Soil Temperature and Humidity Sensor

Type NO.: RD-SMS-03

1. Product introduction and principle

RD-SMS-03 soil temperature and humidity integrated sensor integrates soil moisture and soil temperature sensor, which is convenient for measuring soil moisture and soil temperature. It has the advantages of convenient carrying, sealing and high precision. It is soil moisture and soil temperature. Ideal for measurement. Soil moisture is a soil volumetric water content measuring instrument developed by the FDR principle. In addition to being directly used with the control instrument, the device can also be connected to various data collectors, handheld terminals, and the like. For scientific research or irrigation management, the sensor's stainless steel probe can be inserted into the soil surface or soil profile to quickly measure soil temperature and humidity, by permanently burying the probe underground and connecting to a data logger for long-term measurements.

Frequency Domain Reflectometry (FDR) is a method for measuring soil moisture content by measuring the frequency change caused by the change of the dielectric constant of the sensor in the soil and converting it into a voltage or current relationship corresponding to the soil water content. It has the characteristics of high measurement accuracy, fast, accurate, continuous fixed point measurement, no radioactivity and no disturbance to the soil.

It can be widely used in soil moisture monitoring, water saving irrigation, greenhouse control, precision agriculture, road monitoring, hydrometeorology and other fields.

2. Product Features

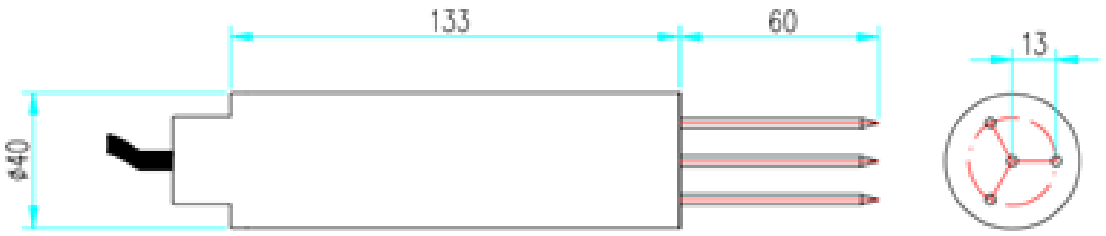
1. Less thermal response time, reducing dynamic error;
2. Small diameter and unlimited length;
3. High measurement accuracy and good consistency;
4. Imported probe components, reliable and stable performance

3. Technical Parameters

Item	Content
Output signal	RS485 standard modbus protocol
Measuring range	-20~80℃, 0~100%（（m3/m3））
Response time	＜1s
Precision	±1°C (25°C); ±2% (0 to 50% (m3/m3), 25°C
Working voltage	DC12~24V
Working current	40ma（DC12V）

Power consumption	DC12V <=0.6W
Measuring area	90% of the effect is in a cylinder 2.5 cm in diameter and 6 cm in length around the central probe
Sealing material	ABS (abrasive processing)
Size	130*40mm(Probe:60mm)
Cable length	3 meters
Cable pins	4 pins
Stabilization time	about 10 seconds after power on
Protection level	IP68

4. Dimensions



5. Wiring definition

Wire colour	Interface
Red	Power positive (12-24VDC)
Black	Power negative
Yellow (gray) color	RS485A
Blue	RS485B

6. Installation instructions

1. The steel needle of the sensor is completely inserted into the soil to be tested, and the sensor cannot be shaken when inserted to prevent the sensor probe from being affected;

2. The sensor can be used for multi-layer observation to establish a soil moisture monitoring station;

3. When you feel that there is a hard object in the soil, please reselect the measured point to prevent damage to the sensor probe.

4. Do not connect the probe into the hard clod to avoid damage to the probe; when measuring, the measured soil

density should be as uniform as possible;

5. When removing the sensor from the soil, do not pull the cable directly; after use, clean and dry the probe to keep the probe clean.

6. Improper measurement points (>10% vol) may result if the measurement points are not selected properly. Barbaric installation will cause damage to the stainless steel needle of the sensor, which will affect the measurement accuracy. Attention must be paid to the following aspects during installation:

(1) abnormal holes or pores. If there are holes or air holes in the sensing range of the sensor, measurement errors will occur, especially when the sensor is inserted and removed, it is necessary to avoid repeated operation at the same position;

(2) Mounting angle. Sensors can be installed in different applications in different applications, usually in two, horizontal and vertical installations. The distribution of water in the soil medium is affected by many factors such as space and time. The reasonable installation of the sensor must eliminate these effects to the greatest extent. In the vertical installation, the sensor measures the average moisture of the sensing area of approximately 6 cm long;

(3) the sampling point. The choice of sampling points must be carefully considered. In addition to the two points mentioned above, there are many other factors that affect the measurement accuracy of the sensor. It can be listed as: soil density and composition change, crushed stone, plant roots, cockroach loosening effect, soil drainage state, soil surface moisture Volatilize and so on.

7. Due to the different water sources, the water quality will change accordingly. The measured voltage output value of the sensor placed in the simple water sample will fluctuate within a range. This measurement value can only be used as a reference value and cannot be used to judge the measurement accuracy of the sensor itself.

7. Communication protocol

1. Basic agreement

- Sensor default station number: 0x00FF
- Baud rate: 9600
- Data bits: 8
- Stop position: 1
- Check digit: none
- Flow control: none

2. **Read station number: (fixed command)**

Device address	Function code	Start register address	Number of registers	CRC check
00	03	0001	0001	CRCloCRChi

Reply

Device address	Function code	Data length	Data	CRC check
00	03	02	00XX	CRCloCRChi（XX=01-ff）

Example: Read station number

Command: 00 03 00 01 00 01 D4 1B

Reply: 00 03 02 00 FF C5 C4

3. Write station number

Device address	Function code	Start register address	Number of registers	Data length	Data (new station number)	CRC check
00	10	0001	0001	02	00XX	CRCloCRChi（XX=0X01-0XFF）

Reply:

Device address	Function code	Start register address	Number of registers	CRC check
00	10	0001	0001	CRCloCRChi

Example

Command: 00 10 00 01 00 01 02 00 33 EA 04

Reply: 00 10 00 01 00 01 51 D8

(4) Reading data (host computer)

Device address	Function code	Start register address	Number of registers	CRC check
XX	03	0000	00XX	CRCloCRChi

Data reply

Device address	Function code	Data length	Data	CRC check
00	03	XX	XXXXXXXX	CRCloCRChi

Example

Command: FF 03 00 00 00 02 D1 D5

Reply: FF 03 04 01 2C(Soil moisture) 11 94(Soil temperature) A1 61

Note: The number of command responses is in hexadecimal format.

04 (decimal 4) is the length of the sensor data. A1 61 is the CRC check value.

Two-factor data sequence: soil moisture, soil temperature.

soil moisture =（0x01*256+0x2C）/10 = 30 %VOL

soil temperature =（0x11*256+0x94）/100-20 = 25 ℃