinary yellow, black, and red land. It is not suitable for

absolute moisture measurement in saline-alkali land, sandy land, or other powder objects with large salinity. The single can still characterize the relative moisture difference. For this type of moisture measurement, the manufacturer should be contacted for a separate calibration.

(1) Quick test method

Select a suitable measurement location, avoid stones, and ensure that the steel needle does not touch hard objects. Discard the topsoil according to the required measurement depth, keep the original tightness of the soil below, hold the sensor vertically into the soil, and insert It is not allowed to shake left and right, it is recommended to measure multiple

times to find the average value within a small range of one measurement point. ,

(2) Buried measurement 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 bury the pit tightly. After stable for a period of time, you can measure and record for several days, months or longer.

2.4 matters needing attention

1. All steel needles must be inserted into the soil during measurement.

2. Avoid direct sunlight on the sensor and cause the

temperature to be too high. Pay attention to lightning protection in the field.

3. Do not bend the steel needle violently, do not pull the sensor lead wire with force, and do not beat or violently hit the sensor.

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

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

# III CONFIGURATION SOFTWARE INSTALLATION AND USE

Our company provides matching "sensor monitoring software", which can conveniently use a computer to read the parameters of the sensor, and at the same time flexibly modify the device ID and address of the sensor.

3.1 sensor connected to computer

After correctly connecting the sensor to the computer via USB to 485 and providing power, you can see the correct COM port in the computer (see the COM port in "My

Computer-Properties-Device Manager-Port").
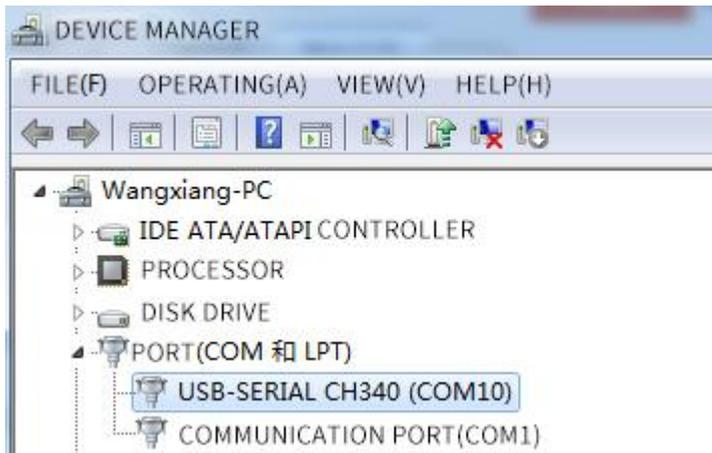
As shown in the figure above, your serial number is COM10 at this time, please remember this serial port, you need to fill in this serial number in the sensor monitoring software.

If the COM port is not found in the device manager, it means that you have not plugged in the USB to 485 or the

driver is not installed properly. Please contact a technician for

help.

3.2 Use of sensor monitoring software

The software interface is shown in the figure:
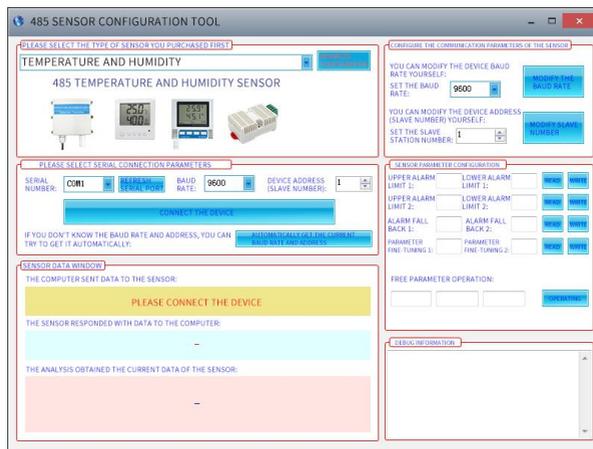
After opening the software, first select the "Sensor Type"

at the top of the software, then obtain the serial port number

according to the method in section 3.1 and select the correct

serial port, then click "Automatically obtain the current baud rate and address" to automatically detect the current 485 bus On all devices and baud rates. Please note that when using software to obtain automatically, you need to ensure that there is only one sensor on the 485 bus. Then click "Connect Device" to get sensor data information in real time.

3.3 Modify the baud rate and device address

In the case of disconnecting the "device connection", click "Modify the baud rate and modify the slave station number" in "Configure sensor communication parameters" to complete the relevant settings. Please note that please restart the device

after setting, and then "automatically obtain the current Baud

rate and address ", you can find that the address and baud

rate have been changed to the address and baud rate you

need

IV COMMUNICATION

PROTOCOLS

4.1 Basic communication parameters

PARAMETERS	CONTENT
Coding	8-bit binary
Data bit	8-bit
Parity bit	no
Stop bit	1 person
Error	CRC (Redundant Cyclic Code)

checking	
Baud rate	2400bps / 4800bps / 9600bps can be set, factory default is 9600bps

4.2 Data frame format definition

Modbus-RTU communication protocol is adopted, 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

Time to end structure ≥ 4 bytes

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

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

Data area: The data area is the specific communication data. Note that the high byte of the 16bits data comes first!

CRC code: two-byte check code.

Inquiry frame

address code	function code	Register start address	Register length	Low check bit	Check code high
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Response frame

address code	function code	Number of valid bytes	Data area	Second data area	Nth data area	Check code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

4.3 Register Address

Register address	PLC or configuration address	content	operating
0012H	40013（40019）	Soil humidity (unit: 0.1% RH)	Read-only
0013H	40014（40020）	Soil temperature (unit: 0.1 ℃)	Read-only
0014H	40015（40021）	Soil salinity (unit 1mg / L)	Read-only
0015H	40016（40022）	Soil conductivity (unit: 1us / cm)	Read-only
0100H	40101	Device address (0-252)	Read and write
0101H	40102	Baud rate (2400/4800/9600)	Read and write

4.4 Communication protocol examples

and explanations

4.4.1 Read soil temperature and humidity value at device address 0x01

Inquiry frame

Address code	Function code	Initial address	Data length	Low check bit	Check code high
0x01	0x03	0x00 0x12	0x00 0x02	0X25	0xCB

Response frame(For example, read that the temperature is

-10.1 ℃ and the humidity is 65.8% RH)

Address code	Function code	Number of bytes	Humidity value	Temperature value	Low check bit	Check code high
0x01	0x03	0x04	0x02 0x92	0xFF 0x9B	0x5A	0x3D

Soil temperature:

Upload when the temperature is below zero

FF9BH (hexadecimal) =-101 => temperature = -10.1 ℃

Soil humidity:

292H (hexadecimal) = 658 => Humidity = 65.8% RH

4.4.2 Read soil humidity value at device address 0x01

Inquiry frame

Address code	Function code	Initial address	Data length	Low check bit	Check code high
0x01	0x03	0x00 0x12	0x00 0x01	0X25	0xCA

Response frame(For example, read that the humidity is 7.4%

RH)

Addres s code	Function code	Number of bytes	Humidity value	Low check bit	Check code high
0x01	0x03	0x02	0x00	0x39	0xB3

			0x4A		

Soil humidity:

4AH (hexadecimal) =74 => Humidity =7.4% RH

4.4.3 Read soil salinity value at device address 0x01

Inquiry frame

Address code	Function code	Initial address	Data length	Low check bit	Check code high
0x01	0x03	0x00 0x14	0x00 0x01	0XC4	0x0E

Response frame(For example, read the salt is 105mg / L)

Address code	Function code	Number of bytes	Salinity value	Low check bit	Check code high
0x01	0x03	0x02	0x00 0x69	0x78	0x6A

Soil salinity:

69H (hexadecimal) =105 =>Salinity=105mg/L

4.4.4 Read soil EC value at device address 0x01

Inquiry frame

Address code	Function code	Initial address	Data length	Low check bit	Check code high
0x01	0x03	0x00 0x15	0x00 0x01	0X95	0xCE

Response frame(For example, read that the conductivity is

1500us / cm)

Address code	Function code	Number of bytes	Salinity value	Low check bit	Check code high
0x01	0x03	0x02	0x05 0xDC	0xBA	0x8D

Soil EC:

5DCH (hexadecimal) =1500 =>EC=1500us/cm

V COMMUNICATION PROTOCOLS

5.1 Product Supplementary Manual

《485 Equipment Field Wiring Manual》: Describes the 485 product wiring guidelines. Please review and follow the guidelines, otherwise it may cause unstable communication and other conditions.

《Revision of Temperature and Humidity Deviation of 485 Sensor》: Describes how to confirm and adjust the temperature and humidity deviation when you feel the temperature and humidity deviation.

《Modify Device Baud Rate and Address Using Modbus》:
Describes the use of modbus instructions to modify the baud
rate and slave number if software is not used.

《How to use a single-chip microcomputer for 485
communication》: Describes how to use 51 single-chip
microcomputers to read sensor information and to popularize
some basic knowledge.

《How to calculate CRC16》: Describes how to calculate
CRC16 in the modbus RTU protocol and an example C language
program.

《How to use USB to 485 to assist debugging when reading
sensor communication problems》: describes how to use

auxiliary tools to solve and troubleshoot when communication problems occur.

《 How to use and set the product alarm function 》 : Describes the optional product alarm function, how to use it, and how to wire it.

5.2 Warranty and after sales

The warranty terms are in accordance with the sensor after-sales clauses of Weihai Jingxun Changtong Electronic Technology Co., Ltd. The warranty for the sensor host circuit is two years, the gas-sensitive probes are guaranteed for one year, and the accessories (shell / plug / cable, etc.) are guaranteed for three months.