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Industrial IOT

USR-SSO10 Specification

Soil sensors



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LRI Distribuída no Brasil pela LRI | vendas@lri.com.br | 51 2129-3000

1.Product Presentation

The USR-SSO series soil comprehensive sensor is an integrated sensor that combines nitrogen, phosphorus, potassium, temperature and humidity, PH, and conductivity. It is suitable for soil moisture monitoring, scientific experiments, water-saving irrigation, greenhouses, flowers and vegetables, grasslands and pastures, rapid soil testing, plant cultivation, wastewater treatment, precision agriculture, and other scenarios. The input power supply, sensing probe, and signal output of the sensor are completely isolated, ensuring safety and reliability. The design is aesthetically pleasing, easy to install, with stainless steel probes that are corrosion-resistant and perform stably.

Product Features

- Multiple parameters are combined into one;
- High precision, stable signal;
- The measurement range is wide and the data linearity is good;
- Corrosion resistant, IP68 waterproof, safe and reliable;
- Simple installation and long transmission distance;
- Low power consumption, suitable for outdoor low power consumption use

2. Specifications

Parameter	Qualification
Product Model	USR-SSO
Power	DC 12~24V
Power Consumption	10mA@12V
Protocol	RS485 ;Modbus-RTU
Working Temperature	-40 ~ 80℃
Soil Temperature	Range ： -40 ~ 80℃
	Resolution Ratio：0.1℃（@25℃）
	Accuracy：±0.5℃
Soil Humidity	Range ： 0 ~ 100%
	Resolution Ratio：0.1%（@25℃）
	Accuracy：±3%
Soil Conductivity	Range：0-10000us/cm
	Resolution Ratio：1us/cm（@25℃）
	Accuracy：±10%
Soil PH	Range：3-9
	Resolution Ratio：0.01（@25℃）
	Accuracy：±0.6Ph
Soil NPK	Range：0-1999mg/Kg

	Resolution Ratio：1mg/L（@25℃）
	Accuracy：±2%
Measuring Method	Soil Electrical Conductivity: Ac Bridge Method. Insert The Soil In-Situ Or Immerse It In The Culture Solution.
	Soil Moisture: Fdr Method. Directly Test In The Integrated Water And Fertilizer Nutrient Solution.
Protection Level	IP68
Sealing Material	Black Flame Retardant Epoxy Resin
Way To Install	Bury In The Soil
Default Cable Length	Wire Length: 5m ; Length Customizable

3. Product installation and size

3.1.Installation and usage

（1）Check

Remove the sensor from the packaging box and check whether the appearance of the sensor is good and the lead is intact

（2）Read and modify the sensor address

The default address of the device is "1" when it leaves the factory. You can use serial port assistant to modify the device address. Device address: 1-255,00 is the broadcast address。

(3) Rapid measurement method

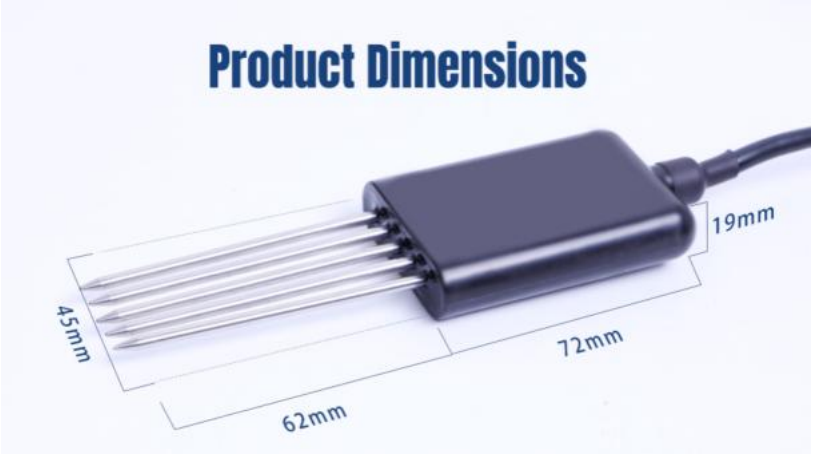
Choose a suitable measurement site, avoiding stones to ensure the electrodes do not touch hard objects. Dig up the topsoil to the required depth while keeping the underlying soil intact. Hold the sensor vertically and insert it firmly into the soil, ensuring full probe insertion without rocking. Ensure tight contact with the soil. Take multiple readings in a small area and average the results.

（4）Buried measurement method

Dig a pit vertically with a diameter over 20 cm as required in depth. Insert the sensor probe horizontally into the pit wall at the set depth. Fill and compact the pit to ensure close contact between the electrodes and the soil. After stabilization, conduct tests and record data for several days, months or longer.

* When measuring on a hard surface, drill a hole smaller than the probe diameter, insert it into the soil, compact the soil, and then measure. Protect the sensor from strong vibration and impact, and don't strike it with hard objects.

3.2. Product size



4.Communication protocol

✧ This product supports Modbus RTU protocol

✧ Address: 01 ; 9600/N/8/1

4.1 Register address

FC	Register Address	**Content**	Unit	Data Type	Operate
USR-SSO10-TH					
03H	00 00H	**Temperature**	0.1 ℃	Int16	Read-Only
03H	00 01H	**Humidity**	0.1%Rh	Int16	Read-Only
USR-SSO10-THEC					
03H	00 00H	**Temperature**	0.1 ℃	Int16	Read-Only
03H	00 01H	**Humidity**	0.1%Rh	Int16	Read-Only

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03H	00 02H	**Electrical Conductivity**	Us/Cm	Int16	Read-Only
USR-SSO-THPH					
03H	00 00H	**Temperature**	0.1 ℃	Int16	Read-Only
03H	00 01H	**Humidity**	0.1%Rh	Int16	Read-Only
03H	00 02H	**PH**	0.01Ph	Int16	Read-Only
USR-SSO-NPK					
03H	00 00H	**Nitrogen Content**	Ug/L	Int16	Read-Only
03H	00 01H	**Phosphorus Content**	Ug/L	Int16	Read-Only
03H	00 02H	**Potassium Content**	Ug/L	Int16	Read-Only
USR-SSO10-THPHEC					
03H	00 00H	**Temperature**	0.1 ℃	Int16	Read-Only
03H	00 01H	**Humidity**	0.1%Rh	Int16	Read-Only
03H	00 02H	**Electrical Conductivity**	Us/Cm	Int16	Read-Only
03H	00 03H	**PH**	0.01Ph	Int16	Read-Only
USR-SSO-THNPK					
03H	00 00H	**Temperature**	0.1 ℃	Int16	Read-Only
03H	00 01H	**Humidity**	0.1%Rh	Int16	Read-Only
03H	00 02H	**Nitrogen Content**	Ug/L	Int16	Read-Only
03H	00 03H	**Phosphorus Content**	Ug/L	Int16	Read-Only
03H	00 04H	**Potassium Content**	Ug/L	Int16	Read-Only

USR-SSO10-PH					
03H	00 00H	**PH**	0.01Ph	Int16	Read-Only

4.1.1. Read parameter data

✧ Read the soil temperature and humidity data of the device with the address of 01.

Ask	Slave Address	Function Code	Starting Address	Length	CRC-Lower Bit	CRC-Higher Bit
	01	03	00 00	00 02	C4	0B
Reply	Slave Address	Function Code	Byte Count	Data	CRC-Lower Bit	CRC-Higher Bit
	01	03	04	01 23 01 46	8A	67

Temperature : 0x0123 (HEX)= 291 (DEX)， 291/ 10 = 29.1℃;

Humidity ： 0x0146（HEX）= 326（DEX），316/10 = 32.6%RH;

4.1.2.Modify the device address

✧ Read the device address

Ask	Slave Address	Function Code	Starting Address	Length	CRC-Lower Bit	CRC-Higher Bit
	00	03	27 01	00 01	De	Af
Reply	Slave Address	Function Code	Byte Count	Data	CRC-Lower Bit	CRC-Higher Bit
	00	03	02	00 01	44	44

Device address ： 0X0001（HEX）=1（DEX）

✧ Change the device address 01 to 02

Ask	Slave Address	Function Code	Starting Address	Length	CRC-Lower Bit	CRC-Higher Bit
	00	06	27 01	00 02	52	Ae
Reply	Slave Address	Function Code	Byte Count	Data	CRC-Lower Bit	CRC-Higher Bit
	00	06	27 01	00 02	52	Ae

Note: The modifiable slave address is a byte with a range of 1-255, where 00 is the broadcast address.

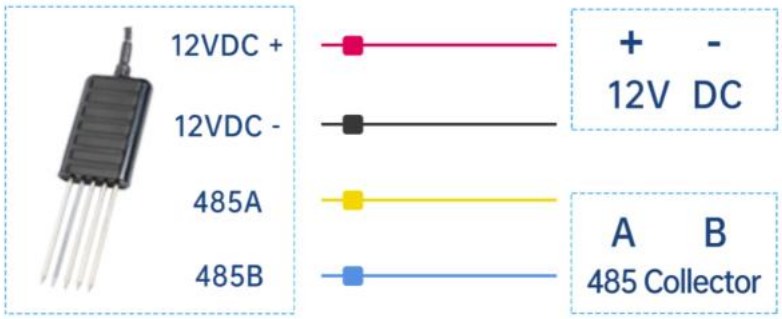
5.Wiring

5.1.Definition of line sequence

	Line Sequence	**Instruction**
USR-SSO	Red	(DC12~24V)
	Black	(GVD)
	Yellow	RS485 A
	Blue	RS485 B

5.2.Product wiring diagram

Note: Please do not connect the wrong wiring sequence, the wrong wiring will cause the equipment to burn out.



6.Product maintenance

6.1.Equipment applicable environment

The operating voltage of the device is 12~24V DC. Too high or too low input voltage may cause the device to fail to work properly or even damage.

The equipment protection level is IP68. Do not use this product in condensation or liquid immersion environment.

6.2.Common problems and solutions

After ower supply, the 485 interface cannot establish communication.

▶ Whether the 485 line is reversed or whether the voltage is within the specified range;

▶ Whether the device address and baud rate are correct。

The 485 bus mounts multiple devices and fails to modify the broadcast address。

✦ The broadcast address is used when there is only one device on the test bus. If there are more than one device, it needs to be connected and modified separately. Otherwise, all devices will respond at the same time and cannot be executed correctly。

7. Contact US

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