NiuBoL

## Product introduction

**NBL-S-THR** soil temperature and humidity sensor is a high-precision, high-sensitivity soil moisture measuring instrument. The electromagnetic wave pulse emitted by the sensor is transmitted to the probe through the coaxial cable, and then enters the soil medium to measure the apparent dielectric constant of the soil, thereby obtaining the real water content of the soil. The influence of metal ions, etc. This instrument can be widely used in soil moisture monitoring, water-saving irrigation, greenhouses, grassland pastures, soil speed measurement and other fields.

## Technical Parameters

Measuring range: soil moisture 0~100%, soil temperature -50~100℃

Power supply mode: DC 12-24V

Resolution: soil moisture 0.1%, temperature 0.1℃

Accuracy: soil moisture ±3%, temperature ±0.5℃

Output form: RS485, current 4～20mA

(RL≤250Ω),Voltage 0-5V (RL≥1KΩ)

Product power consumption: about 0.3W

Operating environment: -40℃～80℃

Protection class: IP68

## Method of Calculation

Current type (3-wire 4～20mA output) calculation:

Soil moisture R=(I-4)/16 × 100%

Soil temperature T = (I-4) / 16 × 150 -50

Voltage type (0～5V output) calculation:

Soil moisture R=V/ 5 × 100%

Soil temperature T=V/ 5 × 150-50

## Connection method

(1) If equipped with the collector produced by our company, directly connect the sensor to the corresponding interface on the collector.

(2) If the sensor is purchased separately, the supporting line sequences are:

| Line Color | output signal | | |
| --- | --- | --- | --- |
| | voltage | current | communication |
| Red | + | + | + |
| Black（Green） | - | - | - |
| Yellow | soil temperature signal | soil temperature signal | A |
| Blue | Soil Moisture Signal | Soil Moisture Signal | B |

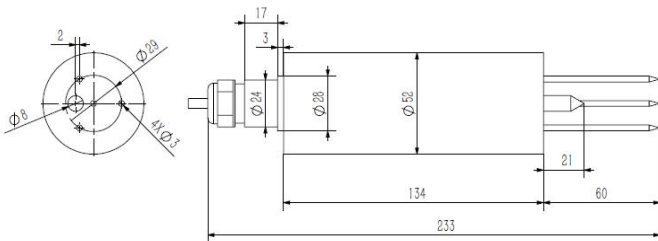(3) There are two output wiring methods for sensor voltage and current:
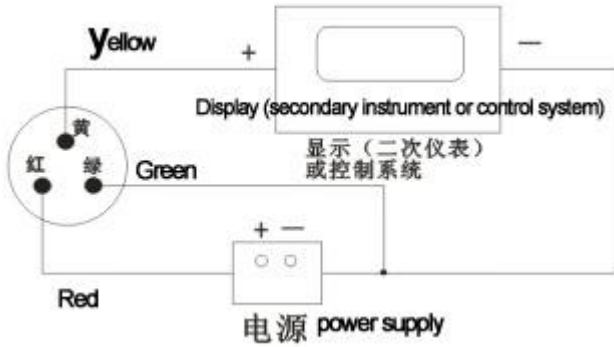
(Wiring diagram of voltage output mode)
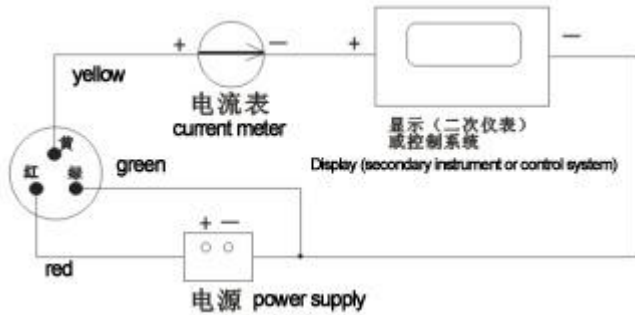


(Wiring diagram of current output mode)

## Structural Dimensions



## MODBUS-RTU Communication protocol

1. Serial format

Data bits: 8 bits

Stop bits: 1 or 2 bits

Check Digit: None

The baud rate is 9600bps, and the interval between two communications is more than 1000ms.

2. Communication format

[1] Write the device address

Send: 00 10 Address CRC (5 bytes)

Return: 00 10 CRC (4 bytes)

Instructions: 1. The address bit of the read/write address command must be 00.

2. Address is 1 byte, the range is 0-255.

For example: send 00 10 01 BD C0

return 00 10 00 7C

[2] Read the device address

Send: 00 20 CRC (4 bytes)

Returns: 00 20 Address CRC (5 bytes)

Description: Address is 1 byte, the range is 0-255

For example: send 00 20 00 68

Return 00 20 01 A9 C0

[3] Read real-time data

Send: Address 03 00 00 00 02 CRC

Description: As shown in the figure below:

| code | Feature Definition | Description |
|---|---|---|
| Address | Address | Device Unique Address |
| 03 | Function Code | Fixed value 0x03 |
| 00 00 | Start Address | The first register number read |
| 00 02 | Reading points | 2 parameters |
| CRC | CRC Check code, low front and high back | low front and high back |

Return: Address 03 04 XX XX XX XX YY YY

Description:

| No. | implication | byte count | Description |
|---|---|---|---|
| | | | |

| 1 | Address field | 1 | Address |
|---|---|---|---|
| 2 | Opcodes | 1 | Read only(0x03) |
| 3 | Data Length Field | 1 | Data length |
| 4 | Data field | 2 | Soil temperature: 0x7FFF table invalid/missed |
| | | 2 | Soil Moisture: 0x7FFF table invalid/missed |
| 5 | Check Field | 2 | low front high back |

**Note: After the data is parsed, it needs to be divided by 10 with one decimal point.**
For example: send 01 03 00 00 00 02 C4 0B
Return 01 03 04 00 B4 01 10 BA 49
**Note: 00 B4 converted to hexadecimal is 180. After data analysis, it needs to be divided by 10 with a decimal point. The actual soil temperature is 18.0℃, and 01 10 converted to hexadecimal is 272. After data analysis, it has a decimal point. Need to divide by ten, the actual soil moisture is 27.2%**

**Attachment:**
**The steps to calculate the CRC code:**
1. The preset 16-bit register is hexadecimal FFFF (that is, all 1s). Call this register the CRC register;
2. XOR the first 8-bit data with the lower bits of the 16-bit CRC register, and place the result in the CRC register;
3. Shift the contents of the register one bit to the right (toward the lower bit), fill the highest bit with 0, and check the shifted out bit after the right shift;
4. If the shift out bit is 0: repeat step 3 (shift right

one bit again)
  If the shift-out bit is 1: XOR the CRC register with the polynomial A001 (1010 0000 0000 0001);
5. Repeat steps 3 and 4 until the right shift is performed 8 times, so that the entire 8-bit data is processed;
6. Repeat steps 2 to 5 to process the next 8-bit data;
7. The final CRC register is the CRC code;
8. When the CRC result is put into the information frame, the high and low bits are exchanged, and the low bits are first.

## Instruction manual

Wire the sensor according to the instructions in the wiring method, then insert the probe pin of the sensor into the soil where the humidity is to be measured, turn on the power supply and the switch of the collector, and then the soil temperature and humidity at the measurement point can be obtained.

## Notice

1. Please check whether the packaging is in good condition, and check whether the product model is consistent with the selection;
2. Do not connect with live power. After the wiring is completed and checked, the power can be turned on;
3. Do not arbitrarily change the components or wires that have been soldered when the product leaves the factory;
4. The sensor is a precision device, please do not

disassemble it by yourself, or touch the surface

of the sensor with sharp objects or corrosive

liquid, so as not to damage the product;

5. Please keep the verification certificate and

certificate of conformity, and return it together with

the product during maintenance.

## Trouble Removal

1. During analog output, the indicator indicates

that the value is 0 or not within the range. The

collector may not be able to obtain information

correctly due to wiring problems. Please check

whether the wiring is correct and firm;

2. If it is not for the above reasons, please contact

the manufacturer.

## Contact Us

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