Product introduction

◆It has the function of simultaneous detection of soil salinity and electrical conductivity;
◆Simple structure, stable performance and convenient operation;
◆Using advanced ceramic technology, directly buried in the soil, maintenance-free;
◆High integration, small size, low power consumption, easy to carry;
◆Real realization of low cost, low price and high performance;
◆Long life, convenience and high reliability;
◆Support secondary development;

This product is suitable for agricultural irrigation, flower gardening, grassland pastures, soil rapid testing, plant cultivation, scientific experiments and other fields. It can also be used for anti-corrosion monitoring of underground oil and gas pipelines and other pipelines.

Technical Parameters

Salt measurement range: 0～8000mg/L
Resolution: 1mg/L
Accuracy: ±5%
EC measurement range: 0~15 mS/cm
Resolution: 0.01 mS/cm
Accuracy: ±5%
Power supply mode:
□ DC 12V-24V
□ Others

Output :
□ Voltage: 0~5V
□ Current: 4~20mA
□ RS485
Working environment:
Temperature: -10℃～60℃
Humidity: 0~95%RH
Shell material: waterproof plastic shell
Transmitter size: 80*60*33mm

Calculation formula

Voltage type (0～5V)
$$Y=V / 5 × 8000$$
(Y is the measured salt concentration (mg/L), V is the output voltage (V), this formula corresponds to the salt measurement range of 0～8000mg/L)
$$Y=V / 5 × 15$$
(Y is the measured conductivity (mS/cm), V is the output voltage (V), this formula corresponds to the conductivity measurement range of 0～15mS/cm)
Current type (4～20mA)
$$Y=(I-4)/16×8000$$
(Y is the measured salt concentration (mg/L), I is the output current (mA), this formula corresponds to the salt measurement range of 0～8000mg/L)
Current type (4～20mA)
$$Y=(I-4)/16×15$$
(Y is the measured conductivity (mS/cm), I is the output current (mA), this formula corresponds to the conductivity measurement range of 0～15mS/cm)

Connection method

(1) If equipped with the weather station produced by our company, directly use the sensor cable to connect the sensor to the corresponding interface on the weather station.
(2) If the transmitter is purchased separately, the cable sequence of the transmitter is as follows:

NiuBoL

Line Color	Output signals		
	Voltage	Current	Communications
Red	+	+	+
Black （Green）	-	-	-
Yellow	Voltage signals	Current signals	A
Blue			B

MODBUS-RTU Communication protocol

Ⅰ Serial port format

Data bits 8 bits

Stop bit 1 or 2 bits

Check Digit None

Baud rate 9600 The interval between two communications is at least 1000ms

Ⅱ Communication format

【1】Write the device address

Send: 00 10 Address CRC (5 bytes)

Returns: 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 XX XX

Description: As shown in the figure below:

Code	Functional Definition	Remark
Address	Station No. (Address)	
03	Function code	
00　00	Start address	
00　02	Read points	
XX XX	CRC Check code,	

	low front and high back	

Return:Address 03 04 XX XX XX XX

Explanation

Code	Functional Definition	Remark
Address	Station No. (Address)	
03	Function code	
04	Read unit byte	
XX　XX	Data (front high and back low)	Hex, salt value
XX　XX	Data (front high and back low)	Hex, conductivity value
XX　XX	CRC Check code	

For example:

send 01 03 00 00 00 02 C4 0B

Return 01 03 04 00 B4 01 0A 3B 82

Note: 00 B4 is the salinity data, converted to decimal is 180, after data analysis, the actual salinity value is 180mg/L;
**01 0A is the conductivity data, converted to decimal is 266, after data analysis, with two decimal points need to be divided by 100, the actual conductivity is 2.66 mS/cm**

Steps to calculate 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 lowest bit;
4. If the lowest bit is 0: repeat step 3 (shift again) If the lowest 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.

RS485 circuit
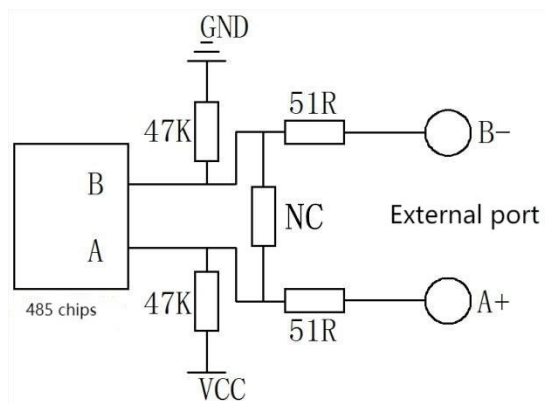
Instructions for use

Wire the sensor according to the instructions in the wiring method, and try to place the sensor in a place with low terrain, close to the water source, or a place with relatively moist soil.

There are two methods for field installation: excavation section and ground drilling.

1. The excavation section turns darkly

Dig a soil profile where the sensor needs to be buried, and determine the position and depth of the sensor on the profile. From bottom to top, use a small earth borrower with the same (or slightly larger) outer diameter as the sensor, and dig out a horizontal depth of about 10- 20 cm soil hole, insert the sensor horizontally to the bottom of the hole, and then fill it with soil and compact it. Make sure that the ceramic element of the sensor probe is in close contact with the soil. It is best to lead the sensor wire away from the vertical section at a certain distance to the ground, so as to avoid rainwater flowing directly around the sensor along the wire and affecting the authenticity of the test results. The plugs of

several sensors embedded in a section are fixed on a simple bracket in sequence. And wrap it in a plastic bag to prevent soil particles and rainwater from entering, after the sensor is buried. Backfill and compact the profile pit according to the original soil layer order and bulk density, and keep the ground cover the same as the original.

2. Ground drilling installation

In the place where the sensor needs to be installed, use a soil extractor (shovel, twist soil drill or special soil extractor) to drill a soil hole from the ground down to a predetermined depth, and use a thin rod with an open end to support the sensor to the bottom of the hole, so that It is in close contact with the soil, and the thin rod is slowly pulled out. Then backfill and compact in layers.

Corresponding to the embedded sensor, a set of soil moisture tension meters can be embedded at the same time about 20 cm away from the sensor to observe the change of soil moisture.

After the installation is completed, turn on the power supply and the switch of the collector, wait for a period of time to make the salt solution reach equilibrium, and then the soil salinity at the measurement point can be obtained.

Correction method

The world is vast, and the salinity composition of soil solutions in different regions is significantly different. Although the sensor has been repeatedly tested and calibrated in the laboratory before leaving the factory, the calibration process is carried out in KCl or NaCl solution. However, the user can re-calibrate the sensor according to the composition of the salt in the region before use, so that the measured results can conform to the actual local conditions.

In addition, after the sensor has been used for a long time, or when obvious abnormalities are found during use, the performance of the sensor needs to be re-checked and corrected to

avoid large errors in use.

Correction method

According to the salt composition of the soil solution in the working area, prepare a set of calibration solutions with different concentrations of KCl or NaCl, such as 0.01, 0.05, 0.1, 0.15, 0.2 mol/L.

The electrode constant regulator of the instrument is at 1, and the temperature compensation file is turned on during measurement. Measure a set of calibration solutions (from low concentration to high concentration) respectively (it is recommended to measure three times and take the average value), and read a set of 25 ℃ on the conductivity meter. The conductance value of , plotted against a set of calibration solution concentrations.

Linear regression can be used, or quadratic polynomial fitting can be used, and the latter has high accuracy.

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 welded 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 qualification certificate, and return it together with the product during maintenance.

Trouble clearing

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; it may also be that the soil moisture is insufficient, irrigate a small amount of water to make the soil moist.

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

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