

Soil NPK Sensor

JW-S5S(Z9) Digital Output



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1. Product Introduction

JW-S5S(Z9) soil nitrogen, phosphorus and potassium sensors are suitable for detecting the content of nitrogen, phosphorus and potassium in the soil, and judging the fertility of the soil by detecting the content of nitrogen, phosphorus and potassium in the soil, thereby facilitating the evaluation of the soil condition by the customer system.

Adhering to the company's consistent product quality, sturdy and durable. Imported epoxy resin, high-quality stainless steel, more resistant to acid and alkali corrosion, steel needle isolation, never electrolysis, guarantee more than 3 years of service life.

It has multi-directional protection functions for power lines, ground lines, and signal lines, which can prevent damage caused by reverse connection, wrong connection, etc.

2. Technical parameter

Measuring Parameter	Nitrogen, Phosphorus,Potassium	Temperature
Measuring Range	0-2000mg/kg	-40.00°C ~ 85.00°C
Unit	mg/kg	°C
Resolution	1mg/kg (mg/l)	0.01°C
Accuracy	±2%FS	<0.3°C(-10°C ~ 50°C); other<0.6°C
Interchange Accuracy	±2%FS	<0.3°C
Retest error	±2%FS	<0.2°C
Power Supply	DC5~24V or DC2~5V	
Quiescent Current	Peak <20mA; Average <5mA	
Response Time	1s	
Stabilized Time	2s	
Ingress Protection	IP68	
Working Temperature	-40°C ~ 85°C	
Measurement Area	center on the central probe in a cylinder withΦ7cm and 10cm height	
Cable Length	3.5M(Standard); others for optional	

3. Product Drawings

※Cable length: standard 3.5 meters

(5-core sheathed wire, UL2464-22AWG-5C
user can customize the length



4. Wiring Definition--5 wire connection

1 Red: VCC

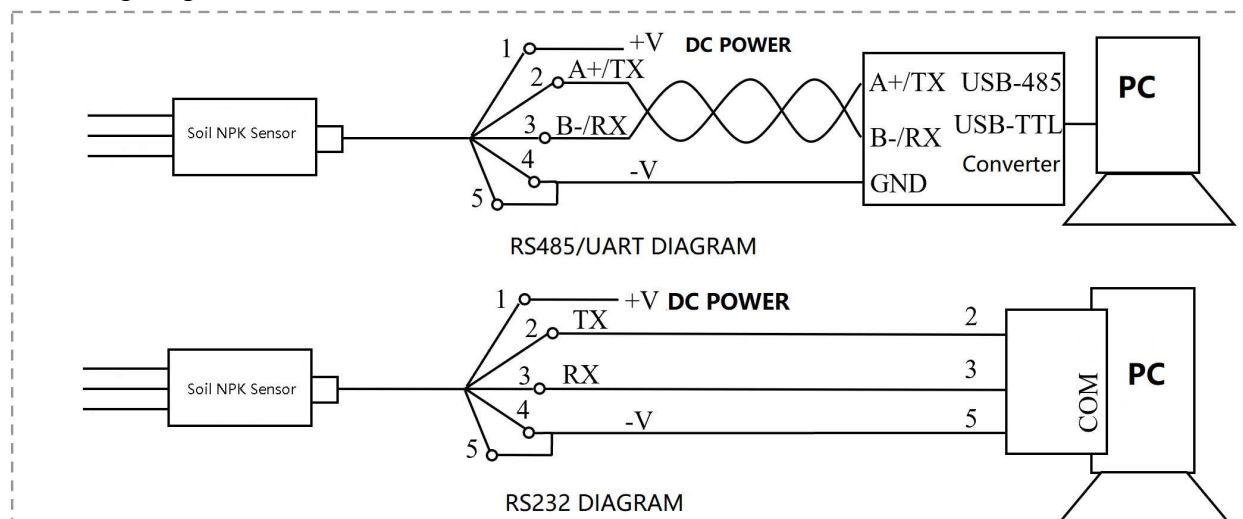
4 Black: GND

2 Green:485A+/232TX/UART-TX

3 Yellow:485B-/232RX/UART-RX

5 White: Set

The wiring diagram is shown below.



Note: When the SET terminal is connected to the negative pole of the power supply, it is the acquisition mode, and when the power supply is connected to the positive pole, it is the setting mode.

5. How To Use

5.1 Communication parameter setting

The RS-485/232 interface is a physical interface, and the 485 communication line is generally bus type, and all communication stations are connected to the 485 bus. The communication protocol adopts the MODBUS-RTU protocol, which is a master-slave protocol. There is a master station and multiple slave stations on a bus. The communication parameters between each station must be consistent, including baud rate, data bits, and parity. Both the check method and the number of stop bits must be the same. The station address of each slave station must be different, otherwise it will cause the slave station response conflict. RS-232 is generally point-to-point communication, with one COM port with one sensor.

The SET terminal of the sensor is connected to a high level, the sensor is in the setting mode, and the internal EEPROM is allowed to be modified. The communication parameters displayed by the sensor at this time are fixed as: station address 255, 9600, n, 8, 1. You can set the parameters of the sensor and modify the value of the 0X200-0X204 register.

The SET terminal of the sensor is connected to low level, and the sensor is in acquisition mode. At this time, the communication parameters set in the sensor are effective, that is, the communication runs according to the parameter definition of 0X200-0X204.

In the acquisition mode, the internal parameters cannot be modified. Even if the sensor responds to the write command, the internal parameters will not be modified.

5.2 Soil Measurement

Quick measurement method: select a suitable measurement location, avoid rocks, ensure that the steel needle will not touch hard objects such as rocks, plan the surface soil according to the required measurement depth, maintain the original tightness of the soil below, and hold Tighten the sensor body and insert it into the soil vertically. The steel needle must be inserted into the soil completely. It is recommended to measure multiple times to average within a small range of a measuring point.

Buried measurement method: Vertically dig a pit with a diameter of > 20 cm, and the depth is as required for measurement, and then insert the sensor needle horizontally into the pit wall at a predetermined depth to fill and compact the pit. After stabilizing for a period of time, you can perform continuous measurement and recording for several days, months or even longer.

5.3 Precautions

1. All steel needles must be inserted into the soil during measurement.
2. Avoid strong sunlight directly shining on the sensor body and cause the temperature to be too high. Pay attention to lightning protection when using in the field.
3. Do not violently bend the steel needle, do not pull the lead wire of the sensor forcefully, and do not drop or hit the sensor violently.
4. The sensor protection grade is IP68, and the sensor can be completely immersed in water.
5. When multiple sensors are installed in close distance and are energized at the same time, the installation interval shall not be less than 10cm.

6. Communication Specification Setting

Brief description of MODBUS-RTU protocol

What is the function code: the content of the second byte sent by the host. Among them, the function code 03 and 04 are to read the register value; the function code 06 is to write a single register; the function code 16 is to write multiple registers; the function code 17 is to read the device ID. No response to other function codes.

Acronym description:

TT: station address, address range 1-255;

SS: start address, 2 bytes, high byte first;

NN: number of registers ($NN \leq 11$), 2 bytes, high byte in Before;

MM: number of bytes, 1 byte;

RR: register address, a group of 2 bytes, high byte first;

VV: register value, a group of 2 bytes, high byte first;

CRC: CRC correction Verification code;

? ? :version number

1) 03, 04 function codes, read single (or multiple) registers (read up to 8 registers at a time)

Host sends: TT 03 SS SS NN NN CRC1 CRC2, 8 bytes,

Slave response: TT 03 MM VV VV. . . CRC1 CRC2, up to 21 bytes

2) 06 function code, write a single register

Host sending: TT 06 RR RR VV VV CRC1 CRC2, 8 bytes

Slave response: TT 06 RR RR VV VV CRC1 CRC2, 8 bytes

3) 16 (0X10) function code, write multiple registers

Host sending: TT 10 SS SS NN NN MM VV VV ... CRC1 CRC2, up to 9+16=25 bytes

Slave response: TT 10 SS SS NN NN CRC1 CRC2, 8 bytes

4) 17 (0X11) function code, read the device ID

Host sending: TT 11 CRC1 CRC2, 4 bytes

Slave response: TT 11 0B "SNPK-1-485V??" CRC1 CRC2, 19 bytes

For example (the SET terminal is connected to the negative pole of the power supply, the acquisition mode, the station address is the factory default value of 254):

Host sends: FE 03 00 00 00 03 11 C4

The meaning of the data:

FE-station address 254; 03-function code; 0000-register starting address; 0003-read 3 registers.

Sensor response: FE 03 06 00 FC 00 62 03 89 54 1D

The meaning of the data:

FE-station address 254; 03-function code; 06-byte number; 00FC- converted to decimal is 252, which means nitrogen content is 252 mg/Kg; 0062- converted to decimal is 98, which means phosphorus content is 98 mg/Kg; 0389-The decimal system is 905, which means that the potassium content is 905mg/Kg.

Users can send commands in a fixed format: FE 03 00 00 00 03 11 C4 to obtain sensor NPK data.

Sensor internal register address:

Register add.:	Register add. HEX :	Content	Read/Write	Value range	Function Code	Numerical meaning	Remark
00	00	Soil nitrogen content	Only read	0-2000	3/4	0-2000mg/Kg	
01	01	Soil phosphorus content	Only read	0-2000	3/4	0-2000mg/Kg	
02	02	Soil phosphorus content	Only read	0-2000	3/4	0-2000mg/Kg	
03	03	Soil temperature	Only read	-4000- +8000	3/4	-40.00°C ~80.00°C*	
04	04		Only read		3/4		
30	0X1E	Soil nitrogen content	Only read	0-2000	3/4	0-2000mg/Kg	
31	0X1F	Soil phosphorus content	Only read	0-2000	3/4	0-2000mg/Kg	
32	0X20	Soil potassium content	Only read	0-2000	3/4	0-2000mg/Kg	

*: Signed binary number, expressed in two's complement.

Register add.:	Register add. HEX:	Content	Read/Write	Value range	Function Code	Numerical meaning	Defaults
512	0X200	Station Add.	Read &Write	1-255	3/6/16	MODBUS station address	
513	0X201	Baud Rate	Read &Write	0-5	3/6/16	0-1200 1-2400 2-4800 3-9600,default 4-19200 5-38400	
514	0X202	Parity check	Read &Write	0,1,2	3/6/16	0-no check, default 1- odd parity 2-even parity	
515	0X203	Stop Bit	Read &Write	0,1	3/6/16	0-1 stop bit, default 1-2 stop bits	

Note: Serial communication is a fixed 8-bit data bit. The baud rate can be set to: 1200, 2400, 4800, 9600, 19200, 38400, and the factory default is 9600.

7. Product Selection Table

Remark	Series	Type	Power Supply	Output	Cable Length	
BGT						
	NPK					
		A				
			A			DC2~5V
			B			DC5~24V
				A		RS485
				B		RS232
				C		UART
				D		SDI-12
					3500	Unit:mm
					Other	Unit:mm

Example: BGT-NPK(A)-BA3500 Power:DC5~24V; Output:RS485; Cable 3.5m