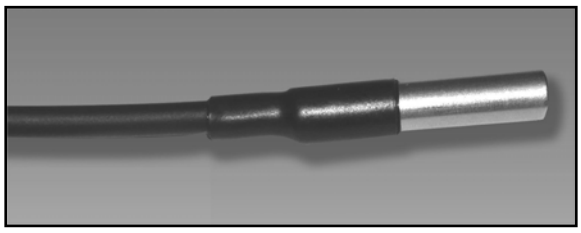
12-Bit Temperature Smart Sensor (Part # S-TMB-M0XX)

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 logger without any programming or extensive user setup.



Specification	12-Bit Temperature Smart Sensor
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 Figure 1
Resolution	< 0.03°C from 0° to +50°C (< 0.054°F from +32° to +122°F), see Figure 1
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: 7 x 38 mm (0.28 x 1.5 in.)
Weight	2 meter: .09 g (3.3 oz) 6 meter: .14 g (5.2 oz) 17 meter: .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
Part Number	S-TMB-M002 (2 meter cable) S-TMB-M006 (6 meter cable) S-TMB-M017 (17 meter cable)
CE Specification	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).

Part #: MAN-S-TMB
Doc #: 7105-G

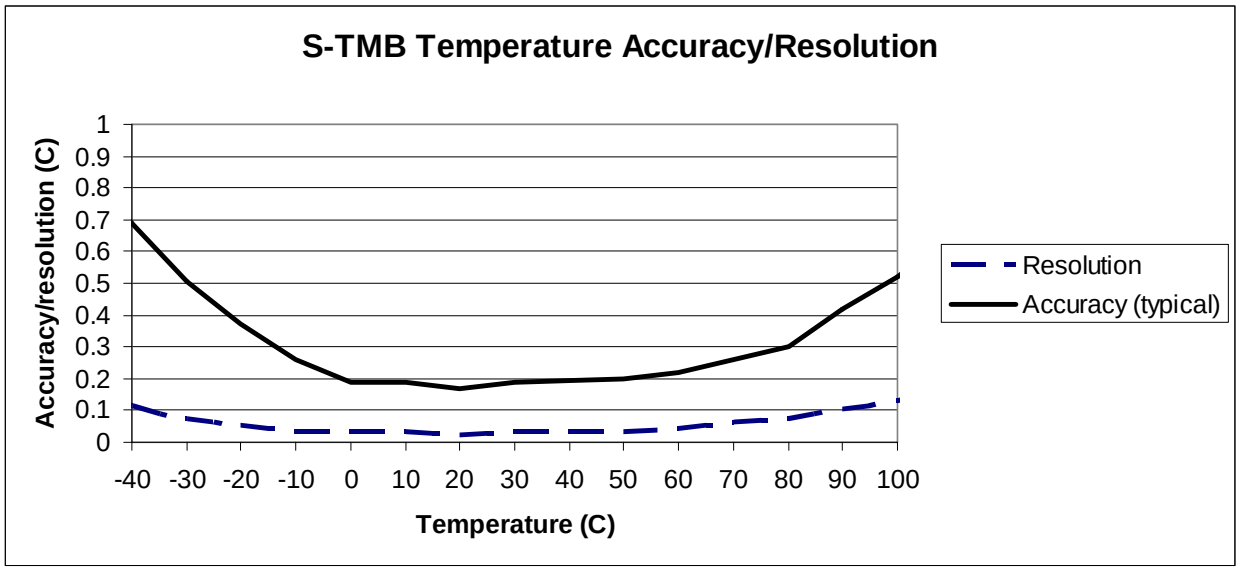


Figure 1: 12-Bit Temperature Smart Sensor Accuracy and Resolution

Inside this package

- 12-Bit Temperature Smart Sensor

Mounting

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.
- 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 (Part # M-RSA) 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 *HOBO Station Tri-pod Setup Guide* for more information about setting up complete HOBO Stations.

Optional Accessories

- Solar Radiation Shield (Part # M-RSA)

Installing the temperature sensor into the solar radiation shield

Use the ¼ inch cable clamp, washer, and screw (included with the solar radiation shield) to secure the sensor in the solar radiation shield as shown below.

1. Remove the bottom two shield plates by removing the three wing nuts.
2. Install the temperature sensor using the small black loop clamp, washer, and screw (see Figure 23).

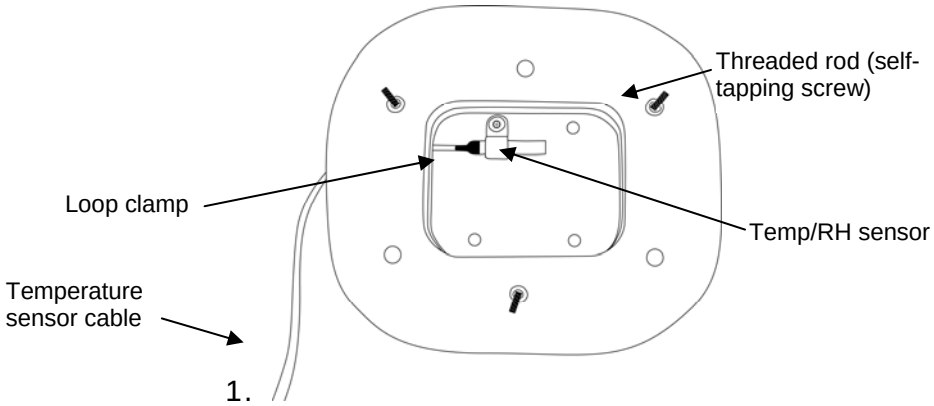


Figure 2: Temperature sensor inside solar radiation shield

Mounting the Solar Radiation Shield to the Tri-pod Mast

1. Mount the white solar radiation shield assembly onto the upper mast using the two U-bolts provided (see Figure 3).
2. Position the solar radiation shield to the desired height and tighten the U-bolt assemblies. Optimum orientation of the solar radiation shield is to face it into the direction of the predominant wind.
3. Feed the cable out through the third and fourth shield plates (see Figure 3).

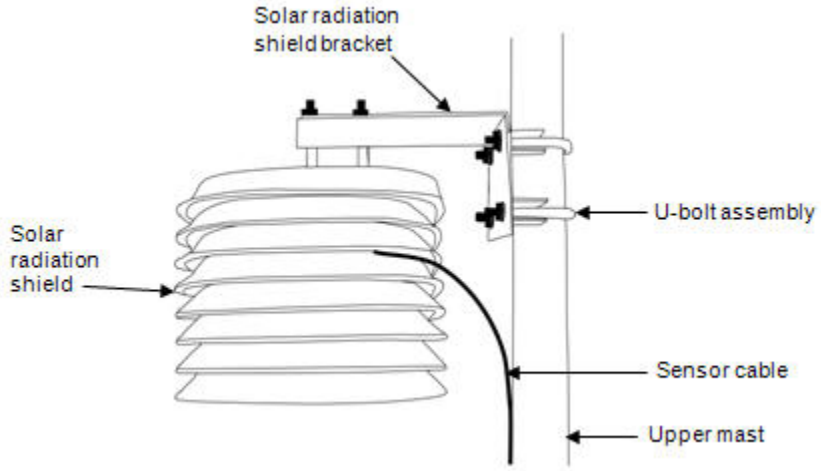


Figure 3: Mounting Solar Radiation Shield

4. Replace the bottom two shield plates.

Connecting the Sensor to a Logger

To use the 12-Bit Temperature smart sensor, stop the HOBO Station logger and insert the sensor's modular jack into an available port on the logger. If a port is not available, use a 1-to-2 adapter (Part # S-ADAPT), which allows you to plug two sensors into one port. The next time you use the HOBO Weather Station, it will automatically detect the new smart sensor. Note that the HOBO Weather Station supports a maximum of 15 data channels; this sensor uses one data channel. Launch the logger and verify that the sensor is functioning correctly.

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 below).

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 Sensor 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. If you are unsure of the smart sensor's accuracy, you can send it back to Onset for re-certification. Contact Onset or your place of purchase for a Return Merchandise Authorization (RMA) number and associated costs prior to sending it.