12-Bit Temperature Smart Sensor (S-TMB-M0xx) Manual

The 12-bit temperature smart sensor is designed to work with HOBO® stations. The smart sensor has a plug-in modular connector that allows it to be added easily to a HOBO station. All sensor parameters are stored inside the smart sensor, which automatically communicates configuration information to the station without any programming or extensive user setup.

12-Bit Temperature Smart Sensor

Models: S-TMB-M002
   S-TMB-M006
          S-TMB-M017

Accessory:

- Solar radiation shield (RS3-B)

Specifications

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Measurement Range	-40° to 100°C (-40° to 212°F) – sensor tip
Accuracy	< ±0.2°C from 0° to 50°C (< ±0.36°F from 32° to 122°F), see Plot A
Resolution	<0.03°C from 0° to 50°C (<0.054°F from 32° to 122°F)
Drift	<0.1°C (0.18°F) per year
Response Time	<2 minutes typical, in 2 m/sec (4.5 mph) moving air flow <1 minute typical in stirred water bath
Operating Temperature Range (In-cable Electronics)	-40° to 75°C (-40° to 167°F)
Environmental Rating	Sensor tip and cable jacket: Immersion in water up to 50°C (122°F) for 1 year
Housings	Stainless steel waterproof sensor tip; weatherproof PVC housing for smart sensor adapter
Dimensions	Temperature probe: 5.1 x 33 mm (0.2 x 1.3 inches)
Weight	2 meter: 0.09 g (3.3 oz) 6 meter: 0.14 g (5.2 oz) 17 meter: 0.30 g (11.2 oz)
Bits per Sample	12
Number of Data Channels*	1
Measurement Averaging Option	Yes
Cable Lengths Available	2 m (6.6 ft) S-TMB-M002 6 m (19.7 ft) S-TMB-M006 17 m (55.8 ft) S-TMB-M017
Length of Smart Sensor Network Cable*	0.5 m (1.6 ft) for all models
CE	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).
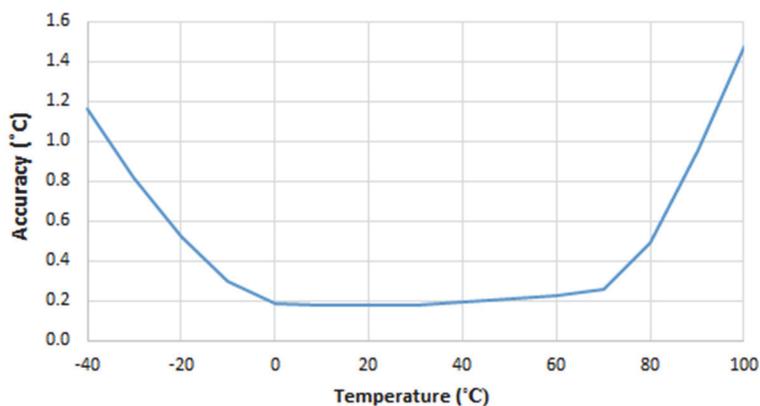
**Plot A: 12-Bit Temperature Smart Sensor Accuracy**

Mounting

Use the cable ties included with the solar radiation shield (RS3-B) to secure the smart sensor in the radiation shield as shown at right (see the Solar Radiation Shield manual for additional assembly details).
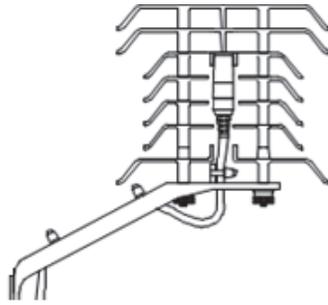
Mounting Considerations

- Mount the sensor so that at least 10 cm (4 inches) of the sensor cable is placed in the medium that is being measured. The temperature sensor is approximately 0.32 cm (1/8 inch) from the end of the stainless steel tip.

- To provide long-term protection from moisture entry, the smart sensor adapter must be mounted horizontally and with the cable wires routed with drip loops so that water drains away from the cable entry point as shown in the example below. When mounted properly, the housing is weatherproof (but not waterproof).

Smart sensor adapter mounted horizontally

Drip loop

Drip loop
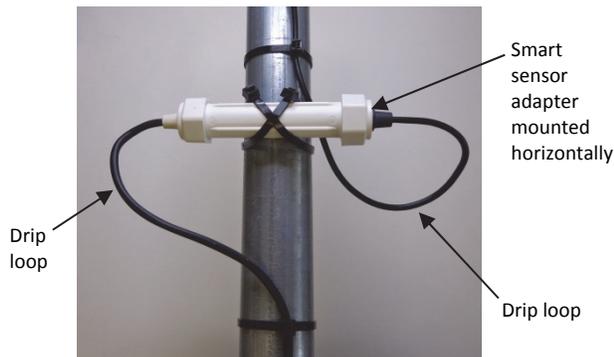
- If the sensor cable is left on the ground, it is recommended that you use conduit to protect against animals, lawn mowers, exposure to chemicals, etc.

- If you are mounting the sensor in water, place the sensor cable on the side of the mounting post facing downstream. This helps protect the sensor cable from getting damaged by floating debris.

- The solar radiation shield is strongly recommended when measuring outdoor air temperatures. Solar radiation can significantly affect the air temperature readings.

- To minimize measurement errors due to ambient RF, use the shortest possible probe cable length and keep the probe cable as far as possible from other cables.

- Refer to the station manual and Tripod Setup Guide for more information regarding setting up stations.

Connecting the Sensor to a Station

To connect the sensor to a station, stop the station from logging and insert the smart sensor's modular jack into an available smart sensor port on the station. See the station manual for details on operating stations with smart sensors.

Operating Environment

The 12-bit temperature smart sensor can be used in air, soil, or water. The sensor is designed to last at least one year in water as warm as 50°C (122°F). If the smart sensor is continually exposed to water for more than a year, it will eventually drift. Exposure to water above 50˚C (122°F) is not recommended and may significantly reduce the life of the sensor.

Response Time

The 12-bit temperature smart sensor has 90% response times of <2 minutes in 2 m/sec (4.5 mph) moving air flow (<1 minute typical in stirred water bath). Faster sensor response times are not always better because they are more likely to be affected by transient conditions. Ideally the response time of a sensor should be the same order of magnitude as the logging interval. For typical logging intervals of 10 to 30 minutes, this smart sensor's response time of <2 minutes is an acceptable match, however, measurement averaging may be useful for longer logging intervals (see the *Operation* section).

Operation

The 12-bit temperature smart sensor supports measurement averaging. When measurement averaging is enabled, data is sampled more frequently than it is logged. The multiple samples are then averaged together and the average value is stored for the interval. For example, if the logging interval is set at 10 minutes and the sampling interval is set at 1 minute, each recorded data point will be the average of 10 measurements. Measurement averaging is useful for reducing noise in the data and preventing aliasing, which can occur when the temperature varies more rapidly than it is being measured. It is recommended that you use measurement averaging whenever the 12-bit temperature smart sensor is placed in an area where the temperatures can change quickly with respect to the logging interval, for example, placed in front of a cycling air vent while using a relatively long logging interval. Note that fast sampling intervals (less than 1 minute) may significantly reduce battery life.

Maintenance

The 12-bit temperature smart sensor does not require any maintenance other than an occasional cleaning. If necessary, rinse the sensor and cable with mild soap and fresh water.

Verifying Accuracy

It is recommended that you check the accuracy of the 12-bit temperature smart sensor annually. The 12-bit temperature smart sensor cannot be calibrated. Onset uses precision components to obtain accurate measurements. If the smart sensor is not providing accurate data, then it may be damaged or worn out if it has been in use for several years.