RK500-05 Soil Water Potential Sensor User Manual

Revision Time	Reviser	Current Version	Remarks
20250701	SUN	V5.0	

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User Notice

Please read this manual carefully before use to ensure safe and optimal operation. Retain this manual for future reference.

Pre-Use Instructions

- Carefully review this manual and follow all operational and safety guidelines to prevent malfunctions and hazards.

Unpacking Inspection

- Upon receipt, carefully inspect the sensor device and accessories for any shipping damage.
- If damage is detected:
- Immediately notify the manufacturer and distributor.
- Retain all packaging materials for return or replacement processing.

Parts List

Item	Quantity	Remarks
Wind speed sensor	1	
Cable	1	The length depends on the order

1. Product Introduction

Soil water potential is the amount of energy required to extract a unit of water from the soil at the same temperature in kilopascals (kPa). When the soil moisture is saturated, the water potential is zero. The water content is lower than the saturation state, and the water potential is negative. The more arid the soil is, the greater the negative value will be. In the study of plant water demand, soil water content cannot reflect the availability of plants, and soil water potential is the only index to judge the degree of drought.

2. Product Features

- Real-time measurement
- Good corrosion resistance,
- High accuracy
- Good linearity
- Suitable for high salinity

3. Applications

- Environmental monitoring
- Weather station
- Aquaculture
- Ground detection
- Water conservancy
- Agriculture

4. Specifications

Item	Technical Specification	
Range	-10~-500kPa,-100~-10kPa	
Supply	5VDC	5-30VDC
Output Signal	500~1000 mV	RS485
Accuracy	±25%(-5~-100kPa),±35%(-100~-300kPa),±50%(-300~-500kPa)	
Resolution	0.1kPa	
Power consumption	5mA@12V	
Element	Ceramic	
Response Time	200ms	
Operating	-40℃~+85℃@0%-100%RH	
Dimension	116.5 × 45 × 18mm	
Storage	-40~125℃@0%-80%RH(No condensation)	
Weight(unpacked)	200g	
Ingress Protection	IP68	

5. Electrical Connections

Connector（Cable）	RS485	Connector（Cable）	Voltage
Red	V+	Brown	V+
Black	V-	Black	V-
Brown	RS485A	Blue	Signal+
White	RS485B		

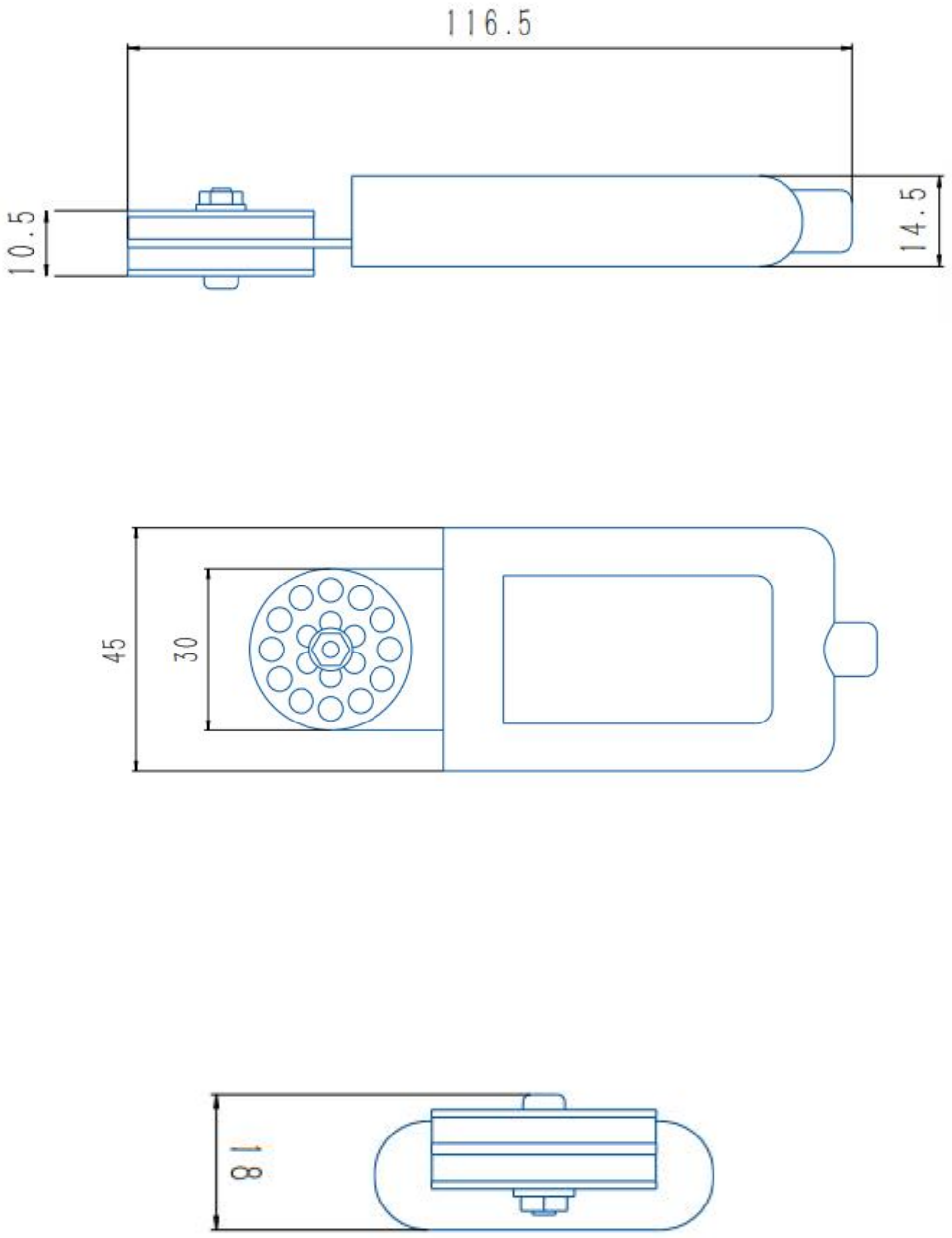
6. Output Types & Formulas

Voltage Type	Water Potential=-EXP(4.8*(10^-5)*(U^2)-(8.46*10^-2)*U+39.45)

U = output voltage(mV)

7. Product Dimensions

Unit:mm



8. Communication Protocol（MODBUS-RTU）

Parameter	Value
Data Bits	8 bits
Check Bit	None
Stop Bit	1 bit
Baud Rate	9600 bps
Slave Address	0x01 (Factory Default)

8.1 Read Real-Time Data

Client sends:

01 03 00 00 00 01 840A

Return:

01 03 02 11 B6 35A2

8.1.1 Description of Return Data Format

No.	Conception	Byte Number	Description	Remarks
1	Address block	1	Address(0x01)	0x01
2	Function code	1	Only read(0x03)	0x03
3	Number of bytes	1	0X02	2bytes
4	Data block	2	Water Potential data	0x11B6(4534/**10-500**= - 46.6kPa)
5	Check block	2		0x35 0xA2

8.2 Modify Slave Address

Client sends:（Change slave address from 01H to 02H.）

Slave id	Function code	Set Reg_H	Set Reg_L	Reg Num_H	Reg Num_L	B count	New id_H	New id_L	CRC_L	CRC_H
0x01	0x10	0x10	0x00	0x00	0x01	0x02	0x00	0x02	0x36	0x50

Response:

Slave id	Function code	Address_H	Address_L	Reg Num_H	Reg Num_L	CRC_L	CRC_H
0x01	0x10	0x10	0x00	0x00	0x01	0x05	0x09

Note: If you forget the original address, you should use the broadcast address(00H) (ensure that no other devices on the bus at this time.

9. Installation Guidelines

● First, determine the installation depth and location for the soil water potential sensor.

● At the installation site, collect a soil sample. Mix the soil with water to create a slurry, then coat the sensor completely with the slurry.

● Bury the slurry-coated sensor at the installation site and backfill with soil.

9.1 Installation Method

Figure 9.1
Sensor Section Installation Examples

10. Precautions

Package and Model Verification

- Ensure the packaging is intact and verify the sensor model and specifications match your purchased product.

Powered Wiring Prohibition

- Do not connect wires while powered. Only energize the sensor after confirming correct wiring.

Component Modification Restriction

- Do not alter factory-soldered components or pre-connected wires.

Precision Handling Requirement

The sensor is a precision device. Avoid:

- Unauthorized disassembly
- Structural components are strictly prohibited from being compressed under stress

Note: Unauthorized modifications void the warranty.

11. Troubleshooting

Incorrect Output Signals (Analog/RS232/RS485):

- Verify wiring correctness and secure connections.
- Check if the serial port is occupied or malfunctioning.
- Confirm serial port settings (baud rate, data/stop bits) match device requirements.

Persistent Issues:

- Contact the manufacturer if the above steps fail to resolve the problem.

12. Product Maintenance

Maintenance and Safety

- Regularly clean and inspect the sensor to maintain performance.
- Do not expose the sensor to extreme temperatures, moisture, or corrosive substances unless explicitly specified.
- Unauthorized disassembly, modification,or repairs may void the warranty and lead to malfunctions.

Troubleshooting Protocol

- In case of malfunction, refer to the troubleshooting section of this manual.
- Do not attempt unauthorized disassembly or repairs.
- Contact the manufacturer's after-sales department directly for technical support.

13.Warranty Terms

This product comes with a one-year warranty, starting from the date of delivery. Within twelve months, the Company shall be responsible for free repair or replacement of any failure caused by sensor quality issues (non-human damage). Fees will be charged for repairs or replacements after the warranty period expires.

CE Complies with applicable CE directives.

Manual subject to change without notice.

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