

# Soil Moisture Smart Sensor (S-SMx-M005) Spec Sheet



Soil moisture smart sensors are used for measuring soil water content and are designed to work with smart sensor-compatible HOBO® stations. They combine the innovative ECH<sub>2</sub>O® Dielectric Aquameter probe from METER Group with Onset's smart sensor technology. All sensor conversion parameters are stored inside the smart sensor adapter so data is provided directly in soil moisture units without any programming or extensive user setup.

## Soil Moisture Smart Sensor

Models: S-SMC-M005  
S-SMD-M005

### Item included:

- Protective cap

## Specifications

S-SMC-M005	
<b>Measurement Range</b>	In soil: 0 to 0.550 m <sup>3</sup> /m <sup>3</sup> (volumetric water content)
<b>Extended Range</b>	-0.401 to 2.574 m <sup>3</sup> /m <sup>3</sup> ; see Note 1
<b>Accuracy</b>	±0.031 m <sup>3</sup> /m <sup>3</sup> (±3.1%) typical 0 to 50°C (32° to 122°F) for mineral soils up to 8 dS/m and ±0.020 m <sup>3</sup> /m <sup>3</sup> (±2%) with soil specific calibration; see Notes 2 and 3
<b>Resolution</b>	0.0007 m <sup>3</sup> /m <sup>3</sup> (0.07%)
<b>Volume of Influence</b>	0.3 liters (10.14 oz)
<b>Sensor Frequency</b>	70 MHz
<b>Soil Probe Dimensions</b>	89 x 15 x 1.5 mm (3.5 x 0.62 x 0.06 in.)
<b>Weight</b>	180 grams (6.3 oz)
<b>METER ECH<sub>2</sub>O Probe Part No.</b>	EC-5
<b>Sensor Operating Temperature</b>	0° to 50°C (32° to 122°F). Although the sensor probe and cable can safely operate at below-freezing temperatures (to -40°C/F) and the smart sensor adapter housing (the portion of the sensor cable that houses the electronics) can be exposed to temperatures up to 70°C (158°F), the soil moisture data collected at these extreme temperatures is outside of the sensor's accurate measurement range.
<b>Bits per Sample</b>	12
<b>Number of Data Channels*</b>	1
<b>Measurement Averaging Option</b>	No
<b>Cable Length Available</b>	5 m (16 ft)
<b>Length of Smart Sensor Network Cable*</b>	0.5 m (1.6 ft)
<b>CE</b>	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

\* A single HOBO station can accommodate 15 data channels and up to 100 m (328 ft) of smart sensor cable (the digital communications portion of the sensor cables).


Note 1: The sensor is capable of providing readings outside the standard volumetric water content range. This is helpful in diagnosing sensor operation and installation. See the *Operation* section for more details.

Note 2: This is a system level accuracy specification and is comprised of the probe's accuracy of ±0.03 m<sup>3</sup>/m<sup>3</sup> typical (±0.02 m<sup>3</sup>/m<sup>3</sup> soil specific) plus the smart sensor adapter accuracy of ±0.001 m<sup>3</sup>/m<sup>3</sup> at 25°C (77°F). There are additional temperature accuracy deviations of ±0.003 m<sup>3</sup>/m<sup>3</sup> / °C maximum for the probe across operating temperature environment, typical <0.001 m<sup>3</sup>/m<sup>3</sup> / °C. (The temperature dependence of the smart sensor adapter is negligible.)

Note 3: Given the nature of the sensor design and sensor operating frequency, the system has inherent susceptibilities to Radio Frequency signals. The accuracy specification when subjected to certain RFI environments, such as those outlined in IEC 61000-4-3 and IEC 61000-4-6, is reduced to 0.061 m<sup>3</sup>/m<sup>3</sup>.

The system level accuracy will be particularly affected when placed in an electric field of 3 V/m or greater in the 70 MHz range. RFI mitigation practices and physical deployment changes may reduce the systems susceptibility.

## Specifications (continued)

<b>S-SMD-M005*</b>	
<b>Measurement Range</b>	In soil: 0 to 0.570 m <sup>3</sup> /m <sup>3</sup> (volumetric water content)
<b>Extended Range</b>	-0.659 to 0.6026 m <sup>3</sup> /m <sup>3</sup> ; see Note 1
<b>Accuracy</b>	±0.033 m <sup>3</sup> /m <sup>3</sup> (±3.3%) typical 0 to 50°C (32° to 122°F) for mineral soils up to 10 dS/m and ±0.020 m <sup>3</sup> /m <sup>3</sup> (±2%) with soil specific calibration; see Notes 2 and 3
<b>Resolution</b>	0.0008 m <sup>3</sup> /m <sup>3</sup> (0.08%)
<b>Volume of Influence</b>	1 liter (33.81 oz)
<b>Sensor Frequency</b>	70 MHz
<b>Soil Probe Dimensions</b>	160 x 32 x 2 mm (6.5 x 1.25 x 0.08 in.)
<b>Weight</b>	190 grams (6.7 oz)
<b>METER ECH2O Probe Part No.</b>	10HS
<b>Sensor Operating Temperature</b>	0° to 50°C (32° to 122°F). Although the sensor probe and cable can safely operate at below-freezing temperatures (to -40°C/F) and the smart sensor adapter housing (the portion of the sensor cable that houses the electronics) can be exposed to temperatures up to 70°C (158°F), the soil moisture data collected at these extreme temperatures is outside of the sensor's accurate measurement range. Extended temperatures above 50°C (122°F) will decrease logger battery life.
<b>Bits per Sample</b>	12
<b>Number of Data Channels**</b>	1
<b>Measurement Averaging Option</b>	No
<b>Cable Length Available</b>	5 m (16 ft)
<b>Length of Smart Sensor Network Cable**</b>	0.5 m (1.6 ft)
	The CE Marking identifies this product as complying with all relevant directives in the European Union (EU).

\* HOBOWare® 3.2.1 or greater is required for the S-SMD-M005 model only (if using HOBOWare).

\*\* A single smart sensor-compatible HOBO station can accommodate 15 data channels and up to 100 m (328 ft) of smart sensor cable (the digital communications portion of the sensor cables). Note that the S-SMD-M005 smart sensor uses more battery power than other models. Therefore, when connecting this smart sensor to H21-00x loggers that use 4 AA batteries, attach no more than 6 of these sensors to maintain battery life of one year.

Note 1: The sensor is capable of providing readings outside the standard volumetric water content range. This is helpful in diagnosing sensor operation and installation. See the *Operation* section for more details.

Note 2: This is a system level accuracy specification and is comprised of the probe's accuracy of ±0.03 m<sup>3</sup>/m<sup>3</sup> typical (±0.02 m<sup>3</sup>/m<sup>3</sup> soil specific) plus the smart sensor adapter accuracy of ±0.003 m<sup>3</sup>/m<sup>3</sup> at 25°C (77°F). There are additional temperature accuracy deviations of ±0.003 m<sup>3</sup>/m<sup>3</sup> / °C maximum for the probe across operating temperature environment, typical <0.001 m<sup>3</sup>/m<sup>3</sup> / °C. (The temperature dependence of the smart sensor adapter is negligible.)

Note 3: Given the nature of the sensor design and sensor operating frequency, the system has inherent susceptibilities to Radio Frequency signals. The accuracy specification when subjected to certain RFI environments, such as those outlined in IEC 61000-4-3 and IEC 61000-4-6, may be significantly reduced.

The system level accuracy will be particularly affected when placed in an electric field of 3 V/m or greater in the 150 KHz to 1000 MHz range. RFI mitigation practices and physical deployment changes may reduce the systems susceptibility, however will yield reduced system accuracy. If deployments are planned in high RFI energy environments, Onset recommends on-site testing to determine system level accuracy.

**ONSET**

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