# RS485 Soil Moisture Sensor Instructions

| Date: | 23/09/2025 | Version: | 1.0 | By: | Matt Little |
|---|---|---|---|---|---|

This is a soil temperature and moisture sensor designed for agriculture, meteorological and environmental monitoring applications.

Manufacturer code: **ZTS-3000-TR-WS-N01**

It is a fully sealed (IP68), can be installed below ground level, with high precision data via an RS485 output.

Soil moisture calculation is based on the principle of frequency domain reflection. By measuring the dielectric constant of soil, it can directly and stably reflect the real moisture content (volumetric moisture content) of all kinds of soil.

You will need to wire this up to your microcontroller along with a suitable RS485 to TTL/Serial converter (neither supplied).

*Warning: Not suitable for under 12 years old.*
*Warning: Sharp points on sensor probes.*

## Parts included:

## Parts list:

| Item | Quantity |
|---|---|
| Moisture sensor unit | 1 |

## Additional parts required:

Some or all of these parts may be needed, depending upon your application.

| Item | Quantity |
|---|---|
| RS485 to TTL converter | 1 |
| Microcontroller (Arduino or other type) | 1 |
| Cable and Connectors | Various |

## Specifications:

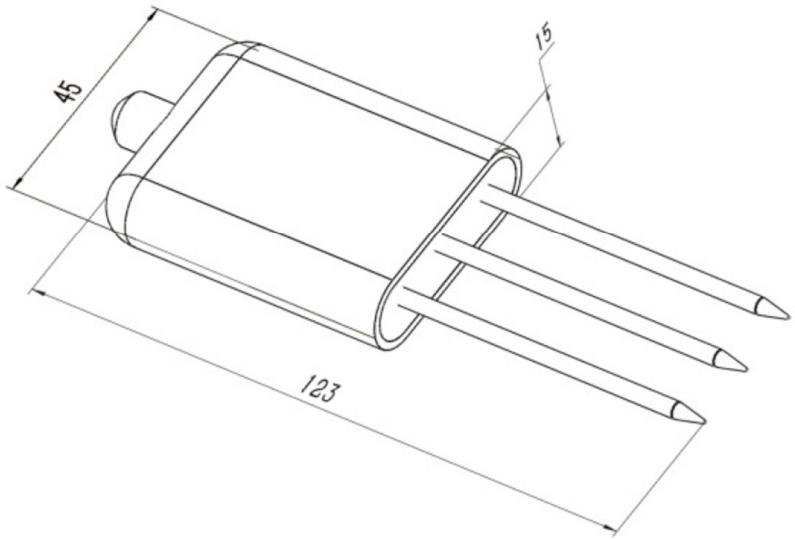
| | | |
|---|---|---|
| Measurement parameters: | soil volumetric **moisture** content; | soil **temperature** |
| Unit of measurement: | % ($m^3$ water/$m^3$ soil); | °C |
| Moisture Range: | 0-100% | |
| Temperature range: | -40 to 80 °C | |

*The measurement accuracy was ± 2% ($m^3$ water/$m^3$ soil) and ± 0.2 ° C in the range of 0-50% ($m^3$ water/$m^3$ soil)*

| | |
|---|---|
| Working Range: | -40 to 80 °C |
| Output Signal: | RS485 (standard Modbus-RTU protocol, device default address: 01) |
| Supply voltage: | 4.5 to 30V DC |
| Supply power: | 0.4W (when powered with 12V DC) |
| Stabilization Time: | < 1 second |
| Response time: | < 1 second |

## Physical parameters

| | |
|---|---|
| Probe size: | 55mm, ϕ3mm |
| Probe material: | 316L stainless steel |
| Sealing materials: | ABS Engineering Plastics, epoxy resin, waterproof grade |
| IP rating: | IP68 |
| Cable specifications: | 2 m |



Instructions:

| **Info: 1** | Power Supply |
|---|---|

This unit can work with a DC supply of 4.5 - 30V DC.
The maximum power consumption is 0.4W at 12V (around 40mA). Ensure there is enough current to power the unit (suggested to ensure 100mA is available).

Cable connections:

- Brown: +V Power Supply (4.5-30V DC)
- Yellow: A+ of RS485
- Blue: B- of RS485
- Black: Ground

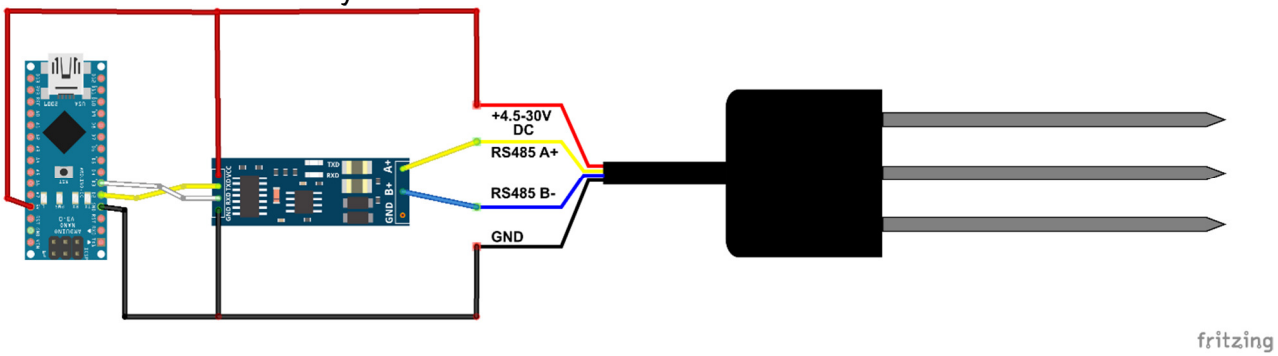
| **Info: 2** | RS485 Connection |
|---|---|

- Default address: 01
- Standard Modbus-RTU protocol
- Baud rate: 4800
- Parity bit: none
- Data bit: 8
- Stop bit: 1

Cable connections:

- Brown: +V Power Supply (4.5-30V DC)
- Yellow: A+ of RS485
- Blue: B- of RS485
- Black: Ground


When testing, the following wiring to an RS485 to TTL converter with Arduino Nano was used and worked reliably:



| **Info: 3** | RS485 Information |
|---|---|

**Change of address**

For example, change the address of a sensor with address 1 to 2, from controller → sensor:

| Original address | Function codes | Start register high | Start register low | Start address high | Start address low | CRC16 low | CRC16 high |
|---|---|---|---|---|---|---|---|
| 0X01 | 0X06 | 0X07 | 0XD0 | 0X00 | 0X02 | 0X08 | 0X86 |

If the sensor receives this command correctly, the data is returned in the same way.

Note: If you forget the original address of the sensor, you can use the broadcast address 0XFF instead, using 0XFF controller can only receive a single sensor, and the return address is still the original address, and can then be used as an address query method.

**Query Data**

Query sensor (address 1) data (soil temperature, soil moisture) from controller → sensor:

| Address | Function codes | Start register address high | Start register address low | Register length high | Register length low | CRC16 low | CRC16 high |
|---|---|---|---|---|---|---|---|
| 0X01 | 0X03 | 0X00 | 0X00 | 0X00 | 0X02 | 0XC4 | 0X0B |

If the sensor receives correctly, return the following data, from sensor → controller:

| Address | Function codes | Data Length | Register 0 data high | Register 0 data low | Register 1 data high | Register 1 data low | CRC16 low | CRC16 high |
|---|---|---|---|---|---|---|---|---|
| 0X01 | 0X03 | 0X04 | 0x04 | 0XDD | 0X01 | 0X64 | 0X5A | 0X66 |
| | | | Soil Temperature: ~ 3.5 °C | | Soil moisture: 35.6 % ($m^3$ water/$m^3$ soil) | | | |

## Software

| Software Examples |
| --- |
| This can be where the fun begins! You can alter the code supplied here and improve it for your application.<br><br>This project has software stored on GITHUB software repository here:<br><br>**https://github.com/curiouselectric/mositureSensor**<br><br>Please follow the readme in this file for the most up to date instructions for uploading code using the Arduino IDE (or any other IDE of your choice).<br><br>A blog post on getting started with this sensor is available here:<br>https://www.re-innovation.co.uk/docs/soil-moisture-sensor-testing/ |

## Contact details:

This sensor has been supplied by:

**The Curious Electric Company**
**hello@curiouselectric.co.uk**
**www.curiouselectric.co.uk**

We would like you to be happy with this kit. If you are not happy for any reason, then please contact us and we will help to sort it out.

Please email **hello@curiouselectric.co.uk** with any questions or comments.
Please tweet us at **@curiouselectric**

If any parts are missing from your kit, then please email **hello@curiouselectric.co.uk** with details, including when and where the kit was purchased.

More technical information can be found via **www.curiouselectric.co.uk**