

INSTRUCTION MANUAL

SOIL NITROGEN, PHOSPHORUS AND POTASSIUM SENSOR

Weihai JXCT Electronic Technology Co., Ltd.

I BRIEF INTRODUCTION

1.1 Product overview

The soil nitrogen, phosphorus and potassium sensor is suitable for the detection of the content of nitrogen, phosphorus and potassium in the soil, and the fertility of the soil is judged by the detection of the content of nitrogen, phosphorus and potassium in the soil, thus facilitating the evaluation of the soil situation by the customer system. Sensors are suitable for all kinds of soil, can be long-term embedded in the soil, long-term resistance to electrolysis, corrosion resistance, vacuum irrigation, completely waterproof.

Analog output is adopted, which is flexible and can output current type or voltage type. Three wire system or four wire system can be used for wiring.

1.2 Scope of application

Widely used in paddy field, greenhouse planting, rice, vegetable planting, orchard nursery, flower and soil research, etc.

1.3 Primary parameters

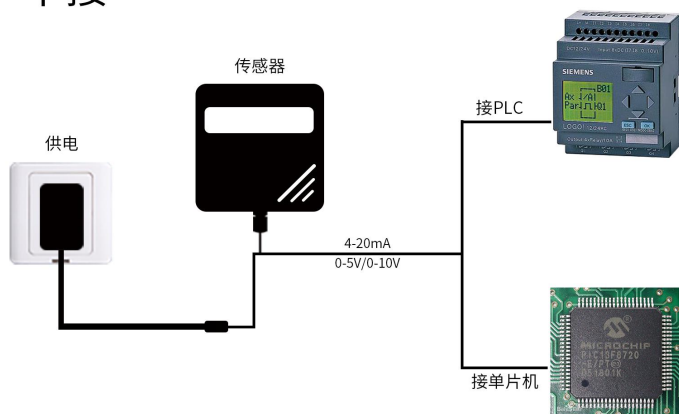
PARAMETERS	TECHNICAL SPECIFICATIONS
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MEASURING RANGE	0-1999mg/kg
MEASUREMENT ACCURACY	±2%F.s
RESOLVING POWER	1mg/kg(mg/l)
RESPONSE TIME	<10s
WORKING TEMPERATURE	5-45℃
WORKING HUMIDITY	5-95%(relative humidity) 、 no condensation
WARRANTY PERIOD	2 years for main engine and 1 year for probe
BAUD RATE	2400/4800/9600
COMMUNICATION PORT	Analog quantity type(4-20mA/0-5v/0-10v)
POWER SUPPLY	12V-24V DC
INSTALLATION METHOD	All buried or probes are inserted into the measured medium
CURRENT OUTPUT TYPE	4-20mA
CURRENT OUTPUT LOAD	≤600Ω
VOLTAGE OUTPUT TYPE	0-5V/0-10V
VOLTAGE OUTPUT LOAD	≤250Ω
POWER CONSUMPTION	<1.15W
WORKING PRESSURE RANGE	0.9-1.1atm

1.4 System frame diagram

When the system needs to connect an analog quantity version sensor, you only need to supply power to the equipment, at the same time, connect the analog quantity output line to the DI interface of the single-chip microcomputer or PLC, and write the corresponding acquisition program according to the conversion relationship in the following paper.

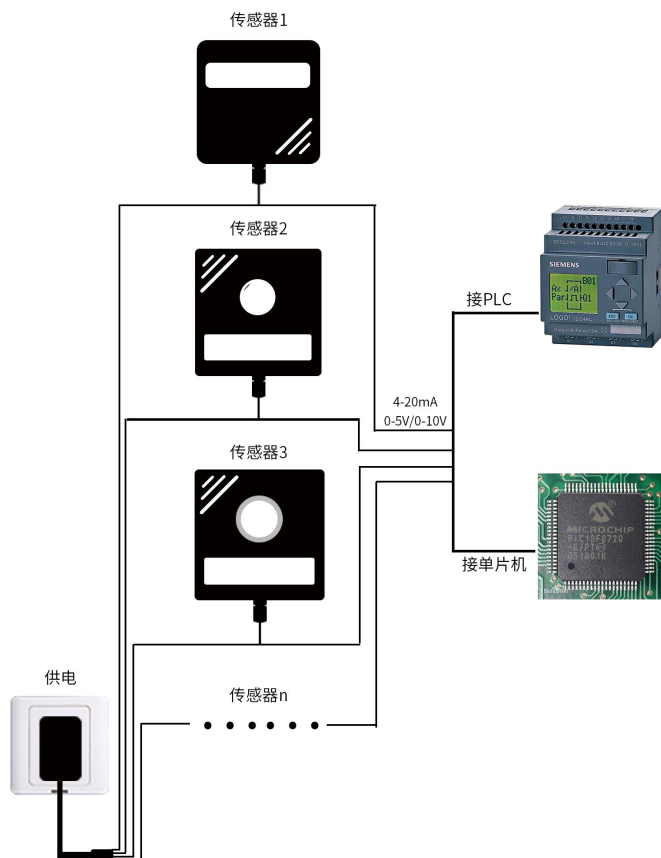
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When the system needs to access multiple analog quantity versions of sensors, it needs to connect each sensor to each different analog quantity acquisition port of single-chip computer or the DI interface of PLC, and write the corresponding acquisition program according to the conversion

relationship in the following paper.

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II USAGE METHOD

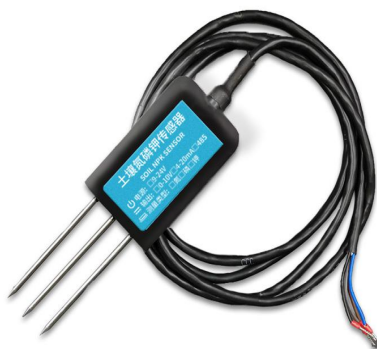
2.1 Checking before installation

Check the list of devices before installation:

Name	Number
THE SENSOR DEVICE	1
12V POWER ADAPTER (Optional)	1
WARRANTY CARD / CERTIFICATE	1

2.2 Interface description

The power interface is wide-voltage power input 12-24V. Analog products should pay attention to the positive and negative signal lines. Do not reverse the positive or negative of the current/voltage signal lines.



	Line Color	Description
Power	Brown	Power supply Positive (12-24V DC)
	Black	Power supply Negative
Communication	Yellow(Gray)	485A (Partial customization)
	Blue	485B (Partial customization)
signal	White	Voltage output (0-5V/0-10V)
signal	Green	Voltage output (0-5V/0-10V)

Caution: please be careful not to take the wrong order. The wrong wiring will cause the equipment to burn down. At the same time, it must be noted that the positive output of voltage/current is an active output, and the positive output of voltage/current must not be connected to the positive position of power supply, which will definitely lead to burnout.

We provide default cable length of 1.5meters, you can extend the cable yourself according to your needs.

Note that there is no yellow line in the line sequence that may be provided in some factory batches. At this time, the gray line is equivalent to replace the yellow line.

Pay attention to the voltage type product, non NPK three

in one product, part of the current type is two in one product, refer to the product label for the specific measurement type.

Note that the green and white lines are the voltage output of the test product, no difference.

Note that some products contain 485a and 485b yellow and blue lines, and can communicate with the upper computer through 485 connection. Refer to the operation manual of 485 soil nitrogen, phosphorus and potassium sensor for specific operation methods.

2.3 Speed measurement method

Select the appropriate measurement site, avoid the stones, ensure that the steel needle does not hit a hard object, throw the topsoil at the required depth of measurement, keep the underlying soil tightness, grip the sensor vertically into the soil, insert It is not possible to shake left and right. It is recommended to measure multiple times within a small area of a measurement point to obtain the average value.

2.4 Buried method

Dig a pit with a diameter of >20cm vertically and insert the sensor steel needle horizontally into the wall of the pit at a predetermined depth. After the pit is buried tightly and stable

for a period of time, it can be measured and recorded for several days, months, or even longer.

2.5 Precautions

1. Steel needle must be fully inserted into the soil.
2. Avoid direct sunlight on the sensor and cause excessive temperature. Use caution in the field against lightning strikes.
3. Do not violently bend the steel needle, do not force pull the sensor leads, do not beat or violently hit the sensor.
4. Sensor protection grade IP68, the sensor can be soaked in water.
5. Due to the presence of radio frequency electromagnetic radiation in the air, it should not be in a state of power in the air for a long time.

III WIRING INSTRUCTIONS

3.1 Wiring mode

The following figure shows the current sensor connection mode. The power line (brown line and black line) of the sensor is connected to the power supply; some customized products contain blue and yellow lines, and the blue and yellow lines of the sensor are 485 type 485A and 485B lines. The green line of the sensor is the signal from the nitrogen/phosphorus/

potassium signal to the acquisition equipment, and the voltage flow direction is from the sensor to the acquisition equipment; the white line of the sensor is the signal from the nitrogen B/phosphorus/potassium signal to the voltage acquisition equipment, and the voltage flow direction is from the acquisition equipment to the sensor.

IV ANALOG PARAMETERS MEANING

4.1 Analog 4-20mA current loop

Current value	N, P, K
4mA	0mg/kg
20mA	2000mg/kg

The formula is $N = (I - 4) * 16 / 2000$

Where I is in mA. Where N is in mg/kg.

For example, the data Iout+ collected in the current situation is 20 mA, and the nitrogen value calculated at this time is 2000mg/kg.

4.2 Analogue 0-10V voltage output

Voltage value	N, P, K
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0V	0mg/kg
10V	2000mg/kg

The formula is $N=10/2000*V$

Where V is in mV. Where N is in mg/kg.

For example, the data V_{out+} collected in the current situation is 10 mV, and the nitrogen value calculated at this time is 2000 mg/kg.

4.3 Analogue 0-5V voltage output

Voltage value	N, P, K
0V	0mg/kg
5V	2000mg/kg

The formula is $N=5/2000*V$

Where V is in mV. Where N is in mg/kg.

For example, the data V_{out+} collected in the current situation is 5 mV, and the nitrogen value calculated at this time is 2000 mg/kg.