



Bio Instruments S.R.L.

SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS

SMTE-3T-485M

Soil Moisture, EC and Temperature Sensor

Quick Start Guide



phyto-sensor.com

Introduction

The SMTE-3 Soil Moisture, Temperature and EC Sensor measures the Volumetric Water Content for Mineral soil, Sandy soil, Clay, Organic soil (%VWC), the Temperature (°C), and the Electrical Conductivity (dS/m) of the substrate.

Model: SMTE-3T-485M.

Interface: RS-485.

Protocol: Modbus RTU.

Installation

The SMTE-3 sensor can be inserted into soilless substrates in a variety of ways; however, the orientation of the sensor will possibly affect the sensor accuracy. In addition, high spatial variability in soilless substrates will drastically affect the difference between sensor readings from one location to another.

Orientation

The goal of installing a sensor into a substrate is to measure those parameters important to plant growth while not changing them. The SMTE-3 can be installed in many different orientations, depending on your needs. However, common sense should be used. For example, installing the sensor in the top of a pot that is being irrigated by micro-sprinkler may cause water to drip around the sensor head, leaving a dry patch of soil immediately below. A better option would be to insert the sensor into the side of the root mass with the needles horizontal, aligned in a vertical row. This will allow water to flow freely through the pot and measurements to be made directly around the roots. Still, when irrigation water is not applied

from the surface, it may be entirely appropriate to install the sensor on top of the substrate. However, please keep in mind that the sensor only measures the VWC in its sphere of influence. Sensor can either be inserted into the top of the plant pot or into the side of the root ball. Insertion into the side of the root ball may be the best option, as it will give the best indication of the water available to the plant.

Removing the sensor

The SMTE-3 is easily removed from substrates. The stainless steel needles slip easily in and out of all types of growing media. Still, we recommend the sensor never be pulled out by their cables, as this can put immense strain on the wires inside. If the sensor is buried, carefully dig down to the sensor, taking care not to damaging the cable with your digging implement. After removing the media around the head, simply grab onto the sensor and remove it.

Cleaning the Probe

1. Clean each pin using a mild detergent such as liquid dish soap and a non-abrasive sponge or cloth.

Note: Avoid detergents that contain lotions or moisturizers.

2. Rinse the sensor and prongs thoroughly with tap or DI water.

Note: Be sure not to touch the prongs with an un-gloved hand or contact them with any source of oil or other non-conducting residue.

Connection

The sequence and correctness of the connection must be observed!

Connection order

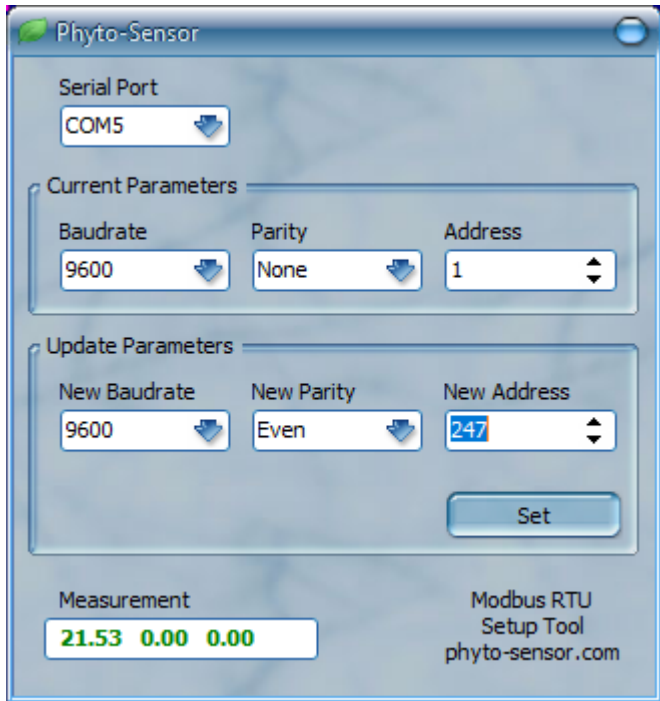
1	Black	Ground
2	Yellow	Output RS485-B
3	White	Output RS485-A
4	Red	Power 3.6 to 30 Vdc

Important notes:

1. The sensor interface meets the requirements of the EIA RS-485 (TIA-485) standard, and shall be connected accordingly. It is important to note that the termination resistor is not internally installed in the sensor.
2. The EIA RS-485 Specification labels the data terminals as "A" and "B", but many manufacturers label their terminals as "+" and "-". It is commonly accepted that the "-" terminal should be connected to the "A" line, and the "+" terminal to the "B" line. Reversing the polarity will not damage a 485 device, but it will not communicate.

3. For proper functioning ground wires of all devices connected to RS-485 bus must be interconnected together. In case of using a separate power supply, its ground (“minus”) terminal must be connected to the ground line of the bus.
4. Please connect ground wires before all other connections.

Set Modbus RTU address



phyto-sensor.com/download/MbRTU_DAST

1. Download, extract and run the Modbus RTU Device Address Set Tool by using the above-mentioned link.
2. Connect the sensor to the PC via RS-485 adapter.

3. Power the sensor on.
4. Specify the RS-485 adapter's serial port.
5. Enter a desired address in 'New Address' field and press 'Set' button. The factory default address is 247.
6. The sensor will start to measure.
7. Power off the sensor.

Data reading

Baud Rate = 9600, 8 bit, no parity bit, 1 stop bit (default settings).

Protocol : Modbus RTU.

Modbus register map

Protocol address	Type Access Modbus function	Parameter	Default
0x0000	INT16 r 3/4	Temperature Value is stored with a scaling of 1:100 (e.g.: -500 is equivalent to -5.00 °C)	N/A
0x0001	UINT16 r 3/4	VWC Value is stored with a scaling of 1:100 (e.g.: 5000 is equivalent to 50%)	N/A
0x0002	UINT16 r 3/4	EC Value is stored with a scaling of 1:100 (e.g.: 100 is equivalent to 10.00 dS·m ⁻¹)	N/A

Protocol address	Type Access Modbus function	Parameter	Default
0x0005	UINT16 r 3/4	Epsilon Value is stored with a scaling of 1:100 (<i>e.g.: 100 is equivalent to 10.00</i>)	N/A
0x0020	UINT16 r/w 3/6/16	Soil type 0: Mineral soil 1: Sandy soil 2: Clay 3: Organic soil	0
0x0021	UINT16 r/w 3/6/16	Temperature unit 0: °C 1: °F	0
0x0200	UINT16 r/w 3/6/16	Slave-ID 0 to 255	1
0x0201	UINT16 r/w 3/6/16	Baudrate 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps 4: 19200bps 5: 38400bps	3

Protocol address	Type Access Modbus function	Parameter	Default
0x0203	UINT16 r/w 3/6/16	Parity 0: No parity bit 1: Even parity 2: Odd parity	0
0x0205	UINT16 r/w 3/6/16	Stop bits 0: 1 Stop bit 1: 2 Stop bit	0

Power supply

The 3.6 to 30 Vdc @ 6 mA typ. regulated power supply may be used.

Specifications

Volumetric Water Content

Measurement range	0 to 100 %VWC
Resolution	0.03% (0 to 50 %VWC) 1% (50 to 100 %VWC)
Accuracy	±2% (0 to 50 %VWC) ±3% (50 to 100 %VWC)

Temperature

Measurement range	-40 to 80 °C
Resolution	0.1 °C
Accuracy	±0.5 °C

Electrical Conductivity

Measurement range	0 to 10 dS·m ⁻¹
Resolution	0.01 dS·m ⁻¹
Accuracy	±3%
Electrical conductivity temperature compensation	Built in temperature compensation sensor, compensation range 0 to 50°C

Output	RS-485 Modbus
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Supply voltage	3.6 to 30 Vdc
Current consumption	6 mA @ 24 Vdc
Operating temperature	-40 to 85°C
Probe dimensions	4.5 × 1.5 × 14.5 cm
Prong length	7 cm
Cable length	2 m
The material of the probe	Anti-corrosion special electrode
Protection index	IP68

Customer Support

If you ever need assistance with your sensor, or if you just have questions or feedback, please e-mail at support@phyto-sensor.com. Please include as part of your message your name, address, phone, and fax number along with a description of your problem.

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