8-in-1
Soil Temperature Moisture EC Salinity N. P. K. pH Sensor
Product Manual

1 Introduction

The soil temperature part is composed of two parts, the A-level ST-1-PT1000 precision platinum resistance imported from Heraeus, Germany and a high-precision sensor. The sensor part is composed of a power supply module, a temperature sensor module, a transmission module, a temperature compensation module, and a data processing module. It completely solves the measurement error introduced by the platinum resistance due to its own characteristics. The sensor has a zero drift circuit and a temperature compensation circuit. The environment is highly adaptable.

The soil moisture is partly based on the principle of frequency domain reflection, using high-frequency electronic technology to manufacture high-precision, high-sensitivity sensors for measuring soil moisture. By measuring the dielectric constant of the soil, it can directly and stably reflect the true moisture content of various soils, and can measure the volume percentage of soil moisture. It is currently the most popular soil moisture measurement method in the world.

The soil conductivity part is converted into an analogue or digital signal of soil conductivity by means of a stainless steel probe through the sensor. By measuring the temperature, the conductivity signal is compensated to 25。C and then output as a salt signal. After burying this conductivity sensor into the soil, the conductivity of the soluble salt ions in the soil solution is directly determined.

During the development, the soil pH value part has absorbed the advanced technology of similar foreign instruments, combined with the actual situation and use requirements of our country, converted the pH value into the corresponding analog or digital signal, and measured the pH value in the soil.

The soil nitrogen, phosphorus and potassium part determines the fertility of the soil by detecting the content of nitrogen, phosphorus and potassium in the soil, thus facilitating the customer's systematic assessment of the soil condition.

2 Characteristics

(1) The sensor has a compact design.

(2) The measurement accuracy is high, the response speed is fast, and the interchangeability is good.

(3) Good airtightness, can be directly buried in the soil for use, and will not be corroded.

(4) The soil quality is less affected and the application area is wide.

(5) The measurement is accurate, the performance is reliable, the normal operation is ensured, and the data transmission efficiency is high.

3 Application

It is suitable for water-saving agricultural irrigation, meteorological monitoring, environmental monitoring, greenhouses, flowers and vegetables, grassland pastures, soil rapid testing, plant cultivation, scientific experiments, etc., which require the measurement of soil temperature, moisture, electrical conductivity, soil pH, soil nitrogen, phosphorus, potassium and Salinity.

4 Product Information

4.1 Technical Parameters

Measuring Parameters: Soil temperature, soil volumetric water content, soil electrical conductivity (EC value), soil pH value, soil nitrogen, phosphorus, potassium,Salinity.

Measuring Unit:°C; %（m^3/m^3）; μS/cm; pH; mg/kg（mg/L）; μS/cm

Temperature Range: -30-70°C (0-50°C or any other range can be customized)

Moisture Range: 0-100% (30%, 50% equal range can be selected or customized arbitrary range)

Salinity/conductivity range:0 ～ 2000μS/cm， 0 ～ 10000μS/cm， 0 ~ 20000μS/cm

pH Range: 3-10

Nitrogen/Phosphorus/Potassium Range: 0-1999mg/kg(mg/L)

Measuring Accuracy: ±0.2°C; ±2%(m^3/m^3) within the range of 0-50%(m^3/m^3);

±2%; ±1; ±3%(mg/kg)

Resolution: 0.1°C; 0.1%; 1μS/cm; 0.01; 1mg/kg(mg/L)

Output Signal: RS485(Standard Modbus-RTU protocol, device default address: 01)

Power Supply Voltage: 12-24V DC

Working Temperature: -30°C-70°C

Stability Time: 3 seconds after power on

Response Time: < 1 second

4.2 Physical Parameters

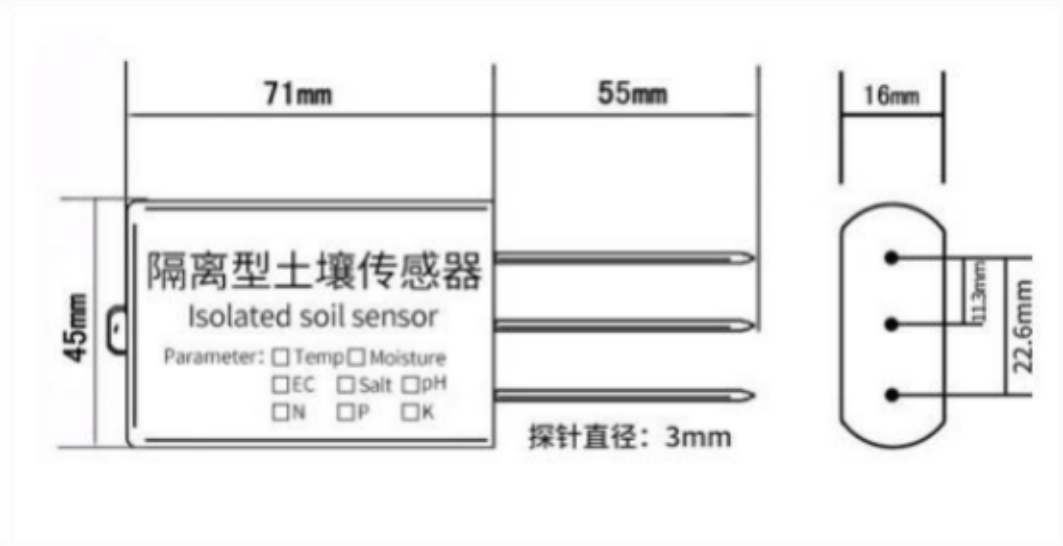
Probe Length: 55mm,φ3mm

Probe Material: 316L stainless steel

Sealing Material: ABS engineering plastics, epoxy resin, waterproof grade IP68

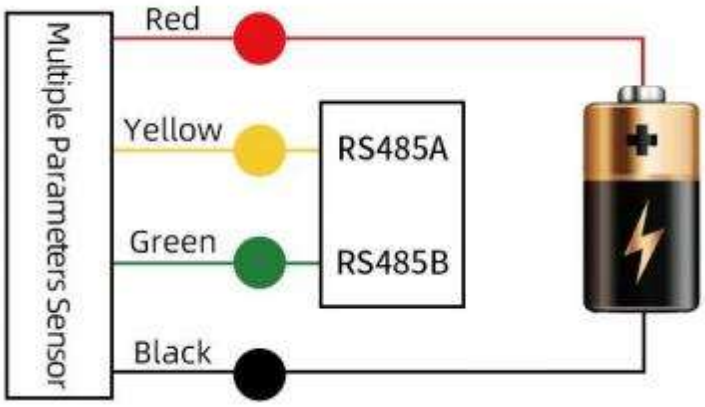
Cable Specifications: Standard 2 meters (Other cable lengths can be customized, the longest is 1200 meters)

5 Dimensions



6 Application Method

The sensor can be connected with various data acquisition devices containing differential input, data acquisition card, remote data acquisition module and other devices. The wiring method is shown in the following figure:



7 Data Convert Method

RS485 signal (default address 01):
Standard Modbus-RTU protocol, baud rate: 9600; Check bit: none; Data bit: 8; Stop bit: 1

7.1 Modification Address

For example, change the address of the sensor whose address is 1 to 2, host → slave

Original Address	Function Code	Start Register High	Start Register Low	Start Address High	Start Address Low	CRC16 Low	CRC16 High
0X01	0X06	0X00	0X30	0X00	0X02	0X08	0X04

If the sensor receives correctly, the data is returned according to the original path.

Note: If you forget the original address of the sensor, you can use the broadcast address 0XFE instead. When 0XFE is used, the host can only

connect to one slave, and the returned address is still the original address, which can be used as an address query method.

7.2 Query Data

Query the data of the sensor (address is 1) (soil temperature, soil moisture, soil conductivity, soil pH value, soil nitrogen, phosphorus, potassium, salinity), host → slave

Address	Function Code	Start Register Address High	Start Register Address Low	Register Length High	Register Length Low	CRC16 Low	CRC16 High
0X01	0X03	0X00	0X00	0X00	0X08	0X44	0X0C

If the sensor receives correctly, return the following data, slave → host

Address	0X01	
Function Code	0X03	
Data Length	0X10	
Register 0 Data High	0XFF	Soil Temperature: -3.5 °C
Register 0 Data Low	0XDD	
Register 1 Data High	0X01	Soil Moisture: 35.6%
Register 1 Data Low	0X64	
Register2 Data High	0X03	Soil Conductivity: 1234μS/cm
Register 2 Data Low	0XF0	
Register 3 Data High	0X02	pH: 6.86
Register 3 Data Low	0XAE	
Register 4 Data High	0X00	Soil Nitrogen: 135mg/kg
Register 4 Data Low	0X87	

Register 5 Data High	0X00	Soil Phosphorus: 138mg/kg
Register 5 Data Low	0X8A	
Register 6 Data High	0X00	Soil Potassium: 142mg/kg
Register 6 Data Low	0X8E	
Register 7 Data High	0X04	Soil salinity: 1234μS/cm
Register 7 Data Low	0XD2	
CRC16 Low	0X04	
CRC16 High	0XD2	

8 Precautions for Use

△ Please read this manual completely before use.

⚠ Don't try to insert the probe into stones or hard soil to avoid damage to the probe.

△ When moving the sensor out of the soil, do not pull the cable directly.

△ The sensor probe should be fully inserted into the soil/substrate to reduce operating errors and improve measurement accuracy.