



Bio Instruments S.R.L.

SENSORS AND SYSTEMS
FOR MONITORING GROWING PLANTS

SMTE-3T-SDI12

Soil Moisture, Temperature and EC Sensor Quick Start Guide



phyto-sensor.com

Introduction

The SMTE-3 Soil Moisture, Temperature and EC Sensor measures Dielectric Constant (relative permittivity ϵ), Bulk Electrical Conductivity (dS/m), and Temperature ($^{\circ}\text{C}$) of substrates. The sensor has built-in factory equations for calculating the Volumetric Water Content (%VWC) for the following media: Mineral soil, Sandy soil, Clay, Organic soil, and Grodan Vital rockwool slabs.

Model: SMTE-3T-SDI12.

Interface: SDI12.

Installation

The SMTE-3 sensor can be used in natural soils and soilless substrates in a variety of ways; however, the orientation of the sensor may possibly affect the sensor's readings. In addition, high spatial variability in soilless substrates may cause significant difference of the sensor/s readings from one location to another.

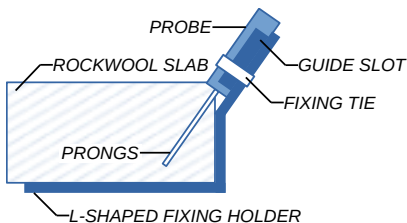
Orientation

The goal of installing a sensor into a substrate is to measure those parameters important to plant growth. The common sense should be used when choosing position and orientation of the sensor. 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.

Recommendations for installation in a Rockwool slab

The main goal is to make the readings comparable and reproducible because of significantly non-uniform distribution of free water in the rockwool. The same reproducible positioning of the sensor's probe in a slab may be considered as solution. That is why the sensor is supplied with a special fixing holder illustrated with the Grodan rockwool slab in the figure below:



Removing the sensor

The SMTE-3 is easily removed from substrates. The stainless steel prongs 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

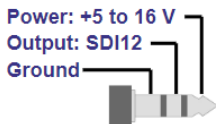
1. Clean each pin using a mild detergent such as liquid dish soap and a non-abrasive sponge or cloth.

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



Data reading

In accordance with SDI12 Standard ([version 1.3](#)).

The order of data in the response to the send data command | data format:

1. Dielectric Permittivity ε | XX.XX
2. Electrical Conductivity, $dS \cdot m^{-1}$ | XX.XX
3. Temperature, $^{\circ}C$ | XX.X
4. Volumetric Water Content - Mineral Soil, %VWC | XX
5. Volumetric Water Content - Sandy Soil, %VWC | XX
6. Volumetric Water Content - Clay, %VWC | XX
7. Volumetric Water Content - Organic Soil, %VWC | XX
8. Volumetric Water Content - Grodan Vital, %VWC | XX

Power supply

The 5 to 16 Vdc regulated power supply may be used.

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.

Specifications

Dielectric Permittivity ϵ

Measurement range	1 to 80
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Electrical Conductivity

Measurement range	0 to 20 $dS \cdot m^{-1}$
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Resolution	0.01 $dS \cdot m^{-1}$
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Accuracy	$\pm 3\%$
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Electrical conductivity temperature compensation	Built in temperature compensation sensor, compensation range 0 to 50 °C
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Temperature

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

Measurement range	0 to 100 %VWC
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Resolution	0.03% (0 to 50 %VWC) 1% (50 to 100 %VWC)
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Accuracy	$\pm 2\%$ (0 to 50 %VWC) $\pm 3\%$ (50 to 100 %VWC)
Output	SDI12
Supply voltage	5 to 16 Vdc
Current consumption	2.5 mA standby @ 12 Vdc 10 mA typ. @ 12 Vdc * 25 mA max. @ 12 Vdc *
Power up time	30 ms
Measurement duration	120 ms
Operating temperature	0 to 50 °C
Probe dimensions	4.5 × 1.5 × 14.5 cm
Prong length	7 cm
The material of the probe	Anti-corrosion special electrode
Protection index	IP68

* During measurement.

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