Five-pin soil transmitter

(485type)

PR-3001-TR-ECTHPH-N01

Ver 2.0

contents

NS 1 Chapter Product Introduction

1.1 product description

The transmitter has stable performance, high sensitivity, fast response, stable output, and is suitable for various soil qualities. It is an important tool for observing and studying the occurrence, evolution, improvement and water and 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. It can measure the volume percentage of soil moisture, which is a soil moisture measurement method that meets the current international standards. Can be buried in the soil for a long time, resistant to long-term electrolysis, corrosion resistance, vacuum potting, and completely waterproof.

The transmitter is suitable for soil moisture monitoring, scientific experiments, water-saving irrigation, greenhouses, flowers and vegetables, grassland pastures, soil rapid testing, plant cultivation, sewage treatment, precision agriculture and other occasions for temperature and humidity, electrical conductivity, PH value testing .

1.2 Features

■ The seven items of soil moisture content, electrical conductivity, temperature, nitrogen, phosphorus and potassium, and pH value are combined in one.

■ Low threshold, few steps, fast measurement, no reagents, unlimited detection times.

■ The electrode is made of specially treated alloy material, which can withstand strong external impact and is not easy to damage.

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

■ High precision, fast response, good interchangeability, probe insertion design to ensure accurate measurement and reliable performance.

■ It can also be used for the conductivity of water and fertilizer integrated solutions, as well as other nutrient solutions and substrates.

■ PH High value measurement accuracy, up to ±0.3PH Accuracy, fast response and good interchangeability.

1.3 The main parameters

DC power supply (default)		DC 4.5-30V
Maximum power consumption		0.5W(24V DC powered by)
Operating temperature		-20℃~+60℃
Core chip temperature resistance		85℃
Conductivity parameter	Range	0-20000us/cm
	Resolution	1us/cm
	Precision	0-10000us/cm Within the range is ±3%FS；10000-20000us/cm Within the range is ±5%FS
Soil moisture parameters	Range	0-100%
	Resolution	0.1%
	Precision	0-50%Inside±2%,50-100%Inside±3% (Brown earth,60%,25℃)
Soil temperature parameter	Range	-40~80℃

	Resolution	Resolution:0.1°C
	Precision	±0.5°C (25°C)
soil PH parameter	Range	3~9PH
	Resolution	0.1
	Precision	±0.3PH
NPK parameters	Range	1-1999 mg/kg(mg/L)
	Resolution	1 mg/kg(mg/L)
	Precision	±2%FS
Conductivity temperature compensation	Built-in temperature compensation sensor, compensation range 0-50°C	
Protection level	IP68	
Probe material	Anti-corrosion special electrode	
Sealing material	Black flame-retardant epoxy resin	
Default cable length	2 Meters, the cable length can be customized according to requirements	
Dimensions	45*15*123mm	
output signal	RS485(Modbus protocol)	

Shell size
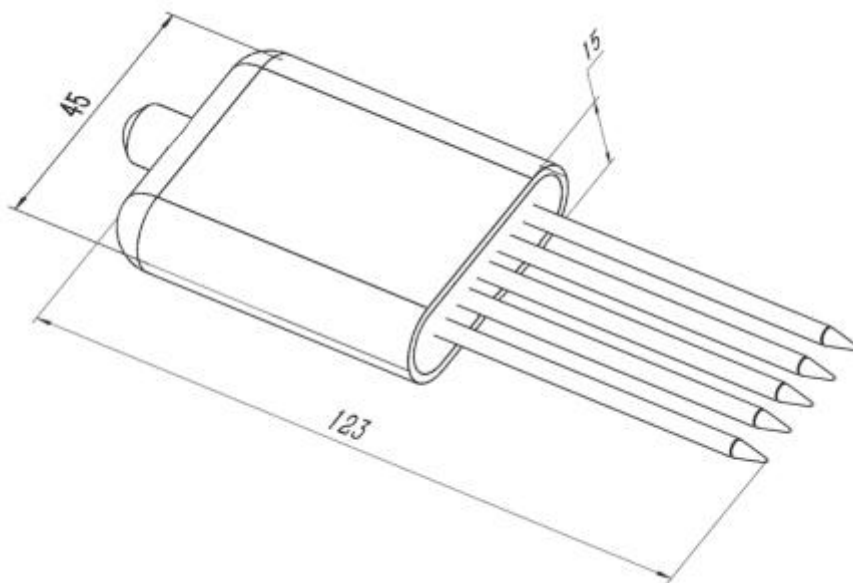
Equipment size drawing (unit:mm)

1.4 System frame diagram

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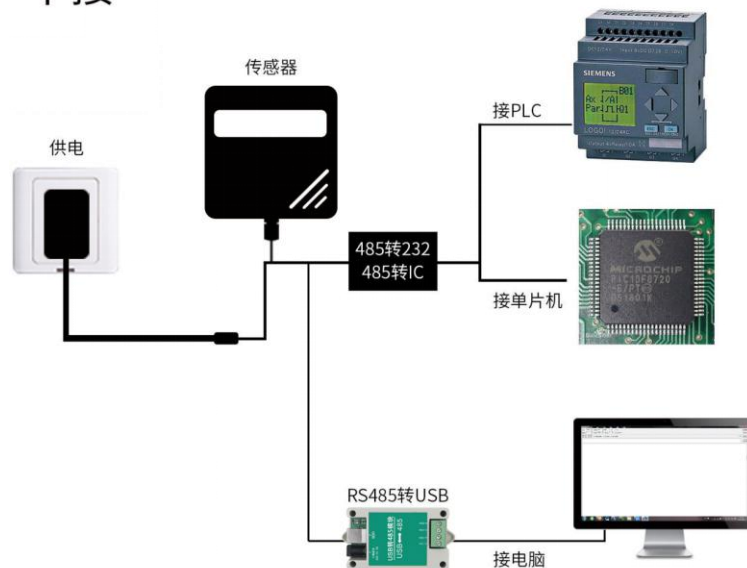
This product can also combine multiple sensors in one 485 Bus use, theoretically one bus can

254 indivual 485 Sensor, the other end is connected with 485 Interface PLC,pass through 485 The interface chip is connected to the single-chip

microcomputer, or use USB change 485 Then it can be connected to the computer, and use the sensor configuration tool provided by our company

for configuration and testing (only one device can be connected when using the configuration software).

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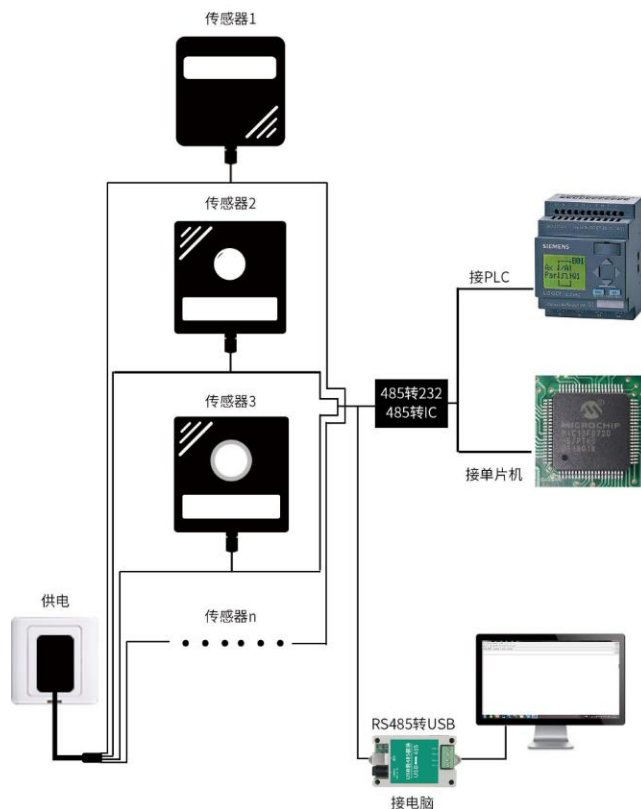
1.5 product model

PR-					Company code
	3001-				
		TR-			Soil detection housing
			NPKPH-		NPK PH Transmitter
			THNPKPH-		Temperature Moisture Nitrogen Phosphorus Potassium PH Transmitter
			ECNPKPH-		Conductivity Nitrogen, Phosphorus and Potassium PH Transmitter
			ECTHNPKPH-		Conductivity Temperature Moisture Nitrogen Phosphorus Potassium PH Transmitter
			THPH-		Temperature moisture PH Transmitter
			ECPH-		Conductivity PH Transmitter
			ECTHPH-		Conductivity temperature moisture PH Value transmitter
				N01	RS485(Modbus-RTU protocol)

NS 2 Chapter Hardware Connection

2.1 Inspection before equipment installation

Equipment List:

■ Transmitter equipment 1 tower

■ Certificate of conformity, wiring instructions, etc.

■USB change 485(Optional)

2.2 Interface Description

Wide voltage power input 4.5~30V It can be.485 Note when wiring the signal wire A/B The two wires cannot be reversed, and the addresses of

multiple devices on the bus cannot be conflicted.

2.2.1 Sensor wiring

Thread color	illustrate	Remark
Brown	Power is positive	4.5~30V DC
black	Power ground	GND
yellow	485-A	485-A
blue	485-B	485-B
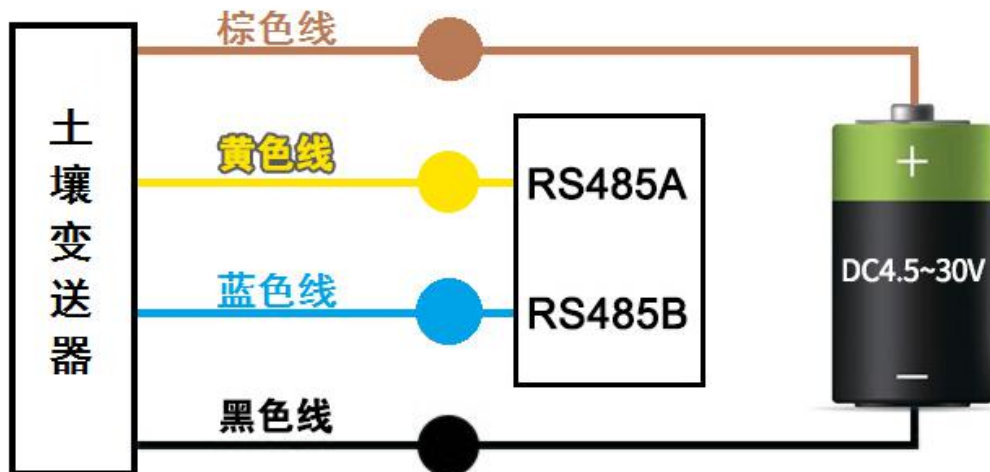
NS 3 Chapter Usage

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 approx. 20%Only the soluble ions in the soil can correctly reflect the electrical conductivity of the soil. In the long-term observation, the measured value after irrigation or rainfall is closer to the true level. If you conduct a quick test, you can first water the soil to be tested,

Measure after the moisture has penetrated sufficiently.

If you are measuring on a hard surface, you should drill holes first (the hole diameter should be smaller than the probe diameter), then insert the soil and compact the soil before measuring; the transmitter should be protected from violent vibration and impact, let alone knocked with hard objects hit. Because the transmitter is a black package, under strong sunlight, the transmitter will heat up sharply (up to50℃ above), in order to prevent excessive temperature from affecting the temperature measurement of the transmitter, please pay attention to shading and protection when using it in the field or in the field.

3.1 Quick test method

Select a suitable measurement location, avoid rocks, make sure that the steel needle will not touch hard objects, throw away the surface soil according to the required measurement depth, maintain the original tightness of the soil below, hold the sensor vertically and insert it into the soil. Do not shake left and right. It is recommended to measure multiple times to find the average value within a small range of a measuring point.

3.2 Buried measurement method

Vertical digging diameter>20cm In the pit, the transmitter steel needle is inserted horizontally into the pit wall at a predetermined depth, and the pit is buried tightly. After a period of stability, the measurement and recording can be carried out for several days, months or even longer.

挖过后填实的土地
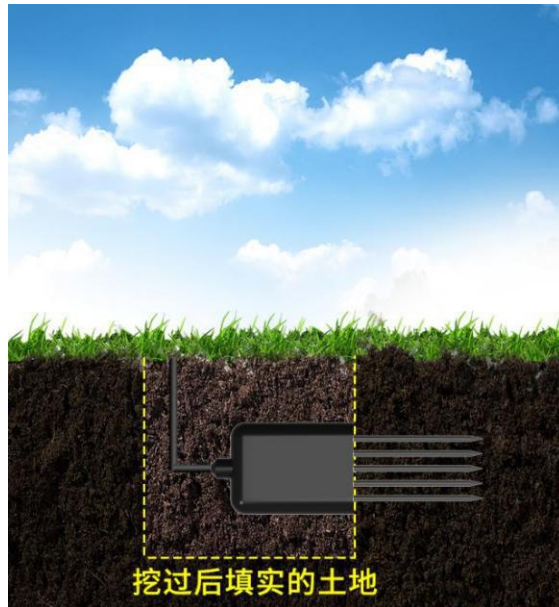
3.3 Precautions

1, All steel needles must be inserted into the soil when measuring.

2, Avoid strong sunlight directly shining on the transmitter and cause the temperature to be too high. Pay attention to lightning protection when using in the field.

3, Do not violently bend the steel needle, do not pull the lead wire of the transmitter forcefully, do not hit or violently hit the transmitter.

4, Transmitter protection level IP68, You can soak the transmitter in water.

5, Due to the presence of radio frequency electromagnetic radiation in the air, it is not suitable to stay in the air for a long time with electricity.

NS 4 Chapter Configuration Software Installation and Use

Our company provides supporting "485 Parameter configuration software", you can easily use the computer to read the sensor's

parameters, and at the same time flexibly modify the sensor's equipment ID And address.

Note that you need to guarantee when using the software to obtain automatically 485 There is only one sensor on the bus.

4.1 Connect the sensor to the computer

Pass the sensor USB change 485 After connecting the computer correctly and supplying power, you

can see the correct COM Port ("My Computer—Properties—Device Manager—Port" to view COM

port).

Open the data package, select "Debug Software" ---"485 Parameter configuration software", find beat

Just open it.

If it is not found in the device manager COM 口, it means that you have not installed USB   change 485

The driver (included in the data package) or the driver is not installed correctly, please contact the technical staff for help.

4.2 Use of sensor monitoring software

① The configuration interface is as shown in the figure, first according to 3.1 Obtain the serial port number and select the correct serial port by the method in the

chapter.

②. Click the test baud rate of the software, the software will test the baud rate and address of the current device, the default wave

Special rate 4800bit/s,The default address is 0x01.

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

device. ④. If the test is unsuccessful, please recheck the equipment wiring and485 Driver installation situation.
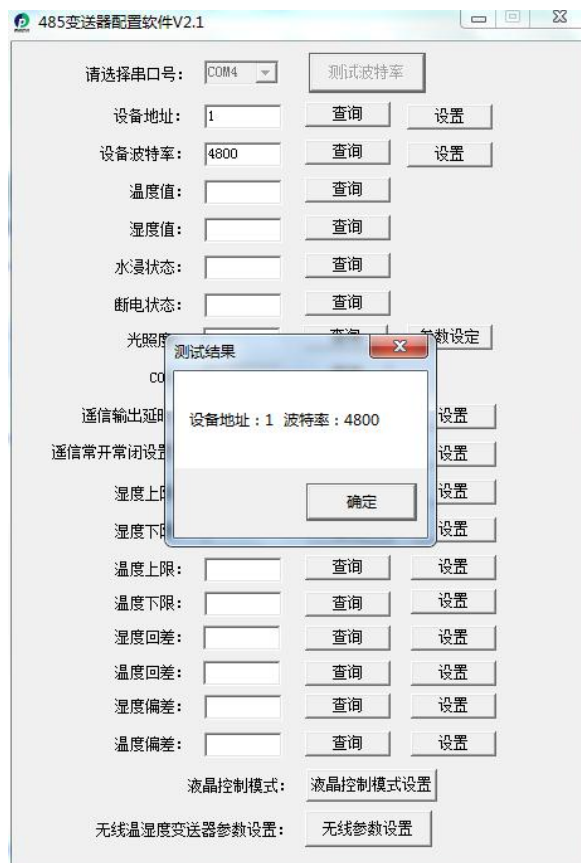
<p align="center">NS 5 Chapter Communication Protocol</p>

5.1 Basic communication parameters

coding	8 Bit binary
Data bit	8 Bit
Parity bit	without
Stop bit	1 Bit
Error checking	CRC(Redundant cyclic code)
Baud rate	2400bit/s,4800bit/s,9600 bit/s Can be set, the factory default is 4800bit/s

5.2 Data frame format definition

use Modbus-RTU Communication protocol, the format is as

follows: Initial structure ≥4 Byte time

Address code = 1 byte

Function code = 1 byte

Data area = N byte

Error check = 16 Bit CRC code

End structure ≥4 Byte time

<p align="center">11</p>

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

function instruction issued by the host, this transmitter only uses the function code0x03(Number of read registers

according to).

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

CRC Code: Two-byte check code.

Host query frame structure:

address code	function code	Register start address	Register length	Check code low bit	High bit of check code
1 byte	1 byte	2 byte	2 byte	1 byte	1 byte

Slave machine response frame structure:

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

5.3 Register address

Register address	PLCOr configuration address	content	operate	Definition description
0000 H	40001 (Decimal)	Moisture content	Read only	Real-time value of water content (expanded10 Times)
0001 H	40002 (Decimal)	Temperature value	Read only	Real-time temperature value (expanded10Times)
0002 H	40003 (Decimal)	Conductivity	Read only	Real-time conductivity value
0003 H	40004 (Decimal)	PHvalue	Read only	PHReal-time value (expanded ten times)
0004H	40005(Decimal)	Nitrogen content	Read only	Actual value of nitrogen content
0005H	40006(Decimal)	Phosphorus content	Read only	Actual value of phosphorus content
0006H	40007(Decimal)	Potassium content	Read only	Actual value of potassium content
0007 H	40008(Decimal)	salinity	Read only	Salinity real-time value
0008 H	40009 (Decimal)	Total dissolved solids TDS	Read only	TDSReal-time value
0022 H	40035 (Decimal)	Conductivity temperature coefficient	Read and write	0-100correspond0.0%-10.0% default0.0%
0023 H	40036 (Decimal)	Salinity coefficient	Read and write	0-100 correspond 0.00-1.00 default55(0.55)
0024 H	40037 (Decimal)	TDS coefficient	Read and write	0-100 correspond 0.00-1.00 default50(0.5)
0050 H	40081 (Decimal)	Temperature calibration value	Read and write	Integer (expanded10Times)
0051 H	40082 (Decimal)	Water content calibration value	Read and write	Integer (expanded10Times)

0052 H	40083 (Decimal)	Conductivity calibration value	Read and write	Integer	
0053 H	40083 (Decimal)	PHCalibration value	Read and write	Integer	
04E8 H	41001 (Decimal)	Nitrogen content coefficient High sixteen	Read and write	actual value (IEEE754Standard floating point)	
04E9 H	41002 (Decimal)	Nitrogen content coefficient Low 16 bits	Read and write		
04EA H	41003 (Decimal)	Nitrogen content calibration value	Read and write	Integer	
04F2 H	41011 (Decimal)	Phosphorus content coefficient High sixteen	Read and write	actual value (IEEE754Standard floating point)	
04F3 H	41012 (Decimal)	Phosphorus content coefficient Low 16 bits	Read and write		
04F4 H	41013 (Decimal)	Phosphorus content calibration value	Read and write	Integer	
04FC H	41021 (Decimal)	Potassium content coefficient High sixteen	Read and write	actual value (IEEE754Standard floating point)	
04FD H	41022 (Decimal)	Potassium content coefficient Low 16 bits	Read and write		
04FE H	41023 (Decimal)	Potassium content calibration value	Read and write	Integer	
07D0 H	42001 (Decimal)	Device address	Read and write	1~254(Factory default1)	
07D1 H	42002 (Decimal)	Device baud rate	Read and write	0represent2400 1represent4800 2represent9600	

Note: There is no temperature value and calibration value register for conductivity moisture equipment

5.4 Communication protocol example and explanation

Example: Read conductivity, temperature and moisture PH Four-in-one device (address 0x01) Parameter value

Interrogation frame

address code	function code	initial address	Data length	Check code low byte	Check code high byte
0x01	0x03	0x00 0x00	0x00 0x04	0x44	0x09

Reply frame

address code	Function code	Return valid Number of bytes	Moisture value	Temperature value	Conductivity value	PH value	Check code Low byte	Check code High byte
0x01	0x03	0x08	0x02 0x92	0xFF 0x9B	0x03 0xE8	0x00 0x38	0x57	0xB6

Temperature calculation:

When the temperature is lower than 0 The temperature data at ℃ is uploaded in the form of complement code.

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

Moisture calculation:

Moisture:292 H (Hexadecimal)= 658 => Humidity = 65.8%, That is, the soil volumetric water content is 65.8%.

Conductivity calculation:

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

PH Value calculation:

PH value:38H(Hexadecimal)=56 => PH Value=5.6

NS 6 Chapter Common Problems and Solutions

No output or output error

possible reason:

①、Computer has COM Mouth, the selected mouth is incorrect.

② The baud rate is wrong.

③、485 The bus is disconnected, or A,B The wire is reversed. ④. If there are too many equipments or too long wiring, power

should be supplied nearby.485 Booster, while increasing 120ΩTerminating resistor.

⑤,USB change 485 The driver is not installed or damaged. ⑥ The

equipment is damaged.